Chapter 3 Affected Environment and Consequences

This chapter presents the environmental consequences of the project alternatives to 15 elements of the environment, as well as cumulative environmental effects and other environmental considerations.

As discussed in Chapter 2, *Alternatives Considered*, FHWA and WSDOT modified the project between publication of the Draft and Final EIS based on additional technical information. These modifications applied to all of the build alternatives. Because of these modifications, the impacts presented differ in some respects from the values presented in the Draft EIS. Impact data for the No-Build Alternative was carried forward from the Draft EIS.

The lead agencies have committed to mitigate environmental impacts that cannot be avoided or minimized. Mitigation is based on legal requirements and performance standards, which establish specific thresholds for project actions. To meet these commitments, the lead agencies will carry out specific compensatory mitigation, and will implement BMPs during construction. BMPs are tools or actions designed to achieve a desired result by establishing factors such as the timing of construction, construction methods, or methods to protect specific resources.

As WSDOT completes the project design and construction plans, it will include and use BMPs designed to meet the project commitments and performance standards for each resource. Example BMPs specific to each discipline are found in each section of Chapter 3. The effectiveness of the BMPs will be monitored as part of WSDOT's construction compliance program. This will allow WSDOT to adjust or replace BMPs in order to assure compliance with performance standards and meet project commitments.

3.1 Geology and Soils

This section discusses potential impacts of the project alternatives to geology and soils. This section also discusses the management of soil and rock materials during construction. The study area for geology and soils includes the regional geology, soils, and hazards that are near, underlie, or are located along the project area.

More information on regional geology can be found in Section 3.1 of the Draft EIS and the *Geology and Soils Discipline Report* (WSDOT 2002e).

What new information has been developed since the Draft EIS?

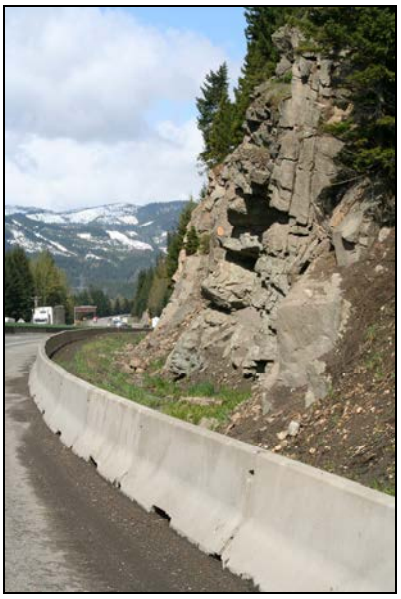
WSDOT has conducted several geologic and geotechnical investigations in the project area since the Draft EIS was completed. These include investigations to further assess the sub-surface soil and rock conditions between Hyak and Keechelus Dam to determine earthquake seismic design criteria, and to examine the stability of several rock slopes and the feasibility of various design approaches (Golder and Wyllie & Norrish 2005, WSDOT 2007b, Wyllie & Norrish 2006). WSDOT also tested rock for use as construction materials. Additional reports include the *Materials and Staging Report* (Appendix E), *Unstable Slopes on I-90 Snoqualmie Pass*, which was requested by the Governor of Washington State (Appendix G), and *Avalanche Loads and Risk on Proposed Viaduct East Shed Area, I-90* (Appendix F).

WSDOT used the results of these technical studies in the *Value Engineering Study Report* (WSDOT 2006a) and CEVP studies. Information from these reports and studies, as well as comments from the public and reviewing agencies, has been incorporated into this section.

What are the major characteristics of the affected environment?

Regional Geology and Soils

The geology in the project area is complex. In general, the highway is underlain by a variety of loosely arranged glacial and stream deposits, and rock units consisting of volcanic and terrestrial sedimentary layers, many of which are fractured and considered hazardous. Deposits from lakes or peat soil underlie the project area adjacent to Keechelus Lake and Swamp Lake. Metamorphic rock common to the Cascade Range, known as the Shuksan Greenschist, underlies the eastern portion of the project area. Major fault systems exist, but none are known to be seismically or geologically active. The project area includes areas with erosion, landslide, rock fall, and avalanche hazards.



Fractured rock is common throughout the project.

Surface Features

The project area lies within the alpine zone on the east side of the Cascade Mountains. The general topography is one of mountainous ridges and peaks, with deep, glacially carved valleys. Most of the valleys exhibit surface features, or geomorphology, typically associated with glacial erosion. The most prominent mountain features surrounding the project alignment are Rampart Ridge, Keechelus Ridge, and Amabilis Mountain. See Section 3.1.1.5 of the Draft EIS for more details.

Rock Resources

The predominant surface material from Hyak to Keechelus Dam is rock from construction of the existing highway, along with glacial, stream, and lake deposits. Glacial materials dominate the surface geology east of Keechelus Dam. The depth of the glacial materials varies along the project area. In areas along the valley bottom and stream channels, the glacial material may be very deep. Several feet of glacial rock is found on all but the steepest slopes outside the limits of the valley bottoms. Some of this rock may be useable during project construction, and WSDOT has assessed several potential rock sources (Appendix E).

Geotechnical crews evaluate rock for design concerns and potential use in road construction. (Shown: Slide Curve)

Soil Resources

In general, project area soils are deep and well drained with moderate permeability, as discussed in Appendix C of the Draft EIS.

Geologic Hazard Areas

Geologic hazards along the existing highway include erosion, unstable slopes, avalanche, and earthquake hazard areas. The locations of unstable slopes and avalanche hazard areas are shown in Exhibit 2-11 in Chapter 2. Further information is available in Section 3.1.1.4 of the Draft EIS, in the geotechnical and rock slope investigations (WSDOT 2007b, Wyllie & Norrish 2006), and in *Avalanche Loads and Risk on Proposed Viaduct East Shed Area, I-90* (Appendix F).

Erosion Hazard Areas

The Draft EIS summarized soil erosion potential, which was identified by reviewing published maps of soil and erosion hazard areas. The analysis identified erosion hazards with potential to deliver sediment to streams.

Unstable Slope Hazard Areas

In the drainages surrounding the highway, WSDOT identified 244 landslides or slope failures. Most of these were classified as "shallow-rapid" events, defined as near-surface landslides consisting of soil and hillside materials with little rock. These events were usually associated with large storms, particularly in areas of recent forest harvest. The inner gorge areas of the steep tributary streams, such as Rocky Run Creek (MP 56.8), are particularly vulnerable to these shallow-rapid slides.

WSDOT regularly cleans landslide debris from I-90 in the project area.

Within the right-of-way, the existing fill embankment beneath the eastbound lane at Slide Curve (MP 59.1 to MP 59.2) is an ongoing landslide hazard due to settling. WSDOT is investigating and monitoring this area as part of ongoing geotechnical investigation, and will identify a solution to this problem during final engineering design.

The highly divided volcanic and sedimentary rocks along the highway are vulnerable to rock fall along many of the existing cut slopes and natural slopes.

WSDOT's goal is to stabilize slopes within the project area.

Rock fall may occur during construction when 1) new cut slopes adversely affect the boundaries between rock types, weakening the rock, or 2) where they are subject to construction activities such as blasting. The vulnerability of the rock slopes depends on the material strength and the character and geometric relations of discontinuities in the rock mass.

Cut slopes may increase unstable slope hazards by redirecting surface water runoff onto landslide areas or areas of high erosion hazard.

Additional geotechnical studies conducted in 2005 determined that the geological integrity of the rock faces in the Keechelus Lake area is sufficiently stable to support the proposed new highway configuration (WSDOT 2007b).

WSDOT has identified and rated 22 unstable slopes in the project area with potential for rock fall. Some slopes have been stabilized under the WSDOT unstable slopes management system. Mitigation for the remaining sites has been deferred to coincide with the I-90 project. Details on the locations and ratings for unstable slopes may be found in the geotechnical studies performed from 2005 to 2007 (WSDOT 2007b, Golder and Wyllie & Norrish 2005).

The potential for slope failures is generally higher where geologic faults intersect rock and soil cuts or natural slopes with loose soil. The highway crosses an inactive geologic fault at MP 64.1 on the north side of Amabilis Mountain near the Cabin Creek Interchange. Currently, WSDOT does not consider this area to have unstable slopes based on the current knowledge of the fault and WSDOT's rating methodology. However, since cut and fill activities are planned for the Cabin Creek Interchange, WSDOT will conduct further geologic and geotechnical investigations as part of the final design for this portion of the project area.

Unstable Slope History

The project area, and especially the area around Slide Curve near MP 59.0, has a history of rock slides. Since 1957, rock slides have caused nine fatalities in the project area.

In 1957, a major rock fall killed several construction workers during road construction. WSDOT concluded that the slide happened because more competent rock material had been weakened or removed during construction activities. Major rock slides also occurred during construction in 1970, resulting in the death of one construction worker.

In response to the danger of rock slides, during the 1960s and 1970s, WSDOT built wide catchment ditches adjacent to the highway shoulders where small-volume events would be captured. Since the mid-1990s, WSDOT has placed concrete barriers along many of the rock fall ditches to improve their effectiveness.

Where slope heights and the volume of falling rock or debris are modest, these treatments have been effective at mitigating the hazards of falling rock. However, large volume slope failures can exceed the capability of the ditch and barrier systems. When this happens, debris can enter the travel lanes. This was the case in February 1998 when one driver was killed, and in September and November 2005 when rock slides occurred at two different locations, one just outside of the project area and one near the snowshed. The September rock slide resulted in three fatalities. The November rock slide caused a short complete closure and an extended partial closure while repairs were made.

WSDOT performed emergency stabilization work at MP 50.3 in 2006 following the 2005 fatalities. As a result of the fatalities in 2005, Governor Christine Gregroire directed WSDOT to evaluate the slope hazards along the I-90 corridor. More details of unstable slope history can be found in the *2006 Conceptual Geotechnical Report - Volume 3 of 5* (WSDOT 2007b) and in Appendix G.

Avalanche Hazard Areas

As discussed in the Draft EIS, there are five avalanche chutes near the existing snowshed (MP 58.1) (Exhibit 3-1). The two avalanche chutes that have historically posed the greatest hazards are ES-3 and ES-4. Both of these avalanche chutes produce numerous small avalanches, although ES-4 presents a greater hazard for the existing eastbound lanes. Historically, an area near MP 59 also has produced small avalanches. ES-5, which is located just east of the snowshed, is considered an extreme hazard for the existing highway, and could experience rare and unusually large avalanches. ES-2, which is located just west of the snowshed, also is considered an extreme hazard (Appendix F).

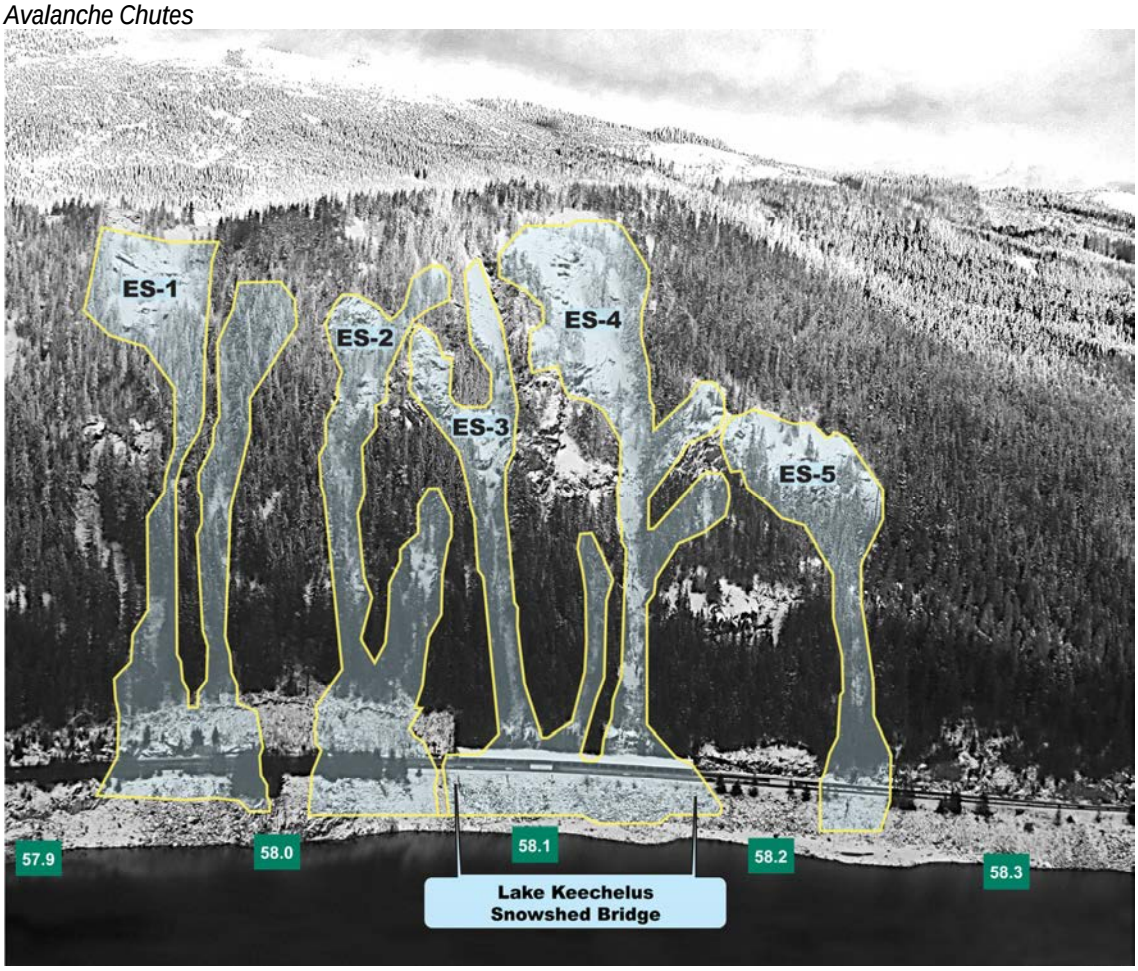
Avalanches regularly block I-90.

Earthquake Hazard Areas

None of the faults in the project area that I-90 crosses are known to be active. However, a relatively strong earthquake in the Seattle area, such as the 2001 Nisqually earthquake, could trigger ground shaking in the project area. Potential effects from earthquake-induced ground shaking could be mitigated by applying standard engineering design techniques, which are governed by national and local building codes.

Soils in the Gold Creek area contain deep zones of loose silt and sand that could liquefy as a result of intense short-duration ground shaking resulting from a large earthquake in Western Washington. This could cause damage to bridges if the bridge foundations were too shallow, since the foundations would sink by several inches. WSDOT would construct all structures in this area with deep foundations to prevent damage as a result of liquefaction.

Exhibit 3-1
Avalanche Chutes



What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

Under the No-Build Alternative, WSDOT would continue its slope stabilization program. This program would provide some direct beneficial effects, including improving safety and reducing the danger of avalanches and rock fall. These beneficial effects would be much smaller than for any of the build alternatives. There would be no indirect beneficial effects.

Build Alternatives

Any of the build alternatives would result in beneficial effects, since reducing hazards due to avalanches and rock fall is part of the project's purpose and need. Beneficial effects would be similar for all of the build alternatives, including the Preferred Alternative.

Erosion Hazard Reduction

Installing larger bridges and culverts would allow water and debris to pass beneath I-90, instead of onto the highway surface. This would reduce maintenance costs and increase public safety.

Unstable Slope Hazard Reduction

WSDOT has designed all of the build alternatives to correct unstable slopes, which would be beneficial to highway safety. Slope stabilization would increase public safety and reduce delays due to rock fall. Stabilization methods would include rock bolting, netting, rock fall ditches, shotcrete treatments, water drainage features, retaining walls, and engineered slopes.

Avalanche Hazard Reduction

One of the greatest beneficial effects would be reducing avalanche hazards at the major avalanche chutes. Reducing avalanche hazards would increase public safety and reduce delays due to avalanche.

Most of the beneficial effects for the project would take place in the Keechelus Lake Alignment area, which is where most of the geologic hazard areas are located. All of the build alternatives would effectively reduce risk of avalanche and rock fall. The difference between the alternatives is that Alternative 1 would avoid major hazard areas by tunneling, while Alternatives 2, 3, and 4 (the Preferred Alternative) would rely on slope stabilization and constructing a larger, longer snowshed. All of the alternatives would meet the project's purpose and need. However, the cost of construction and maintenance vary substantially by alternative, as discussed in Section 2.6, *What would the project cost?*

Earthquake Hazard Reduction

To prevent damage to new bridges during earthquakes, the bridges would be built using deep foundations consisting of drilled shafts of reinforced concrete extending below the liquefiable soils. These shafts would be designed to remain intact during an earthquake.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any direct adverse impacts. The No-Build Alternative would result in indirect adverse impacts as traffic volumes increase over time, and this traffic would be subject to the uncorrected hazards from avalanches and unstable slopes.

Under the No-Build Alternative, WSDOT would continue with its existing slope stabilization program. This program would create temporary adverse impacts from construction during slope stabilization.

Build Alternatives

Temporary Impacts

Temporary impacts to geology and soils would be limited to construction impacts and would be similar for all of the build alternatives.

Excavation. Project construction would require using, transporting, storing, and processing large amounts of fill material, cut material, and aggregate. Exhibit 3-2 shows WSDOT's estimated total cut and fill quantities. While these quantities will change as design is completed, WSDOT believes that these are reasonable estimates for planning purposes.

The Preferred Alternative would result in between 300,000 and 700,000 cubic yards of excess material during Phase 1 of construction. WSDOT would remove most of this material from the existing rock cuts between MP 57.1 and MP 59.3. The final amount of excess materials would depend on the contractor's methods and the amount of excavated material that could be re-used for aggregate.

WSDOT may use the majority of this material near Slide Curve, where the profile of the westbound lane would be raised and additional material would be required. Some of the excess material may be suitable for use as select wall backfill or as aggregate for the crushed surfacing base course. It would not be suitable for asphalt concrete pavement or Portland cement concrete pavement. WSDOT will develop detailed calculations of the amount of material that is available and needed prior to permitting.

Exhibit 3-2
Estimated Cut and Fill Volumes (thousand cubic yards)

	Keechelus Lake Alignment Alternatives				CEA Improvement Packages			
Material Type	**1**	**2**	**3**	**4 (PA)**	**A**	**B**	**C**	**PA**
Highway Excavation	362	842	847	451	2,077	2,085	2,218	3,480
Tunnel Excavation	1,907	615	307	0	0	0	0	0
Total Cut	**2,269**	**1,457**	**1,154**	**451**	**2,077**	**2,085**	**2,218**	**3,480**
Common Embankment	374	344	357	376	2,850	2,400	1,865	3,050
Select Wall Backfill	39	178	279	344	73	73	73	680
Total Fill	**413**	**522**	**636**	**720**	**2,923**	**2,473**	**1,938**	**3,730**
Net Cut/Fill	**1,856**	**935**	**518**	**(269)**	**(846)**	**(388)**	**280**	**(250)**

CEA – connectivity emphasis area
PA – Preferred Alternative

Aggregates. Exhibit 3-3 shows WSDOT's estimated aggregate quantities for the project. These quantities would be similar for all of the build alternatives, since WSDOT would widen the highway to three lanes in each direction and replace all of the existing pavement under all alternatives.

Exhibit 3-3
Estimated Aggregate Quantity Summary (cubic yards)

Material Type	Phase 1	Remaining Project Area
Crushed Surfacing Base Course	58,000	228,000
Asphalt Aggregate	28,000	90,000
Portland Cement Concrete Pavement Coarse Aggregate	43,000	80,000
Portland Cement Concrete Pavement Sand	15,000	46,000

WSDOT identified five potential aggregate sources in the project area, which were evaluated in the *Materials and Staging Report* (Appendix E). WSDOT's preferred site for aggregate is Pit Site PS-S-255 at Rocky Run Creek.

Sand, gravel, and crushed rock are the most common **aggregate** types used for road building.

Pit site PS-S-255 contains approximately 500,000 cubic yards of material, of which only 50 percent is suitable for aggregate. This material was deposited as a composite alluvial fan from Rocky Run Creek and is exposed only during low lake levels. WSDOT could only extract the aggregate material when Keechelus Lake water levels are low enough to gain access to the site.

WSDOT's use of this site would be in consultation with USBR, which manages Keechelus Lake. Removing rock from Pit site PS-S-255 would mitigate the potential decrease of lake storage capacity from additional fill to Keechelus Lake, as discussed in Section 3.3, *Water Resources*.

At this site, WSDOT plans to excavate only the amount necessary to mitigate for the project's irrigation storage impacts to Keechelus Lake. The primary impact from extracting this aggregate material for construction would be depletion of this resource. However, over time, natural deposition processes from Rocky Run Creek would replenish these materials. Consequently, WSDOT considers removal of this material to be a temporary impact.

Although several other existing rock sources exist outside the project area on USFS lands, WSDOT does not intend to develop additional rock source sites on these lands. Private rock sources may be used for specialized materials as needed; however, these sites would be subject to environmental review and permitting, and would be required to be consistent with the ecological connectivity objectives of the MDT.

Staging, Stockpiling, and Processing. WSDOT identified sites that were already disturbed to use for staging, stockpiling, and processing. Even so, storing cut and fill materials may cause impacts on resources such as wetlands. WSDOT has inventoried the potential staging and stockpiling sites for wetlands, and will examine

them further as part of the permitting process. WSDOT believes that impacts can be eliminated through avoidance, minimization, timing, and construction BMPs. Restoring the sites following completion of the project would create a substantial environmental benefit. WSDOT is tracking the issue of site restoration through their Commitment Tracking System.

Additional information on materials, staging, stockpiling, and processing sites is available in the *Materials and Staging Report* (Appendix E), and illustrated in Exhibit 2-20 in Chapter 2.

Transporting Materials. Transporting cut and fill material could impact traffic flow. Impacts would be highest at the four interchanges within the project area. A more detailed discussion of transportation impacts can be found in Section 3.7, *Transportation,* and in the *Transportation Discipline Report* (Appendix P).

Disposal of Materials. Phase 1 of the project would result in 300,000 to 700,000 cubic yards of surplus material. Most of this material would be used at Slide Curve, although WSDOT may dispose of some material off site. Disposal would be conducted under permit by the contractor. Permit conditions will be developed in conjunction with appropriate regulatory agencies.

Erosion Hazards. Constructing the project has the potential to increase erosion, especially in areas with soft and loose soil conditions. Erosion also could occur in areas where grades direct surface water to vulnerable areas, fill embankments are constructed near soft or loose soil, or where construction occurs in streams or Keechelus Lake. Areas most susceptible to erosion are located along Keechelus Lake, especially in areas of soft and potentially liquefiable soil in the vicinity of the proposed bridges crossing Gold Creek. WSDOT will mitigate for these soil conditions by designing appropriate deep foundations for the highway structures. BMPs would be used to minimize project area erosion.

For Keechelus Lake Alignment Alternatives 1, 2, and 3, hazards associated with rock stability during tunneling would depend on site-specific engineering design and construction techniques, as well as

on the inherent site conditions. Groundwater drainage from tunnel excavations also could affect high-erosion hazard areas. The hazards associated with tunneling would be less for Alternatives 2 and 3, which include shorter tunnels.

Unstable Slope Hazards. Construction activities such as blasting and grading can create landslide conditions. Temporary drainage associated with road construction could trigger shallow debris slides along the highway if BMPs are not properly implemented, or if runoff is routed onto a slope with potentially unstable soils. WSDOT does not expect most of the identified landslide or slope failure hazards to directly affect the highway, as long as bridges and culverts are large enough to allow slide debris to pass beneath the highway. Highway design features and BMPs would minimize landslide hazards**.**

Construction activities may increase rock fall hazards temporarily where new slopes intersect either weak rock or loose or marginally stable slopes, especially along Keechelus Lake. WSDOT does not expect these impacts to continue past the construction period. All the build alternatives would include stabilizing rock slopes.

Geologic and geotechnical investigations have assessed the feasibility of planned and potential rock cuts, and provided a preliminary assessment of potential measures for stabilizing slopes necessary to obtain an acceptable safety factor. WSDOT will perform more detailed investigations and analysis of the rock slopes along the entire alignment and use this information during final design.

Avalanche Hazards. WSDOT does not expect construction activities to increase avalanche hazards, since work will not take place during the winter.

Permanent Impacts

Permanent impacts are those associated with ongoing highway operation. None of the build alternatives would result in substantial direct or indirect permanent impacts to geologic and soil resources.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT has worked to avoid and minimize impacts to geology and soils by conducting extensive geotechnical investigation and by designing the project based on the findings of that investigation. The project has been designed to avoid areas of unstable soil and rock to the greatest extent possible, and to stabilize these areas where necessary.

Best Management Practices

BMPs for geology and soils will be designed to meet applicable commitments and performance standards, including:

- National Pollutant Discharge Elimination System (NPDES) General Permit for Construction Activities
- NPDES General Permit for Sand and Gravel Operations
- Temporary Erosion and Sediment Control Plans
- Erosion and sediment control requirements of the WSDOT *Design Manual* (WSDOT 2007c) and *Standard Specifications for Road, Bridge, and Municipal Construction* (WSDOT 2008b)
- Spill Prevention, Control and Countermeasure Plans
- Applicable permit requirements
- Conditions imposed by the USFS related to use of federal land for additional easement
- Applicable conservation measures included in the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) ESA Consultation Concurrence Letter (NOAA Fisheries 2008)

- Applicable parts of the *Implementing Agreement between the Washington State Department of Ecology and the Washington State Department of Transportation* (Ecology and WSDOT 1998), or as revised

- Objectives of the USFS ACS

- Construction safety requirements and maintaining operation of the highway during construction, including Occupational Safety and Health Administration requirements and highway safety standards

Some example BMPs that WSDOT could use to comply with these standards would include requiring:

- Covered loads

- Short-term stabilization during construction, including seasonal shut-down and stabilization procedures

- Perimeter ditching or other erosion control measures

- Plastic sheeting in severe weather to protect sub-grades or fill materials

- Staged fill placement or surcharges

- Temporary walls

- Temporary crushed rock armoring of exposed soil

- Approved water diversions to avoid streambank destabilization

- Soil preparation and integrated vegetation management, as well as design meeting the roadside master plan for roadside vegetation mitigation measures

- Blasting and removal in lifts rather than large blasts

- Rock fall fencing and netting at high risk locations
- Piling material at regulated levels
- Rock ballast for buttressing in landslide areas
- Temporary containment fences for rock fall and avalanches
- Replacing soft or unsuitable foundation materials
- Rock bolting, netting, drainage, shotcrete, terracing, rock fall ditches, and other methods to mitigate rock fall hazard areas and unstable slopes
- Slope monitoring as needed, such as optical or physical stationing, to monitor and track expected slope movement or settlement
- Additional core sampling to understand underlying material and geology
- Barges and large drilling equipment for lake shore placement of drilled caissons in soft or loose conditions
- Placing compacted soil or rock to span poor sub-grade areas, and to more evenly distribute loads or settlement

Compensatory Mitigation

Since there will be no permanent adverse impacts to geology and soils, no compensatory mitigation will be required.

3.2 Air Quality

Motor vehicle emissions can affect air quality.

This section discusses the expected impacts of the project alternatives to air quality. Air quality is discussed in terms of the area affected, the applicable air quality regulations, and the key air pollutants. The study area for air quality varies with the potential pollutant.

Further information on air quality impacts can be found in Section 3.2 of the Draft EIS and in the *Air Quality Discipline Report* (WSDOT 2003b).

What new information has been developed since the Draft EIS?

No new issues were introduced and WSDOT did not conduct any new analysis beyond that which was done for the Draft EIS. Comments from the public and reviewing agencies have been incorporated into this section.

What are the major characteristics of the affected environment?

What are the key potential pollutants?

Carbon monoxide (CO) in vehicle exhaust is the primary pollutant of concern because of its potential to cause CO hotspots. Consequently, CO is the primary focus of the analysis and the only pollutant for which WSDOT performed predictive modeling.

"Hotspots" are locations where emissions from specific sources may expose individuals and population groups to elevated risks of adverse health effects.

Other potential pollutants include ozone precursors and particulate matter. Ozone precursors are volatile organic compounds and nitrogen oxides, which are emitted by vehicles; however, WSDOT does not expect them to produce substantial localized or regional air pollution impacts. Particulate matter less than 10 microns in diameter (PM_{10}) is emitted in vehicle exhaust, and released by tire and brake wear. Motor vehicles also emit sulfur oxides and nitrogen oxides, but the impact of these pollutants near highways is generally

low. Refer to the *Air Quality Discipline Report* (WSDOT 2003b) for more details.

What is the area of potential environmental impact?

For CO, the area of potential environmental impact is the same as the project area. Because of this, WSDOT modeled existing and future CO concentrations within 500 feet of I-90 throughout the project area.

The impact of fugitive dust and PM_{10} from construction activities usually occurs adjacent to construction areas. The area of potential environmental impact for these emissions is within the project area, in proximity to proposed construction.

For nitrogen oxides and volatile organic compounds, the area of potential environmental impact is Kittitas County, including the Alpine Lakes Wilderness Area north of I-90. (See Exhibit 1-3 in Chapter 1, *Purpose and Need*.) The effect of these chemicals on ozone levels usually occurs several hours after they are emitted and can occur many miles from the source.

What are the applicable air quality standards?

Ambient Air Quality Standards

The Washington State Department of Ecology (Ecology) Central Regional Office in Yakima enforces air quality regulations in Kittitas County. The United States Environmental Protection Agency (USEPA) National Ambient Air Quality Standards (NAAQS) and Ecology's suspended particulate regulations apply. These regulations are designed to limit emissions from air pollution sources, and to minimize concentrations of pollutants in the outdoor air. Unless the State has adopted more stringent standards, the NAAQS apply.

Regional Air Quality Standards

Ecology maintains a network of air pollutant monitoring stations throughout the state. These stations are located in areas where there may be air quality problems, usually in or near urban areas or close

to large air pollution sources. A limited number of additional stations are located in remote areas to provide a measure of regional background air pollution levels.

One air pollutant monitoring station in Kittitas County in Ellensburg measures PM_{10} and in one North Bend measures ozone and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). Another monitoring station at the top of the Snoqualmie Pass Ski Area measures air quality values as part of the national network of the Interagency Monitoring of Protected Visual Environments Program. Based on monitoring information collected over a period of years, state and federal agencies designate regions as being "attainment," "non-attainment," or "unclassifiable" areas for regulated air pollutants. "Attainment" means that air quality in an area meets the federal health-based ambient air quality standards. The project area is in an attainment area for ozone and PM_{10}. There are no substantial local or regional sources of ozone precursors. Because of this, WSDOT did not develop a qualitative analysis of photochemical ozone for the Draft or Final EIS.

Prevention of Significant Deterioration

The Clean Air Act Section 162 established the goal of preventing significant deterioration of air quality in all international parks, national parks that exceed 6,000 acres, and national wilderness areas that exceed 5,000 acres, if these areas were in existence on August 7, 1977. These areas were defined as mandatory Class I areas, where any appreciable deterioration of air quality is considered significant.

The Alpine Lakes Wilderness Area is a Class I area under the Clean Air Act.

The Clean Air Act allows almost no air quality degradation in Class I areas resulting from proposed emission sources, and Clean Air Act Section 169A established the additional goal of preventing impairment of visibility in Class I areas. The 1999 USEPA Regional Haze Regulation also directs states to achieve "natural" visibility conditions in Class I areas within the next 60 years. The closest Class I area to the project site is the Alpine Lakes Wilderness Area, whose nearest border is about one mile northeast of I-90.

What is the current air quality in the project area?

The air pollutant monitoring site nearest to the project is Ecology's monitoring site 0017, located in North Bend. The site collects data on ozone, $PM_{2.5}$, wind, and temperature.

Overall, air quality in the area is considered good. Data collected during the period between January 1, 2002 and December 31, 2004 showed that on 991 days out of the 1,041 days for which data were collected, the site had an air quality index value less than or equal to 50, which is considered to be "good" air quality with no advisories to citizens. There were 48 days with values between 51 and 100, which is considered "moderate" with an advisory to unusually sensitive individuals to consider limiting prolonged outdoor exertion. Two summer days had values over 100, which is considered "unhealthy for sensitive groups" with an advisory to sensitive individuals to limit prolonged outdoor exertion.

The criteria air pollutant report for Kittitas County reported 100 percent days of "good" air quality values in 2003, and no PM_{10} exceedances (USEPA 1999).

What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would not result in any beneficial direct or indirect effects.

Build Alternatives

Any of the build alternatives would result in beneficial direct effects to CO concentrations by reducing traffic congestion. This improvement would continue at least until traffic congestion reaches present levels once again. There would be no indirect beneficial effects.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any direct adverse impacts. The No-Build Alternative would result in increased traffic congestion; however, the Draft EIS concluded that this would not result in violation of any applicable air quality standards.

Build Alternatives

Temporary Impacts

Any of the build alternatives would result in temporary adverse impacts from construction.

Fugitive Dust. Construction activities would produce fugitive dust due to wind erosion and by operating construction equipment on exposed earth surfaces. Dust emissions depend on soil types and moisture. Fugitive dust releases generally constitute the largest source of PM_{10} during construction. Most of the dust particles would settle out adjacent to construction areas, while a small fraction would be transported further downwind and would contribute to the regional ambient PM_{10} level. Air quality impacts caused by construction equipment emissions are short-term and would cease upon completion of construction activities. Implementing the BMPs described at the end of this section would minimize fugitive dust emissions and eliminate adverse air quality impacts.

Slash Disposal. Wood debris generated during construction will be used as habitat features or chipped and mulched whenever possible. However, some material may be burned for disposal, producing dust and smoke. If material is burned, WSDOT would obtain permits or approvals from Ecology, Washington Department of Natural Resources (WDNR), and the USFS. Burning would occur only during favorable weather conditions.

Odors. Short-term, localized odors might be generated by exhaust from construction equipment, asphalt paving, line painting, and burning. Because of the rural nature of the project area and the relatively large distances to sensitive receptors, WSDOT does not

expect that these temporary odor emissions would produce any adverse air quality impacts.

Combustion Emissions from Construction Equipment. Mobile construction equipment and portable stationary engines would emit air pollutants from combustion, including nitrogen oxides, CO, PM_{10}, and toxic air pollutants. Because of their temporary and intermittent nature, the concentrations of such emissions would be substantially lower than the applicable air quality standards. Also, because of the rural nature of the project and the minor amount of PM_{10} released by mobile sources, WSDOT does not expect PM_{10} emissions associated with the I-90 project to result in substantial environmental effects.

Emissions from Temporary Stationary Sources. Highway construction could require operating temporary asphalt plants, concrete batch plants, and gravel borrow pits. These operations would be subject to permitting by Ecology's Central Regional Office. Emission controls would be required based on best available control technology. With these controls, WSDOT anticipates that ambient pollutants would not exceed the NAAQS or Washington State standards.

Permanent Impacts

A permanent impact occurs when air quality standards are exceeded. The Draft EIS concluded that the environmental impacts to air quality would be the same for the No-Build Alternative and any of the build alternatives. The Draft EIS also concluded that under any of the build alternatives, federal, state, and regional air quality standards would be met, including the NAAQS and Clean Air Act standards. WSDOT analyzed potential permanent impacts from CO and toxic air pollutants.

Impacts from Carbon Monoxide. The Draft EIS concluded that the CO modeling analysis found in the *Air Quality Discipline Report* (WSDOT 2003b) represented the potential CO impact from all of the build alternatives studied, including the Preferred Alternative. For the project area, WSDOT conducted CO modeling analysis based on the requirements of Washington Administrative Code (WAC) 173-

420 and USEPA guidelines. WSDOT used the CAL3QHC air quality dispersion model for estimating CO concentrations.

For both existing conditions and future conditions for all of the alternatives, the modeled CO concentrations at all receptors within 500 feet of the highway were much lower than the 1-hour state and federal CO standard of 35 parts per million and the eight-hour state and federal CO standard of nine parts per million.

Traffic congestion can lead to increased carbon monoxide concentrations.

Further, all build alternatives, including the Preferred Alternative, would most likely result in lower CO concentrations than current conditions or the No-Build Alternative, through the projected reduction in traffic congestion. Based on these findings, WSDOT concluded that constructing any of the build alternatives, including the Preferred Alternative, would not produce any adverse air quality impacts from CO.

Impacts from Toxic Air Pollutants. Vehicle emissions from combustion contain toxic air pollutants, which have the potential to produce acute or chronic public health effects, especially in sensitive receptors. In addition to inhalation of toxic air pollutants, some of these toxins may be deposited on soils and surface waters. Toxic air pollutants may then be taken up by plants or ingested by animals, concentrating the toxins up through the food chain.

Due to the mobile nature of toxic air pollutant sources and their relatively low emission rates, WSDOT concluded that emissions from the project highway would produce minimal pollutant impacts in a localized area, and emissions from operating vehicles within the project highway would not produce any adverse air quality impacts to receptors within the project area. Vehicle emissions are almost completely proportional to traffic volumes, and would be similar under either the No-Build Alternative or any of the build alternatives.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT will avoid and minimize air quality impacts as possible throughout the project. Measures may include:

- Staging construction to minimize overall traffic congestion
- Encouraging construction workers to car pool

Best Management Practices

BMPs for air quality will be designed to meet applicable commitments and performance standards, including:

- Permit conditions from Ecology's Central Regional Office for temporary exhaust emissions sources and suspended particulates
- The NAAQS
- Air quality BMPs included as permit requirements or as conditions imposed by the USFS related to use of federal land for additional highway easement

Some example BMPs that WSDOT could use include requiring contractors to:

- Water all active construction areas as needed to control dust
- Cover all trucks hauling soil, sand, and other fine-grained material that would create dust, or require all trucks to maintain at least two feet of freeboard
- Pave, apply water regularly, or apply nontoxic soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites
- Sweep to control dust (with water sweepers) at all paved access roads, parking areas, and staging areas at construction sites

- If practicable, limit traffic speeds on unpaved access roads to 15 mph
- Install erosion control measures to prevent silt runoff to public highways
- Route transport vehicles to minimize the impacts to traffic flow
- Minimize the size of the construction area, cover exposed soil, and re-vegetate disrupted areas as soon as practical
- Construct wind barriers to reduce wind velocity over exposed earth
- Use wheel washers to remove mud from construction vehicles prior to exiting the site to reduce the potential emissions from particulate matter
- Clean road surfaces regularly to reduce re-entrained particulate matter

Exhaust emission control BMPs could include requiring contractors to:

- Use newer construction equipment and maintain all equipment in good mechanical condition to minimize exhaust emissions
- Limit unnecessary engine idle time for vehicles and equipment

Other BMPs could include:

- Re-use wood from downed trees, logs, and removed vegetation as habitat features or chipped and mulched instead of burning whenever possible
- Obtain and comply with applicable permits if slash is burned

Compensatory Mitigation

Since there will be no permanent adverse impacts to air quality, no compensatory mitigation will be required.

3.3 Water Resources

This section discusses the expected environmental impacts of the project alternatives to water resources, including surface water, groundwater, stormwater, floodplains, and stream geomorphology.

The study area for water resources is the Upper Yakima River Sub-Basin, which contains the Keechelus Lake, Lake Kachess, and Lake Easton watersheds. After leaving Hyak, I-90 runs along the north shore of Keechelus Lake and then along the left bank of the Yakima River (looking downstream) for the remainder of the project area. The highway crosses 14 major tributary streams that flow into Keechelus Lake or the Yakima River.

Keechelus Lake is the headwater of the Yakima River.

I-90 and its associated fill, bridges, and culverts influence many hydraulic and hydrologic processes associated with water resources in the project area. The highway impedes passage of surface and groundwater in some areas, creating a barrier to hydrologic connectivity (Appendix D).

Surface water includes lakes, streams, ponds, and wetlands.

Groundwater is water found beneath the earth's surface in saturated soil and rock.

Stormwater is precipitation that runs off impervious surfaces and enters drainage ditches or other features constructed to convey and/or treat it.

Stream geomorphology refers to the processes that form and transform stream channels.

What new information has been developed since the Draft EIS?

Since publishing the Draft EIS, WSDOT has revised and completed several additional technical reports that are relevant to water resources, including:

- *Mitigation Development Team Recommendation Package* (Appendix D)
- *Water Resources Addendum to the EIS* (Appendix H)
- *Stormwater Treatment and BMP Report* (Appendix I)
- *Biological Assessment* (Appendix M)

Hydrologic connectivity is maintaining natural flow paths that transmit water, sediment, and nutrients to and through watersheds, aquifers and streams.

Ecological connectivity is a general term that incorporates hydrologic connectivity. The project's purpose and need statement identifies ecological connectivity as a project need.

- *2006 Conceptual Geotechnical Report, I-90 Snoqualmie Pass East, Hyak to Keechelus Dam, Washington, Volumes 1 through 5* (WSDOT 2007b)

- *Analysis of Groundwater Monitoring Data for Hydrologic Connectivity I-90 Snoqualmie Pass East* (WSDOT 2007d)

- *Draft Technical Memorandum No. 5 - Off-Site Hydrologic & Hydraulic Analyses* (WSDOT 2007e)

- *Technical Memorandum No. 3 – Hydrologic/ Hydraulic Design Standards and Procedures* (WSDOT 2007f)

- *Draft Technical Memorandum No. 4 – Stormwater Quality BMP Selection: Constrained Areas and Mitigation* (WSDOT 2008c)

The Final EIS has been updated to be consistent with these technical reports and with the 2006 amendments to the WSDOT *Highway Runoff Manual* (WSDOT 2006b).

Following identification of the Preferred Alternative, WSDOT formed an interagency Stormwater Technical Committee to assist with problem solving associated with stormwater treatment. The committee includes technical specialists from WSDOT, USFS, Ecology, USFWS, and USEPA. The committee will continue to advise WSDOT through completion of final design, and has concentrated its efforts on areas where specific site conditions pose challenges to meeting the requirements of the *Highway Runoff Manual* (WSDOT 2006b).

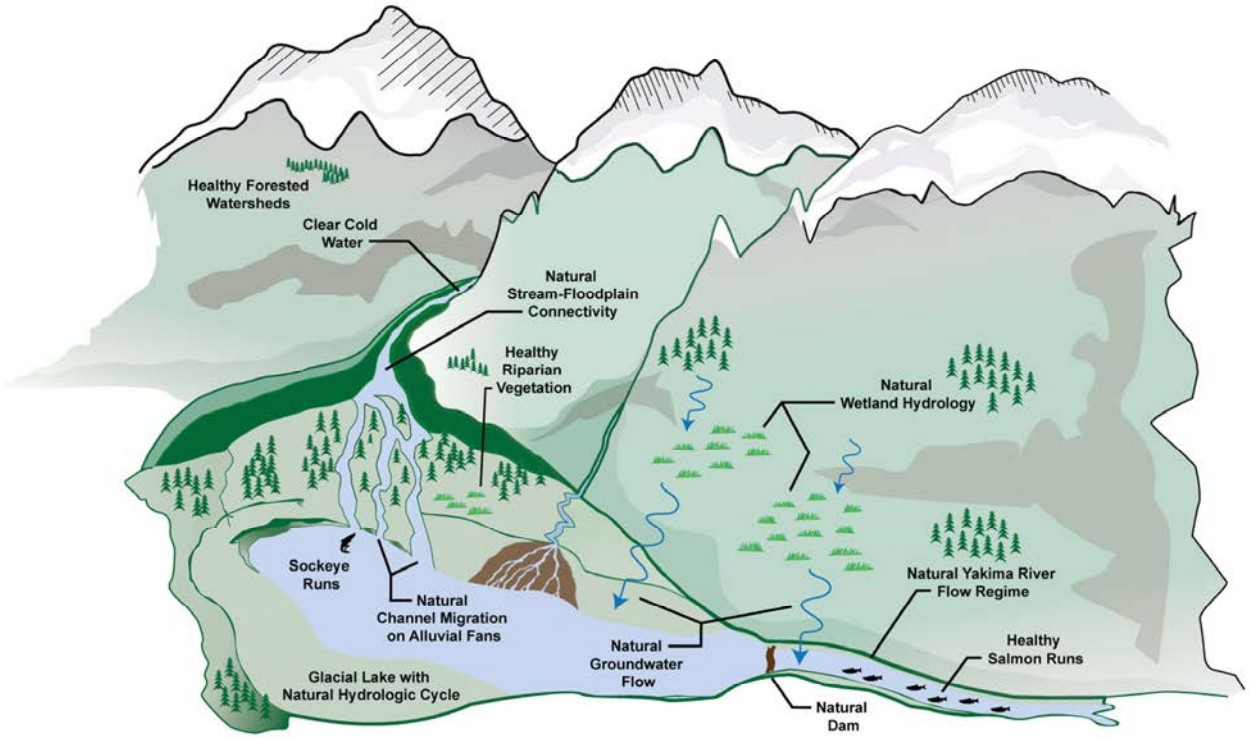
In addition, the lead agencies have incorporated comments from the public and reviewing agencies into this section.

What are the major characteristics of the affected environment?

This section describes the water resources within the project area. The movement of water, or the hydrologic cycle, in project area watersheds has changed over time due to dam construction and the

establishment of the reservoir system, timber harvest, railway construction and construction of I-90. This history is shown in Exhibit 3-4 and Exhibit 3-5.

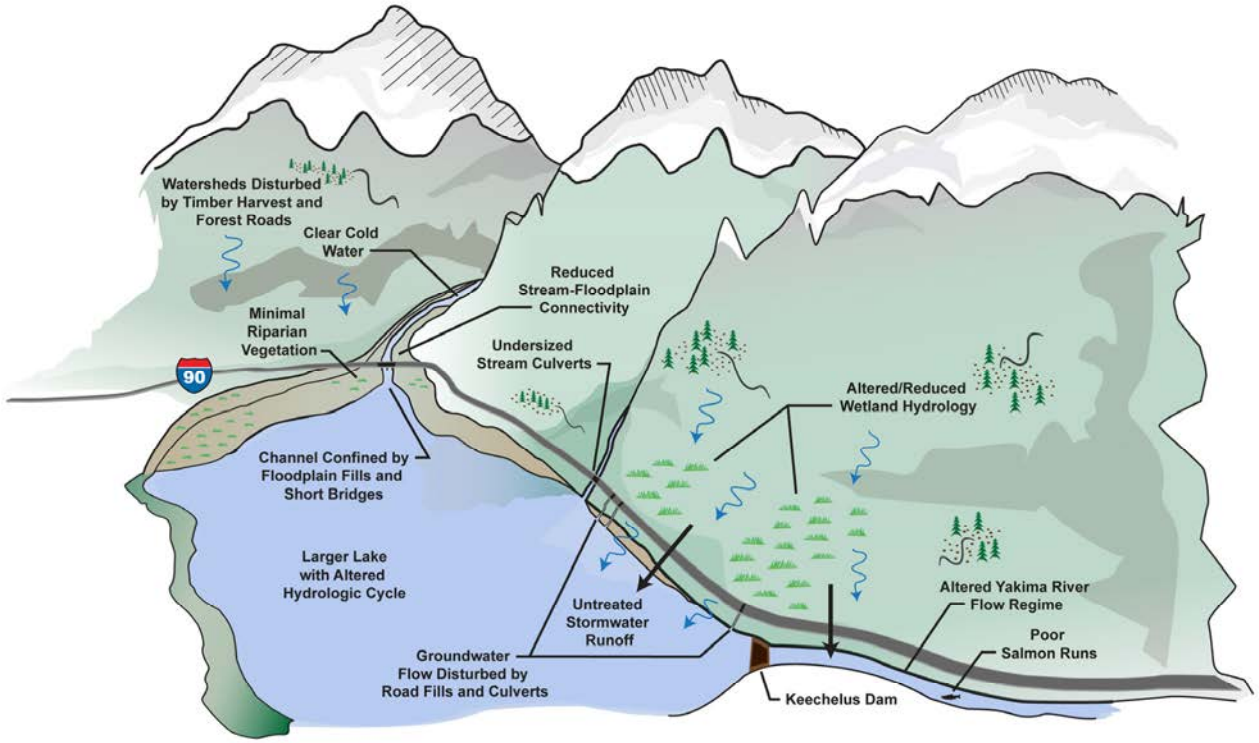
Exhibit 3-4
Pre-Settlement Hydrologic Cycle



These exhibits illustrate the ways that historic practices have modified the original flows of surface and ground water. The primary effects have been that:

- Stream channels have been artificially confined by bridges and culverts
- Groundwater flow has been altered by highway fill
- Freeway stormwater runoff is not being treated
- Water levels in Keechelus Lake fluctuate with its use as an irrigation reservoir

Exhibit 3-5
Existing Conditions Hydrologic Cycle



Surface Water

The project area is within the 6,000-square-mile Yakima River Basin, which Ecology has designated as Water Resource Inventory Area 39. The study area is the 2,100-square-mile Upper Yakima River Sub-Basin. Fourteen main tributaries and numerous smaller unnamed creeks either cross the highway or may otherwise be directly affected by the project. There are three USBR-operated reservoirs in the vicinity of the project. Two of the reservoirs, Keechelus Lake and Lake Easton, are located within the project area. The third reservoir, Lake Kachess, is located just outside of the project area to the east. Additional details can be found in Section 3.3 of the Draft EIS.

Generally, surface water quality within the project areas is high. Water quality evaluation has been based on macroinvertebrates, Section 303(d) listings, limited water quality monitoring, and sedimentation.

Macroinvertebrates. The composition of an aquatic invertebrate community can be an indicator of water quality. Because of their low mobility, aquatic invertebrates typically cannot escape the effects of reduced water quality, substrate alteration, or fluctuation in stream flows. Aquatic macroinvertebrates were collected from sites upstream and downstream of I-90 on nine project area streams. The data indicated that aquatic macroinvertebrate communities in the project area are generally in good condition, and that communities downstream of the highway are, in some cases, in better condition than communities upstream of the highway (WSDOT 2002f).

Macroinvertebrates are aquatic invertebrates including insects, crustaceans, mollusks, and worms that live in a river channel, pond, lake, wetland, or ocean. Their presence or absence is one indicator of water quality.

Aquatic macroinvertebrate communities in project area creeks are generally in good condition.

Many of the sites showed an increase in Benthic Index of Biotic Integrity scores downstream of I-90 relative to sites upstream of I-90. With the exception of Coal Creek, the project area streams are not measurably affected by I-90 using the Benthic Index of Biotic Integrity score. Only Coal Creek showed a decrease in biotic integrity score at both riffle and pool sites downstream of I-90 relative to upstream sites (WSDOT 2002f).

The Benthic Index of Biotic Integrity is an index which measures the health of streams. It is composed of metrics that measure different aspects of stream biology, including diversity, amount, habit, reproductive strategy, and feeding ecology of macroinvertebrates.

Section 303(d) Listings. In accordance with Section 303(d) of the federal Clean Water Act, every four years each state must identify water bodies that do not meet water quality standards. These are water quality-limited estuaries, lakes, and streams that fall short of state surface water quality standards, and are not expected to improve within the next four years.

Most project area streams meet the water quality requirements of the Clean Water Act. (Shown: Telephone Creek)

Within the project area, two water bodies are included on the 2004 303(d) list: one segment of the Yakima River near the mouth of Lake Easton and Keechelus Lake. The Yakima River segment is listed for exceeding stream temperature. According to the *Wenatchee National Forest Water Temperature Total Maximum Daily Load Technical Report* (Ecology 2003), elevated temperatures in forest streams are attributed to several factors: small amounts of riparian shade, a small percentage of groundwater inflow making up the total stream flow, thermally stratified inflow from lakes and reservoirs, and low flow from flow diversion. However, the effects of reservoir storage on stream temperatures are not completely understood at this time. For example, the Keechelus Lake intake structure is located

well below the full pool elevation. During full pool, it is expected that the lake would discharge cool water to the Yakima River. The influence of lake discharges on stream temperatures during low pool relative to historical conditions is unknown.

Keechelus Lake is listed for exceeding the National Toxics Rule criterion for dioxin and for total polychlorinated biphenyls in composite fish tissue samples. The source of the pollutants in Keechelus Lake that result in the listing is unknown. None of these listings appear to be the result of constructing or operating I-90.

Limited Water Quality Monitoring. The water quality of the streams crossing I-90 is generally considered excellent and the streams currently meet the designated uses for Ecology's water quality standards. In 2001, WSDOT performed water quality monitoring during storm events. Some short term and localized exceedances of numeric water quality criteria were measured during these storm events. Detailed results of the monitoring are available in Section 3.3 of the Draft EIS and in the *Final Discipline Report for I-90 Snoqualmie Pass East: Hydrologic Systems, Water Quality, and Floodplains* (WSDOT 2002g).

WSDOT educates local students on water quality monitoring.

Monitored water quality parameters included temperature, turbidity, fecal coliform, dissolved oxygen, lead, arsenic, chromium, pH, and specific conductivity. This effort showed that streams that cross I-90 in the project area do not have substantial levels of contamination; however, pollutant levels were sometimes higher than State criteria. It was not clear to what extent these exceedances were related to the presence of the highway. For example, some criteria were exceeded upstream of the highway but not downstream, where highway runoff would have an effect. These are referred to as "potential" exceedances since only four samples were taken for most parameters and normal water quality is high.

Sedimentation. Sediment deposition due to streambed erosion has been documented in the project area (Appendix I). Streambed erosion is largely driven by watershed-scale activities. However, highways and other forms of land development can add to such

deficiencies incrementally by introducing pollutants and modifying land cover and hydrology. For some streams crossing I-90, localized sediment deposition may be partially attributed to the historical accumulation of traction sand in runoff from the existing I-90 roadbed. In addition to traction sand, sediment impacts were identified to be from channel cross-section alterations. These channel cross-section alterations are due to undersized highway crossing structures and accelerated bank erosion from both upstream and downstream of I-90.

Groundwater

Groundwater quality in the project area appears to be very good, which is likely due to its mountainous terrain and low level of development. There have been few groundwater studies in the project area; however, all of the federally regulated drinking water systems in the area currently meet state and federal water quality standards.

In the project area, I-90 is primarily located on the boundary between the Yakima River valley and the surrounding uplands. As a result, it passes over transitional zones between geologic formations. These transition zones are important for seepage, groundwater recharge, and wetland flow. Groundwater monitoring data collected in 2005 and 2006 indicate that fall storms and spring snowmelt are critical periods for groundwater recharge and flow. Groundwater levels are lowest during the late summer, and in midwinter when soils and seepage zones freeze. Snowmelt from higher elevations and leakage from Keechelus Lake and Lake Kachess may elevate late-spring and early-summer groundwater levels in the Swamp Creek valley (WSDOT 2007d).

The highway and associated fill materials have intercepted and re-routed the original pattern of groundwater flow in some locations. During project planning, the MDT identified 10 specific HCZs where conveying surface water and shallow subsurface water beneath the highway is important. HCZs are typically located adjacent to wetlands, seeps, springs, or other visible signs of water (Appendix D).

Hydrologic Connectivity Zones

HCZs are geographic zones where connections between groundwater and surface water play an important role in maintaining natural flow paths which transmit water, sediment and nutrients in support of aquatic organisms and sustaining streamflow. WSDOT identified HCZs where I-90 divides wetlands, alluvial fans, seepage zones and important aquifer recharge areas.

Floodplains and Stream Geomorphology

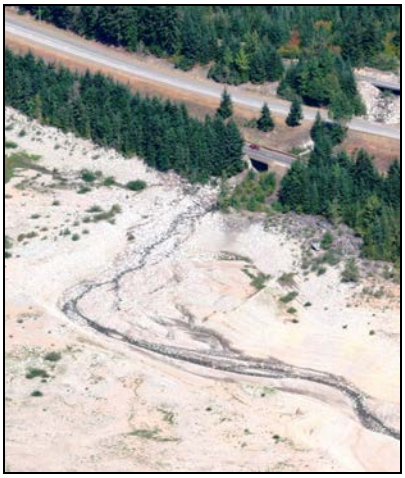
I-90 is located outside the 100-year floodplains of most of the streams that it passes over in the project area. Exceptions include portions of the Yakima River floodplain and where the highway crosses Gold Creek, Swamp Creek, and the Kachess River. In general, reservoir operations govern the floodplain hydrology in the project area.

Stream geomorphology refers to stream channel characteristics such as connectivity to floodplains, channel migration or confinement, capacity for sediment transport, and base and peak flows. Three types of stream systems occur in the project corridor: naturally confined channels, artificially confined channels, and alluvial fans. Streams with naturally confined channels do not actively migrate, and can be accommodated by crossing structures that are sufficient to provide fish passage. Rocky Run Creek, Wolfe Creek, Telephone Creek, and several unnamed creeks have naturally confined channels. Townsend Creek has a natural, moderately confined channel.

Artificially confined channels have restricted migration, generally as a result of culverts and bridges, which can result in restricted meander, decreased channel complexity, bank erosion, and altered sediment transport characteristics. Culverts and bridges may prevent fish passage due to high water velocities, low water depths, and, for culverts, drop-offs at the downstream ends. The Kachess River, Gold Creek, Resort Creek, Price Creek, Noble Creek, Bonnie Creek, Swamp Creek, Toll Creek, Cedar Creek, Hudson Creek, and several unnamed creeks in the project area have artificially confined channels.

Throughout the project area, bridges and culverts have created artificially confined stream channels. (Shown: Gold Creek)

An alluvial fan is a fan-shaped deposit formed where a fast-flowing stream flattens, slows, and spreads, typically at the exit of a canyon onto a flatter plain. Resort Creek, Gold Creek, and Rocky Run Creek are examples of streams with alluvial fans.



Rocky Run alluvial fan system

Refer to Section 3.4, *Wetlands and Other Jurisdictional Waters,* for more details regarding streams.

What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would have no beneficial direct or indirect effects to water resources.

Build Alternatives

The I-90 project offers an opportunity to restore some of the natural hydrology and hydraulics of the streams in the project area, which were altered as a result of the original highway construction and other land use changes. The project would achieve these beneficial effects by replacing existing bridges, culverts, and highway fill with longer bridges and wider, bottomless culverts, along with additional smaller culverts at HCZs. These replacements would improve hydrologic connectivity, sediment transport, channel migration, floodplain function, and groundwater movement. Water quality would be improved through lowered water temperature and sediment load.

Most of the beneficial effects of the project would be direct effects; however, all of the build alternatives also would create indirect beneficial effects as the removal of barriers would allow for the gradual restoration of more natural stream movement and habitat. The types of beneficial effects to water resources would be similar for all of the build alternatives.

Types of Beneficial Effects

Improved Hydrologic Connectivity. Replacing narrow bridges and culverts would result in major benefits to hydrologic connectivity at each of the stream crossings.

Lower Stream Velocities. Narrow bridges and culverts raise stream velocities, which can impede fish passage and lead to increased channel scour and erosion. Replacing them with wider bridges and culverts should result in lower stream velocities.

Improved Channel Migration. Installing wider bridges and culverts would improve channel migration at each of the artificially confined stream channels. The benefit would be greater where longer bridges are installed, since this would provide more potential area for the stream to meander.

Floodplain Restoration. Floodplain function improves when streams can access more of their natural floodplain during floods. Installing wider bridges and removing highway fill would allow for more normal floodplain functions.

Restored Capacity for Sediment Transport. Normal sediment transport would be improved by replacing undersized culverts that currently block sediment flow. WSDOT has designed new culverts and bridges to improve sediment transport.

Reduced Sediment and Temperature. Reducing stream velocities and restoring floodplain function would help to stabilize stream banks and improve riparian vegetation and cover. Increased vegetation and cover would reduce temperature and decrease sediment loading.

Improved Groundwater Flow. The MDT identified locations throughout the project area where special measures are needed to reestablish natural surface and subsurface flow paths. These areas, called HCZs, were established where I-90 divides wetlands, alluvial fans, seepage zones and important aquifer recharge areas. The MDT

identified the following general objectives for hydrologic connectivity at these locations:

- Maintain natural mechanisms for delivering and routing water
- Improve floodwater retention and groundwater recharge
- Provide lower water temperatures
- Provide continuity between surface and subsurface flow, particularly at low gradient wetlands or areas of unconfined surface flow

These objectives emphasize restoring natural hydrologic functions. This does not necessarily mean providing natural flow conditions or water levels within the immediate area of the highway. It does mean that WSDOT would seek to transmit water across the highway in a way that maintains and restores the functions that natural dispersed groundwater flow paths would provide.

Exhibit 3-6 and Exhibit 3-7 illustrate two examples of structures that might be used at HCZs. The design shown in Exhibit 3-6 could be used to link low-gradient wetland habitats on either side of the highway. Open-bottomed culverts would allow surface and subsurface flow at multiple locations along the HCZ, as well as passage for small animals. The design in Exhibit 3-7 focuses on subsurface drainage, and might be appropriate in locations where the objective is to convey hillslope seepage to aquifer recharge areas and wetlands on the downslope side of the highway.

Additional information on the general location and function of the HCZs is available in Section 3.3 of the Draft EIS, and in the *Mitigation Development Team Recommendation Package* (Appendix D). More precise HCZ locations are shown in Appendix C, *Project Design*. None of the HCZs are located in Phase 1 of the project. WSDOT will determine the final design and location of each structure when later phases of the project are funded.

Exhibit 3-6
Hydrologic Connectivity Structures Linking Low Gradient Wetlands

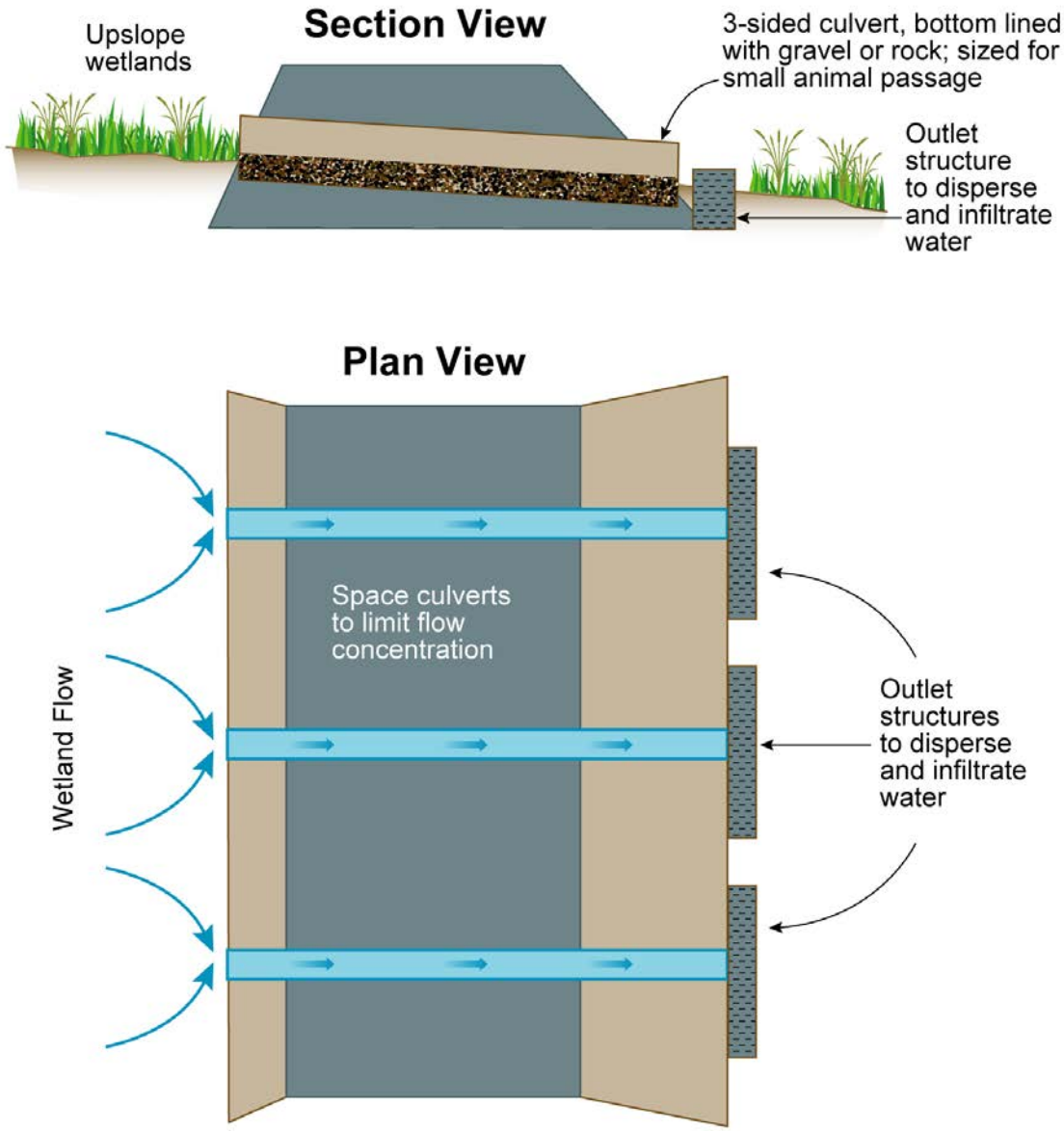
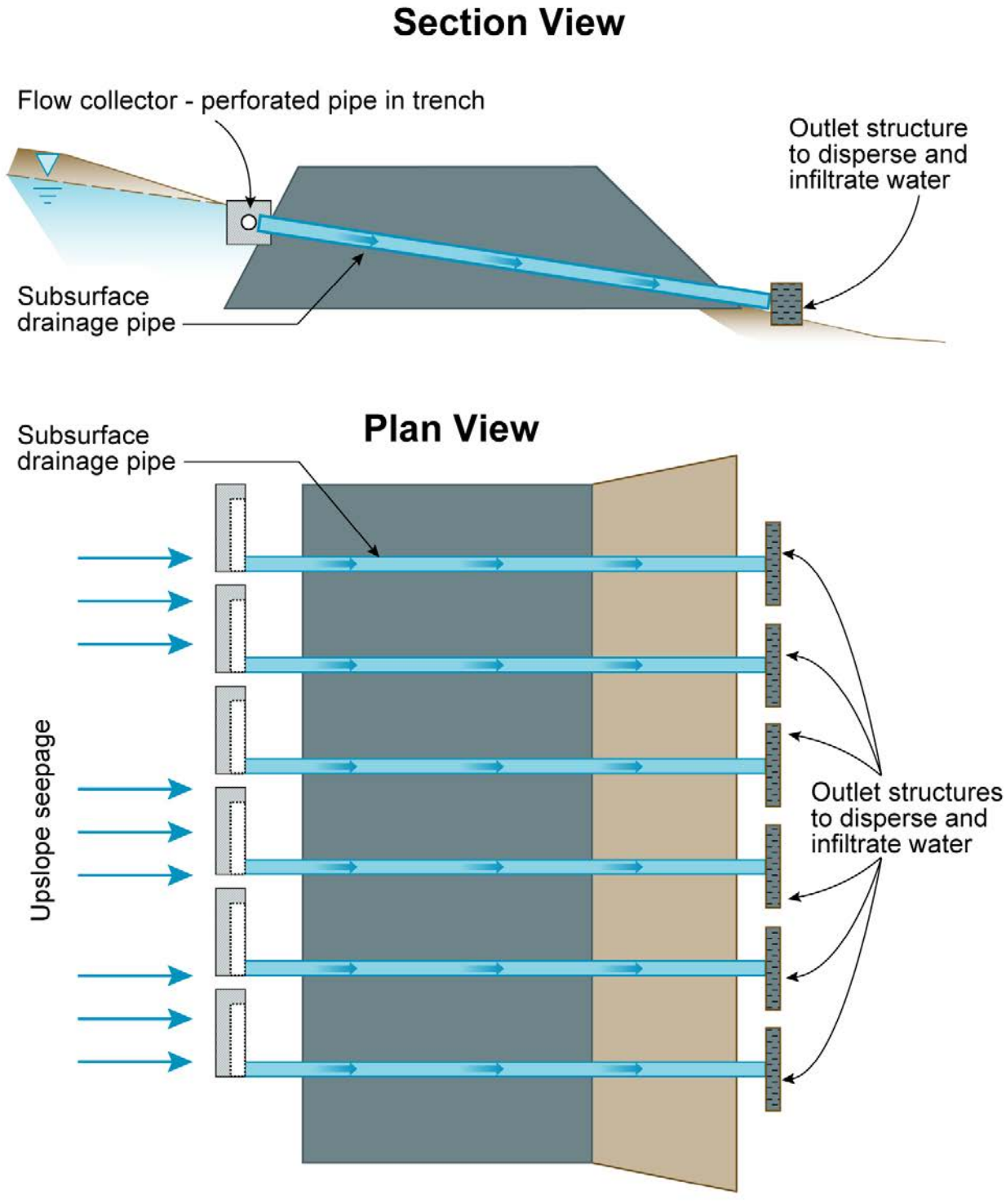


Exhibit 3-7
Hydrologic Connectivity Structures for Seepage Zones



Improved Surface Water Quality. When the present highway was built in the 1940s and 1950s and upgraded in the 1970s, it did not include stormwater treatment facilities, following the guidelines in place at the time of construction.

Steep constrained slopes uphill of I-90 cause snow and stormwater to accumulate in existing undersized ditches and flow to streams untreated.

WSDOT has committed to treating stormwater runoff for the equivalent of all new and existing impervious surfaces in the project area. WSDOT will provide on-site treatment systems and off-site mitigation when on-site treatment is not possible because of physical constraints. This commitment meets or exceeds the requirements of the *Highway Runoff Manual* (WSDOT 2006b). WSDOT conducted additional feasibility and design work for stormwater mitigation sites in 2008, and determined that in some areas, stormwater treatment is physically impossible because the highway is located between steep rock banks and Keechelus Lake, with no additional room. The project design will compensate for the lack of stormwater treatment in these constrained areas by providing additional treatment at other sites near the project area.

Steep slope on the uphill side of I-90.

Stormwater treatment would be accomplished through the use of BMPs such as biofiltration swales, detention ponds, vegetated filter strips, planted roadsides, ecology embankments, and natural or engineered dispersion. Some example structures are shown in Exhibit 2-13 in Chapter 2.

Stormwater inlets clog with snow and ice, which causes water to build up on the roadway creating unsafe conditions.

Exhibit 3-8 shows modeled pollutant load rates for treated and untreated disturbed surfaces. The exhibit shows that stormwater treatment substantially reduces the pollutant loading rate.

Exhibit 3-8
Modeled Pollutant Load Rates (pounds per acre)

Mean Annual Load	TSS	Total Zinc	Dissolved Zinc	Total Copper	Dissolved Copper
Load from untreated surfaces	565	1.1	0.4	0.2	0.053
Load from treated surfaces	45	0.28	0.2	0.065	0.035

Source: Biological Assessment (Appendix M)
TSS – total suspended solids

Exhibit 3-9 shows the pollutant loading before and after construction of the project. This exhibit shows that although the amount of impervious surface would increase, installing stormwater treatment for the entire highway would lower the overall pollutant loads. The amounts shown are for the Preferred Alternative; however, the differences between the Preferred Alternative and the other build alternatives would be extremely small, since the total amount of impervious surface would be similar for all build alternatives, and WSDOT's commitment to treating the equivalent of all impervious surfaces would be the same for all of the build alternatives.

Exhibit 3-9
Pre- and Post-Project Pollutant Loading (pounds)

Annual Effluent Load	TSS	Total Zinc	Dissolved Zinc	Total Copper	Dissolved Copper
Phase I					
Load from existing impervious surface, pre-project	32,431	63.14	22.96	11.48	3.04
Load from new and existing impervious surface, post-project	22,856	52.12	22.84	10.03	3.36
Net change	-9,575	-11.02	-0.12	-1.45	0.32
Remaining project area					
Load from existing impervious surface, pre-project	50,172	97.68	35.52	17.76	4.71
Load from new and existing impervious surface, post-project	1,255	7.81	5.58	1.81	0.98
Net change	-48,917	-89.87	-29.94	-15.95	-3.73
Project Total					
Load from existing impervious surface, pre-project	82,603	160.82	58.48	29.24	7.75
Load from new and existing impervious surface, post-project	24,112	59.93	28.42	11.85	4.34
Net change	-58,491	-100.89	-30.06	-17.39	-3.41

Post-project pollutant loadings do not include the beneficial effects of off-site compensatory treatment.
TSS – total suspended solids

Exhibit 3-10 shows modeled pollutant concentrations for treated and untreated runoff. The exhibit shows that stormwater treatment substantially reduces the pollutant concentrations.

Exhibit 3-10
Modeled Pollutant Concentrations

Expected Pollutant Concentrations	TSS (mg/L)	Total Zinc (µg/L)	Dissolved Zinc (µg/L)	Total Copper (µg/L)	Dissolved Copper (µg/L)
Concentrations for untreated runoff	93	174	62	31	7.6
Concentrations for treated runoff	6.4	40	27	7	5

Source: Biological Assessment (Appendix M)
TSS – total suspended solids

Exhibit 3-11 shows the pollutant concentrations before and after construction of the project. This exhibit shows that installing stormwater treatment for the entire highway would lower the overall pollutant concentrations just as it would lower overall pollutant loads, even though the amount of impervious surface would increase. The amounts shown are for the Preferred Alternative; however, as with overall pollutant loads, the differences between the Preferred Alternative and the other build alternatives would be extremely small.

Alternatives Comparison

Keeechelus Lake Alignment Alternatives. The beneficial effects of the Keechelus Lake Alignment Alternatives on water resources would differ from each other only slightly. All of the alternatives considered would include the same improvements to Rocky Run Creek, Wolf Creek and Resort Creek. The four alternatives would create different amounts of new impervious surface, and this would in turn lead to differing amounts of stormwater runoff. However, WSDOT has committed to treating runoff from 100 percent of both existing and new impervious surfaces, or treating the off-site equivalent in cases where treatment would be physically impossible.

CEA Improvement Packages. The benefits to water resources would include those described in Section 3.4, *Wetlands and Other Jurisdictional Waters*. As described in that section, the Preferred Alternative would have the largest benefit, followed by Improvement

Packages A, B and C. All of the CEA Improvement Packages would provide similar beneficial effects to water quality resulting from treatment of stormwater runoff.

Exhibit 3-11
Pre- and Post-Project Pollutant Concentrations

Concentration	TSS (mg/L)	Total Zinc (µg/L)	Dissolved Zinc (µg/L)	Total Copper (µg/L)	Dissolved Copper (µg/L)
Phase I					
Pollutant concentration for runoff pre-project	93.0	174.0	62.0	31.0	7.60
Pollutant concentration for runoff post-project	48.40	105.0	43.98	18.64	6.26
Net change	-44.6	-69.0	-18.02	-12.36	-1.34
Remaining project area					
Pollutant concentration for runoff pre-project	93.0	174.0	62.0	31.0	7.60
Pollutant concentration for runoff post-project	6.40	40.0	27.0	7.0	5.0
Net change	-86.60	-134.0	-35.0	-24.0	-2.60
Project Total					
Pollutant concentration for runoff pre-project	93.0	174.0	62.0	31.0	7.60
Pollutant concentration for runoff post-project	37.22	87.69	39.46	15.54	5.93
Net change	-55.78	-86.31	-22.54	-15.46	-1.67

Post-project pollutant loadings do not include the beneficial effects of off-site compensatory treatment.
TSS – total suspended solids

Exhibit 3-12 illustrates the improvements that the Preferred Alternative would have on the hydrologic cycle in the project area. Improvements would be similar for all of the build alternatives.

Additional information on the options considered at each CEA and their potential beneficial effects can be found in the Draft EIS (WDOT 2005a), the *Mitigation Development Team Recommendation Package* (Appendix D), and the *Conceptual Wetland & Aquatic Resources Mitigation Plan* (Appendix J).

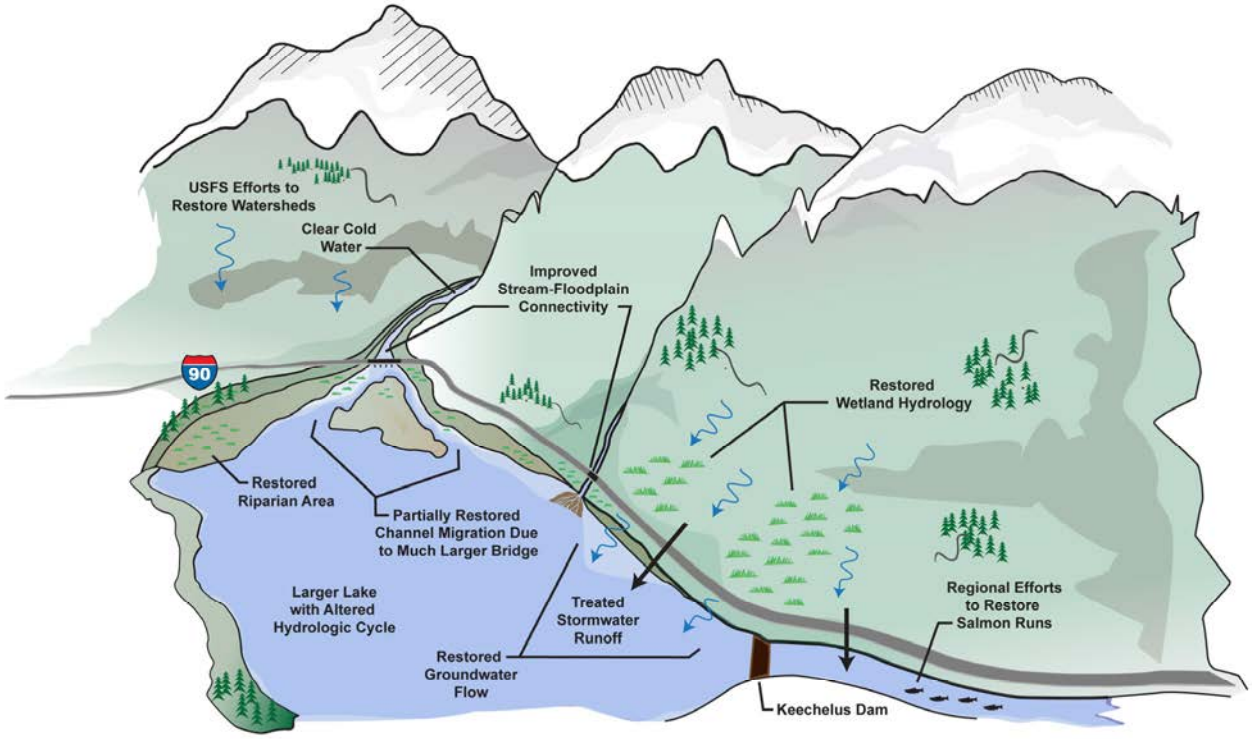
What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any temporary adverse impacts to water resources. This alternative would result in indirect

adverse impacts, including water quality impacts as traffic volume continued to grow in the absence of treatment for stormwater runoff.

Exhibit 3-12
Preferred Alternative Hydrologic Cycle



Build Alternatives

Temporary Impacts

Temporary impacts to water resources may result from construction activities that occur during highway realignment and widening, crossing structure replacement, and tunnel construction. The types of temporary construction impacts are generally similar for all of the build alternatives.

Surface Water Runoff. Construction has the potential to increase runoff to surface water through soil compaction, changes in drainage patterns, and clearing of vegetation in temporary staging areas. Fill removal and restoration activities may cause temporary surface water diversions or confinement during construction. WSDOT expects flow alterations to be minor, and anticipates that standard construction BMPs would minimize the potential for additional

runoff. Required BMPs will include Temporary Erosion and Sediment Control Plans and Spill Prevention, Control, and Countermeasure Plans, which would be designed and implemented in accordance with the *Highway Runoff Manual* (WSDOT 2006b).

Water Use for Construction. Any of the build alternatives would require large amounts of water for processing materials, concrete production, dust suppression, and highway fill compaction. WSDOT estimates that the Preferred Alternative would require approximately 152 million gallons of water for Phase 1 of construction. The remainder of the project area would require approximately 309 million gallons. For further details see Appendix Y, *Construction Water Needs Technical Memorandum*.

Construction water may be from groundwater or surface water sources, and may be acquired through purchase of water or through purchase or lease of valid water rights. Final selection of water sources will depend on construction phasing (which would determine the amount of water needed and peak demands) and on the location and cost of potential water sources. WSDOT will approve all construction water sources prior to their use and any water rights acquired, either through lease or purchase, would be approved by Ecology or Yakima County Superior Court. WSDOT believes that the acquisition of water from properly permitted sources with valid rights would not adversely impact groundwater or surface water, or impair existing water rights.

Floodplain Disturbance. Floodplains would likely be disturbed when installing bridges and culverts, removing highway fill, and widening and realigning the highway. Floodplain soils may be compacted by equipment, impairing shallow groundwater flow and recharge. WSDOT expects all of these impacts to be temporary, and that impacts can be avoided or minimized by limiting construction access, restoration efforts, and applying construction BMPs. Post-construction restoration may include rehabilitating areas by removing temporary road surfaces, treatment to reduce the effects of compaction, and revegetation.

Channel Disturbance. Channel function may be affected during construction by temporary cofferdams and diversions that impair natural channel form and function. Construction activity may directly affect channels during bridge and culvert installation by disturbing banks and the channel bed. These impacts would be temporary and WSDOT does not anticipate that they would result in permanent changes to channel function. For more information see Section 3.3.2.2 of the Draft EIS.

As discussed in Section 3.4, *Wetlands and Other Jurisdictional Waters,* WSDOT calculated temporary impacts using the following assumptions:

- A 15-foot buffer around all project fills
- A 30-foot buffer around all proposed structures, including bridges, culverts and retaining walls, which would allow room for construction equipment
- Impacts from proposed haul roads

Exact numbers for temporary impacts will continue to change until project design is finalized, and will be included in project permitting documents.

Release of Hazardous Materials. The 303(d) listing for dioxins and polychlorinated biphenyls in Keechelus Lake indicates that there may be a source of these pollutants in the area. WSDOT has conducted extensive geotechnical drilling in the project area, including the lake sediments that will be disturbed during construction. No evidence of contamination has been found, and WSDOT believes that it is unlikely that the source is within the construction area. However, the project will include continuous monitoring for environmental compliance, and the monitoring plan will include provisions for unanticipated discovery of hazardous material.

Permanent Impacts

Permanent impacts are those associated with the design and operation of the new highway. All of the build alternatives would result in some permanent impacts to surface water, groundwater, floodplains, wetlands, and stream geomorphology. WSDOT expects that the all permanent impacts would be direct, and that none of the build alternatives would result in indirect impacts to water resources.

Filling Aquatic and Shoreline Habitat. All of the build alternatives would require filling some areas of shoreline and aquatic habitat. WSDOT assessed the amounts of fill to all jurisdictional waters for each of the alternatives. This information is presented in Section 3.4, *Wetlands and Other Jurisdictional Waters.*

Increased Surface Water Runoff. Adding impervious surface could increase the flow of untreated stormwater to surface water, including Keechelus Lake and its tributaries. Stormwater runoff contains traction sand and phosphorus from the use of de-icers, which are two potential categories of pollutants that are not modeled in Exhibit 3-8 through Exhibit 3-11.

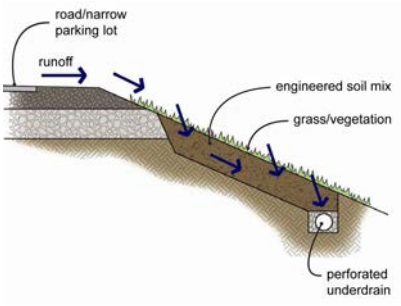
Traction sand use has decreased substantially in recent years. WSDOT now only applies sand under certain winter road conditions, primarily to provide traction at curves and grades where chemical treatment may not be effective. WSDOT has partially replaced sand use with chemical deicers (magnesium chloride and calcium chloride).

Orthophosphate is a common trace substance found in anti-icer and deicer products and is expected to be present in highway runoff within the project area. WSDOT's approach to deicer use also involves source control, by following application guidelines in the *Statewide Snow and Ice Plan* (WSDOT 2007g). However, WSDOT cannot eliminate the use of either traction sand or chemical deicers entirely, because they are essential to winter highway safety.

According to the *Highway Runoff Manual (*WSDOT2006b), phosphorus control BMPs are required only when the receiving

water has been identified and documented as having excess phosphorus. This is not the case for the I-90 project, where all of the receiving water bodies have been identified as being naturally low in phosphorous. Consequently, there is no requirement to treat the additional phosphorus from de-icers.

Nevertheless, stormwater treatment will remove both traction sand and phosphorus, and their use is expected to decrease overall levels of both. The primary stormwater treatment mechanism proposed would be Ecology Embankments. The *Highway Runoff Manual* (WSDOT 2006b) states that "*The Ecology Embankment removes suspended solids, phosphorus, and metals from highway runoff through physical straining, ion exchange, carbonate precipitation, and biofiltration*" (page 5-7).



Ecology Embankment

Groundwater. WSDOT expects that the overall impacts to groundwater would be positive, and that there would be no permanent adverse impacts.

Floodplains and Stream Geomorphology. WSDOT expects that the project would not increase flood flows or reduce flood capacity at any of the project area streams. Installing the proposed bridges and culverts would allow for channel migration, increase capacity for sediment and debris flow, and expand floodplains currently confined under the highway. In some instances, streams may become shallow and a new channel may form. WSDOT expects that the overall impacts to stream geomorphology would be positive and that there would be no permanent adverse impacts. Restoration efforts would focus on streams and CEAs where there is a need to improve floodplain, stream, and overall ecological connectivity.

Impacts to Lake Storage Capacity. Despite fill to Keechelus Lake, there would be no net loss of storage capacity of the lake. WSDOT would replace the capacity lost through fill by removing material from Pit Site PS-S-255, which is below the ordinary high water mark (OHWM) of the lake. Additional storage capacity would be added by removing existing highway fill at the new Gold Creek bridges. Excavation amounts would be adjusted so that no net loss or gain of the reservoir's storage capacity would result. If WSDOT elected to

use the Gold Creek site, temporary impacts to the wetland buffer could occur. WSDOT would restore the site and buffer to a condition that meets or exceeds the existing wetland functions.

Lake Easton is the only other reservoir in the project area. Construction would not take place near this lake and no temporary or permanent impacts are anticipated.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT has designed the I-90 project to avoid and minimize impacts to water resources wherever possible, including:

- Adjusting the alignment and decreasing median widths to avoid impacts to sensitive aquatic habitat.
- Using the existing highway rather than placing new fill.
- Incorporating retaining walls, steep fill slopes, long-span bridges and wide culverts in areas where existing structures and standard fill slopes encroach into floodplains, stream channels, and wetlands.
- Incorporating the MDT design objectives and performance standards wherever applicable and reasonable.
- Designing outfalls to reduce adverse impacts, including sediment plumes. Typical outfall systems include rock splash pads, flow dispersal trenches and other energy dissipaters.

Best Management Practices

BMPs for water resources will be designed to meet applicable commitments and performance standards, including:

- Clean Water Act Section 404 Permit(s)
- Clean Water Act Section 401 Water Quality Certification
- NPDES General Permit for Construction Activities

- NPDES General Permit for Sand and Gravel Operations
- Temporary Erosion and Sediment Control Plans
- Spill Prevention, Control and Countermeasure Plans
- Erosion and sediment control requirements of the WSDOT *Design Manual* (WSDOT 2007c) and *Standard Specifications for Road, Bridge, and Municipal Construction* (WSDOT 2008b)
- WSDOT *Highway Runoff Manual* (WSDOT 2006b)
- Applicable measures specified in the USFWS Biological Opinion
- Applicable conservation measures included in the NOAA Fisheries' ESA Consultation Concurrence Letter (NOAA Fisheries 2008)
- Applicable parts of the *Implementing Agreement between the Washington State Department of Ecology and the Washington State Department of Transportation* (Ecology and WSDOT 1998), or as revised
- Objectives of the USFS ACS
- MDT design objectives and performance standards
- Applicable permit conditions
- Applicable conditions and stipulations related to the transfer of federal land for highway easement

Some example BMPs that WSDOT could use to comply with these standards includes requiring:

- Covered loads
- Short term stabilization during construction, including seasonal shut-down and stabilization procedures
- Perimeter ditching or other erosion control measures
- Plastic sheeting in severe weather to protect sub-grades or fill materials
- Staged fill placement or surcharges
- Temporary walls
- Temporary crushed rock armoring of exposed soil
- Approved water diversions to avoid streambank destabilization
- Roadside vegetation measures, including soil preparation, integrated vegetation management, and meeting the standards in the roadside master plan
- Conducting work around Keechelus Lake during low pool elevations when the shoreline is exposed
- Conducting vehicle fueling and maintenance at least 150 feet from the nearest stream wherever possible
- Using coffer dams to isolate all in-water structures from surrounding water until concrete is fully cured

Compensatory Mitigation

WSDOT will provide stormwater treatment for the equivalent of all impervious surfaces. To compensate for areas where the terrain makes treatment impracticable, WSDOT will provide additional treatment in other off-site locations in or near the project corridor.

WSDOT will use the *Highway Runoff Manual* (WSDOT 2006b) Appendix 2A procedure or the "equivalent area" approach to mitigate for constrained areas in which stormwater treatment is physically impossible. This approach allows WSDOT to retrofit stormwater treatment onto existing off-site impervious surface with pollution loading characteristics similar to the constrained areas.

WSDOT conducted reconnaissance field work to evaluate equivalent area treatment opportunities on I-90 to the west of the project area and within the Keechelus Lake watershed, and has tentatively identified compensatory treatment areas. Final decisions will be made as part of final design and permitting. WSDOT's analysis is discussed in *Draft Technical Memorandum No. 4 – Stormwater Quality BMP Selection: Constrained Areas and Mitigation* (WSDOT 2008c).

3.4 Wetlands and Other Jurisdictional Waters

This section describes the impact of the project alternatives to jurisdictional waters in the project area, including wetlands, reservoirs, streams, and certain ditches.

Jurisdictional waters: Aquatic and wetland features that are regulated by federal, state, and local agencies. Jurisdictional waters include both "waters of Washington State" and "waters of the US."

The study area for wetlands and other jurisdictional waters includes any jurisdictional waters that would be affected by the project, including potential mitigation sites, materials staging and stockpiling sites, and haul roads.

What new information has been developed since the Draft EIS?

Since publishing the Draft EIS, WSDOT has updated the *Wetland/Biology Discipline Report* (Appendix K). This update:

- Included additional information on jurisdictional waters in the study area, including buffers, ditches and the OHWM of streams and reservoirs
- Identified wetlands without hydric soil indicators located within Keechelus Lake
- Revised wetland ratings using the revised *Washington State Wetland Rating System for Eastern Washington* (Ecology 2004)
- Updated wetland impacts based on revisions to the preliminary design of the Preferred Alternative

WSDOT also published the *Conceptual Wetland & Aquatic Resources Mitigation Plan* (Appendix J). This document describes WSDOT's conceptual strategy to mitigate impacts to wetlands, aquatic resources, and other habitats associated with I-90 and the proposed project. A final Wetland & Aquatic Resources Mitigation Plan will be submitted to the relevant agencies as part of the permitting process.

Comments from the public and reviewing agencies have been incorporated into this section.

What are the major characteristics of the affected environment?

Wetlands

Palustrine systems are nontidal wetlands dominated by trees, shrubs, emergent herbaceous plants, mosses, and/or lichens, and some tidal wetlands. Palustrine wetlands are commonly referred to as marshes, swamps, bogs, fens, prairies, seeps, and intermittent ponds.

Riverine systems include all wetlands and deepwater habitats contained within a river channel, except wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens; and some marine wetlands.

WSDOT identified over 100 wetlands within the study area. Most of these are palustrine wetlands, with a few riverine wetlands found adjacent to the streams. These wetlands are described individually in the *Wetland/Biology Discipline Report* (Appendix K).

The wetlands in the study area vary in their plant communities, species diversity, habitat structure, and landscape position. In general, wetlands immediately adjacent to the highway are degraded herbaceous wetlands dominated by non-native species, while those farther from the road are higher-quality forested wetlands.

WSDOT rated project area wetlands based on their functions, using the *Washington State Wetland Rating System for Eastern Washington* (Ecology 2004). The ratings range from Category I to IV, with Category I considered the most valuable and Category IV considered the least valuable. A few Category I wetlands are located in the study area. These typically contain old-growth or mature conifer trees. Category II wetlands in the study area often are associated with streams. The majority of the wetlands in the study area are Category III and Category IV. Many of the Category IV wetlands in the study area are associated with the ditches that run parallel to the highway.

Category I wetlands are the highest value wetlands. (Shown: Category I Palustrine wetland near Stampede Pass)

The largest wetland complex in the study area is adjacent to the highway and below the OHWM of Keechelus Lake. These wetlands and other jurisdictional waters in the drawdown zone of Keechelus Lake are difficult to classify. Because of the artificial hydrologic regime of the reservoir, many Keechelus Lake wetlands are completely flooded when the reservoir is filled and completely dry during the summer months. The depth of inundation depends on

the amount of water available annually and management activities of the USBR, with some parts of the Keechelus Lake wetlands under 25 feet of water at its spillway elevation, or "maximum pool."

Category IV wetlands are lower-value wetlands, and are often associated with roadside ditches. (Shown: Category IV Emergent wetland near Swamp Creek.)

Wetlands are normally classified based on three characteristics: hydrology, hydrophytic vegetation, and hydric soils. Pockets of hydrophytic vegetation exist along much of the shoreline of Keechelus Lake; however, many of these areas do not have hydric soils. WSDOT consulted with USACE and Ecology in order to clarify the regulation of these areas. Following review of the wetland survey data and a review in the field, the three agencies agreed on the following classification system for jurisdictional waters within the drawdown zone of Keechelus Lake:

- ***Wetlands*** exhibit all three wetland characteristics (hydrology, hydrophytic vegetation, and hydric soils)
- ***Wetlands without hydric soil indicators*** exhibit hydrology and hydrophytic vegetation but lack hydric soil indicators
- ***Other waters*** exhibit hydrology but lack hydrophytic vegetation and hydric soil indicators

In calculating impacts to wetlands in Keechelus Lake, WSDOT included wetlands and wetlands without hydric soil indicators.

Wetland Buffers

Wetland buffers are relatively undisturbed areas adjacent to wetlands, which can reduce impacts from adjacent land uses. WSDOT determined preliminary wetland buffer widths using guidance issued jointly by Ecology, USACE, and USEPA (Ecology et al. 2006). This guidance provides buffer widths that vary by wetland type, rating, and the intensity of adjacent land uses. Kittitas County, in conjunction with the USFS, will determine the final wetland buffers during project permitting, in order to meet codes as well as meet the USFS Aquatic Conservation Strategy objectives. The County determines the buffer requirements for each wetland on a case-by-case basis.

Most project area wetlands have relatively undisturbed buffers, since these buffer areas are part of undeveloped state or federal land. These buffers primarily provide habitat for birds, amphibians and mammals, as well as protecting water quality.

Wetland buffers immediately adjacent to the highway are disturbed. Here, the area that would normally be wetland buffer is occupied by the highway or an un-vegetated shoulder.

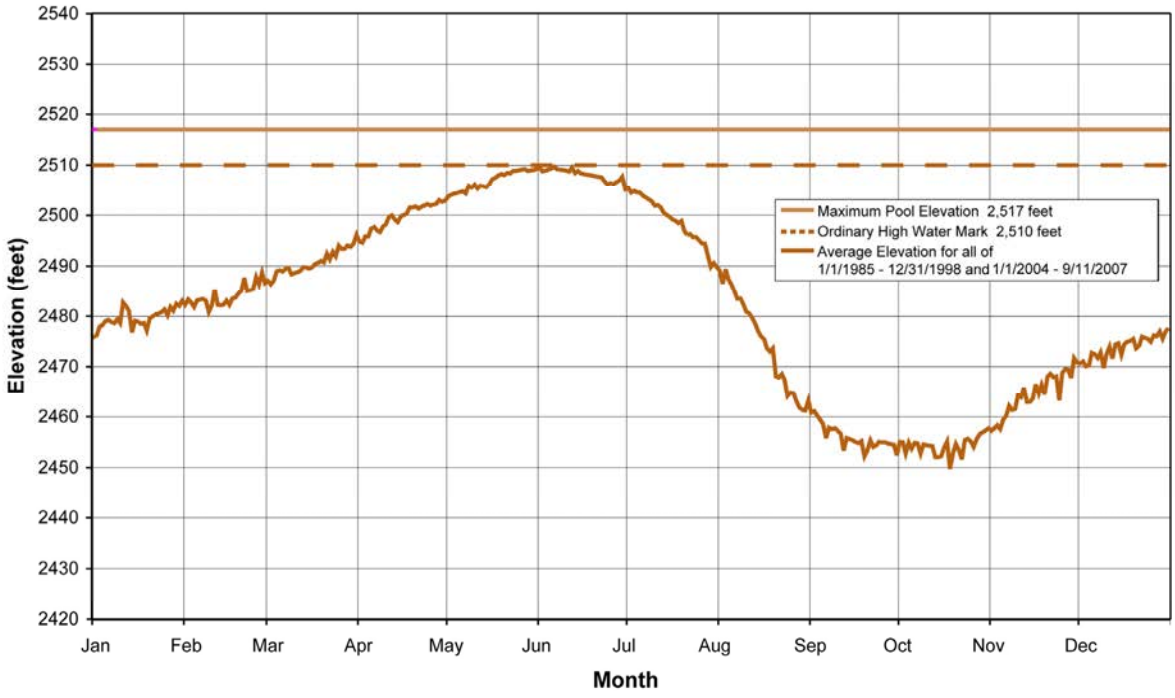
Other Jurisdictional Waters

Reservoirs. The USBR operates three reservoirs within the project vicinity: Keechelus Lake, Kachess Lake, and Lake Easton. Two of the reservoirs, Keechelus Lake and Lake Easton, are located within the project area. The third reservoir, Kachess Lake, is just outside of the project area to the east. The water levels in Keechelus Lake vary seasonally depending on factors such as snowmelt and irrigation needs. The lake has a maximum pool of 2,517 feet above sea level. Average high water elevation reaches approximately 2,510 feet, and WSDOT considers this elevation to be the OHWM of the lake (see Appendix K). Exhibit 3-13 shows average lake elevation and typical annual fluctuations.

Ponds. WSDOT identified and delineated three ponds within the project area. All are located at Crystal Springs Sno-Park. These ponds are abandoned gravel pits with very steep banks that were excavated in upland areas. All three ponds appear to be hydrologically isolated. Soils are extremely gravelly and lack hydric indicators, or are too deeply ponded for soil investigation. Two of the ponds contain standing water for most of the spring and summer. They are almost entirely devoid of vegetation, except for willows at the OHWM. The third pond dries up by June and contains scattered herbaceous vegetation at the bottom.

Abandoned gravel pit located at Crystal Springs Sno-Park.

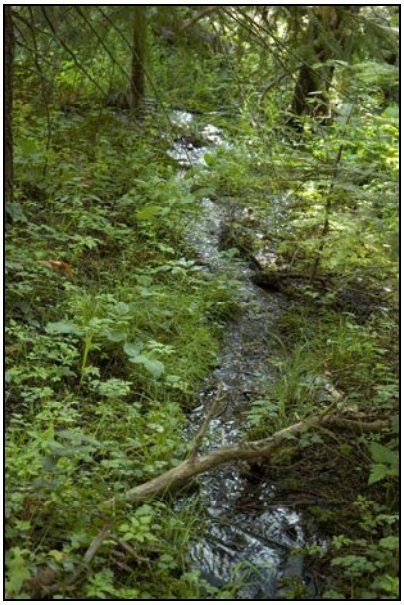
Exhibit 3-13
Average Keechelus Lake High Water Elevation from 1985 through 2007



Note: Data from 1999 through 2003 was removed from the data set because during this period lake levels were held artificially low due to the Keechelus Dam Safety of Dams Project

Streams. WSDOT identified approximately numerous small unnamed streams within the project area. Eight are located between Hyak and Keechelus Dam, drain into Keechelus Lake, and eventually flow into the Yakima River. The remaining streams are located between Keechelus Dam and Easton. The majority of these streams are tributaries to the Yakima River; however, a few flow subsurface and their connection to the river is not known.

WSDOT has completed a comprehensive stream inventory for Phase 1 of the project and does not expect to encounter additional streams in this area. However, WSDOT does expect to encounter additional small streams in the remainder of the project area. Inventoried project area streams are listed in Appendix K.



The project area contains approximately 42 streams. (Shown: Unnamed Creek [MP 65.0])

Potentially Jurisdictional Ditches. Under certain circumstances, drainage ditches can be jurisdictional waters. WSDOT inventoried potentially jurisdictional ditches for Phase 1 of the project. Within this area, WSDOT found 31 potentially jurisdictional ditch segments. These ditches are mostly parallel to the westbound lanes of I-90, on the upgradient (north) side of the highway. A few potentially jurisdictional ditches are located in the median.

WSDOT surveyed potential jurisdictional ditches for the first phase of the project.

Potentially jurisdictional ditches are likely to exist in the remainder of the project area. WSDOT will survey these areas prior to permitting for further phases of the project.

What are the expected environmental consequences?

While any of the build alternatives would have some adverse impacts on jurisdictional waters, FHWA and WSDOT anticipate that overall effects would be highly positive.

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would not result in direct or indirect beneficial effects to wetlands or other jurisdictional waters.

Build Alternatives

Types of Beneficial Effects

WSDOT has designed the project, including all of the build alternatives, to have substantial benefits to wetlands and other jurisdictional waters. Most of these beneficial effects would be direct effects; however, all of the build alternatives also would create indirect beneficial effects as the removal of barriers gradually allows for the restoration of wetland habitat, more natural stream movement, and more natural passage of groundwater.

Restored Habitat. The project has been designed to restore riparian habitat at each stream crossing. The area under the larger bridges and culverts would be planted with native vegetation and augmented with habitat elements such as natural substrates, logs, and root wads.

The largest beneficial impact would be at Gold Creek, where 8.45 acres of wetland, stream channel, and riparian zone would be restored under the Preferred Alternative. Smaller but similar improvements would be made at other stream crossings.

Habitat restoration opportunities at the Price/Noble Creek CEA include animal crossings, land restoration, hydrologic connectivity zones, and improved stream channel migration.

Connected Wetlands and Riparian Areas. WSDOT designed bridges and culverts to connect habitat that is currently separated by the highway. This would enhance the functions of the existing habitat and allow for species movement between currently-separated habitats.

Improved Channel Migration. In areas where longer bridges would be installed, WSDOT would remove road fill and restore stream channel, floodplain, wetland and riparian habitat underneath and adjacent to the bridges. This would allow for more normal stream functions, including increased stream meander and the formation of additional aquatic habitat.

Enhanced Groundwater Flow. The project would include hydrologic connectivity improvements at the HCZs, reestablishing a more natural flow of groundwater under the highway. These improvements would improve water quality, hydrologic function, and habitat.

Improved Water Quality. The existing highway has no facilities for treating stormwater runoff. The project includes stormwater treatment as an element of both construction and operation, and would include treatment for all impervious surfaces, or off-site compensatory treatment for those areas that cannot be treated due to site constraints. Stormwater treatment would minimize the degradation of adjacent wetlands and other aquatic resources.

Alternatives Comparison

Keechelus Lake Alignment Alternatives. The primary difference in beneficial effects between the Keechelus Lake Alignment Alternatives would result from the amount of highway fill that would be removed. In all, Alternative 1 would remove a total of 38 acres of highway fill, Alternative 2 would remove 21 acres, Alternative 3

would remove 13 acres, and Alternative 4 would remove five acres. However, these figures do not accurately indicate the beneficial effect, since most of the highway fill removed along Keechelus Lake would be on steep slopes that would not be conducive to aquatic restoration.

Alternatives 1 and 2 would involve removing highway along portions of the Keechelus Lake shoreline that were bypassed by the tunnels. This could result in some improvement to lakeshore vegetation and habitat. Alternative 2 would have a smaller benefit than Alternative 1, since removal would be limited to the area of Slide Curve. Alternatives 3 and 4 (the Preferred Alternative) would not involve removal of the existing highway, and thus would not result in this beneficial effect. For Alternatives 2, 3 and 4, replacement of the existing culverts at Rocky Run Creek, Wolfe Creek, and Resort Creek would increase hydrologic and habitat connectivity.

CEA Improvement Packages. All of the options considered at the CEAs would improve hydrologic conditions in the vicinity of I-90, which would help to restore wetlands and other aquatic habitat, improve habitat connectivity, and facilitate movement of wildlife across the highway. However, the amount of improvement to wetlands and other jurisdictional waters would be greatest for the Preferred Alternative, which most fully implements the MDT's ecological connectivity recommendations. Under this alternative, WSDOT would remove and restore approximately 19.3 acres of highway fill.

Improvement Package A would provide the second greatest improvement to wetlands and other jurisdictional waters. Bridges would be installed at a larger number of streams than under Improvement Packages B or C. These would improve channel migration and improve water supply to downstream wetlands.

Improvement Package B would provide benefits similar to Improvement Package A; however, there would be less benefit to wetlands, since shorter bridges and smaller culverts would be

installed. There would nevertheless be a major improvement in hydrologic connectivity and wetland habitat.

Improvement Package C would provide the least improvement in connectivity. While there would be substantial improvement over existing hydrologic connectivity and benefits to wetlands, Option C would not meet the MDT's connectivity objectives at all of the CEAs.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in direct permanent impacts to wetlands or other jurisdictional waters. This alternative would result in indirect adverse impacts, including water quality impacts to wetlands and other jurisdictional waters as traffic volumes continue to grow in the absence of treatment for stormwater runoff. The current situation, including artificially constrained channels, habitat separation, and lack of stormwater treatment, would continue.

Build Alternatives

Types of Adverse Impacts

Temporary Impacts

Construction of any of the build alternatives would cause temporary impacts to wetlands and other jurisdictional waters. Temporary impacts generally would be the result of vegetation clearing and ground disturbance during construction. These activities would cause temporary impacts to wetlands, wetland buffers, reservoirs, streams, and potentially jurisdictional ditches. The lead agencies expect that all temporary impacts would be mitigated and limited through the use of appropriate BMPs, including re-vegetation.

WSDOT analyzed temporary impacts for the Preferred Alternative. These figures are presented in the *Wetland/Biology Discipline Report* (Appendix K). These temporary impacts would be similar for all of the build alternatives. WSDOT calculated temporary impacts using the following assumptions:

- A 15-foot buffer around all project fills
- A 30-foot buffer around all proposed structures, including bridges, culverts and retaining walls, which would allow room for construction equipment
- Impacts from proposed haul roads

Exact numbers for temporary impacts will continue to change until the project design is finalized, and will be included in project permitting documents.

Permanent Impacts

WSDOT analyzed the effects of the build alternatives on wetlands, wetland buffers, streams, reservoirs, and potentially jurisdictional ditches. This analysis was based on revised impact footprints for each of the alternatives following the revisions to the project to eliminate the viaduct bridges, replace the snowshed, modify the proposed design speed, and move the alignment to avoid high-quality resources. WSDOT's analysis also was based on the results of updated wetland inventories conducted in 2006 and 2007. Because WSDOT's analysis of permanent impacts is based on this updated information, the impacts reported in this section are different than those presented in the Draft EIS, which were based on the information available at that time.

Most permanent impacts would be direct impacts from wetland fill. Indirect impacts to wetlands could occur in some places where wetlands would be partially filled and the function of the remaining wetland could be compromised because of their smaller size. WSDOT assessed potential indirect impacts for the first phase of construction and determined that such impacts could occur at several

wetlands near Resort Creek and Townsend Creek. These results are presented in Appendix K. Indirect impacts will be offset by the proposed mitigation activities, which would connect the remaining wetland to other wetlands in the vicinity.

No permanent adverse impacts to materials and staging sites or other auxiliary sites are expected. However, WSDOT will conduct further wetland impact analysis as part of permitting for these sites.

Alternatives Comparison

Keechelus Lake Alignment Alternatives

The differences in impacts between the Keechelus Lake Alignment Alternatives result primarily from impacts to the Category I wetlands near Resort Creek, which would be severely affected by the tunnel outlet included in Alternatives 1, 2, and 3.

Exhibit 3-14 shows the anticipated permanent impacts to wetlands, wetland buffers, reservoirs, streams, and potentially jurisdictional ditches in the Keechelus Lake Alignment.

Exhibit 3-14
Permanent Impacts, Keechelus Lake Alignment Alternatives

Category	Alternative 1	Alternative 2	Alternative 3	Alternative 4/ Preferred Alternative
Category I wetlands (acres)	2.00	1.93	1.41	0.00
Category II wetlands (acres)	0.87	0.87	0.87	0.87
Category III wetlands (acres)	0.36	0.36	1.02	0.80
Category III wetlands without hydric soil indicators (acres)	3.89	4.02	4.48	4.48
Category IV wetlands (acres)	0.26	0.46	0.46	0.46
Total wetlands (acres)	**7.38**	**7.64**	**8.24**	**6.61**
Wetland buffers (acres)	3.80	3.72	2.21	0.74
Wetlands buffers for wetlands without hydric soil indicators (acres)	4.34	6.45	6.89	6.89
Reservoirs (acres)	0.94	1.22	4.06	3.80
Streams (acres)	0.19	0.19	0.08	0.07
Potentially jurisdictional ditches (feet)	454.28	1,522.16	1,559.98	2,538.25

The area of permanent impact is between MP 56.6 and MP 59.9.

CEA Improvement Packages

Permanent impacts to wetlands would differ only slightly between the alternatives, depending on the structures that would be built at each CEA.

Exhibit 3-15 shows the anticipated permanent impacts to wetlands, wetland buffers, reservoirs, streams, and potentially jurisdictional ditches for the CEA Improvement Packages.

Exhibit 3-15
Permanent Impacts, CEA Improvement Packages

Wetland Category	Option Package A	Option Package B	Option Package C	Preferred Alternative
Category I wetlands (acres)	0.22	0.32	0.42	0.3
Category II wetlands (acres)	3.28	3.54	3.51	4.39
Category III wetlands (acres)	2.61	3.24	3.31	2.59
Category III wetlands without hydric soil indicators (acres)	1.23	1.23	1.23	1.30
Category IV wetlands (acres)	1.00	1.05	1.05	1.01
Total wetlands (acres)	**8.34**	**9.38**	**9.52**	**9.59**
Wetland buffers (acres)	11.22	12.44	12.82	11.37
Wetlands buffers for wetlands without hydric soil indicators (acres)	2.08	2.08	2.08	2.08
Reservoirs (acres)	2.30	2.34	2.34	2.33
Ponds/Pits (acres)	NA	NA	NA	2.55
Streams (acres)	0.83	0.85	0.91	0.83
Potentially jurisdictional ditches (feet)	1,229.49	1,284.64	1,204.91	1,271.56

The area of permanent impact includes the entire project area, except the area between MP 56.6 and MP 59.9.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

FHWA, WSDOT and their partner agencies have developed a landscape-scale, watershed-based strategy to mitigate for project impacts. Applying this strategy to the project will mitigate localized impacts related to project implementation on a sub-basin scale, address watershed level connectivity objectives, and decrease the impact of I-90 on the larger landscape. The wetland and aquatic

resource mitigation and design strategy developed for this project includes:

- Collecting data necessary for initial design and adaptive management through extensive research and monitoring
- Incorporating connectivity investments and design elements into the project that will reestablish and enhance hydrologic, water quality, and habitat functions and meet ecological connectivity objectives
- Minimizing and avoiding project-related impacts to wetlands and other jurisdictional waters to the extent practicable through design modification, BMPs, and other reasonable measures
- Shifting unavoidable impacts from high- to low-quality wetlands and habitats
- Working with agency and non-governmental partners on habitat conservation acquisitions that provide long-term protection of connectivity investments and design elements
- Preserving high-quality and unique habitats
- Providing thoughtful, focused compensatory mitigation, compatible with the needs identified for the project, and commensurate with the level and degree of impact

Avoidance and Minimization

WSDOT designed the I-90 project to avoid and minimize impacts to wetlands and other jurisdictional waters where ever possible. Through these measures, WSDOT has lowered the overall amount of impacts and shifted impacts from higher-quality to lower-quality wetlands.

Avoidance and minimization has been accomplished by measures such as:

- Using retaining walls rather than fill slopes in order to avoid affecting wetlands and other waters
- Shifting the alignment at specific locations to avoid wetlands and other jurisdictional waters
- Lowering the design speed to use more of the existing right-of-way and decrease the amount of fill
- Eliminating the viaduct bridges to reduce fill to Keechelus Lake from retaining walls and support structures
- Retaining narrow medians in order to minimize areas of new fill despite the need for more snow storage
- Incorporating the MDT design objectives and performance standards wherever applicable and reasonable.

The effects of these avoidance measures have been substantial, as shown in Exhibit 3-16, which shows the change in projected impact to wetlands for the Preferred Alternative between 2004 and 2008.

Exhibit 3-16
Change in Acres of Wetland Impacts by Wetland Category for Entire 15-mile Project from 2004 to 2008 Design

Source	Wetland Category				
	I	II	III	IV	Total
November 2004 Wetland/Biology Discipline Report	2.74	9.64	1.94	0.94	15.26
May 2008 Wetland/Biology Discipline Report	0.3	5.26	9.18	1.46	16.20
Percent Change	-91.3	-54.6	+473.2	+55.3	+6.20

The 2004 report did not include additional wetland areas added during 2007, nor did it contain WSDOT avoidance and minimization measures.

Incremental design changes have shifted wetland impacts from higher-quality Category I and II wetlands to lower-valued Category III and IV wetlands, based on the wetland delineations current before September 2007. The increase in impacts to Category III wetlands is a result of the addition of areas classified as “wetlands without hydric soil indicators” by the USACE in fall 2007.

Best Management Practices

BMPs for wetlands will be designed to meet applicable commitments and performance standards listed in Section 3.3, *Water Resources*, as well as:

- The final Wetland & Aquatic Resources Mitigation Plan
- The project-specific roadside master plan, which will guide re-vegetation adjacent to the highway

Example BMPs that WSDOT could use to comply with these standards include all of those listed in Section 3.3 plus the following:

- Delineating boundaries of expected permanent impacts
- Delineating boundaries of expected temporary impacts, both horizontally and vertically, utilizing recoverable material and allowing full restoration
- Placing high visibility fencing around wetlands and sensitive habitats to avoid inadvertent impacts during construction
- Isolating the work zone with material such as sand bags or silt curtains
- Working during low water periods
- Minimizing clearing and grading
- Implementing an education and outreach program for contractors and construction workers

Compensatory Mitigation

Compensatory mitigation will be needed to offset areas of permanent loss of wetlands. The overall goals of the proposed compensatory mitigation are to:

- Replace wetland functions and area equal to the permanent impacts resulting from building the Preferred Alternative
- Advance landscape-scale, watershed-based ecological connectivity objectives in the project area

These goals provide a framework for selecting mitigation sites and mitigation ratios, as well as for developing target functions at the mitigation sites. The proposed compensatory mitigation will achieve the overall goals by focusing restoration efforts at locations currently affected by the highway. In addition, protecting high-quality, unique wetlands and other habitats from development will preserve wildlife corridors within the project area.

WSDOT has completed a *Conceptual Wetland & Aquatic Resources Mitigation Plan* (Appendix J). This plan is subject to regulatory review and will be finalized as part of the project's Clean Water Act Section 404 permit and other applicable permits. WSDOT commits to implementing the measures contained in the final plan.

Restoration of Wetlands and Other Aquatic Habitats

WSDOT will restore wetland areas, stream channels, and riparian areas at each CEA where new bridges and culverts are installed. Wetlands and riparian areas probably existed prior to the original highway construction at these locations, and the project has been designed to reestablish connections between wetlands and other high quality habitats, as well as restore channel migration and floodplain functions.

Mitigation measures proposed at locations within and adjacent to CEAs include:

- Restoring and creating wetland, stream, and riparian zone area and function
- Restoring connections between wetlands and other important wildlife habitats
- Restoring channel migration and surface and subsurface flow paths
- Restoring connections between streams, floodplains, and riparian zones
- Restoring passage for fish and aquatic organisms at stream crossings

Impacts from these restoration activities would be limited to soil disturbance during construction. Mitigation sites temporarily affected by construction will be restored once construction is complete. Restoration activities may include:

- Restoring pre-construction contours
- Replacing or amending surface soils
- Planting or seeding with native herbaceous and/or woody vegetation

WSDOT will maintain and monitor all planted areas, based on the commitments made in the final Wetland & Aquatic Resources Mitigation Plan, which will be completed by WSDOT as part of project permitting.

Habitat Preservation

Preservation is an important component of reestablishing and maintaining ecological connectivity and will help to protect the project's connectivity investments. Although preservation does not

replace wetland area or function affected by the project, it has the benefit of providing larger mitigation areas, protecting high-quality, high-functioning wetlands that might otherwise be affected adversely by future development, and removing the uncertainty of success associated with creation or restoration projects.

WSDOT is acquiring a 265-acre property for habitat preservation in the Gold Creek Valley. This property contains wetlands, riparian areas, and mature forest, including potential habitat for northern spotted owls, marbled murrelets, and bull trout. This property has potential for high-density development, which would be avoided through this acquisition. WSDOT has committed to preserve this property in perpetuity.

WSDOT is acquiring a 265-acres preservation site in the Gold Creek valley.

Proposed Wetland Mitigation Ratio

Compensatory mitigation is one component of the cumulative, sequenced mitigation strategy developed for this project. Within the context of the unprecedented investment in landscape-scale habitat and hydrologic connectivity incorporated into this project, WSDOT is proposing a minimum wetland replacement ratio of 1:1 for required compensatory wetland mitigation. Stream and riparian zone restoration will contribute additional area and function, which is not accounted for in this ratio.

WSDOT will compensate for unavoidable impacts to wetland area and function at a minimum 1:1 mitigation ratio, in accordance with Federal Executive Order 11990, Governor's Executive Order 89-10 (Protection of Wetlands: "No Net Loss") and WSDOT Directive 31-12 (Protection of Wetlands Action Plan). A Clean Water Act Section 404 permit will be obtained. The number of traditional compensatory mitigation sites in the project area is limited due to both public ownership of the majority of the surrounding land and to geography. However, within the unique context of the project, opportunities to improve wetland and stream function abound. The connectivity investments within CEAs and HCZs will improve water quality, hydrologic function, and habitat by reestablishing connections through the barrier created by I-90. Removing highway fill and incorporating natural substrates and habitat elements into the

design of connectivity structures also will increase the area of wetlands, riparian zones, stream channels, and floodplains.

In addition to the enhancements to wetland area and function designed into the project, WSDOT has identified several areas where restoring degraded wetlands and preserving unique, high-quality habitat will promote ecological connectivity objectives in the project area. The *Conceptual Wetland & Aquatic Resources Mitigation Plan* (Appendix J) identifies potential wetland restoration and preservation sites and describes proposed activities at each site.

Proposed Wetland Mitigation Sites

WSDOT has performed an extensive ongoing wetland mitigation site assessment in the project area. As a result of the work completed to date, six preferred or acceptable wetland mitigation sites have been identified for Phase 1. These sites would provide wetland restoration, wetland and upland habitat preservation, and enhanced wildlife connectivity.

WSDOT has conducted a preliminary assessment of the area of restoration. Based on current design information, wetland restoration would total:

- 7.06 acres of Category II riverine/lake fringe scrub-shrub wetlands
- 0.13 acre of Category II riverine emergent and forested wetlands
- 3.75 acres of Category II slope emergent and forested wetlands

At this time, two preferred wetland mitigation sites have been selected for the remaining project area. These are the Bonnie Creek and Swamp Creek sites. These sites would provide restoration of riverine and depressional wetlands with emergent, scrub-shrub, and forested classes. Additional wetland mitigation is expected to be available at Swamp Creek and/or Unnamed Creek (MP 67.1). WSDOT will continue to work with resource agencies to identify additional wetland mitigation area for the remaining project area.

Further details on all of these potential mitigation sites can be found in Chapter 4 of the *Conceptual Wetlands & Aquatic Resources Mitigation Plan* (Appendix J).

Proposed Stream Mitigation Sites

Stream mitigation proposed for Phase 1 includes stream channel, riparian zone, and/or hydrologic connectivity restoration at Gold Creek, Rocky Run Creek, Wolfe Creek, Unnamed Creek (MP 57.3), Resort Creek, Unnamed Creek (MP 59.7), Townsend Creek and Unnamed Creek (MP 60.9). Total riparian zone restoration for this phase would be 4.11 acres.

Stream mitigation proposed for the remaining project area includes stream channel, riparian zone, and/or hydrologic connectivity restoration at Price Creek, Noble Creek, Bonnie Creek, Swamp Creek, Unnamed Creek (MP 63.7), Toll Creek, Cedar Creek, Unnamed Creek (MP 65.1), Telephone Creek, Hudson Creek Unnamed Creek (MP 67.1), and Unnamed Creek (MP 67.2). Total riparian zone restoration for the remaining project area would be 7.2 acres.

Further details on all of these potential stream mitigation sites can be found in Chapter 4 of the *Conceptual Wetlands & Aquatic Resources Mitigation Plan* (Appendix J).

Highway Reclamation

As phases of the project are completed, WSDOT will perform extensive restoration activities that include areas of additional forested habitat, highway reclamation, buffer improvements, and highway slope vegetation with native species.

3.5 Fish, Aquatic Species, and Habitats

The I-90 project area is entirely within the Upper Yakima River Basin. (Shown: Yakima River near Crystal Springs Campground)

This section discusses the expected environmental impacts of the project alternatives to fish and aquatic habitat, with additional information on fish species listed under the ESA and other statutes. The study area for fish, aquatic species, and habitats consists of streams, lakes, and ponds within or downstream of the project area. Associated wetlands are discussed in Section 3.4, *Wetlands and Other Jurisdictional Waters*. Further information can be found in the *Aquatic Species Discipline Report* (WSDOT 2002f) and its supplement (WSDOT 2005b).

What new information has been developed since the Draft EIS?

Since publishing the Draft EIS, the MDT completed their report and recommendations regarding the Preferred Alternative (Appendix D). WSDOT completed a *Biological Assessment* (Appendix M) that provides updated information on the presence of ESA-listed species. The USFS completed a *Biological Evaluation* that describes potential effects on sensitive species and their habitat. The *Biological Evaluation* appears as an appendix to the *Biological Assessment* (Appendix M). Comments from the public and reviewing agencies have been incorporated into this section.

What are the major characteristics of the affected environment?

The study area comprises streams, lakes, ponds, and wetlands along the 15-mile I-90 corridor. Exhibit 3-17 lists the primary water bodies in the project area. Each of these water bodies has associated wetlands and riparian areas that provide components of fish habitat. In addition, the project area contains numerous small unnamed streams. Additional information on project area streams and their associated habitat can be found in Section 3.5 of the Draft EIS, the *Wetland/Biology Discipline Report* (Appendix K), and the

Conceptual Wetland & Aquatic Resources Mitigation Plan (Appendix J).

Exhibit 3-17
Primary Water Bodies in the Project Area

Creeks	Creeks (continued)	Lakes	Rivers
Coal Creek	Unnamed Creek (MP 64.5)	Keechelus Lake	Yakima River
Gold Creek	Cedar Creek	Lake Easton	Yakima River Side Channel
Rocky Run Creek	Unnamed Creek (MP 65.0)	Kachess Lake	Kachess River (below Kachess Dam)
Wolfe Creek	Unnamed Creek (MP 65.1)	Swamp Lake	
Unnamed Creek (MP 57.3)	Unnamed Creek (MP 65.2)		
Resort Creek	Unnamed Creek (MP 65.4)		
Unnamed Creek (MP 59.7)	Telephone Creek		
Townsend Creek	Unnamed Creek (MP 65.6)		
Unnamed Creek (MP 60.9)	Unnamed Creek (MP 66.1)		
Unnamed Creek (MP 61.0A)	Unnamed Creek (MP 66.3)		
Unnamed Creek (MP 61.0B)	Unnamed Creek (MP 66.4)		
Price Creek	Hudson Creek		
Noble Creek	Unnamed Creek (MP 66.8)		
Unnamed Creek (MP 62.2)	Unnamed Creek (MP 66.9)		
Bonnie Creek	Unnamed Creek (MP 67.0)		
Unnamed Creek at Crystal Springs	Unnamed Creek (MP 67.1)		
Swamp Creek	Unnamed Creek (MP 67.2)		
Unnamed Creek (MP 63.7)	Unnamed Creek (MP 67.3)		
Toll Creek	Unnamed Creek (MP 67.4)		

Aquatic Habitat

Several measures show that the overall health of the aquatic environment in the project area is good. As described in Section 3.3, *Water Resources*, water quality is high throughout the study area, with only local and occasional deviations from state standards. These deviations do not appear to be related to the highway.

Amphibians

Amphibians are an important indicator of the health of the aquatic environment. (Shown: Rough-Skinned Newt)

Amphibians are another measure of the health of the aquatic environment. Amphibians are relatively sedentary and have semi-permeable skin, which makes them more sensitive to contamination and degradation than many other species. Wetlands and streams within approximately 0.5 mile of I-90 were assessed for amphibian habitat. These surveys showed that the highway separates amphibian habitat in at least two locations:

- I-90 separates habitat areas that occur on both sides of the highway from the beginning of the project area to Wolfe Creek
- I-90 separates the wetland complexes along the Yakima River floodplain from the Swamp Creek drainage

These surveys showed that amphibian habitat is present within the project area and that in some cases it is fragmented by the highway. Additional information on amphibian habitat in the project area is presented in Section 3.5 of the Draft EIS and in the *Aquatic Species Discipline Report* (WSDOT 2002f).

Shown: Pacific Giant Salamander

Habitat for Western toad, Cascade frog, Pacific tree frog, long-toed salamander, northwestern salamander, rough-skinned newt, Pacific giant salamander, and tailed frog were found in the project area (Exhibit 3-18). With the exception of the long-toed salamander, all of these species were observed in the field.

None of these species are listed as threatened or endangered under the ESA, nor does the USFWS consider them to be species of concern. (The Draft EIS incorrectly stated that the Cascade frog and Columbia spotted frog were listed as species of concern.) Three species are candidate or monitor species for the Washington Department of Fish and Wildlife (WDFW). Refer to Section 3.5 of the Draft EIS for descriptions of available habitat and species distribution by project area segment.

Exhibit 3-18
Amphibian Species Status

Amphibian	Habitat	USFWS/USFS Status	WDFW Status
Western toad	Marshes, pond or stream margins/forested uplands	None	Candidate
Cascade frog	Marshes, pond or stream margins/forested uplands	None	Monitor
Pacific tree frog	Marshes, pond or stream margins/forested uplands	None	None
Long-toed salamander[1]	Marshes, pond or stream margins/forested uplands	None	None
Northwestern salamander	Marshes, pond or stream margins/forested uplands	None	None
Rough-skinned newt	Marshes, pond or stream margins/forested uplands	None	None
Pacific giant salamander	Cool, forested streams	None	None
Tailed frog	Cool, forested streams	None	Monitor

1. Habitat found in study area although species not directly observed
USFS – US Forest Service
USFWS – US Fish and Wildlife Service
WDFW – Washington Department of Fish and Wildlife

Fish Species

How have project area dams affected fish populations?

Anadromous salmon, steelhead, and over 30 resident fish species inhabit the Yakima River system. The *Aquatic Species Discipline Report* (WSDOT 2002f) presents detailed life history information on some of the important fish species in the project area.

Salmon and steelhead populations in the Upper Yakima system are much smaller than their historic numbers, partially as a result of dams on the Yakima and Columbia Rivers that block or reduce passage or alter flow regimes. In the project area, the presence of Keechelus Dam has resulted in isolated populations of bull trout and redband trout that live in Keechelus Lake (above the dam) and spawn in Gold Creek, but cannot migrate to the Yakima River below the dam.

Flow regime refers to a river basin's flow magnitude and duration given a particular precipitation event (amount and intensity) and also the frequency of the events.

How has I-90 affected fish passage?

Culverts in the project area can create barriers to fish passage. (Shown: "perched" culvert at Resort Creek)

The highway affects fish populations primarily through culverts that either block or limit fish passage at streams within the project area, including cutthroat trout populations that cannot move from the Yakima River or Keechelus Lake to their tributary streams. The upstream dewatering of Gold Creek also is a barrier to fish passage. Culverts block fish passage in a variety of ways, including shallow water depths, high water velocities, or "perched" culverts, where erosion creates a drop from the end of the culvert that blocks returning fish. The highway can increase these effects by confining the stream and thus leading to higher water velocities and increased erosion.

Exhibit 3-19 shows the known fish barriers in the project area. The remaining stream crossings will be evaluated for their fish barrier effect, and solutions will be developed during the design of the appropriate phase of the project.

Exhibit 3-19
Known Fish Passage Barriers in the Project Area

Water Body	Barriers
Gold Creek	Channel confinement, lack of riparian vegetation, upstream dewatering
Rocky Run Creek	Culverts that constrict flow and increase velocity
Wolfe Creek	Culvert barrier that constricts flow
Resort Creek	Culvert barrier except at Keechelus Lake high pool
Townsend Creek	Culvert barrier; possible barrier at the old US Highway 10 roadbed
Price Creek	Culvert barrier (10-foot box culvert)
Noble Creek	Culvert barrier
Bonnie Creek	Culvert barrier
Swamp Creek	No barrier
Toll Creek	Culvert barrier
Cedar Creek	Culvert barrier
Telephone Creek	Culvert barrier
Hudson Creek	Non-fish bearing

Source: Biological Assessment (Appendix M)

Which fish species have special status?

Distinct Population Segment: a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species.

Several species and distinct population segments of fish found in the project area are listed under the ESA, or are special status species by the USFWS, USFS, or WDFW. Exhibit 3-20 shows listed species or species of concern.

Exhibit 3-20
Fish Species Status

Fish	WDFW Status	USFS Status	ESA Status
Bull trout – Columbia River Distinct Population Segment	Candidate	Sensitive	Threatened
Steelhead trout – Middle Columbia River Distinct Population Segment	Candidate	Sensitive	Threatened
Westslope cutthroat trout	None	Sensitive	Species of concern
Pacific lamprey	None	Sensitive	Species of concern
River lamprey	Candidate	Sensitive	Species of concern
Pygmy whitefish	Sensitive	Sensitive	Species of concern
Umatilla Dace	Sensitive	Not listed	Not listed
Redband trout	Unknown	Sensitive	Species of concern

ESA – Endangered Species Act
USFS – US Forest Service
WDFW – Washington Department of Fish and Wildlife

Survey data have documented the presence of bull trout, westslope cutthroat trout, and pygmy whitefish in the study area. Survey results for these species are given below. Pacific lamprey, river lamprey and steelhead trout are present in the Yakima River watershed below the Lake Easton dam. However, there is no evidence to indicate that adults of these species can bypass the dam, although Lake Easton dam may provide passage for juvenile steelhead trout.

Bull Trout - Columbia River Distinct Population Segment

Two populations of bull trout live in the project area.

Two isolated bull trout stocks occur in the project area: 1) the Keechelus Lake stock, and 2) the Yakima River stock occurring in Lake Easton and the mainstem of the Yakima River.

Keechelus Lake Stock. Construction of the Keechelus Dam between 1913 and 1917 isolated the Keechelus Lake stock.

Currently, the only known population in Keechelus Lake spawns in Gold Creek, and surveys for this project detected bull trout only in Gold Creek. However, bull trout are likely present in Coal Creek, and there is anecdotal evidence of their presence at Rocky Run Creek. The Keechelus Lake stock is considered critical, primarily because of its chronically low numbers and isolation from other stocks. Refer to the *Biological Assessment* (Appendix M) for more details.

Yakima River Stock. WDFW recognizes the Yakima River bull trout as a distinct stock. These bull trout are assumed to inhabit the mainstem and spawn in tributaries. Yakima River bull trout are listed as threatened under the ESA because of chronically low numbers of fish encountered in reference areas. The USBR has concluded that the principle limiting factor for bull trout populations in the Yakima Basin is the lack of spawning and juvenile rearing habitat. Other limiting factors include brook trout hybridization and competition, decline in juvenile salmon as a prey base, an extremely altered river flow regime to deliver irrigation water, and limited access to spawning areas in creeks because of barriers to fish passage.

Steelhead Trout - Middle Columbia River Distinct Population Segment

Before the Easton Diversion dam was constructed, Middle Columbia River steelhead had access to most of the upper Yakima watershed reaches, including Keechelus Lake. Good quality spawning and rearing habitat is located between the Keechelus and Easton Dams, but returning numbers to the upper Yakima River are small. The fish ladder at Easton Dam provides passage for juvenile Middle Columbia River steelhead under certain flow regimes. All Yakima River steelhead are summer-run steelhead.

Summer-run steelhead enter freshwater in a sexually immature condition between May and October and require several months to mature and spawn.

Westslope Cutthroat Trout

Cutthroat trout are distributed throughout the project area, and high numbers were found in Coal, Gold, Rocky Run, Resort, Bonnie, and Hudson Creeks (WSDOT 2002f). Several of these populations cannot move between the lakes, rivers, and tributary streams because

culverts along I-90 block access to Keechelus Lake and the Yakima River. Isolation and the presence of brook trout threaten the persistence of cutthroat trout above Keechelus Dam.

Pygmy Whitefish

Pygmy whitefish most commonly occur in large, deep, unproductive (low nutrient) lakes. Pygmy whitefish are found in both Keechelus Lake and Kachess Lake (WDFW 1998).

Pacific Lamprey and River Lamprey

Both of these species are present within the Yakima River watershed below Lake Easton Dam, and their presence is suspected in Keechelus Lake. There is a high probability that suitable habitat exists within the project area.

Critical Habitat

Under the ESA, the USFWS or NOAA Fisheries may designate critical habitat for a listed species. Critical habitat is a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species. Critical habitat may include an area that is not currently occupied by the species but that would be needed for its recovery.

For Columbia River bull trout, the USFWS has designated a 0.5-mile reach of Gold Creek beginning about 0.25 river mile above the I-90 bridges as critical habitat, along with portions of the Yakima and Kachess Rivers. The USFWS did not designate any federal lands as critical habitat.

For Middle Columbia River steelhead, NOAA Fisheries has designated the mainstem of the Yakima River downstream from Keechelus Dam and the Kachess River as critical habitat, including the portion within the project area.

What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would not result in any beneficial effects to fish, aquatic species, or aquatic habitat.

Build Alternatives

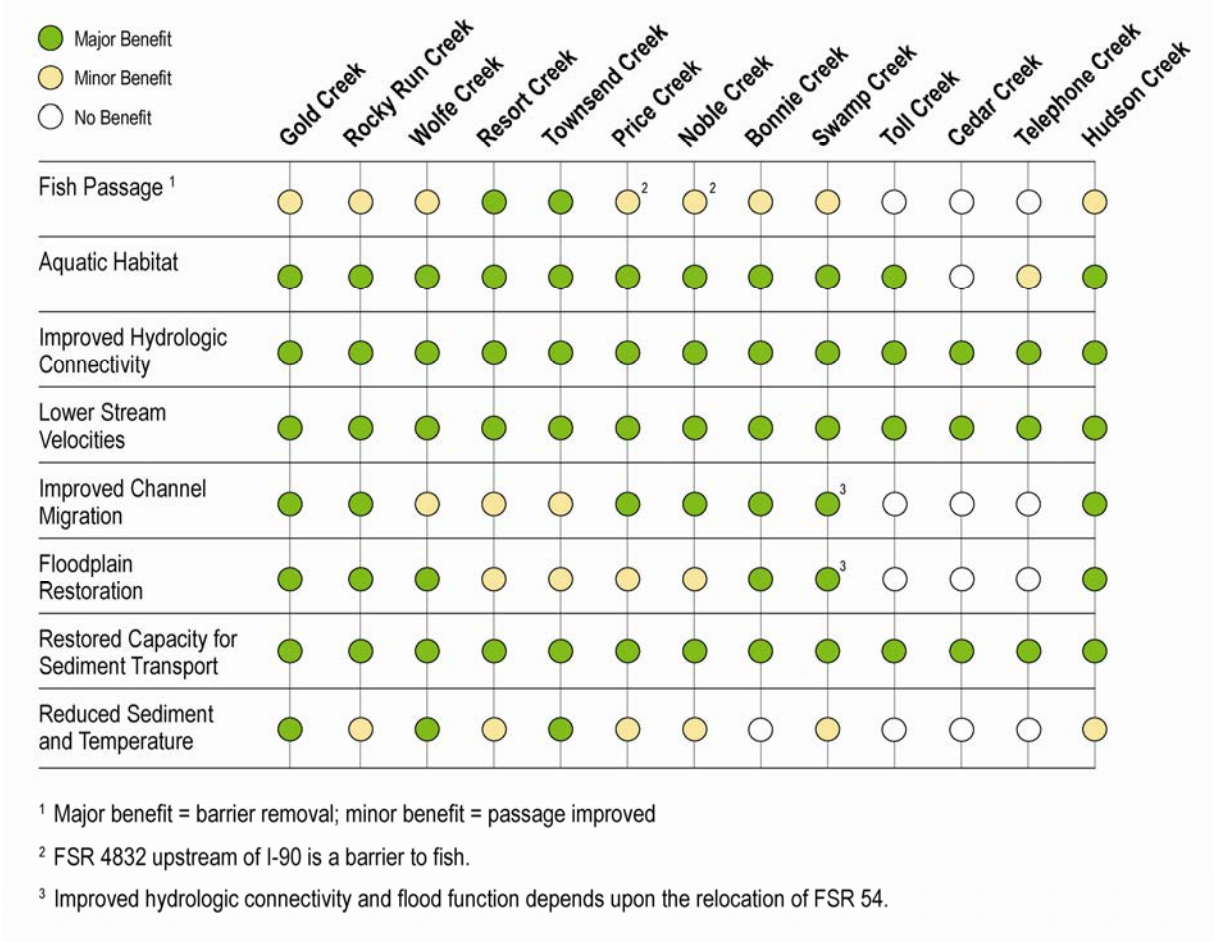
While all of the build alternatives would have some negative impacts on aquatic habitat and species, FHWA and WSDOT anticipate that overall effects of any of the build alternatives would be highly positive.

Exhibit 3-21 summarizes the beneficial effects at each major water body for the Preferred Alternative. Beneficial effects would be similar but less effective for the other build alternatives, since the Preferred Alternative was designed to maximize the benefit at each CEA.

Improved Fish Passage. Few culverts in the project area allow fish passage. In some cases, the original culvert design did not allow fish passage. In other cases, the culvert created increased water velocities leading to erosion at the downstream end of the culvert, which eventually created a barrier to fish passage.

WSDOT would design the proposed bridges and culverts for fish bearing streams to meet WDFW stream simulation criteria for fish passage. These structures would open up currently inaccessible habitat areas and improve connection to the designated critical habitat for bull trout and steelhead. These improvements would benefit resident fish populations, and as fish passage is improved throughout the Yakima River basin, returning populations would be able to re-colonize a larger amount of stream habitat for spawning.

Exhibit 3-21
Beneficial Impacts for Keechelus Lake Alignment and Improvement Packages Area



Information derived from the most current WSDOT design plans and the MDT Recommendation Package (Appendix D).

Connected Habitat. WSDOT has designed bridges and culverts to connect habitat that is currently separated by the highway. Culverts would have a bottomless clearspan design using natural substrate materials. Using longer bridges and natural substrates in the culverts, along with restoring riparian vegetation along restored stream channels, should connect habitats for fish and other aquatic species.

Increasing Aquatic Habitat. In areas where longer bridges would be installed, WSDOT will remove road fill and restore stream channels, floodplains, and riparian habitat underneath and adjacent to the bridges. Restoring floodplains for streams that currently have

artificially confined movement should lead to increased stream meander and the formation of additional aquatic habitat.

Restoring In-Stream Physical Processes. WSDOT has designed bridges and culverts to improve passage of channel sediment and large woody debris.

Improving Water Quality. Under existing conditions, no designed stormwater treatment is provided for runoff from impervious surfaces in the project area. The combination of proposed stormwater treatment measures described in Section 3.3, *Water Resources*, along with avoidance, minimization, and BMPs, would contribute to improved water quality and to the health of fish and fish habitat.

Improving Groundwater Flow. Designing and installing additional culverts at the HCZs would help restore surface and shallow subsurface water flows under the highway. This water is currently channeled along the side of the highway into streams and culverts, and contributes to higher flow volumes, velocities, and channel instability.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any direct adverse impacts. This alternative would result in indirect adverse impacts, including water quality impacts as traffic volumes continue to grow in the absence of treatment for stormwater runoff.

Build Alternatives

Temporary Impacts

Constructing any of the build alternatives would create temporary impacts to fish habitat because of impacts to wetlands and other jurisdictional waters, including streams, reservoirs, and jurisdictional ditches. Temporary impacts would be similar for all of the build alternatives, all of which would widen the highway to three lanes in each direction. All would include constructing improvements at

each of the CEAs. The primary differences between the build alternatives would be the area of disturbance of stream habitat for each of the improvements proposed.

FHWA and WSDOT have concluded that applying appropriate construction BMPs and restoration activities would successfully mitigate for all temporary impacts, regardless of which build alternative was chosen. WSDOT has completed a detailed assessment of temporary impacts to wetlands, wetland buffers, reservoirs, streams, and potentially jurisdictional ditches for the Preferred Alternative. The assessment is presented in the *Wetland/Biology Discipline Report* (Appendix K) and in the *Conceptual Wetland & Aquatic Resources Mitigation Plan* (Appendix J).

Excavation and Grading. Excavation and grading may increase sediment delivery to water bodies. Removing portions of the existing highway would generate fine concrete dust and slurry, which may run off to surface water. High levels of sediment can cause direct injury, increase avoidance behavior, and reduce feeding success for aquatic species, as well as affect the survival of eggs and newly hatched fish.

Removing Riparian Vegetation. Removing riparian vegetation would be necessary where bridges, culverts and the snowshed are replaced. Removing riparian vegetation can cause direct mortality to amphibians and small mammals, and may disrupt the movement of species, increase vulnerability to predation, increase water temperatures, and cause erosion and sedimentation. Most impacts from removing vegetation would be temporary, since WSDOT would require its contractors to minimize vegetation clearing to the extent possible and implement an approved revegetation plan.

Removal of existing culverts would have long-term benefits, but would require BMPs to prevent short-term construction impacts.

Removing and Replacing Culverts and Bridges. While the overall impacts of replacing culverts and bridges would be positive, removal and construction have the potential to cause erosion, increases in turbidity, and sedimentation.

In-Water Work. In-water work includes constructing footings, piers, and retaining walls, and in some cases removing culverts. In-water work has the potential to temporarily increase turbidity.

Concrete Curing. Uncured concrete has the potential to cause elevated pH in water.

Blasting and Pile Driving. Fish may be disturbed by the sound of or physical shock from blasting or pile driving. The potential effect is reduced with distance from streams and with reduced blasting charge size. Blasting in the vicinity of Keechelus Lake would occur on the slopes north of I-90, which are substantially higher in elevation than the shoreline, far enough from the lake that there would be no impacts to fish. Some pile driving would be necessary but would be very limited in duration and frequency. WSDOT does not propose any blasting or pile driving in the vicinity of the Yakima or Kachess Rivers or their tributaries.

Equipment Maintenance and Fueling. Heavy equipment and vehicles used during construction present the potential for spills during fueling and maintenance.

Construction Timing and Duration. The potential for water quality effects are greater during rainy periods, which increase potential runoff from the site.

Permanent Impacts

WSDOT analyzed the potential adverse permanent impact of the build alternatives on wetlands, wetland buffers, streams, reservoirs, and potentially jurisdictional ditches, all of which contribute to fish habitat. The results of this analysis are presented in Section 3.4, *Wetlands and Other Jurisdictional Waters,* since these impacts represent the permanent impacts to fish and aquatic habitat as well.

WSDOT based this analysis on impact footprints for each of the build alternatives that included revisions to the project to eliminate the viaduct bridges, replace the snowshed, modify the proposed design speed, and move the alignment to avoid high-quality

resources. WSDOT's analysis also was based on the results of updated wetland inventories conducted in 2006 and 2007. Consequently, the impacts described in this section are somewhat different than those presented in the Draft EIS, which were based on the information available at that time.

Under the ESA, FHWA is required to analyze the potential impacts of the identified Preferred Alternative to listed species. These potential impacts are presented in the *Biological Assessment* (Appendix M). As shown in Exhibit 3-22, the *Biological Assessment* concluded that the Preferred Alternative is likely to adversely affect one listed species, Columbia River bull trout. FHWA therefore requested formal USFWS consultation for this species. Based on this consultation, FHWA and WSDOT believe that the project would not have a substantial adverse impact to this species.

Because Middle Columbia River Steelhead are present and the *Biological Assessment* (Appendix M) concluded that that project is unlikely to adversely affect this species, FHWA and WSDOT have completed informal consultation with NOAA Fisheries for Middle-Columbia River Steelhead, and received a letter of concurrence dated April 7, 2008 (NOAA Fisheries 2008).

Exhibit 3-22
Effects Determination – ESA-Listed Fish Species

Threatened Species in Project Area	Species	Critical Habitat
Columbia River Bull Trout	LAA	NLAA
Middle Columbia River Steelhead	NLAA	NLAA

LAA = May Affect and is Likely to Adversely Affect
NLAA = May Affect but Not Likely to Adversely Affect

For sensitive species that are not listed under ESA, the USFS prepared a *Biological Evaluation* (Appendix M). This document concluded that while the Preferred Alternative may impact individuals or habitat, it is unlikely to contribute to a trend toward federal listing or loss of viability to the population or any of these species.

While these impact determinations are based on the Preferred Alternative, FHWA and WSDOT believe that impacts would be similar for any of the build alternatives.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT has designed the project to avoid and minimize impacts to fish and aquatic habitat wherever possible. The new highway alignment for all of the build alternatives has been designed to avoid aquatic habitat, including streams and associated wetlands, as much as possible. These measures have resulted in a reduction in overall wetland impacts, and in shifting those impacts from higher-value to lower-value wetlands. Section 3.3, *Wetlands and Other Jurisdictional Waters*, describes the results of this avoidance and minimization effort.

WSDOT also incorporated the MDT design objectives and performance standards into the design of the project wherever applicable and reasonable.

Best Management Practices

BMPs for fish and aquatic habitat and species will be designed to meet applicable commitments and performance standards listed in Section 3.3, *Water Resources*, as well as:

- The *Design of Road Culverts for Fish Passage* manual (WDFW 2003)

- WSDOT's *Fish Exclusion Protocols and Standards* (WSDOT 2006c), which requires isolating the work area during construction and conducting fish removal and release of fish only by qualified biologists

- The Washington State Hydraulic Code (WAC 220-110), which governs culvert and bridge removal and replacement

- Applicable measures specified in the USFWS Biological Opinion

- Applicable conservation measures included in the NOAA Fisheries' ESA Consultation Concurrence Letter (NOAA Fisheries 2008)

- WDFW guidelines for stream crossing structures

Example BMPs that WSDOT could use to comply with these standards include all of those listed in Section 3.3, as well as:

- Removing as much of the existing structure as possible during bridge removal before dismantling it to minimize material and debris entering the water

- Any in-water construction would be subject to seasonal restrictions to minimize adverse impacts to fish spawning and larval development

- Removing fish from the work zone prior to construction

Compensatory Mitigation

The lead agencies believe that by combining avoidance, mitigation, and BMPs, the impacts of the project to fish and other aquatic species and their habitats will be minimized. Potential impacts to Columbia River bull trout will be mitigated through compliance with the applicable measures specified in the USFWS Biological Opinion. The project also will implement the conservation measures in the *Biological Assessment* and the *Biological Evaluation* (Appendix M). The remaining impacts will be mitigated through beneficial effects including fish passage restoration, increase in overall habitat, improved in-stream physical processes, and improved water quality. Consequently, no additional compensatory mitigation will be required.

3.6 Terrestrial Species

This section discusses the expected environmental impacts of the project alternatives on terrestrial plant and animal communities. The study area for terrestrial species is approximately one mile on either side of I-90.

More detail on impacts to terrestrial species can be found in the *Terrestrial Species Assessment* (WSDOT 2003c) and its supplemental report (WSDOT 2004a), and in the *Wildlife Habitat Linkage Assessment* (USFS 2000).

WSDOT determined whether species were present or absent within the I-90 corridor based on review of existing scientific literature, databases, or computer-aided modeling of wildlife-habitat associations.

Field surveys conducted for the I-90 project

- Camera and snow tracking surveys for mammals throughout the corridor
- Inventories of fungi, lichen, mosses, liverworts, vascular plants, and mollusks throughout the corridor
- Marbled murrelet surveys in the Gold Creek area
- Amphibian surveys throughout the corridor
- Additional baseline wildlife monitoring beginning in summer 2007
- Testing of potential wildlife fencing designs beginning in summer 2007

What new information has been developed since the Draft EIS?

Since publishing the Draft EIS, WSDOT completed a *Biological Assessment* (Appendix M) that provides updated information on the presence of ESA-listed species. The USFS completed a *Biological Evaluation* that describes potential effects on sensitive species and their habitat. The *Biological Evaluation* appears as an appendix to the *Biological Assessment* (Appendix M).

The *Mitigation Development Team Recommendation Package* (Appendix D) was finalized in July 2006. The MDT recommendations formed the basis of the Preferred Alternative for improvements at the CEAs. WSDOT also completed the *Wildlife Monitoring Plan* (Appendix O).

Comments from the public and reviewing agencies have been incorporated into this section.

What are the major characteristics of the affected environment?

Why is the project corridor important for terrestrial species?

Important wildlife habitat areas

North of I-90:

- Alpine Lakes Wilderness
- North Cascades National Park

South of I-90:

- Goat Rocks Wilderness
- Mt. Rainier National Park

The I-90 project is located in an area recognized as a critical connective link in the north-south movement of species in the Cascade Range (Exhibit 3-23). The importance of the project area for wildlife movement is based on its location between large blocks of federal land that are largely protected from development. See Section 3.11, *Land Use,* for a discussion of land management in the project area.

Connection between these areas of relatively protected lands is limited to an area approximately 25 miles wide. Land to the east and west of the I-90 project area is largely in private ownership, and development is occurring rapidly. These areas of private land have potential value as wildlife corridors, but the cost and other difficulties in acquiring a sufficient amount of land would be high. The project area, with its lower amount of private land, is a more appropriate site for investing public funds.

I-90 bisects the entire width of this wildlife corridor. Along with the three lakes in the project area, the highway is the primary barrier to north-south movement of wildlife. The average daily traffic volume on I-90 for 2007 was approximately 28,000 vehicles per day, which represents a very substantial barrier to the movement of wildlife.

Image of a deer from a mounted wildlife monitoring camera near Snoqualmie Pass.

Wildlife/vehicle collisions in the project corridor affect both wildlife populations and traffic safety. Some data are available for deer and elk mortality from collisions with vehicles. Deer and elk are safety hazards to motorists because they are large mammals. Mortality for smaller mammals, birds, amphibians, or any other terrestrial species has not been studied.

Exhibit 3-23
Habitat Linkage Areas

Through a partnership between WSDOT and USFS, pathways on federally-managed and private lands adjacent to the project were evaluated for their ecological connectivity in relation to I-90.

From 1996 through 2006, WSDOT maintenance personnel collected data on deer and elk mortality in the project area. WSDOT removed 160 deer and elk carcasses during the 10-year period. These numbers underestimate the actual number of animals killed because they only reflect the animals that were picked up and reported by WSDOT maintenance personnel. The numbers do not include animals that were hit and died off the highway or were picked up by others. Most deer are killed during June and July, and most elk are killed in April and October.

Mortality rates were highest at the north end of Keechelus Lake (MP 55 to MP 57), the south end of Keechelus Lake (MP 60 to MP 63), and Easton Hill (MP 67 to MP 69). These locations are the same as the known wildlife corridors in the area and appear to be driven largely by landforms that channel animal movement to particular locations. These landforms include lakes, rivers, rock cuts and other steep grades, and mountains. Wildlife corridors also are influenced by the tendency of some species of wildlife to avoid areas of human development and disturbance. Fencing to prevent wildlife from reaching the highway within the project corridor is sporadic.

Elk killed in collision with vehicle near proposed wildlife overcrossing structure.

Forested habitats dominate the immediate area, with six different forest zones located in or near the project area, each with multiple plant associations. Wetland and riparian communities are interspersed throughout the corridor, especially at stream crossings and along the shore of Keechelus Lake. Refer to Section 3.4, *Wetlands and Other Jurisdictional Waters,* for further discussion.

A checkerboard pattern of private and public land ownership exists along the I-90 project corridor. This pattern of land ownership has resulted in occasionally conflicting land management practices and habitat fragmentation, which is a threat to some species in the project area (Exhibit 3-24). The area is a patchwork of forest types and ages, including relatively recent clear-cuts, single-species even-aged stands, and small areas of old-growth forests.

This fragmented pattern of land ownership has been and continues to be a driving force behind public and private efforts to acquire land for conservation purposes. As described in Section 3.11, *Land Use*, many thousands of acres of private land in the Central Cascades area have been transferred to public ownership since the late 1990s, much of it near the project area.

There are some small patches of mature or old-growth forest within the highway corridor, much of it immediately adjacent to the highway. Other mature forest occurs on steep slopes and along several riparian corridors. Other unique habitats in the vicinity of the project area include talus slopes, cliffs, bluffs, and wetlands.

Wetlands and riparian areas are discussed in Section 3.4, *Wetlands and Other Jurisdictional Waters*.

Exhibit 3-24
Habitat Fragmentation in and Near the I-90 Corridor

The combination of the highway, power lines, and timber harvest creates fragmented habitat.

In addition to its value as a wildlife corridor, a wide variety of wildlife species live in the project area. The rain shadow effect of the Cascade Mountains, along with rapid change in elevation, creates a wide variety of habitats within a relatively small area, and this leads to wide diversity of wildlife species.

What protected species use the project area?

The project area is home to five terrestrial species that are listed as endangered, threatened, or as species of concern under the ESA. These species and their habitat associations are described in detail in the *Biological Assessment* (Appendix M). ESA-listed fish species are discussed in Section 3.5, *Fish, Aquatic Species, and Habitats*.

Gray wolf (Canis lupus). Gray wolves are extremely rare in the project area, and evidence of their presence is very limited. Gray wolves generally avoid areas of human activity, including highways, but their presence in the project area cannot be ruled out.

Gray wolves are not common in the project area but their presence cannot be ruled out. (Photo not from project area)

Grizzly bear (Ursus arctos horribilis). Sightings and other evidence indicate that a limited number of grizzly bears (probably less than 50) use the area north of I-90 in the North Cascades. Because bears from other populations are not expected to contribute substantially to the North Cascades population, maintaining connectivity within the North Cascades is especially important. The immediate project area contains little or no suitable habitat for grizzly bears because of the relatively high level of human activity in the immediate vicinity of the I-90 corridor. However, grizzly bears are a wide-ranging species and may travel through the project corridor.

Canada lynx (Lynx Canadensis). Lynx are considered present, but uncommon or rare in the project area. Lynx habitat occurs outside the project area between Keechelus and Kachess Lakes, in the Alpine Lakes Wilderness and other land north of the project area, and in the vicinity of Manastash Ridge and Rimrock Lake south of the project area.

Northern spotted owl (Strix occidentalis caurina). Northern spotted owls may occur in forests along the project corridor during foraging and dispersal, but nesting is not likely. Northern spotted owl sites have been documented near the project area, though none are closer than about 1.5 miles from I-90. There are no known northern spotted owl nests in the general project vicinity. Suitable habitat for northern spotted owls is likely to be present along the I-90 corridor, but this habitat is likely too fragmented to support nesting. Dispersal habitat (which allows northern spotted owls to move across the landscape to establish new territories) is present, particularly in the vicinity of Gold Creek, Swamp Lake, and Crystal Springs.

Northern spotted owls have been documented near the project area.

Critical habitat for the northern spotted owl has been designated in Kittitas County. The project area is located between three different critical habitat units but does not overlap any these units.

Marbled murrelet (Brachyramphus marmoratus). The marbled murrelet is a small seabird in the auk family. It is unusual because it

nests far inland in old-growth and mature forest. Surveys indicated marbled murrelet presence in the Gold Creek Valley, though outside of the project area.

Federal regulations require the evaluation of Forest Service Sensitive Species, Sensitive and Strategic Species, Landbird Conservation Strategy Focal Species, Forest Service Management Indicator Species, and Federal and State Species of Concern. The USFS evaluated these species, and concluded that the project may impact individuals or habitat, but is unlikely to contribute to a trend toward federal listing or loss of viability for any of these populations or species. More information is available in the project *Biological Evaluation*, which is an appendix to the *Biological Assessment* (Appendix M).

What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would not result in any beneficial effects to terrestrial species. I-90 would continue to act as a barrier to wildlife movement and would continue to divide wildlife habitat.

Build Alternatives

Including ecological connectivity as part of the project's purpose and need led WSDOT to design the project from the beginning with the aim of making major improvements to wildlife habitat and connectivity. Consequently, while the build alternatives would result in some adverse impacts, the overall effect of the project on terrestrial species would be strongly beneficial.

Improving Ecological Connectivity. The project would make the following investments to improve ecological connectivity:

- Replace existing narrow bridges and culverts at the following stream crossings with longer structures (some streams would have more than one bridge): Gold Creek, Rocky Run Creek,

Resort Creek, Unnamed Creek (MP 60.9), Price Creek, Noble Creek, Bonnie Creek, Swamp Creek, Unnamed Creek (MP 63.7), and Hudson Creek.

- Replace small culverts with wider bottomless culverts, which would be sized to serve as wildlife undercrossings, at the following stream crossings: Wolfe Creek, Townsend Creek, Toll Creek, Cedar Creek, and Telephone Creek.

- Build three wildlife overcrossings, one at the rock knob at the east end of Keechelus Lake near MP 60.8, and two near the Kachess River near MP 68.5 (westbound) and MP 68.7 (eastbound).

- Build bridges at the east end of the Gold Creek valley near MP 55.3, MP 63.2, and MP 67.1, and at Easton Hill near MP 67.7 (westbound) and MP 67.8 (eastbound) to allow wildlife to cross under the highway.

- Install small- and medium-sized culverts (approximately six per mile) to provide passage for smaller and low-mobility species as well as to improve groundwater flow under the highway. The width of the culverts will correspond with the passage size needed by low mobility species to connect with adjacent habitat. WSDOT will add culverts at increased frequency and density in areas where habitat and topography allows; however, areas with engineering constraints will have less frequent and dense culverts. In the later phases of the project, WSDOT will use monitoring data from the first phase of the project, along with inter-agency input, in the design and placement of these culverts.

- Direct animals to the crossing locations using an integrated mix of fencing, topography, and walls.

These improvements have been designed so that benefits at each individual location also would result in benefits at the watershed and landscape scale. This concept of site-specific improvements that will "roll up" to watershed and landscape scale benefits was central to the recommendations made by the MDT for improvements at each CEA.

The likelihood that wildlife would use connectivity structures is high. WSDOT designed these structures with input from recognized experts following proven designs. The openness ratio at each creek crossing would be improved, and the total openness ratio would improve over existing conditions, which would encourage wildlife use. These larger structures would also provide more secure dispersal opportunities for a wider variety of species. WSDOT would use fencing, land forms, and retaining walls to guide wildlife away from the highway and toward the crossing structures.

Openness Ratio is defined as the characteristics of a crossing structure that represents the animal's perception of the passage under the highway.

The proposed connectivity improvements would substantially improve the ability of wildlife to cross the highway. Highly mobile terrestrial species with large home ranges would see the largest benefit, since these populations would likely experience a greater degree of gene flow between populations north and south of I-90. The potential for inbreeding and localized extinctions would be reduced. Low-mobility species with smaller home ranges also would benefit, especially as habitat quality and connection improve over time.

All wildlife species potentially would benefit by gaining access to vacant areas of suitable habitat on opposing sides of the highway. Dispersal of young would be increased and individuals would have greater access to a range of breeding and foraging sites.

Increasing Riparian Habitat. Riparian habitat, in addition to its benefits to aquatic species, is an important source of shelter, foraging habitat, and water for many terrestrial species. WSDOT has designed the project to restore riparian habitat at stream crossings. The area under the larger bridges and culverts would be planted with native vegetation and augmented with habitat elements such as natural substrates, logs, and root wads. These improvements would result in an increase in riparian habitat for the project area as a whole, and would add an important element of habitat connectivity, linking riparian habitat upstream and downstream along the streams where structures would be built. Wetland areas that are currently separated by the highway would be connected.

The largest beneficial impacts would be at Gold Creek and Bonnie Creek. Under the Preferred Alternative, WSDOT would remove roadbed fill and restore approximately 8.45 acres of riparian area, wetlands, and streams at Gold Creek. At Bonnie Creek, WSDOT would restore 3.2 acres of riparian area wetlands and streams. Smaller but similar improvements would be made at other stream crossings.

Decreasing Wildlife Mortality. The lead agencies expect that wildlife crossing structures, along with installing guide fencing, would reduce wildlife mortality and increase traffic safety by reducing wildlife/vehicle collisions. WSDOT would use fencing with vertical retaining walls, natural topographic barriers, boulder fields, and other measures to form a continuous integrated system.

The specific beneficial effects to USFS sensitive species and their habitats are discussed in the *Biological Evaluation* (Appendix M).

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any temporary or permanent direct impacts to terrestrial species or habitat. I-90 would continue to act as a barrier to wildlife movement, and would continue to divide wildlife habitat. An indirect adverse impact of increasing traffic volume would be that the barrier effect of the highway would continue to grow.

Build Alternatives

Temporary Impacts

All of the build alternatives would result in similar temporary impacts to wildlife. Temporary impacts would generally be the result of noise and other disturbance during construction, including noise from blasting and operating machinery. These impacts would occur during the spring, summer, and fall when the project area is free of snow.

Potential construction noise impacts could include:

- Causing wolves, grizzly bears, lynx and/or their prey species to avoid the project area.

- Causing birds, including northern spotted owls, marbled murrelets, and other species of breeding birds to abandon nest sites prematurely. Blasting is especially likely to cause disturbance to birds. Noise can displace owls from foraging and roosting activities. The *Biological Assessment* (Appendix M) analyzed impacts to species listed under the ESA, and the *Biological Evaluation*, which is an appendix to the *Biological Assessment* (Appendix M), analyzed adverse impacts to USFS sensitive species and their habitats.

WSDOT would minimize the effects of construction noise through phased construction, which would allow higher mobility species to move to habitat area not experiencing disturbance.

An additional potential temporary impact would be vegetation clearing for staging and stockpiling areas. To the extent possible, WSDOT has identified potential staging and stockpiling areas, temporary access roads, and material processing areas on previously disturbed lands that are not heavily used by wildlife. Some additional vegetation would be cleared during construction of new highway lanes.

WSDOT calculated temporary impacts using the following assumptions:

- A 15-foot buffer around all project fills

- A 30-foot buffer around all proposed structures, including bridges, culverts and retaining walls, which would allow room for construction equipment.

- Impacts from proposed haul roads

Exact numbers for temporary impacts will continue to change until the project design is finalized, and will be included in project permitting documents. Temporary impacts would last no longer than the construction period and would be successfully mitigated by standard construction BMPs.

Permanent Impacts

FHWA and WSDOT anticipate that all impacts to terrestrial habitat and species would be direct rather than indirect impacts.

Habitat Loss. Permanent impact to terrestrial species would primarily result from the permanent fill to create the new highway lanes. Realigning and widening the highway would result in permanent loss of some habitat, including mature forest, immature forest, and non-forested lands. This may include areas important to wildlife for breeding, shelter, or foraging, and may cause some direct mortality to birds, small mammals, invertebrates, plants, or other terrestrial organisms.

Exhibit 3-25 and Exhibit 3-26 summarize the impacts to habitat for the Keechelus Lake Alignment Alternatives and the CEA Improvement Packages.

Exhibit 3-25
Summary of Habitat Impacts – Keechelus Lake Alignment Alternatives (acres)

No Build	Alternative 1	Alternative 2	Alternative 3	Alternative 4/ Preferred Alternative
Mature forest lost (> than 80 years)				
None	1.7	3.4	2.8	5.1
Terrestrial habitat lost				
None	31.3	46.7	45.8	49.2

Listed and Sensitive Species. Under the ESA, FHWA is required to analyze the potential impacts of the identified Preferred Alternative to listed species. These potential impacts are presented in the *Biological Assessment* (Appendix M). As shown in Exhibit 3-27, the *Biological Assessment* concluded that the Preferred Alternative may affect and is likely to adversely affect one listed species, the northern

spotted owl. Based on this finding, FHWA conducted formal consultation with USFWS. During consultation, FHWA and USFWS agreed that the project also may adversely affect marbled murrelets. FHWA therefore requested formal USFWS consultation for this species as well. Based on this consultation, FHWA and WSDOT believe that the project would not have a substantial adverse impact to these species.

Exhibit 3-26
Summary of Habitat Impacts – CEA Improvement Packages (acres)

No Build	Option A	Option B	Option C	Preferred Alternative
Mature forest lost (>80 years)				
None	70.2	71.3	79.1	70.3
Terrestrial habitat lost				
None	197.2	202.2	205.5	199.5

Exhibit 3-27
Effects Determination – Terrestrial Species

Listed or Proposed Species in Project Area	Species	Critical Habitat
Gray wolf (E)	NLAA	NA
Grizzly bear (T)	NLAA	NA
Canada lynx (T)	NLAA	NA
Bald eagle (T)	NLAA	NA
Northern spotted owl (T)	LAA	NE
Marbled murrelet (T)	LAA	NA
Ute ladies'-tresses (T)	NE	NA

E – endangered
LAA – may affect and is likely to adversely affect
NA – not applicable since critical habitat is not present in the action area
NE – no effect
NLAA – may affect but not likely to adversely affect
T – threatened

The *Biological Assessment* concluded that the Preferred Alternative may affect but is not likely to adversely affect an additional five listed species: gray wolf; grizzly bear; Canada lynx; bald eagle; and marbled murrelet.

The USFS prepared a *Biological Evaluation* (Appendix M) that discusses the impacts on all Federal and State Species of Concern, Forest Service Management Indicator Species, Landbird Conservation Strategy Species, and Forest Service Sensitive and Strategic Species. This document concluded that while the Preferred Alternative may impact individuals or habitat, it is unlikely to contribute to a trend toward federal listing or loss of viability to the population or any of these species.

While these impact determinations are based on the Preferred Alternative, the lead agencies believe that impacts would be similar for any of the build alternatives.

Potential Introduction or Spread of Noxious Weeds. Fourteen noxious weed species are established within the I-90 corridor. The build alternatives will not increase the total roadside area where these species are known to initially establish themselves. However, construction-related ground disturbance has the potential to spread already-established noxious weeds to new areas, especially near stockpiling and staging areas or along new access roads. Noxious weeds also may be introduced by vehicles, personnel, and construction materials that may inadvertently carry the seeds to the project site.

WSDOT would minimize the spread of noxious weed through project design and by using construction BMPs. WSDOT would continue to work closely with the USFS and the county and state Noxious Weed Control Boards to keep noxious weeds from invading native habitats. WSDOT will comply with USFS guidelines for invasive plant management (USDA 2005a and 2005b).

Disturbance to Wildlife from Operational Noise. WSDOT does not expect that operational noise from the growth in traffic volume on I-90 would have an impact on wildlife. Modeling results suggest

that the increase over present conditions would be at most two to three A-weighted decibels (dBA), or approximately five percent over existing levels in the immediate vicinity of the right-of-way. While noise can affect activities such as nesting or feeding, it is unlikely that noise-sensitive species currently use the area for critical life stages because of existing noise levels. See the *Biological Assessment* (Appendix M).

Disturbance to Wildlife from Lighting. WSDOT does not expect lighting to affect wildlife. Lighting would be limited to chain-up and chain-off areas at interchanges and locations within the project corridor for safety reasons, and would be directed towards the highway surface. See Section 3.12, *Visual Quality*.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT has worked to adjust the location of the highway to avoid and minimize impacts wherever possible, including moving the highway alignment to avoid old growth forest, riparian areas, and wetlands. WSDOT expects that as the design is completed, impacts can be reduced further, and that the impacts presented represent the worst case.

Recreational use near the proposed crossing structures could interfere with wildlife attempting to use them. FHWA and WSDOT anticipate that the USFS will manage lands adjacent to crossing structures in a manner that is consistent with their use for wildlife, as discussed in Section 1.13, *What other actions are necessary to complete the project?*

WSDOT will use fencing to reduce wildlife/vehicle collisions and enhance use of the connectivity structures. WSDOT began testing various fence designs in 2007 to determine their ability to withstand the harsh weather conditions in the project area.

Fencing is never completely effective, and WSDOT does not expect that fencing will completely exclude every animal, especially small

species that can go through mesh fences or species that can go over fences (for example, by using overhanging trees). This is particularly true in the I-90 project area, where harsh weather conditions make some kinds of fencing impractical. However, WSDOT believes that even for these species, the combination of fencing and the connectivity structures will lead to enhanced population viability. While the primary focus of wildlife fencing will be on reducing wildlife/vehicle collisions and enhancing traffic safety, WSDOT will consider specialized treatment for special status species.

Wildlife Monitoring

WSDOT has developed a *Wildlife Monitoring Plan* (Appendix O) in cooperation with its Wildlife Monitoring Technical Committee and the Western Transportation Institute at Montana State University. WSDOT has started pre-construction monitoring, which will continue through construction and after completion of the project. Because the project would be built over many years, WSDOT expects to apply the monitoring results from earlier construction phases to subsequent phases.

An I-90 citizen monitoring group has been collecting pre-construction data on wildlife movement by snow tracking.

Monitoring would consist of two tiers:

- Baseline monitoring in and near the highway right-of-way, which would collect data on current wildlife movement (including accidents involving wildlife), and data on the use and effectiveness of the crossing structure designs after they are built. Pre-construction monitoring began in 2008.

- Additional monitoring farther away from the highway right-of-way, which would complement the baseline monitoring and may help to advance the state of knowledge of wildlife crossing design and performance, along with landscape level topics such as population viability. WSDOT would most likely partner with other agencies and groups to accomplish this additional monitoring.

Image of a bear from a mounted wildlife monitoring camera near Snoqualmie Pass.

Habitat Preservation

WSDOT is working with federal and state partner agencies to acquire habitat preservation areas in the project area, as described in Section 3.4, *Wetlands and Other Jurisdictional Waters*.

Best Management Practices

BMPs for terrestrial species will be designed to meet applicable commitments and performance standards, including:

- NPDES General Permit for Construction Activities
- NPDES General Permit for Sand and Gravel Operations
- Temporary Erosion and Sediment Control Plans
- Spill Prevention, Control and Countermeasure Plans
- Erosion and sediment control requirements of the WSDOT *Design Manual* (WSDOT 2007c) and *Standard Specifications for Road, Bridge, and Municipal Construction* (WSDOT 2008b)
- Applicable measures specified in the USFWS Biological Opinion
- Applicable parts of the *Implementing Agreement between the Washington State Department of Ecology and the Washington State Department of Transportation* (Ecology and WSDOT 1998), or as revised
- Applicable permit conditions
- Applicable conditions related to the transfer of federal land for highway easement

Some example BMPs that WSDOT could use to comply with these standards include:

- Reducing wildlife/vehicle collisions at fence ends by incorporating "V" or "J" shaped fence ends that turn animals back toward the main fence when they approach the fence end
- Designing fences with escape routes, jump-offs and/or one-way gates for animals that get caught inside the fencing
- Merging fence ends with topographic features that limit wildlife movement to reduce the "fence-end effect"
- Managing vegetation at culverts targeted for smaller species to encourage the effectiveness of the crossing
- Following the procedures in the project-specific roadside vegetation management plan, which will be completed before construction begins, to minimize encroachment by invasive weed species during construction
- Using integrated vegetation management techniques and establishing native vegetation, in conformance with WSDOT's and USFS's existing procedures
- Mowing and trimming, selectively using herbicides, releasing weed-eating insects, improving soils, and planting native plants to manage vegetation

Compensatory Mitigation

FHWA and WSDOT believe that by combining avoidance, mitigation, and BMPs, the impacts of the project to terrestrial species will be minimized. Potential impacts to the marbeled murrelet and northern spotted owl will be mitigated through compliance with the applicable measures specified in the USFWS Biological Opinion. The project also will implement the conservation measures in the *Biological Assessment* and the *Biological Evaluation* (Appendix M). The project will mitigate for the remaining impacts through the beneficial effects of the build alternatives, which includes improved

ecological connectivity, an increase in riparian habitat, and a decrease in wildlife mortality. Consequently, no additional compensatory mitigation will be required. However, WSDOT has acquired areas of mature forest now in private ownership as part of the preservation component of the *Conceptual Wetland & Aquatic Resources Mitigation Plan* (Appendix J).

3.7 Transportation

This section describes the expected impacts of the project alternatives to transportation. The study area for transportation is the project area. More detail on transportation impacts is available in Chapter 3.7 of the Draft EIS.

The project area near the summit of Snoqualmie Pass.

What new information has been developed since the Draft EIS?

Since publishing the Draft EIS, WSDOT revised the *Transportation Discipline Report* (Appendix P), including updating traffic projections and accident data.

Comments from the public and reviewing agencies have been incorporated into this section.

What are the major characteristics of the affected environment?

What makes up the transportation system and network?

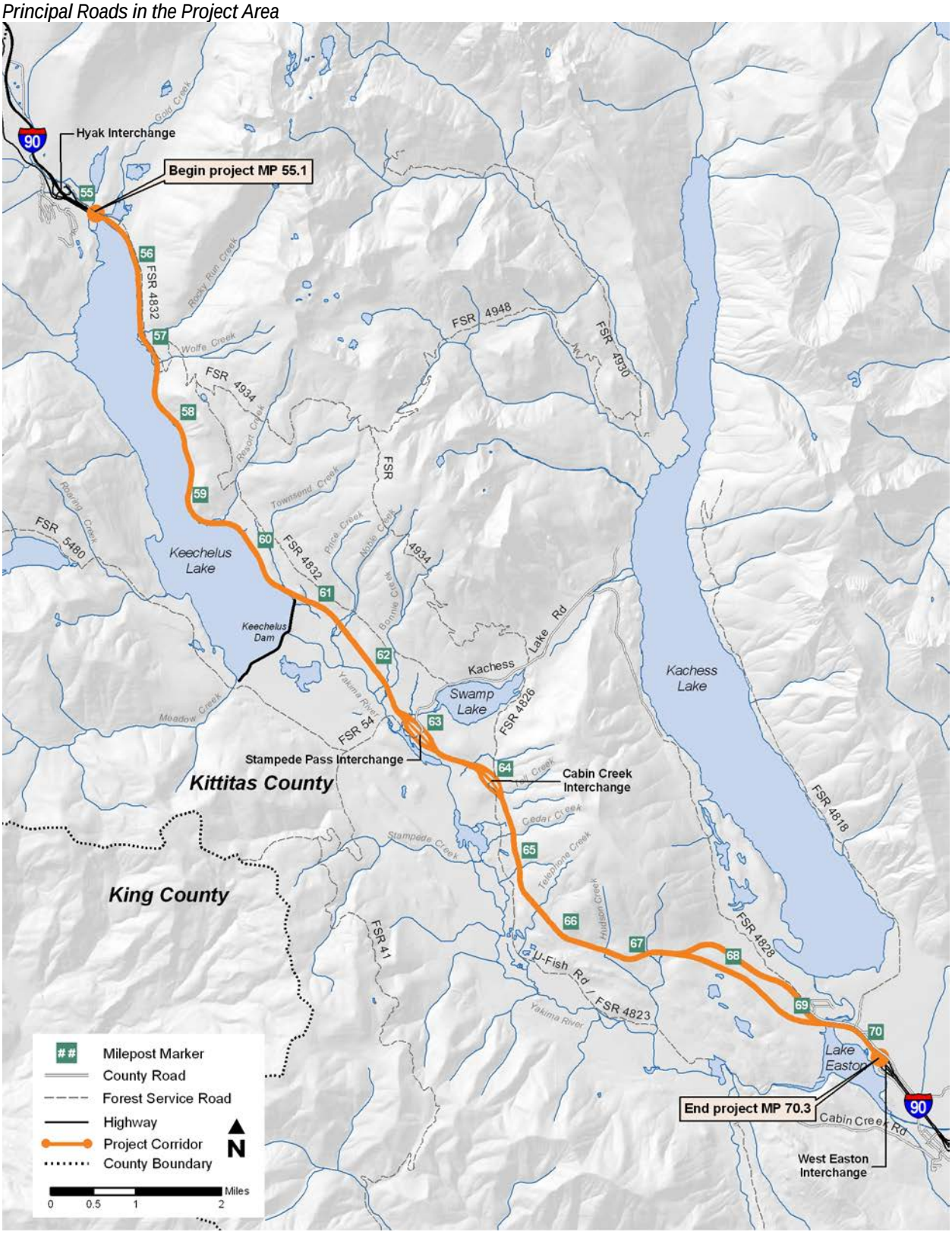
Exhibit 3-28 shows the principal roads in the project area.

State Roads. I-90 is part of the Interstate Highway System and is designated as a Rural-Principle Arterial in Kittitas County. I-90 has a posted speed limit of 70 mph at MP 70.0 in the eastern portion of the project corridor. The speed limit from Hyak to MP 70.0 varies, and is typically 65 mph along Keechelus Lake.

The project area contains three interchanges: the Stampede Pass Interchange, Cabin Creek Interchange, and West Easton Interchange. The Hyak Interchange is just west of the western project limit.

The project area ends near Easton.

Exhibit 3-28
Principal Roads in the Project Area



County Roads. There are several Kittitas County roads within the project area. Most access Kachess Lake and the private land and recreation sites in the area of the lake. Just outside the western limit of the project area, several County roads serve the developed areas at the Snoqualmie Summit.

The USFS and Kittitas County also manage roads in the project area.

USFS Roads. The USFS manages a number of roads in the project area that cross I-90. Most are historic logging roads, and some access private roads serving private land within the National Forest.

Bicycle and Pedestrian Facilities. Pedestrian access is prohibited on I-90 itself. Currently, cyclists use the 10-foot wide outside shoulders along I-90. As many as 600 cyclists use the I-90 shoulders during two bicycle rallies that occur during the summer. Use by cyclists during the remainder of the year has not been measured but is observed to be low, on the order of several cyclists per week in the summer.

The project area also is served by a large network of trails maintained by State Parks and USFS. These trails are accessed from the project corridor. Although the number of recreational users has not been measured, use is observed to be heavy. Recreational use is discussed in more detail in Section 3.10, *Recreation Resources*.

What is the current level of traffic and how is it expected to grow?

WSDOT estimates the current annual average daily traffic (AADT) for the highway at 28,100 vehicles. Traffic growth rates were estimated for the Draft EIS, using a base year of 2008 and a design year of 2028. At that time, WSDOT calculated the estimated annual traffic growth rate to be 3.5 percent, and the AADT for the design year of 2028 to be 55,500 vehicles.

WSDOT revised this calculation in February 2007, using a base year of 2010 and a design year of 2030. This calculation used additional years of monitoring data. Based on this new data, WSDOT estimated the annual growth rate to be 2.1 percent. This decrease in the projected traffic growth rate was based on several factors, including additional years of monitoring data and correction for what

appeared to be unusually high growth rates for a short period prior to the previous estimate. Using this growth rate, WSDOT estimated the AADT for the 20-year design period (Exhibit 3-29).

Exhibit 3-29
Predicted Annual Average Daily Traffic – 2005

Year	Predicted Annual Average Daily Traffic
2007	28,139
2010	28,849
2015	33,697
2020	35,546
2025	38,394
2030	41,243

As traffic levels go up and congestion becomes more frequent and lasts longer, the level of service (LOS) for the highway will go down. Based on the revised traffic growth figures and the physical characteristics of the highway, WSDOT estimated the decline in LOS for the project (Exhibit 3-30).

Exhibit 3-30
Estimated Level of Service Deterioration

Year	Annual Average Daily Traffic	Level of Service
2013	31,500	D
2025	38,400	E
2033	43,000	F

How do traffic volumes vary?

Traffic volumes in the project area are higher during the daylight hours and on weekends (including Friday, Saturday and Sunday) (Exhibit 3-31). Traffic volumes also are higher during the summer than during the winter (Exhibit 3-32).

Level of Service (LOS) Standards

LOS A – Free-flow speed prevails. Vehicles can maneuver easily; incidents such as accidents do not affect traffic flow.

LOS B – Free-flow speeds are maintained. Vehicles can maneuver easily with only slight restriction; minor incidents are still easily absorbed.

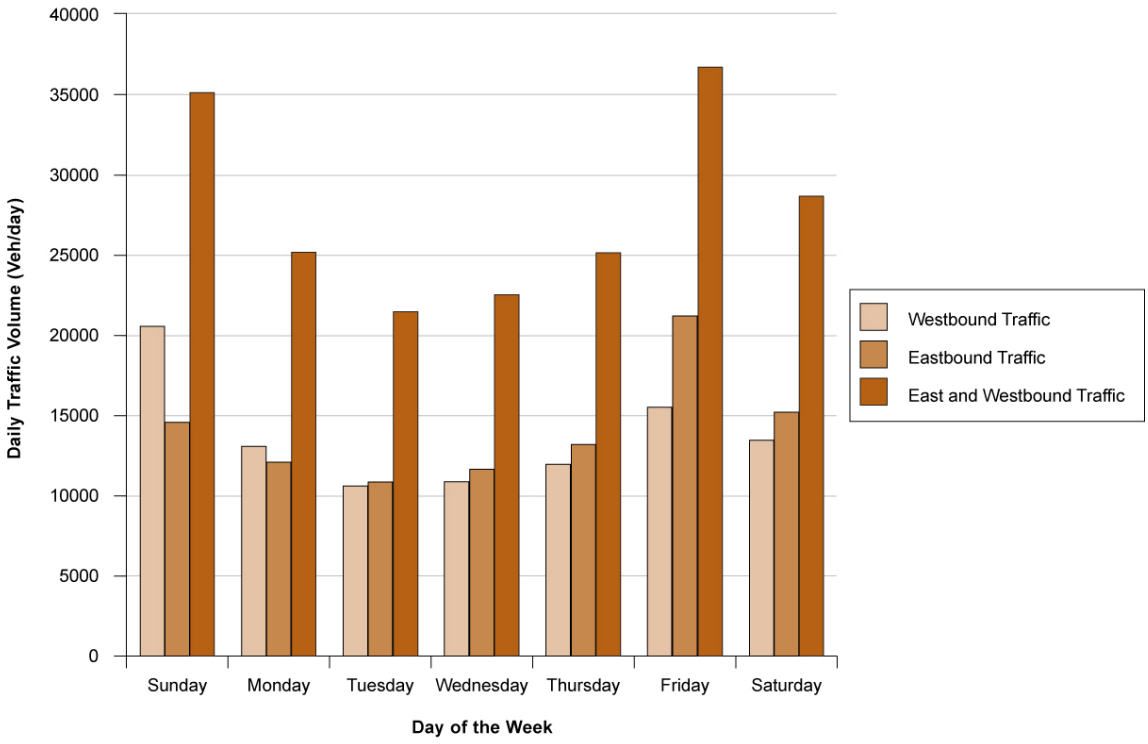
LOS C – Speed remains near free-flow, but freedom to maneuver is noticeably restricted. Minor incidents may still be absorbed, but with substantial local deterioration in service.

LOS D – Speed begins to decline slightly with increasing flows, and density increases more quickly. Freedom to maneuver is noticeably limited, and driver comfort level is significantly reduced; even minor incidents can create queuing.

LOS E – Flow is unstable, with volume at capacity. Maneuverability is extremely limited, and driver comfort level is poor; the traffic stream has no ability to absorb even the most minor disruption, and any incident will produce extensive queuing.

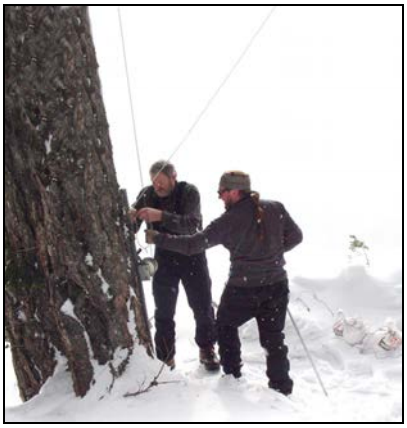
LOS F – Breakdown in traffic flow. Queuing forms behind breakdowns.

Exhibit 3-31
Hourly Traffic Volumes – 2007 Yearly Average



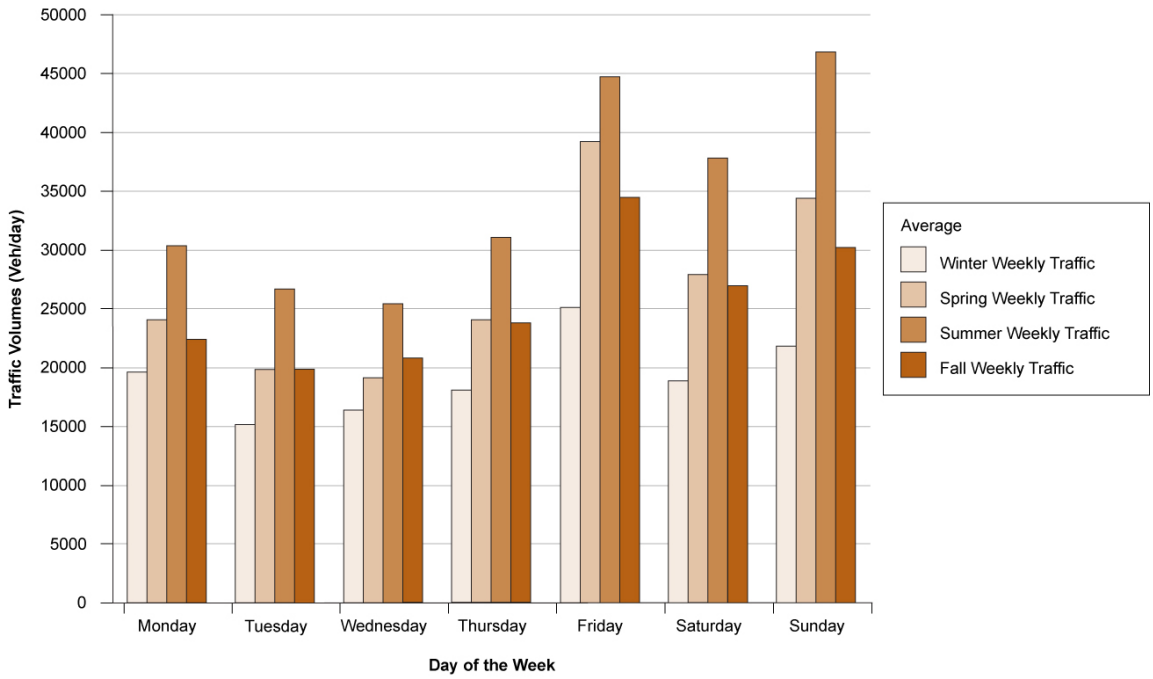
What are the primary transportation-related needs?

Avalanche Control. There are two avalanche-prone areas within the project corridor. One is in the vicinity of the existing snowshed, and the other is at Slide Curve in the vicinity of MP 59.0. The area in the vicinity of the existing snowshed contains six avalanche paths. Each winter, WSDOT's avalanche control teams actively monitor and manage these areas using explosives to stimulate controlled snow avalanches. These avalanches, though controlled, require WSDOT to close the highway in order to remove the resulting debris. Avalanche control within the project area closes I-90 an average of 42 hours each year, with 30 hours due to avalanche control activities, and 12 hours due to natural slides or extreme avalanche risk (Exhibit 3-33).



WSDOT avalanche control teams work to keep I-90 safe.

Exhibit 3-32
Seasonal Traffic Variation – 2005



Stabilizing Unstable Slopes. The project area, especially the area around Slide Curve, has a history of rock slides. Rock slides close I-90 approximately 12 hours each year, and can cause serious accidents. Since 1957, rock slides have caused nine fatalities in the project area. Unstable slope history is described in more detail in Section 3.1, *Geology and Soils*.

Unstable slopes cause damage to the highway, put motorists at risk, and can cause delays.

Repaving Deteriorating Pavement. The existing pavement is deteriorated and failing. The highway pavement has cracked both along and across the highway, and the cracked sections are tilting. The deteriorated state of the pavement forces WSDOT to devote more time and effort to normal maintenance activities such as fixing pot holes, repaving shoulders, and fixing damaged panels. These activities take time away from other needed maintenance such as ditching, vegetation management, and repairing winter damage.

Exhibit 3-33
Historic I-90 Highway Closure Data between 1992 and 2008

Type of Closure	Total Closure Duration (Average Hours:Minutes per Year)
Entire Snoqualmie Pass Closure	101:58
Full Closures EB and WB	43:54
Partial Closures EB	39:16
Partial Closures WB	18:48
Inside Project Corridor	61:31
Full Closures EB and WB	39:22
Partial Closures EB	15:34
Partial Closures WB	6:35
Outside Project Corridor	40:27
Full Closures EB and WB	4:32
Partial Closures EB	23:42
Partial Closures WB	12:13
Avalanche Closure Inside Project Corridor[1]	41:56
Avalanche Control	29:54
Full Closures EB and WB	19:45
Partial Closures EB	6:52
Partial Closures WB	3:17
Naturally Occurring Snow Avalanches[2]	12:02
Full Closures EB and WB	8:35
Partial Closures EB	2:59
Partial Closures WB	0:28
Accidents Over Snoqualmie Pass	20:15
Inside Project Corridor	3:56
Outside Project Corridor	16:19
Oversize Load Detours	0:22

[1] *Avalanche-related closures are calculated by using "Avalanche Control" closure time plus 50% of "Naturally Occurring Slides/Weather" closure time per conversation with Hyak Maintenance.*
[2] *Values in this exhibit for "Naturally Occurring Snow Avalanches" represent 50% of the "Naturally Occurring Slides / Weather" closure time.*

The deteriorated state of the pavement also forces WSDOT to perform major repaving more often to keep the highway drivable. Overlays with hot mix asphalt, which normally last for approximately seven years, are lasting for no more than three years on this part of I-90. Asphalt is less durable under the extreme winter weather conditions on the pass.

Pavement in the project area has outlived its intended lifespan and is deteriorating rapidly.

If this project were not built, WSDOT would expect to perform the following projects to keep the pavement in a satisfactory condition:

- In 2009, existing areas of hot mix asphalt would be rotomilled and overlain with new hot mix asphalt
- In 2014, the entire corridor would be overlain with hot mix asphalt
- In 2021, 2027, 2032, 2036, and 2041, all lanes would be rotomilled and repaved with hot mix asphalt

Each of these planned pavement overlays would cause major traffic congestion and delay, and the cost of these overlays would be in addition to the cost of normal maintenance and operations.

The deteriorated state of the highway requires WSDOT to overlay the pavement with asphalt frequently, causing traffic delay and adding to costs.

Improving Highway Capacity. Traffic volume on I-90 is often higher than the design capacity of the highway. Peak traffic is high, and peak traffic periods are becoming more frequent. Because of the increase in traffic volume, backups are getting longer and becoming more frequent.

There are two chain-up/chain-off areas in the project corridor, and one chain-up/chain-off area just outside the project area at the West Easton interchange. The amount of space provided by these three areas is insufficient for the existing traffic volume. These areas frequently fill up during snowy weather, sometimes backing traffic into the main lanes, which adds to congestion and backups. Frequently, chains are required only in the area of the Snoqualmie Pass Summit, which overloads the Gold Creek area. Exhibit 3-34 shows the dimensions of the existing areas.

Exhibit 3-34
Chain-Up and Chain-Off Areas (feet)

Area	Approximate MP Location	Westbound		Eastbound	
		Width	Length	Width	Length
Gold Creek	55.8	20–30	6,000	35	1,150
Bonnie Creek	62.1	20	1,000	None	None
Lake Easton	70.5	20	6,900	20	1,200

During the winter, snowplows push snow into highway ditches and the median. These areas are narrow, and the highway has limited areas for storing snow. In two sections of the project corridor, maintenance crews can plow snow only to one side of the highway. These are a 2.25-mile stretch along Keechelus Lake and a 3.3-mile section along Easton Hill. During heavy snow years, WSDOT needs to close lanes several times each year in order to remove snow from the storage areas.

Increasing Safety. Safety concerns for the project corridor include weather, sharp curves, low bridge clearance, and risks to wildlife and the public from vehicle/wildlife encounters. Weather conditions in the project area also create safety hazards, especially during the winter months. Snoqualmie Pass averages nearly 450 inches of rain and snow each year, making the travel lanes slippery and limiting visibility. Other hazards created by heavy precipitation include ice, flooding, avalanches, and rock slides. WSDOT's records show that approximately 59 percent more accidents occur during the winter months between November and March, even though traffic is substantially lower during this period than during the summer.

Severe winter weather and sharp curves increase the risk of accidents.

Redesigning Sharp Curves. Approximately 55 percent of the corridor is composed of curves and 45 percent is straight. The sharp curves along the highway reduce sight distances and the speed at which vehicles can negotiate the curve without sliding or losing control. WSDOT analyzed the curves within the project corridor, and concluded that these individual curves met current geometric and stopping sight distance criteria for design speeds between 35 mph and 70 mph, with an average design speed of 53 mph. Speed studies

within the project corridor in 2004 showed that drivers average 66 mph, or 13 mph faster than the average design speed.

Between 1991 and 2006, there were 1,640 reported accidents within the project area. Three segments in the project area had higher-than-expected accident rates. The first section runs from MP 57.5 to MP 60.0 between Wolfe Creek and Resort Creek, where the existing highway is highly curved and constricted with concrete barriers on both sides. The second section runs from MP 61.5 to MP 63.0 between Bonnie Creek and Swamp Creek, where the existing highway is curved with an open median. The third section runs from MP 66.0 east of Telephone Creek to MP 70.0 at the bottom of Easton Hill, where the existing highway is highly curved and constricted with concrete barriers on both sides. Poor pavement conditions and inclement weather also contribute to the accidents in these locations.

Accidents occur more frequently in areas where the highway is sharply curved.

Replacing Low-Clearance Bridges. The overpass bridges at the Stampede Pass, Cabin Creek and West Easton Interchanges are lower than the state standard of 16 feet, 6 inches. These low-clearance bridges require oversized loads to detour around the interchanges, and can pose a safety hazard.

In October 2007, an oversized load struck the Easton overpass bridge at MP 71.0, one mile east of the project end point, causing severe damage to the overpass. The Easton overpass bridge design is the same as the overpass bridges in the project area. The bridge span over the eastbound lanes was damaged, and WSDOT repaired and repaved this part of the bridge as part of an emergency contract in December 2007.

An oversized load hit the Easton Bridge outside the project limits, causing extensive damage. Similar low bridges occur at two interchanges in the project area.

What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would result in no beneficial effects to transportation. The current transportation problems would continue and worsen over time.

Build Alternatives

Solving the transportation problems is part of the project's purpose and need. Under all of the build alternatives, WSDOT would replace the existing deteriorated pavement, widen the existing four-lane highway to six lanes, add additional chain-up and chain-off areas, and straighten unsafe curves. These improvements would have the following beneficial effects:

Avalanche Control. Under all of the build alternatives, WSDOT would make improvements at all of the avalanche chutes. These would include scaling (forcing loose rocks to fall in a controlled setting), bolting, wire mesh, reducing the steepness of the slope, and improving catchment areas. WSDOT would revegetate cut slopes with soil. The existing snowshed would be replaced with a larger and longer structure under all of the Keechelus Lake Alignment Alternatives except Alternative 1. WSDOT designed these improvements to prevent all avalanches that have a 30-year return period or less from reaching the highway.

The new snowshed will cover the entire width of I-90, preventing avalanches from reaching the highway at this location. (Design Visualization)

Avalanche return period: the average expected time between events reaching or exceeding a given positions. Larger return periods imply that the avalanche is larger. A 30-year return period event is the largest avalanche expected every 30 years (Canadian Avalanche Association).

Highway Capacity Improvements. Constructing additional lanes would increase the highway's capacity substantially. Exhibit 3-35 shows that constructing the Preferred Alternative would delay the deterioration to LOS D by approximately 23 years compared to the No-Build Alternative. These beneficial effects would be similar for all of the build alternatives.

Exhibit 3-35
Change to Level of Service – Preferred Alternative vs No-Build Alternative

	Preferred Alternative		No-Build Alternative	
LOS	Year	AADT	Year	AADT
D	2041	47,500	2013	31,500
E	2058	57,200	2025	38,400
F	2070	64,000	2033	43,000

AADT – annual average daily traffic

Unstable Slope Stabilization. WSDOT would stabilize slopes using methods including scaling, bolting, installing wire mesh, or reducing the steepness of the slope (see Section 3.1, *Geology and Soils*). Sufficient catchment at the toe of the slopes would be provided so that rock fall would not reach the highway.

WSDOT installs rock bolts and netting to improve safety from rock fall within the project area.

Low-Clearance Bridge Replacement. Replacing low-clearance bridges with new structures that meet or exceed the minimum 16-foot 6-inch clearance would reduce the need for oversized trucks to detour around them and reduce the risk of accidents. Replacing the snowshed would eliminate the need to close the eastbound lanes in order to move oversized loads around it because of its low clearance.

Additional Chain-up/Chain-off Areas. WSDOT would build additional chain-up/chain-off areas where conditions are favorable (Gold Creek to Wolfe Creek, Resort Creek to Townsend Creek, and Price Creek to Bonnie Creek) under all the build alternatives (Exhibit 3-36). Chain-up areas would be 30 feet wide, and chain-off areas would be 20 feet wide. This would reduce the potential for chain-up/chain-off activities to interfere with normal traffic flow, and would concentrate chain-up/chain-off areas closer to the Snoqualmie Pass summit, where they are needed most.

Exhibit 3-36
Proposed Chain-Up/Chain-Off Areas

Direction	MP	Approximate Length
Westbound	Between MP 55.5 and 57.3	1.81 miles (10,000 feet)
Westbound	Between MP 59.8 and 60.7	0.92 miles (5,000 feet)
Eastbound	Between MP 55.8 and 56.8	0.99 miles (5,200 feet)

Increased Snow Storage. Under all of the build alternatives, snow storage capacity would improve substantially. Non-paved medians would be widened, except where narrower medians are needed to minimize impacts to wetlands, forests, and construction activities. Winter snow plowing operations would continue to direct snow to the outside of the highway in areas with paved medians. Paved medians would be widened where possible, but would continue to provide limited or no snow storage capacity. Paved medians would be a minimum of 24 feet wide, except in the vicinity of Gold Creek, where the minimum paved median width would be approximately 18 feet for roughly 1,000 feet.

Replacing Deteriorating Pavement. All of the build alternatives would replace the existing pavement with new Portland cement concrete pavement. This would eliminate the need for repeated asphalt overlays to keep the highway in a driveable condition. In addition to being more durable, the new road surface would be smoother and would result in less wear on vehicles using the highway. Long-term maintenance costs would be reduced, since Portland cement concrete pavement has a 50-year design life, and the design includes dowel bars that would help prevent faulting in the future.

Increased Safety. Under all of the build alternatives, FHWA and WSDOT would design the new highway to meet a 65 mph design speed between Hyak and Keechelus Dam, and a 70 mph design speed between Keechelus Dam and Easton. Safety would improve substantially through increased shoulder width and a straighter alignment with longer sight distances. New or longer bridges at critical wildlife crossing locations would reduce the number of vehicle/wildlife collisions. Improvements to unstable slopes and

avalanche chutes would further reduce the risk of accidents. WSDOT estimated that together these improvements would reduce accident risk over existing conditions by 20 percent to 30 percent along Keechelus Lake, and by 30 percent to 35 percent in the remaining project area.

Within the project area, ecological connectivity structures would reduce wildlife/vehicle collisions.

Reduced Operation and Maintenance. The build alternatives would reduce many maintenance and operations activities, including pavement repair and snow hauling. Other maintenance activities would increase, such as plowing the additional lanes, maintaining the avalanche control structures, and additional de-icing and general maintenance for the longer bridges. These changes would require WSDOT to hire a small number of additional maintenance staff and purchase additional snow removal equipment. See Section 2.6, *What would the project cost?*

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any temporary impacts due to construction. This alternative would not result in any direct adverse impacts. However, it would create indirect impacts as traffic volumes grow and safety and capacity problems worsen.

Build Alternatives

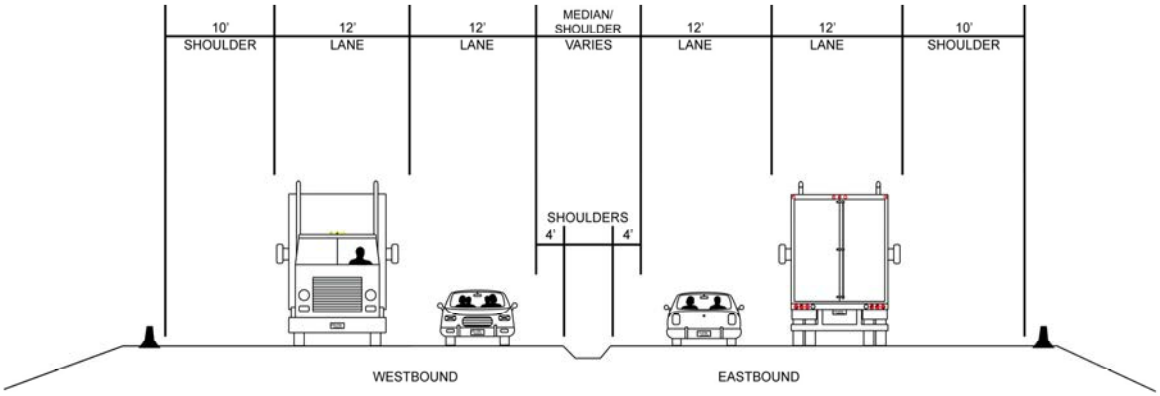
Temporary Impacts

Auto and Truck Traffic. The primary temporary impacts to transportation would take place during construction. These impacts would include detours, construction work zones, and reduced speed limits.

Construction would sometimes require WSDOT to reduce traffic to a single lane; however WSDOT would keep lane closures as short as possible and would typically limit them to Monday through Thursday during low traffic periods. During blasting operations, traffic traveling both directions would be required to stop as a safety measure.

Currently, the existing typical highway cross section consists of four 12-foot lanes (two in each direction of travel), 10-foot outside shoulders, and four-foot inside shoulders (Exhibit 3-37).

Exhibit 3-37
Existing Highway Cross Section



During construction, WSDOT would use a similar alignment. Detour alignments would physically separate traffic from the work zone and would include four 12-foot lanes, two in each direction of travel. Both the inside and outside shoulders would be four feet wide. Each direction of travel would be separated by a temporary concrete barrier. The traffic capacity of the construction detour alignment would be reduced from 2,000 to 1,300 vehicles per hour per lane, as a result of the unfamiliar alignment and reducing the speed limit to 55 mph in the work zone. All detour alignments would be located within the project's disturbed area, and detours would not create additional environmental impacts.

Construction would usually stop for the winter months, and traffic would be separated from construction zones using a four-lane configuration similar to existing conditions where possible.

Bicycle Traffic. Bicycle traffic would be affected during construction, since the existing shoulder may become hazardous or temporarily unusable. Along the narrow area of the highway along

Keechelus Lake, it would be particularly difficult for bicycles and vehicles to coexist.

Conceptual Construction Phasing

Each of the build alternatives would result in different construction phases, and WSDOT will determine the exact sequence of construction steps during final design and permitting. For the Preferred Alternative, WSDOT would use the following general approach to Phase 1 of the project, the funded phase between Hyak and Keechelus Dam.

- ***Phase 1A.*** Build a detour bridge at Gold Creek, develop the materials site at Rocky Run Creek, and stockpile and process material from the Rocky Run Creek site at Crystal Springs Sno-Park. This sub-phase would begin in 2009 and last for one construction season.

- ***Phase 1B.*** Widen the highway between MP 55.1 (the project end point at Hyak) and MP 57.5, including the bridges at Gold Creek and the culverts at Rocky Run Creek, Wolfe Creek and Unnamed Creek (MP 57.3). This sub-phase would begin in 2010 and last for four construction seasons.

- ***Phase 1C.*** Widen the highway from MP 57.5 to the end of Phase 1 at MP 59.9, including the culverts and bridges at Resort Creek, Unnamed Creek (MP 59.7), and Townsend Creek, and construct the new snowshed. WSDOT will extend Phase 1C past MP 59.9 if funding allows. This sub-phase would begin in 2011 and last for five construction seasons.

More detailed information on potential construction phasing for the Preferred Alternative can be found in the revised *Transportation Discipline Report* (Appendix P).

Permanent Impacts

The build alternatives would not create either direct or indirect permanent adverse impacts to transportation.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Best Management Practices

BMPs for transportation will be designed to meet commitments and performance standards that apply to temporary traffic control during construction, as well as the *Standard Specifications for Road, Bridge, and Municipal Construction* (WSDOT 2008b) and all other applicable WSDOT design manuals and standards.

WSDOT will implement a comprehensive communications program during construction, which could include the following:

- Highway Advisory Radio messages during construction
- Newsletter with pertinent construction information for travelers
- Install the Intelligent Transportation System early enough to be used during construction

WSDOT has considered several options to manage bicycle traffic, and currently plans to use a combination of four options:

- Informing local bike clubs of planned closures so that they can alert their members
- Temporary bicycle detours through the construction zone
- Temporary closures with event shuttles and posted detour routes
- Equipping incident response team vehicles with bicycle racks that could accommodate three to four bicycles so that the incident response team vehicles could give bicyclists rides through the construction zone

WSDOT has developed an environmental outreach program to educate people about the I-90 project.

Compensatory Mitigation

Since there will be no permanent adverse impacts to transportation, no compensatory mitigation will be required.

3.8 Noise

Construction operations will create increased noise levels within the project area.

This section discusses expected noise impacts to humans resulting from construction and operation of the project alternatives. Noise impacts to wildlife are discussed in Section 3.6, *Terrestrial Species*. The study area for noise includes residential dwellings and campgrounds classified as sensitive land uses or sensitive noise receptors within 500 feet of the I-90 pavement edge. For more detailed information on noise impacts see Section 3.8 of the Draft EIS, the *Noise Discipline Report* (WSDOT 2003d) and the *Noise Discipline Report Supplement* (Appendix R).

What new information has been developed since the Draft EIS?

Since publishing the Draft EIS, WSDOT produced the *Noise Discipline Report Supplement* (Appendix R). This report re-evaluated noise impacts from traffic growth and analyzed the feasibility and reasonableness of construction of a noise barrier wall at five sites in the project area. WSDOT added a revised method to evaluate potential noise impacts and re-analyzed the residential equivalency for campgrounds.

The WSDOT *Traffic Noise Analysis and Abatement Policy and Procedures* (WSDOT 2006d) were revised in 2006 to limit the study area for noise to 500 feet from the pavement edge. As discussed in Section 3.7, *Transportation*, WSDOT re-evaluated the traffic growth rate and changed the project design year to 2030. These items were incorporated into the analysis in the *Noise Discipline Report Supplement* (Appendix R).

Comments from the public and reviewing agencies have been incorporated into this section.

What are the major characteristics of the affected environment?

The project area is mostly rural and lightly developed. Areas sensitive to noise are limited to a small number of cabins and several campgrounds.

Baseline Noise Levels

WSDOT performed baseline monitoring in 2002 for representative dwellings and campgrounds in the study area to determine the existing conditions. Sound levels were modeled in 2003, and the model was validated using the earlier, measured values. Peak-hour traffic sound levels for 2007 were modeled using the validated noise model. Modeling results showed that sound levels from peak-hour traffic at 24 existing homes, 16 campsites, and one picnic area currently exceed FHWA's Noise Abatement Criteria (Appendix R). Exhibit 3-38 shows monitoring and modeling locations and Exhibit 3-39 shows model results for 2007.

State and County Noise Regulations

The Kittitas County Noise Ordinance establishes noise standards for County roads, but it does not explicitly specify what sound levels are considered to be unacceptable within certain areas of the county. The noise ordinance states that it is unlawful to create noise "*which unreasonably disturbs the peace, comfort, or repose of others.*" The noise ordinance further states that motors, engines, motorcycles, and snowmobiles may not generate noise within 200 feet of a dwelling, and limits noise between 10:30 pm and 7:00 am in residential areas. The Kittitas County Noise Ordinance applies only to private citizens. It is not directly applicable to noise generated by constructing or operating the I-90 project.

Exhibit 3-38
Modeled Noise Receptors

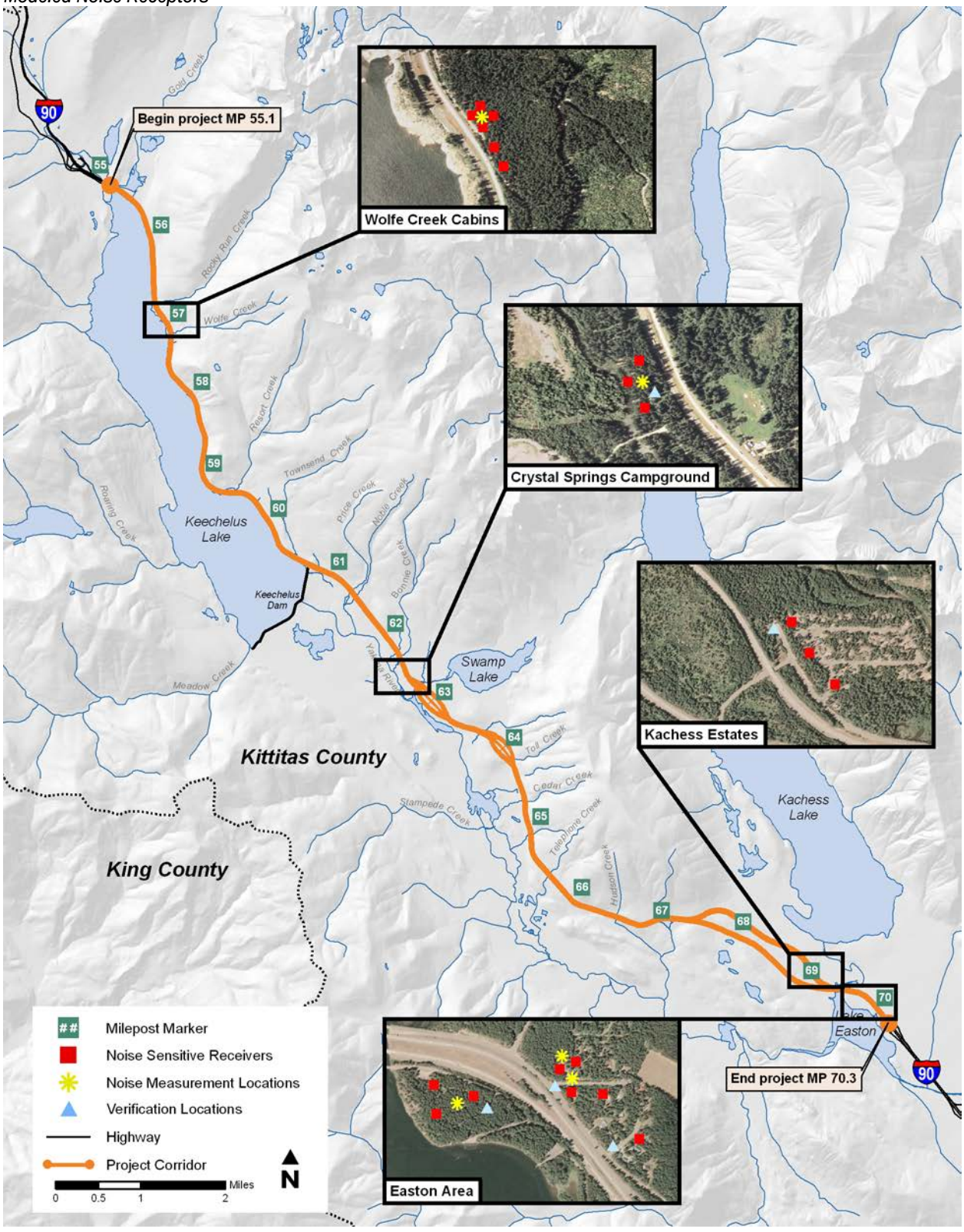


Exhibit 3-39
Noise Model and Validation Results for 2007

Location	Measured Value (dBA)	Modeled Value (dBA)	Difference (dBA)
Wolfe Creek - Validation	65.3	64.8	+/-0.5
Crystal Springs - Validation	61.8	60.9	+/-0.9
South - Lake Easton State Park - Validation	61.8	60.2	+/-1.6
North - Homes near the Easton Municipal Airport - Validation	73.6	71.6	+/-2.0
North - Homes in or near the Lake Easton Estates	63.0	62.3	+/-0.7

Source: Noise Discipline Report Supplement (Appendix R)
dBA – A-weighted decibel

Washington State regulations establish limits for noise exposure. Temporary daytime construction is exempt from these limits; however, the limits would apply to nighttime construction between 10:00 pm and 7:00 am. For purposes of noise impacts, WSDOT policy regards construction and operation of a freeway to be a commercial activity. The allowable noise levels from commercial activities are shown in Exhibit 3-40.

Exhibit 3-40
Construction Noise Limits

Averaging period	Daytime Limit (dBA)	Nighttime Limit (dBA)
$L_{2.5}$ (1.5 minutes per hour)	72	62
$L_{8.3}$ (5 minutes per hour)	67	57
L_{25} (15 minutes per hour)	62	52

Source: Washington Administrative Code 173-60
dBA – A-weighted decibel

What are the expected environmental consequences?

A noise impact occurs when a predicted traffic noise level at the design year approaches or exceeds the noise abatement criteria, or when the predicted traffic noise level substantially exceeds the existing noise level.

State and federal standards state that a noise level of 66 dBA is considered to approach the noise abatement criteria (67 dBA), while a noise level greater than or equal to 67 dBA is considered to exceed the noise abatement criteria. A 10 dBA increase over existing noise levels is considered to be a substantial increase.

What beneficial effects would result?

Neither the No-Build Alternative nor the build alternatives would result in any beneficial noise effects.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any direct or indirect adverse noise impacts.

Build Alternatives

Temporary Impacts

Construction equipment would be the primary source of temporary noise impacts for any of the build alternatives. The types of construction equipment WSDOT expects to use for highway construction include trucks, pavers, backhoes, bulldozers, scrapers, loaders, pneumatic tools, and blasting equipment. Based on the assumed types and number of equipment, and their estimated noise levels, the combined sound levels caused by simultaneous use of these pieces of equipment are estimated to be at a steady sound level of 88 dBA, exceeding 91 dBA for 10 percent of the time, measured at 50 feet from the source (WSDOT 2003d). WSDOT expects staging and stockpiling sites to generate noise levels consistent with other construction areas where construction vehicles and equipment would be in use.

Sound levels of 88 dBA to 91 dBA are the highest noise levels WSDOT expects from general construction, and noise would be lower during the majority of the construction period. Construction noise would not be heard in the entire project area at the same time. Construction of the project would take place in phases, with

temporary noise impacts expected to last for no more than one or two construction seasons at each location.

Blasting for the I-90 project could produce noise levels as high as 130 dBA (WSDOT 2006d). Impact hammering of pilings and casings could produce maximum noise levels of 110 dBA. Unattenuated blasting noise could extend for several miles. However, noise is limited by the mountain ridgelines surrounding the project area, which act as berms to reduce noise.

Because daytime construction activities are exempt from Kittitas County and Washington State noise regulations, the project is not subject to any regulatory requirements for daytime construction. WSDOT considers these noise levels to be unavoidable temporary impacts typical of major construction projects.

Temporary noise impacts would be felt by cabin owners and campers near the highway at the Crystal Springs Campground and Lake Easton State Park. It is unlikely that construction noise would affect hikers and bicyclists along the John Wayne Pioneer Trail, which is more than 500 feet from the highway at its nearest point.

In addition to daytime construction, some nighttime construction could be required because of the short construction season and high daytime traffic volumes. Nighttime construction activities would be subject to Washington State noise level regulations (Washington Administrative Code [WAC] 173-60). WSDOT would secure night work permits through Kittitas County and would conform to these regulations. WSDOT would specify noise mitigation measures for nighttime construction in the vicinity of sensitive noise receptors as part of its construction contracts. WSDOT has adopted the FHWA criteria for evaluating noise impacts associated with federally-funded highway projects (23 CFR 772).

WSDOT would construct tunnels under Keechelus Lake Alignment Alternatives 1, 2, and 3, which would require additional equipment and blasting. WSDOT estimates that tunnel construction would occur 24 hours a day for at least two years. Cabins located near Wolfe Creek would likely experience noise impacts from the tunnel

construction. Cabins at Resort Creek also could experience noise impacts from tunnel and bridge construction.

Permanent Impacts

Traffic noise was modeled for the study year of 2007 and the design year of 2030, using the projected traffic volumes for those years and the FHWA traffic noise model.

Traffic noise was modeled at the monitoring locations in the study area (Exhibit 3-38). Future increases in traffic volume would generate higher traffic sound levels along the project corridor and would cause sound levels to exceed the Noise Abatement Criteria at four of the five monitoring locations. The highest future sound level would be approximately 76 dBA at a home situated north of I-90 between Sparks Road and the highway.

At all sites, the modeled increase is between one and four dBA. The Preferred Alternative would result in a very slight increase over the No-Build Alternative, from zero to one dBA. This increase would be similar for any of the build alternatives. People generally cannot detect differences of one to two decibels (dB) between sound sources. Under ideal conditions, some people can detect differences of three dB. Most people would perceive a five dB change.

Residents in the project area would sometimes have a different experience of noise levels than that predicted by noise models. This is because temperature inversions and wind conditions can sometimes refract and focus sound waves toward a location at greater distance from the sound source. Consequently, the sound level environment can be highly variable, depending on local conditions.

Noise impacts approached or exceeded federal criteria of 67dB at five locations: Wolfe Creek cabins, Crystal Springs Campground, Lake Easton State Park, homes near Easton Municipal Airport, and homes south of Kachess Lake.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Best Management Practices

BMPs for noise will be designed to meet applicable commitments and noise standards, including Washington State and Kittitas County noise requirements. Some example BMPs that WSDOT could use to comply with these standards include requiring contractors to:

- Equip construction equipment engines with adequate mufflers, intake silencers, or engine enclosures
- Turn off construction equipment during prolonged periods of nonuse
- Locate stationary equipment away from sensitive properties where feasible
- Erect noise berms and barriers as early as possible
- Request that USFS close adjacent roads where noise impacts would combine with noise impacts from project construction
- Impose seasonal restrictions on construction near nest sites or other locations for species listed under the ESA

Compensatory Mitigation

WSDOT studied possible noise mitigation measures, including altering horizontal and vertical alignments, managing traffic, and constructing noise barrier walls. Construction of noise barriers was considered at five sites: the Wolfe Creek cabins, Crystal Springs Campground, Lake Easton State Park, homes near the Easton Municipal Airport, and homes south of Kachess Lake.

WSDOT guidance, which is based on federal noise abatement standards, stipulates that noise mitigation shall be implemented only if it is both feasible and reasonable. A number of factors go into

determining whether noise abatement measures are feasible and reasonable, including:

- Achievable noise reduction
- Cost of abatement per unit or dwelling benefited
- Highway safety (obstruction of sight distance along curves)
- Environmental effects of abatement construction

For a noise barrier to be considered feasible, it must be constructible without adversely affecting either the structural integrity of the highway or sight distances along curves. The barrier must provide a minimum five dBA reduction for the first row of receivers, with at least one receiver having a seven dBA reduction. Efforts also must be made to attain a 10 dBA or greater reduction in sound levels at the first row of receivers.

After determining that constructing a noise barrier is feasible, FHWA and WSDOT must determine whether constructing the barrier is reasonable, based primarily on the cost of the barrier wall relative to its expected benefits. WSDOT analyzed feasibility and reasonableness for noise barrier walls in 2003, and found that at all five sites, noise barrier walls would be too expensive to meet WSDOT's reasonableness criteria.

WSDOT re-analyzed all five sites in 2008 using FHWA's Noise Abatement Criteria. WSDOT found that a noise wall at Lake Easton State Park campground would be both feasible and reasonable, and State Parks has requested that a noise wall be built. However, WSDOT based this conclusion on current guidance and the worst-case scenario, since WSDOT did not conduct a survey to determine whether the sites were within 500 feet of edge of I-90 pavement. A noise wall at Lake Easton State Park would not impact views for any residents since there are no residences in the area of the wall.

Lake Easton State Park is not within the currently funded portion of the project. When funding becomes available for this portion of the

I-90 project, WSDOT will conduct a supplemental noise analysis that addresses potential noise impacts and the feasibility of a noise barrier wall. WSDOT will continue to consult with State Parks to determine whether a noise wall or other suitable noise mitigation measure is required at Lake Easton State Park.

3.9 Historic, Cultural, and Archaeological Resources

This section discusses the expected impacts from the project alternatives to historic, cultural, and archaeological resources. The study area for cultural resources is 400 feet on either side of the existing I-90 edge of pavement. For cultural resources studies, this area is referred to as the area of potential effect. Additional information on archaeological resources can be found in *Evaluative Testing of Eleven Sites for the WSDOT's I-90 Snoqualmie Pass East Project* (WSDOT 2004b). For a discussion of the cumulative impacts of the project within the context of past actions, present actions, and reasonably foreseeable future actions, see Section 3.16, *Cumulative Effects*.

What new information has been developed since the Draft EIS?

Since publishing the Draft EIS, WSDOT completed the *Materials and Staging Report* (Appendix E) and modified the project design to include replacing the snowshed at MP 58.1 with a longer structure spanning all six lanes. The snowshed is a historic bridge structure listed on the NRHP. FHWA and WSDOT analyzed the decision to remove the snowshed as required under Section 4(f) of the Department of Transportation Act. This analysis is presented in Chapter 5, *Programmatic Section 4(f) Evaluation*. FHWA, WSDOT, and the State Historic Preservation Officer (SHPO) at the Washington State DAHP completed a Memorandum of Agreement establishing mitigation for removal of the snowshed, which appears as an appendix to Chapter 5 in this document.

Comments from the public and reviewing agencies have been incorporated into this section.

What are the major characteristics of the affected environment?

WSDOT inventoried the project area for cultural, historic and archeological resources prior to publishing the Draft EIS. Within the project area, WSDOT found a total of 58 cultural resources, of which 37 are archaeological resources and 21 are historical architectural or engineering resources. One site, the snowshed, is listed on the NRHP, and 12 other sites were eligible for listing.

The snowshed is listed on the National Register of Historic Places, based on its method of construction.

Detailed results of the inventory are found in Section 3.9 of the Draft EIS and in the *Cultural Resources Discipline Report* (WSDOT 2003e), which also contains a description of the historical setting.

What are the expected environmental consequences?

What beneficial effects would result?

Neither the No-Build Alternative nor the build alternatives would result in any beneficial effects to cultural, historic, or archaeological resources.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any direct or indirect adverse impacts to cultural, historic, or archaeological resources.

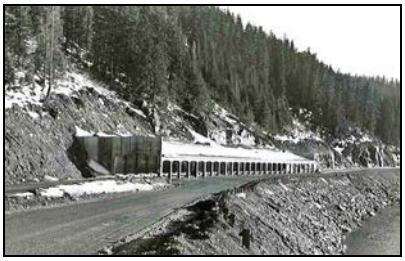
Keechelus Lake Alignment Alternatives

Temporary Impacts

The major potential temporary impact to historic, cultural, and archaeological resources would be inadvertent disturbance of previously unknown objects or sites. This potential impact would be similar for any of the build alternatives. WSDOT will develop a project-specific unanticipated discovery plan to cover pre-construction, construction activities, and cultural resource monitoring for each phase of the project.

Permanent Impacts

Keechelus Lake Alignment Alternatives 2, 3, and 4 (the Preferred Alternative) would require removing and replacing the snowshed, which is a historic structure listed on the NRHP. None of the build alternatives for the Keechelus Lake Alignments or for the remaining project area would result in either direct or indirect impacts to any other known historic, archaeological, or cultural resource in the area of potential effect.



The existing snowshed, built in 1950, only covers two of the four lanes on I-90 and does not adequately protect the highway from avalanches, or accommodate traffic volumes and oversized loads.

FHWA and WSDOT analyzed removal of the snowshed under Section 106 of the National Historic Preservation Act, and Section 4(f) of the Department of Transportation Act of 1966. Section 106 and Section 4(f) regulate the use of historic, cultural, and archaeological resources by transportation projects.

Section 106

Section 106 promotes historic preservation by ensuring that historic properties are considered as part of a federal agency's decision-making process. Section 106 establishes a consultation and agreement process that FHWA must follow before approving WSDOT actions that have the potential to adversely affect cultural resources. The process includes the following steps:

Cabins along Old US Highway 10 in the 1930s.

1. ***Consultation.*** Consultation is a major component of the archaeological and historical survey. For this project, WSDOT carried out Section 106 consultation with FHWA, affected tribes including their Tribal Historic Preservation Officer (THPO), the SHPO from the Washington State DAHP, and the federal Advisory Council on Historic Preservation, which oversees Section 106 compliance. WSDOT consulted with the Confederated Tribes of the Colville Reservation, Muckleshoot Tribe, Snoqualmie Tribe, Tulalip Tribe, Wanapum Tribe and Yakama Nation. During consultation, WSDOT agreed to coordinate revegetation and mitigation plant lists with interested tribes to include plants traditionally used by Native Americans.

2. ***Determining NRHP Eligibility.*** NRHP eligibility is determined in the archaeological and historical survey by licensed professionals. WSDOT confirmed NRHP eligibility determinations in consultation with the SHPO and the THPOs.

3. ***Determining Adverse Effects.*** FHWA and WSDOT must determine if the project would have an adverse effect on any historic, cultural, or archaeological resources, based on the Section 106 criteria defined in CFR 800.5(a)(1), on all eligible resources within the area of potential effect. FHWA and WSDOT, in consultation with the SHPO and THPOs, determined that no cultural or archaeological resources would be adversely affected, and only one historic resource (the snowshed) would be adversely affected by the project. Following the decision to remove the snowshed, the lead agencies made a separate determination of impact for that resource and concluded that there would be an adverse impact. The DAHP concurred with these determinations.

4. ***Memorandum of Agreement.*** FHWA, WSDOT, and DAHP signed a Memorandum of Agreement on October 10, 2007. (See Chapter 5, *Programmatic Section 4(f) Evaluation*). This agreement commits FHWA and WSDOT to carry out measures to mitigate for adverse impacts to the snowshed.

Section 4(f)

Section 4(f) of the Department of Transportation Act prohibits the use of NRHP-eligible or -listed cultural and recreational resources for transportation projects unless there is no prudent and feasible alternative. If a project causes an adverse effect to an NRHP-eligible or -listed resource, it is considered a “use” under Section 4(f), and a Section 4(f) evaluation must be prepared. FHWA concluded that removal of the snowshed is a use under Section 4(f) and prepared a Programmatic Section 4(f) Evaluation, which appears as Chapter 5 of this document.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

Both Section 106 and Section 4(f) require FHWA and WSDOT to avoid or minimize impacts to cultural, historical, and archaeological resources to the extent possible. The project has successfully avoided impacts to all such resources in the project area except for the existing snowshed.

WSDOT sought to avoid impacts to the snowshed throughout project planning. However, after evaluating various project alternatives, FHWA, WSDOT, and the SHPO concluded that because of safety, constructability, and operational concerns that reach an extraordinary magnitude, retaining the snowshed did not meet the project's purpose and need, and for these reasons, is not prudent and feasible.

FHWA and WSDOT took the following measures to avoid impacts to eligible resources, including the snowshed:

- The lead agencies considered a wide range of initial alternatives to meet the project's purpose and need. Alternatives were eliminated only if they were found not to meet the project's purpose and need, had unacceptably high environmental consequences, or if the construction and operations reached extraordinary magnitude.

- Once the Common Route was advanced for further study, the lead agencies developed four alternatives for the Keechelus Lake Alignment, all of which would have avoided impact to the snowshed. Alternative 1 included a tunnel that would avoid the snowshed completely. Alternatives 2, 3 and 4 would have avoided the snowshed by building a viaduct over Keechelus Lake in front of the snowshed. As discussed in Chapter 2, Alternative 1 was rejected because of its extremely high cost. FHWA and WSDOT modified Alternatives 2, 3 and 4 to use the existing alignment and replace the snowshed. This modification was made after studies revealed serious engineering problems with viaduct construction in the lake and serious safety concerns

with the viaduct during avalanches. At the same time, studies revealed stronger and more stable rock material that would allow for widening the existing alignment into the hillside near the snowshed.

- FHWA and WSDOT examined and rejected the alternatives that involved expanding or moving the snowshed. Construction methods used for the original structure make it essentially impossible to move or modify, since it consists of both pre-cast and cast in place concrete. The SHPO concurred with the determination that the snowshed can neither be moved nor modified without destroying its historic integrity.

Best Management Practices

The major temporary impact to historic, cultural, and archaeological resources would be inadvertent disturbance of previously unknown objects or sites. WSDOT will develop and implement a project-specific unanticipated discovery plan, which will establish procedures to deal with unanticipated discovery of cultural resources before and during construction, and cultural resource monitoring for each phase of the project.

Compensatory Mitigation

FHWA, WSDOT, and the SHPO agreed on mitigation measures for removing the snowshed. WSDOT agreed to perform the following measures, all located at Travelers' Rest, a potentially historic WSDOT-owned building located at the Snoqualmie Pass summit:

- Historic structures report for the Travelers' Rest building
- Site assessment of current and potential uses of Travelers' Rest, including mitigation options and needs
- Phase 1 environmental site assessment for hazardous materials
- Interpretive signs at Travelers' Rest depicting historic travel, including Native Americans, over Snoqualmie Pass, history of

the Travelers' Rest building and site, and history and engineering facts of the snowshed

3.10 Recreation Resources

This section discusses the expected impacts of the project alternatives to recreation resources. The study area for recreation is approximately one mile on either side of the existing highway. Other recreation sites that are outside the study area have been included in instances where I-90 provides the primary access route to these areas. More information on recreation resources is available in the *Recreation Baseline Study* (WSDOT 2002h), the *Recreation and Section 4(f) Evaluation Discipline Report* (WSDOT 2002i), and the *Snoqualmie Pass Adaptive Management Area Plan FEIS* (USFS and USFWS 1997).

Trails and roads within the project area provide a variety of opportunities for recreation activities throughout the year.

What new information has been developed since the Draft EIS?

Since publishing the Draft EIS, WSDOT developed the *Recreation Impacts/Preliminary Mitigation Site Analysis* (Appendix S), which discusses mitigation for permanent impacts to the Price Creek Sno-Park (Westbound). This section is also based on statewide recreation planning described in the *I-90 Corridor Winter Recreation Strategy* (State Parks 2007).

Since the build alternatives have the potential to affect publicly owned parks and recreation lands, WSDOT has completed a *Section 6(f) Recreation Lands Technical Memorandum* (49 USC § 303) (Appendix T). The memorandum discusses the use of Land and Water Conservation Fund Act grant money to purchase or develop recreation property in the project corridor. It also discusses the potential impacts to those properties from the project. WSDOT also completed a *Programmatic Section 4(f) Evaluation* (see Chapter 5), which discusses potential temporary impacts to recreation resources, and analyzes the proposed removal of the existing snowshed.

Winter recreation opportunities include snowmobiling, skiing, snowshoeing, and dog sledding. (Shown: Price Creek Sno-Park)

Comments from the public and reviewing agencies have been incorporated into this section.

What are the major characteristics of the affected environment?

The project area is heavily used for recreation, and population growth in surrounding regions is increasing the demand for recreation opportunities. Recreation opportunities within or accessible from the project area include skiing, sledding, snowmobile riding, ice climbing, camping, hiking, horseback riding, alpine climbing and rock climbing, hunting, fishing, biking, berry picking, hang-gliding, boating, and running.

The importance of the project area for recreation is reflected in I-90's designation as a National Scenic Byway, the first interstate to be recognized as such, and the investments made by public and private agencies in recreation and conservation throughout the corridor.

Exhibit 3-41 lists the developed recreation destinations within or accessible from the study area that could be affected by the build alternatives. Exhibit 3-42 shows the locations of these sites.

The USFS manages most of the federal land adjacent to the project corridor, which is open to the public for recreation use. State Parks operates sno-parks located on federal land throughout the project area under the State Winter Recreation Program. Winter recreation within the study area is among the highest in the state.

What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would not result in beneficial effects to recreation.

Exhibit 3-41
Developed Recreation Destinations

Recreation Destination	Access from I-90	Estimated Average Annual Use
Hyak and Gold Creek Sno-Parks	Exit 54	50,000
Gold Creek Pond picnic area	Exit 54	7,000
Keechelus Lake boat launch, trailhead, and picnic area	Exit 54	5,000
Iron Horse State Park/John Wayne Pioneer Trail between Hyak and Easton, including Cold Creek Campground and Roaring Creek Campground	Exit 54 and Exit 62	90,000
Stampede Pass Trailhead	Exit 62	NA
East Kachess Group Site	Exit 70	NA
Rachel Lake trailhead	Exit 62 and Exit 63	NA
Kachess Lake Campground and trailhead	Exit 62	23,000
Kachess Lake boat launch	Exit 62	11,000
Kachess Lake Sno-Park	Exit 62 and Exit 63	NA
Price Creek Sno-Park (Westbound)	Exit 62	NA
Crystal Springs Campground	Exit 62	2,000
Crystal Springs Sno-Park	Exit 62	NA
Cabin Creek Cross Country ski area and Nordic racetrack	Exit 63	14,000
Cabin Creek Sno-Park	Exit 63	14,000
Pacific Crest Trail	Exit 54 and Exit 62	NA
Lake Easton State Park	Exit 70	212,400
Alpine Lakes Wilderness Area	Exit 54 and Exit 62	NA

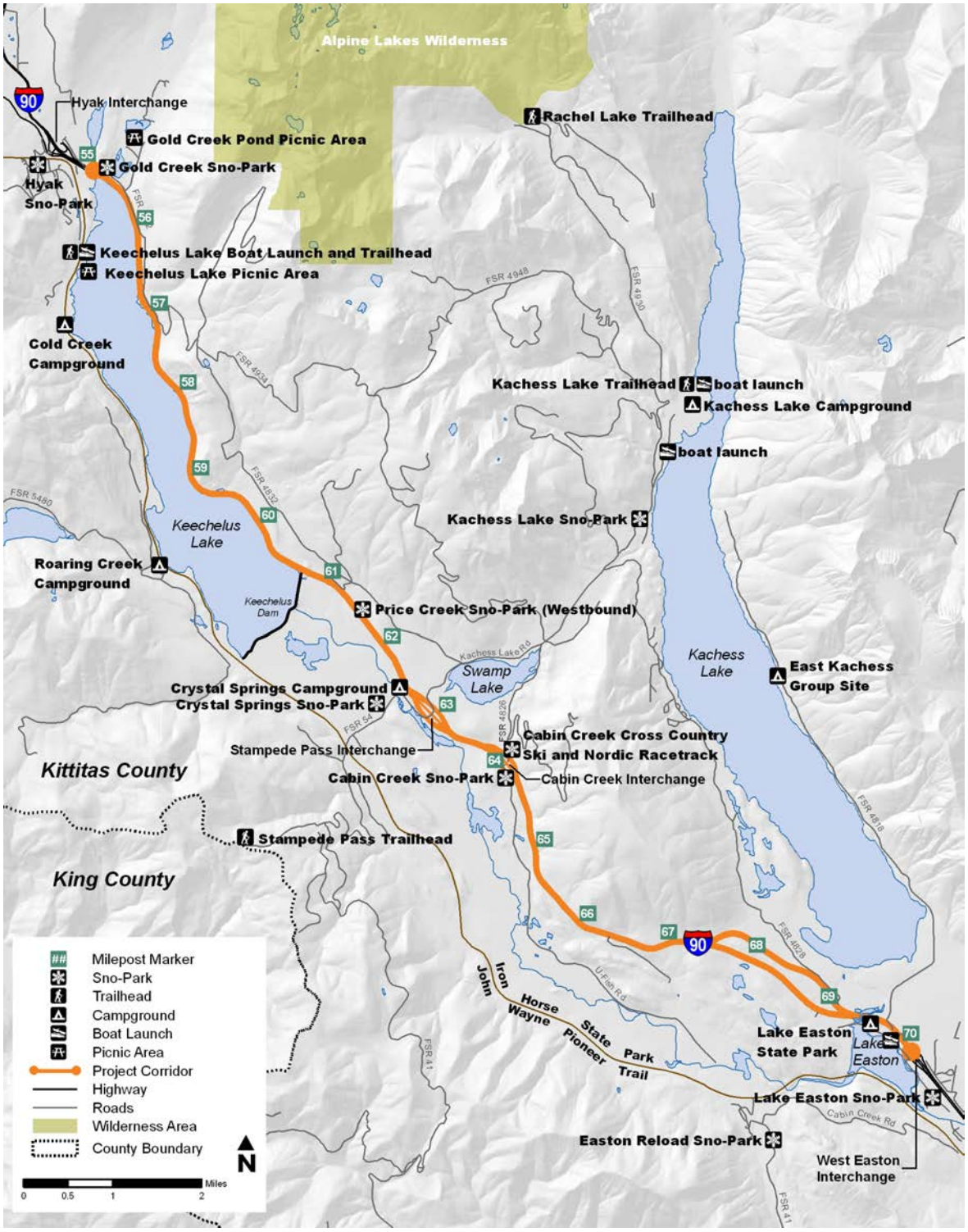
NA – not available

Build Alternatives

All of the build alternatives would result in beneficial effects to recreation, including reduced travel time and increased safety for travelers to area recreation sites. Additionally, FHWA and WSDOT have committed to making improvements the Crystal Springs and Cabin Creek Sno-Parks following their use as staging and stockpiling sites. These improvements would be consistent with long-term plans for these locations. The project would make similar improvements to any other recreation sites that are used by the project.

The proposed tunnels in Alternatives 1 and 2 would slightly reduce noise for recreation users compared to present conditions.

Exhibit 3-42
Recreation Areas Within or Accessible from the I-90 Corridor



Recreation areas and adjacent lands are managed by the USFS and State Parks. WSDOT is working with recreation area managers to replace the Price Creek Sno-Park parking capacity at a location that will meet recreation needs without affecting ecological connectivity objectives.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any temporary adverse impacts to recreation resources from construction. This alternative also would not result in any direct permanent impacts to recreation. However, there would be indirect impacts from the continued deterioration of the highway, increased traffic volumes, and increasing congestion. These may result in increased driver frustration and decreased user enjoyment.

Build Alternatives

Temporary Impacts

All of the build alternatives would create temporary impacts to recreation from construction, including changes to access, detours, or noise, which could cause temporary impacts to Gold Creek Sno-Park, Crystal Springs Campground, Crystal Springs Sno-Park, Cabin Creek Sno-Park, and Lake Easton Sno-Park.

WSDOT may use the Crystal Springs Sno-Park, Cabin Creek Sno-Park, or Price Creek Sno-Park (Westbound) for materials staging or stockpiling during construction of the project. These are winter recreation areas, and would not be affected by the any of the build alternatives. Construction generally will not take place during the winter; however, even in the event of winter construction, WSDOT will maintain access to the sno-parks and return the parking areas to their intended use.

WSDOT may use FSR 4832, FSR 54, or other USFS roads as haul roads, which would impact access to recreation sites temporarily. However, WSDOT would maintain access during construction activities.

For all of the build alternatives, WSDOT would temporarily close ramps at Exit 62 and 63 to reconfigure the Stampede Pass and Cabin Creek Interchanges. WSDOT would ensure that access to recreation facilities in the area would be available throughout construction. Ramp closures would last less than one construction season.

Increased noise and construction activity in the vicinity of the Crystal Springs Campground may cause temporary impacts to users of this facility. However, because the location of this campground is adjacent to I-90, visitors would not expect a quiet wilderness experience while camping there.

Blasting noise could impact some recreation users. WSDOT will limit blasting to weekdays during daylight hours to the extent possible.

Permanent Impacts

Only one recreation area would experience permanent impacts as a result of the project: the Price Creek Sno-Park (Westbound). The project would require closure of this area under any of the build alternatives for the following reasons:

- Removing the sno-park would eliminate the potential conflict between the recreation and wildlife in this area. The area just east of this sno-park has one of the highest concentrations of deer and elk collisions in the project area, indicating that it is a favored crossing area for wildlife. The project includes improvement to wildlife passage at this location under all of the build alternatives.

- The sno-park is accessed directly from I-90, and this direct access does not meet FHWA's safety standards, which specify that access to recreation areas should be from secondary roads. Removing the sno-park would eliminate this safety hazard.

- Problems with a high water table prevent the development of a septic system and rest rooms for recreation users.

WSDOT originally designated the Price Creek Sno-Park (Westbound) as a future full-service rest area. FHWA, WSDOT, USFS, and State Parks developed a joint use easement for that purpose. However, WSDOT could not develop the rest area because of difficulties with providing water and septic service. The area is

being used as a sno-park, but it is located in the I-90 right-of-way and WSDOT continues to designate it for transportation use.

The USFS has classified the Price Creek Sno-Park (Westbound) as Roaded Natural, with a management prescription of RE-1 (developed recreation), in recognition of its current use. However, since the site is within the I-90 right-of-way, this classification by the USFS does not prevent FHWA and WSDOT from changing the use of this site. Following use by the project, the area would revert to the USFS Roaded Natural classification.

Because the site is located within the I-90 right-of-way, it does not qualify as a Transportation Act Section 4(f) resource, and FHWA and WSDOT are not obligated to mitigate for the loss of this area under Section 4(f). However, FHWA and WSDOT will mitigate for the loss of parking at the sno-park as a commitment under NEPA. WSDOT has studied potential mitigation sites for the loss of the sno-park, which are discussed in the *Recreation Impacts/Preliminary Mitigation Site Analysis* (Appendix S).

The Price Creek Sno-Park (Westbound) would remain in operation until the construction phase that affects the sno-park is funded and an alternative site has been selected and approved. After closing the site, WSDOT would restore the sno-park to the standards for the USFS Roaded Natural designation.

The *Section 6(f) Recreation Lands Technical Memorandum* (Appendix T) documents that no recreation properties funded with Land and Water Conservation Fund grants through the Interagency Committee for Outdoor Recreation would be converted to a non-recreation use by the project.

The project does not occur within any USFS Inventoried Roadless Areas or Potential Wilderness Areas.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT has designed the project to avoid the use of or impacts to recreation sites in the project area wherever possible.

Best Management Practices

BMPs for recreation will be designed to meet applicable commitments and performance standards, including:

- The agreement between WSDOT and State Parks to use the Crystal Springs Sno-Park for materials staging and stockpiling
- Permit conditions, which may include the Special Use Permits from the USFS for the temporary use of and improvements to the Cabin Creek Sno-Park, and FSR 4832 and FSR 54 if they are used as haul roads
- Applicable conditions related to the transfer of or use authorization for federal land from the USFS and USBR for highway easement

Some example BMPs that WSDOT could use to comply with these standards include:

- Limiting temporary occupancy of winter recreation sites to snow-free months
- Coordinating with or providing links to recreation management agencies or private organization websites and newsletters
- Coordinating with the USFS and State Parks to provide alternative access routes to forest roads, state parks, campgrounds, and trailheads

Compensatory Mitigation

FHWA and WSDOT will work with the USFS and State Parks to mitigate for the temporary occupancy of the Crystal Springs and

Cabin Creek Sno-Parks, and for the loss of the Price Creek Sno-Park (Westbound).

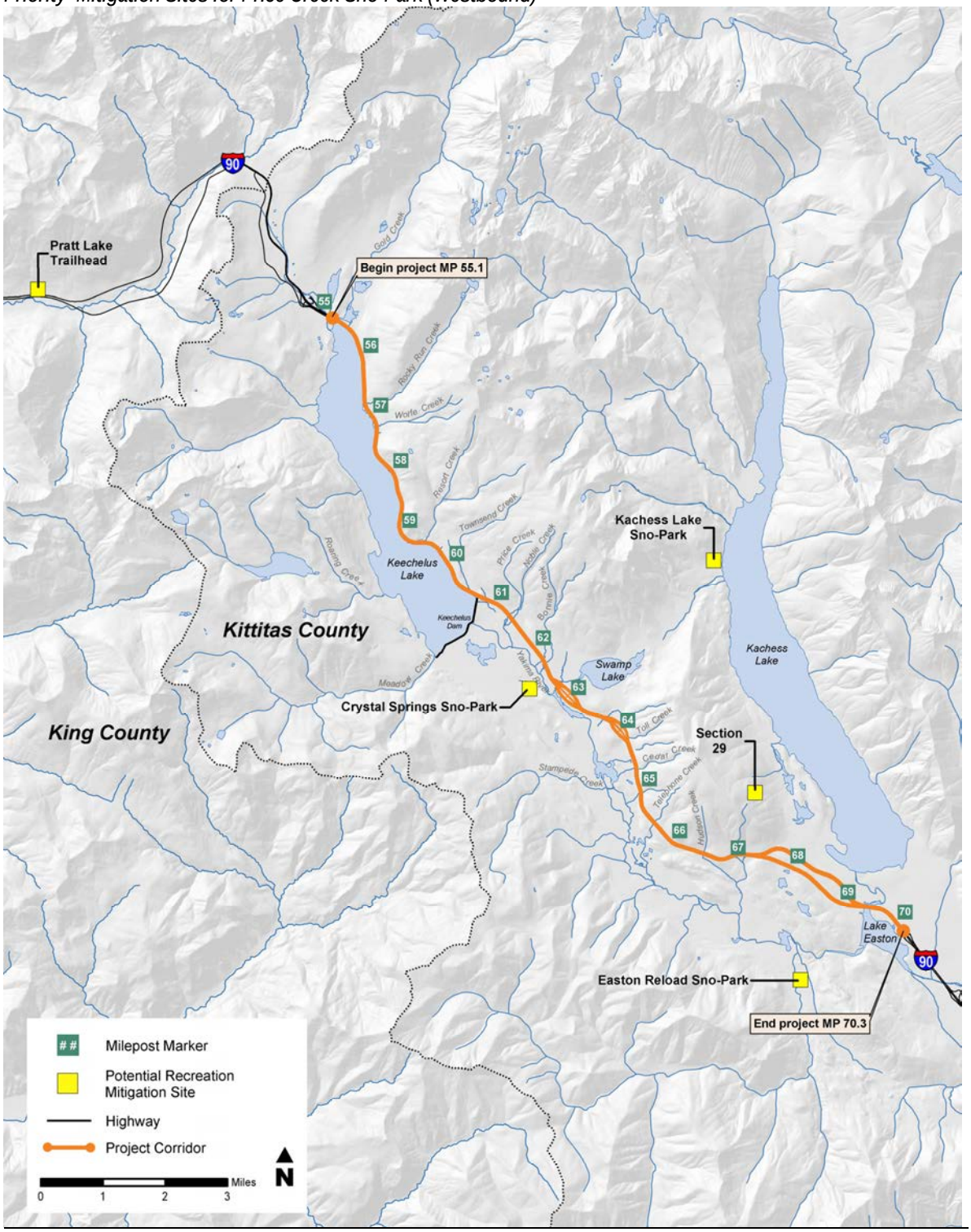
WSDOT will develop an agreement with State Parks for the Crystal Springs Sno-Park to identify temporary and long-term commitments for the site. WSDOT will lease the sno-park for use as a materials and staging area. After project completion, WSDOT will re-grade the area to meet State Parks' long-term plans. WSDOT will work with the USFS to develop a Special Use Permit that will specify details for WSDOT's temporary occupancy of the Cabin Creek Sno-Park and long-term reclamation for the site.

WSDOT will improve FSR 4832 or FSR 54 to accommodate their use as haul roads. WSDOT will replace the parking afforded by the Price Creek Sno-Park (Westbound) at a location to be determined in consultation with the USFS and State Parks, and the current parking lot will be restored to forested conditions. The new sno-park location will not conflict with resources managed by State Parks or the USFS.

WSDOT has studied potential replacement parking areas for the Price Creek Sno-Park (Westbound) in consultation with the USFS and State Parks. The *I-90 Corridor Winter Recreation Strategy* (State Parks 2007) identifies and describes sites in or near the project area that could help provide more sno-park capacity. After reviewing the State Parks report and recommendations, WSDOT prioritized the State Parks-recommended sites based on WSDOT's criteria and identified priority mitigation sites. Exhibit 3-43 shows WSDOT's priority mitigation sites, which include expansion and enhancement at the sites.

WSDOT will study these sites further as design proceeds and funding to construct the remainder of the project is secured. Refer to the *Recreation Impacts/Preliminary Mitigation Site Analysis* (Appendix S) for details.

Exhibit 3-43
Priority Mitigation Sites for Price Creek Sno-Park (Westbound)



Recreation areas and adjacent lands are managed by the USFS and State Parks. WSDOT is working with recreation area managers to replace the capacity of Price Creek Sno-Park at a location that will meet recreation needs without affecting ecological connectivity objectives.

3.11 Land Use

This section discusses expected impacts of the project alternatives to land use. The study area for land use includes lands within three miles of the highway within the project area. More detail is available in the *Land Use Discipline Report* (WSDOT 2003f) and Section 3.11 of the Draft EIS.

What new information has been developed since the Draft EIS?

Since completing the Draft EIS, WSDOT completed the *Land Use Technical Memorandum* (Appendix U), which analyzed current land use patterns and conservation-related land transfers in the project area. Information from this memorandum has been incorporated into this section.

There were no comments on the Draft EIS concerning land use.

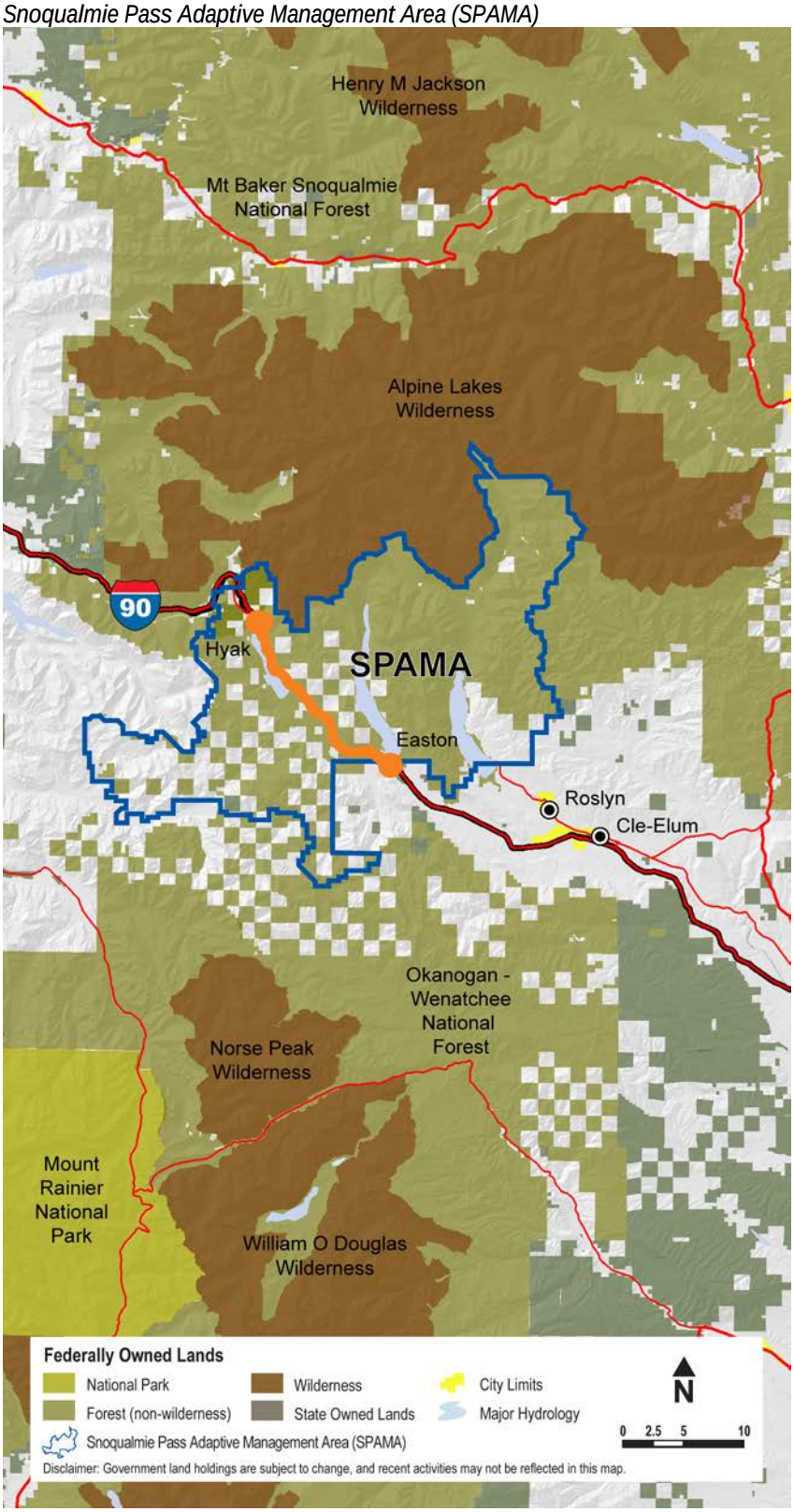
What are the major characteristics of the affected environment?

Public Land

Most of the land within the project area is public land managed by the USFS as part of the Okanogan-Wenatchee National Forest. The USBR manages the land within Keechelus Lake as part of its management of the Yakima Project irrigation water system. The WDNR manages a small amount of property near Easton, and State Parks manages the land in and around Lake Easton State Park.

National Forest land within the project area is part of the 212,700-acre SPAMA, one of ten adaptive management areas in the western United States (Exhibit 3-44). When the SPAMA was established in 1994, it marked an important change to federal land management in the area. In place of an earlier emphasis on timber production, the goals of the SPAMA (USFS and USFWS 1997) are to provide mature forests and habitat connection for species moving north and south.

Exhibit 3-44
Snoqualmie Pass Adaptive Management Area (SPAMA)



Federal land in and near the project area is heavily used for recreation, as described in Section 3.10, *Recreation Resources*. State Parks operates a network of developed sno-parks in the project area, most of which are located on National Forest land through cooperative agreements with the USFS.

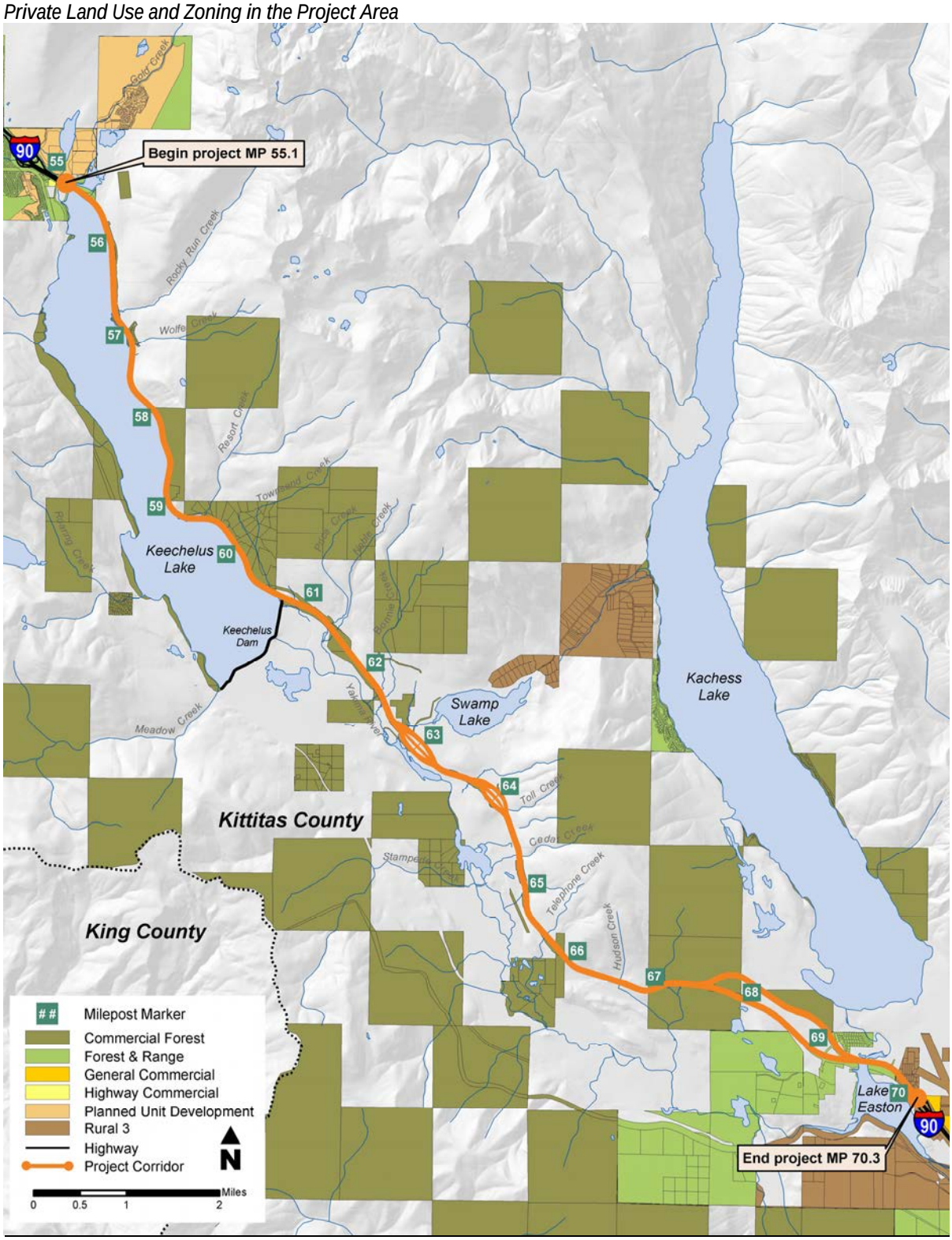
Private Land

Private land in the I-90 project area exists mostly as large blocks surrounded by National Forest land (Exhibit 3-45). This unique "checkerboard" land pattern has had a major impact on land management in the project area.

Beginning in 1864, the United States government deeded every-other-square-mile blocks of federal land to three railroad companies in order to support construction of the trans-continental railroad lines. The Northern Pacific Railroad received the largest of these land grants: 40 million acres in an 80-mile wide swath running 2,000 miles from the Great Lakes to Puget Sound. The original railroad route ran over Stampede Pass, and the land grants covered almost all of the area between White Pass and Stevens Pass, including the I-90 project area.

By 1989, most of the original railroad company land in the I-90 project area had been transferred to Plum Creek Timber Company, one of the successors to the Northern Pacific Railroad. Plum Creek in turn sold some of this land to other private owners for residential development, while retaining the majority of the land for commercial timber harvest. Much of the railroad land has been logged, including the construction of a dense network of roads. Until the 1980s, the emphasis on logging and road building on private timber land was similar to the way the USFS managed adjacent National Forest land. Logging and road building on both federal and private land has contributed to habitat fragmentation.

Exhibit 3-45
Private Land Use and Zoning in the Project Area



Land use designations shown were based on existing zoning and allowed development densities. These designations were taken into account in the design of the CEAs.

The Northwest Forest Plan (USFS and BLM 1994) and the *Snoqualmie Pass Adaptive Management Area Plan Final Environmental Impact Statement* (USFS and USFWS 1997) changed how the USFS manages the Okanogan-Wenatchee National Forest in the project area. The focus of USFS land management in the project area is now on ecosystem management, especially restoring late-successional forests and connecting important areas of wildlife habitat. Timber harvest is limited to activities that are beneficial to the restoration or creation of late-successional forest habitat, and the USFS is actively decommissioning roads to improve wildlife habitat and watershed conditions.

The USFS recognized, however, that the goals of ecosystem management could not be accomplished without acquiring additional private land within the boundaries of the National Forest. As long as this land remained in private hands, management could not be coordinated, roads could not be decommissioned, and timber harvest and housing development would continue to fragment habitat.

In response, the USFS worked closely with Plum Creek and statewide conservation groups to transfer key Plum Creek land parcels to public ownership, through a combination of land trades and purchases. Since 1998, approximately 80,000 acres of Plum Creek land has been acquired.

Conservation groups, including the Mountains to Sound Greenway Trust, Conservation Northwest, and the Sierra Club, formed an umbrella organization, the Cascades Conservation Partnership, to assist in the original acquisition effort. After the USFS completed its campaign of major acquisitions, the Cascades Lands Conservancy assumed this role. This organization continues to make targeted purchases of key private land parcels in the project area, which are then transferred to public ownership.

Before the USFS changed its land management direction and acquired the Plum Creek lands, FHWA and WSDOT would not have made the large-scale investments in wildlife passage across I-90 that are now part of the project. However, the actions of the USFS and conservation groups created a new context. These actions gave the

lead agencies the confidence to make substantial investments in ecological connectivity as part of the I-90 project, knowing that the management of the surrounding federal lands would be consistent with project investments.

Size and Number of Private Land Parcels

WSDOT analyzed private land parcels within approximately three miles of the I-90 project. The study area boundary was designed to include private land parcels where development would add additional traffic in the I-90 project area, or could potentially affect the project's ecological connectivity goals and investments. The analysis did not include private land parcels in and near the communities of Hyak and Easton, except for the Gold Creek Area. The study area contains approximately 890 private land parcels, as shown in Exhibit 3-46. Exhibit 3-47 shows the general distribution and size of these private land parcels, which range from under one acre to over 600 acres.

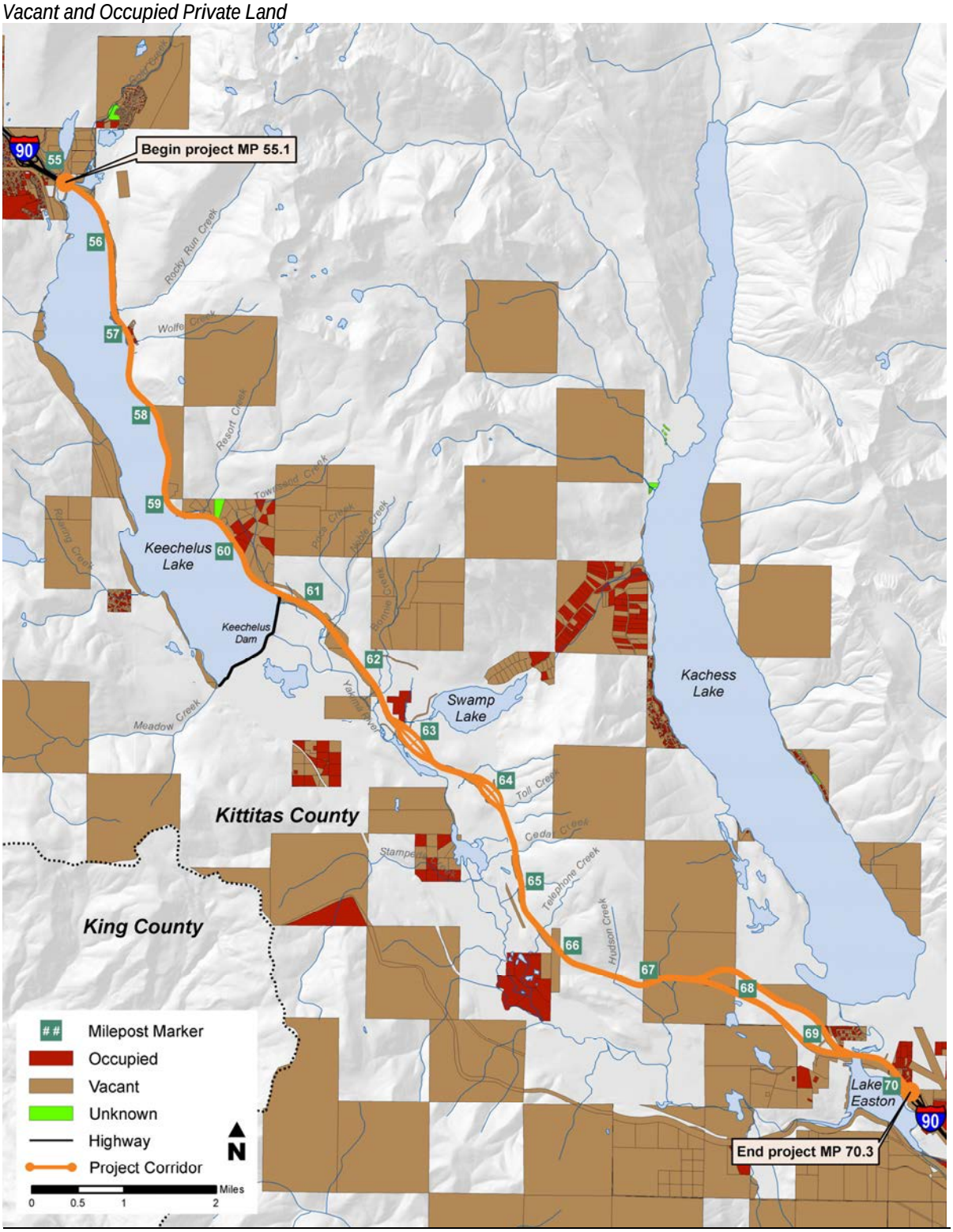
Exhibit 3-47 shows that the 565 parcels under two acres in size make up approximately 175 acres, which is approximately one percent of the total private land acreage in the study area. Most of these small parcels are either lakeshore view lots or Planned Unit Development parcels in the SkiTur Planned Unit Development in the Gold Creek Valley. The 49 largest parcels, consisting of 81 or more acres each, make up 78 percent of the privately-owned land in the study area.

Approximately 61 percent of the private land parcels in the study area are vacant. These parcels represent 95 percent of the private land acreage in this area (Exhibit 3-48). Consequently, most of the private land is the study area could still be developed.

Private Land Regulation

Private land in the project area is regulated by Kittitas County zoning and comprehensive planning regulations, in compliance with the Washington State Growth Management Act (GMA). Exhibit 3-45 shows county zoning designations in the project area.

Exhibit 3-46
Vacant and Occupied Private Land



Land use designations shown were based on existing zoning and allowed development densities. These designations were taken into account in the design of the CEAs.

Exhibit 3-47
Size of Private Land Parcels in the Study Area

Type	Size (acres)	Number of Parcels	Total Acreage	Percent of Total Acreage
Large parcels	81 - 679	49	13,581	78
Mid-sized parcels	2 - 80	276	3,675	21
Small parcels	0.01 - 2	565	175	1
Totals	NA	890	17,431	100

Note: Values have been rounded

Exhibit 3-48
Private Land Vacancy Rates

Type of Land	Percent of parcels	Percent of acreage
Vacant	61	95
Occupied[1]	34	5
Unknown	4	0

Source: Kittatas County 1996
[1] Parcels with improvement values over $5,000 were assumed to be occupied. Most occupied parcels are believed to be occupied part time.

There are no commercially zoned parcels within the project area, although there are several commercial land uses just outside the project area at Hyak and Easton. One proposed Planned Unit Development in the Gold Creek area includes a proposed commercial area. Additionally, there is one commercial business within the project area, the Kachess Lodge rental and towing business, located near MP 61.5 in an area zoned Commercial Forest.

In addition to these overall land use categories, the Kittitas County Comprehensive Plan establishes two other designations that could affect future development in the project are: Urban Growth Nodes and Planned Unit Developments.

Urban Growth Nodes. The 1996 Kittitas County *Comprehensive Plan* (Kittitas County 1996) established Urban Growth Nodes to recognize existing unincorporated communities that had urban characteristics such as established residential, commercial, and industrial uses. The Urban Growth Nodes classification permits

zoning designations that are more typical of incorporated communities, including higher-density residential, commercial, and industrial uses. There are two Urban Growth Nodes just outside the I-90 project area: the unincorporated community of Hyak, and Easton (Exhibit 3-49).

Planned Unit Developments. A Planned Unit Development is a development classification that allows for more flexible regulation and development than traditional zoning. Planned Unit Developments generally allow higher densities of development than the underlying zone, while reserving substantial areas for open space or recreation. In Kittitas County, a Planned Unit Development is the result of a site-specific zoning change, based on a binding site plan. Kittitas County records show three existing Planned Unit Developments within the project area: SkiTur Valley, Chickman Vista, and Mardee Lake/SnoCadia, all in the Gold Creek Valley.

The web site for the proposed SnoCadia development (www.snocadia.com) describes a proposal to develop 112 single-family lots, 110 condominium units, and 260,000 square feet of commercial and retail space. Development of this planned unit development is contingent on pending applications to Kittitas County.

Kittitas County also allows the development of Master Planned Resorts, which is a specific form of Planned Unit Development allowed under the GMA. In Kittitas County, a Master Planned Resort requires a site of at least 320 acres. There is one Master Planned Resort in Kittitas County: the 6000+-acre SunCadia development, which is located east of the project area near Roslyn.

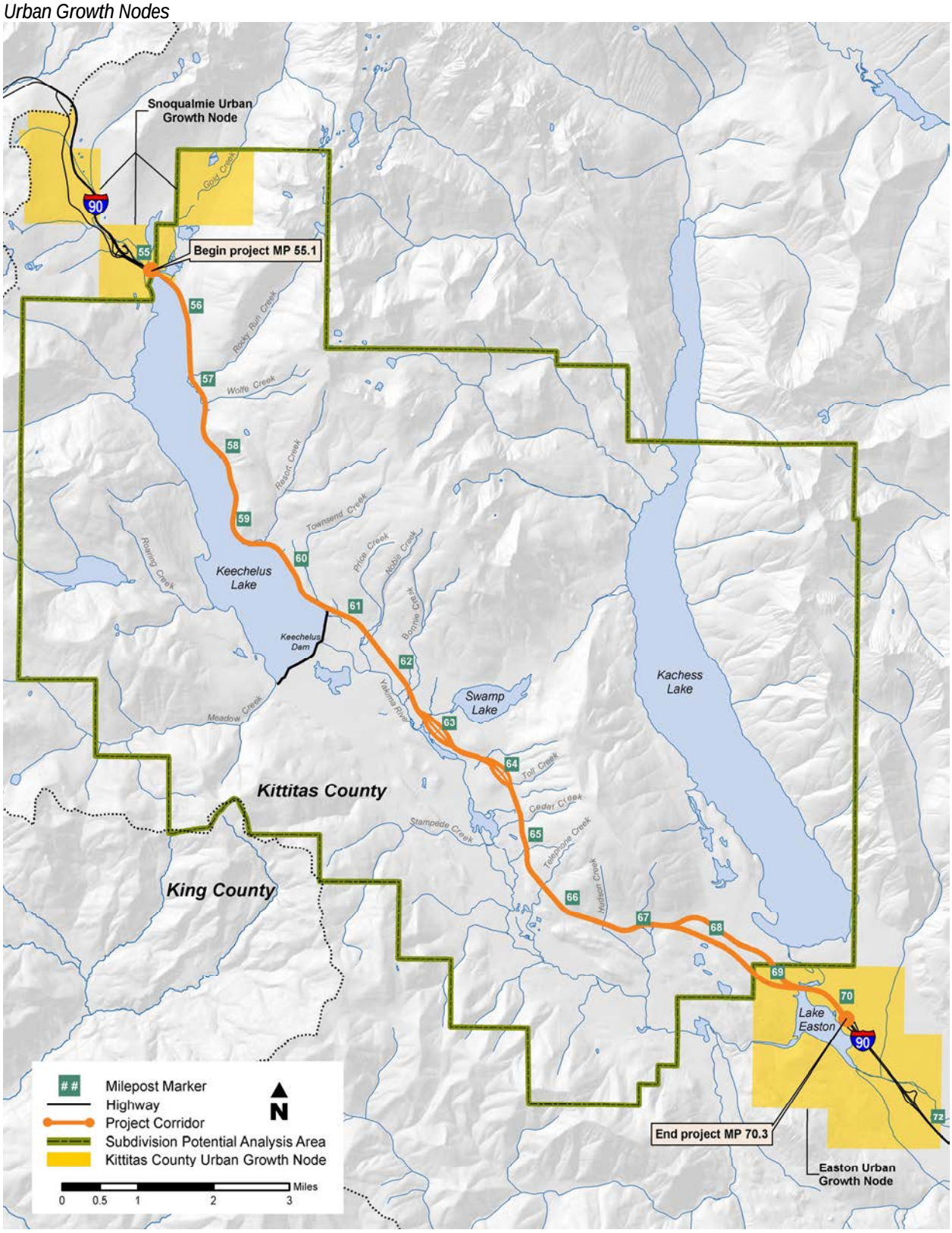
What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would not result in any beneficial effects to land use.

Exhibit 3-49
Urban Growth Nodes



Build Alternatives

Any of the build alternatives would result in direct beneficial effects to land use by supporting the USFS land management goals, which emphasize establishing habitat connections for wildlife movement.

Additionally, any of the build alternatives would provide safer and more reliable access to all of the existing residential, commercial, and recreational land uses in and near the project area.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any direct adverse impacts to land use. Indirect impacts would include:

- I-90 would continue to function as a barrier to wildlife movement, which is inconsistent with the USFS land management goals

- Over time, increased traffic congestion would make access to all land uses more difficult

Build Alternatives

Temporary Impacts

Constructing any of the build alternatives would result in temporary traffic impacts, which could affect access to land uses in and near the project area. Section 3.7, *Transportation,* discussed these potential impacts and measures to mitigate for them. Temporary impacts would be limited to the period of construction.

Permanent Impacts

Adverse impacts to land use are defined as changes to existing land use patterns or incompatibility with existing land use regulations. WSDOT analyzed both of these potential impacts, and this analysis is presented in the *Land Use Technical Memorandum* (Appendix U).

Potential Changes to Land Use Patterns

WSDOT examined potential changes to land use and ownership patterns, including closing the Price Creek Sno-Park (Westbound) and the Price Creek Interim Rest Area (Eastbound), land acquisitions for new highway right-of-way, and land relinquishment.

Closing the Price Creek Sno-Park (Westbound) and the Price Creek Interim Rest Area (Eastbound). Under any of the build alternatives, WSDOT would permanently close the Price Creek Sno-Park (Westbound) and the Price Creek Interim Rest Area (Eastbound). Closing these two sites would not constitute a change to established land use patterns. WSDOT will mitigate for the loss of recreation opportunities from closing the sno-park at a site within or near the project area. WSDOT will restore this area to the standards for USFS land classification Roaded Natural, which is compatible with the USFS's land management goals for the surrounding areas of National Forest.

Land Acquisitions for New Highway Right-of-Way. Under any of the build alternatives, the project would need to acquire or secure authorization to use both public and private land for new highway right-of-way. Land would be acquired in long, narrow strips adjacent to the existing highway. These land acquisitions would take place throughout the corridor, with the largest acquisitions occurring in the Amabilis Grade area. The majority of these acquisitions would be public rather than private land, including some areas of undeveloped National Forest land and some USBR land in Keechelus Lake.

In addition to the land acquired for highway right-of-way, WSDOT will seek to acquire private land for preservation and mitigation. Where possible, these preservation and mitigation areas will be located in the CEAs. WSDOT will work with private land owners, agencies and conservation groups to facilitate purchasing private land.

FHWA and WSDOT have concluded that these acquisitions would not change the existing land use patterns or ownership, nor would

they be incompatible with adjacent land uses. The exact boundaries of the areas for acquisition will be determined during final design. Preliminary estimates for the amounts of land to be acquired for highway easement are shown in Exhibit 3-50 and Exhibit 3-51.

Exhibit 3-50
Permanent Land Acquisition, Keechelus Lake Alignment Alternatives (acres)

Land Acquisition	No Build	Alternative 1	Alternative 2	Alternative 3	Alternative 4/ Preferred Alternative
Private Land	0	6.8	7.4	4.5	0.7
Public Land	0	89.3	48.6	43.5	39.3

Exhibit 3-51
Permanent Land Acquisition, CEA Improvement Packages (acres)

Land Acquisition	No Build	Option Package A	Option Package B	Option Package C	Preferred Alternative
Private Land	0	6.6	6.6	6.6	6.6
Public Land	0	87.9	87.9	87.9	87.9

The Draft EIS and other project documents indicate that the project might affect the 30-lot subdivision near MP 59.3. FHWA and WSDOT have changed the design of the build alternatives to move the alignment further away from this subdivision, and believe that there would be no impacts.

Land Relinquishment. Under all of the build alternatives, WSDOT would move the highway away from its existing right-of-way in several areas. This would allow FHWA and WSDOT to relinquish some areas of former right-of-way. Section 1.13, *What other actions are necessary to complete the project?*, provides information about procedures for land acquisition and relinquishment. Exhibit 3-52 through Exhibit 3-56 show the approximate areas for potential acquisition and relinquishment. Relinquishing these areas would not change existing land use patterns, nor would they be incompatible with adjacent land uses.

Exhibit 3-52
Potential Acquisition and Relinquishment Areas MP 55 to MP 57

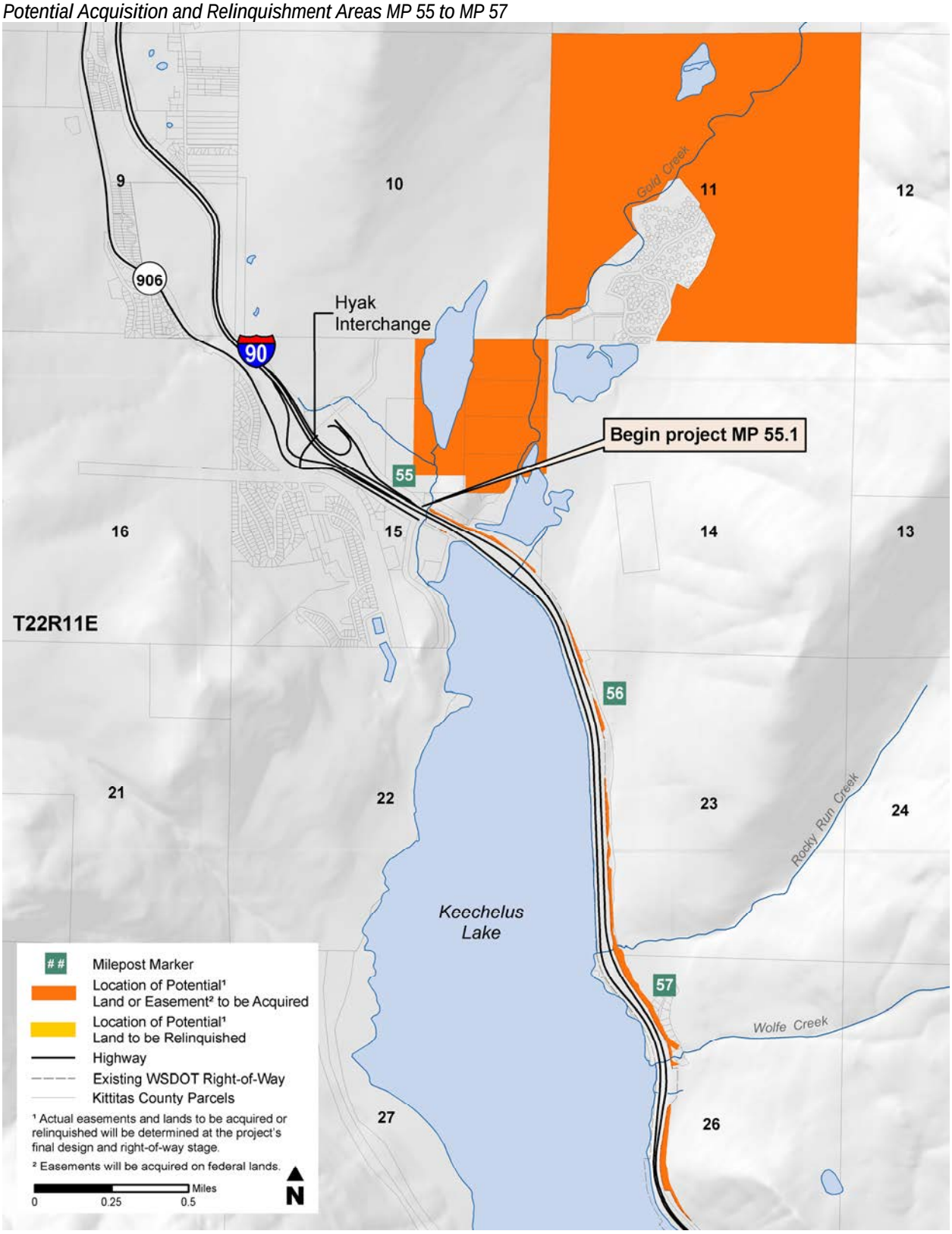


Exhibit 3-53
Potential Acquisition and Relinquishment Areas MP 57 to MP 61

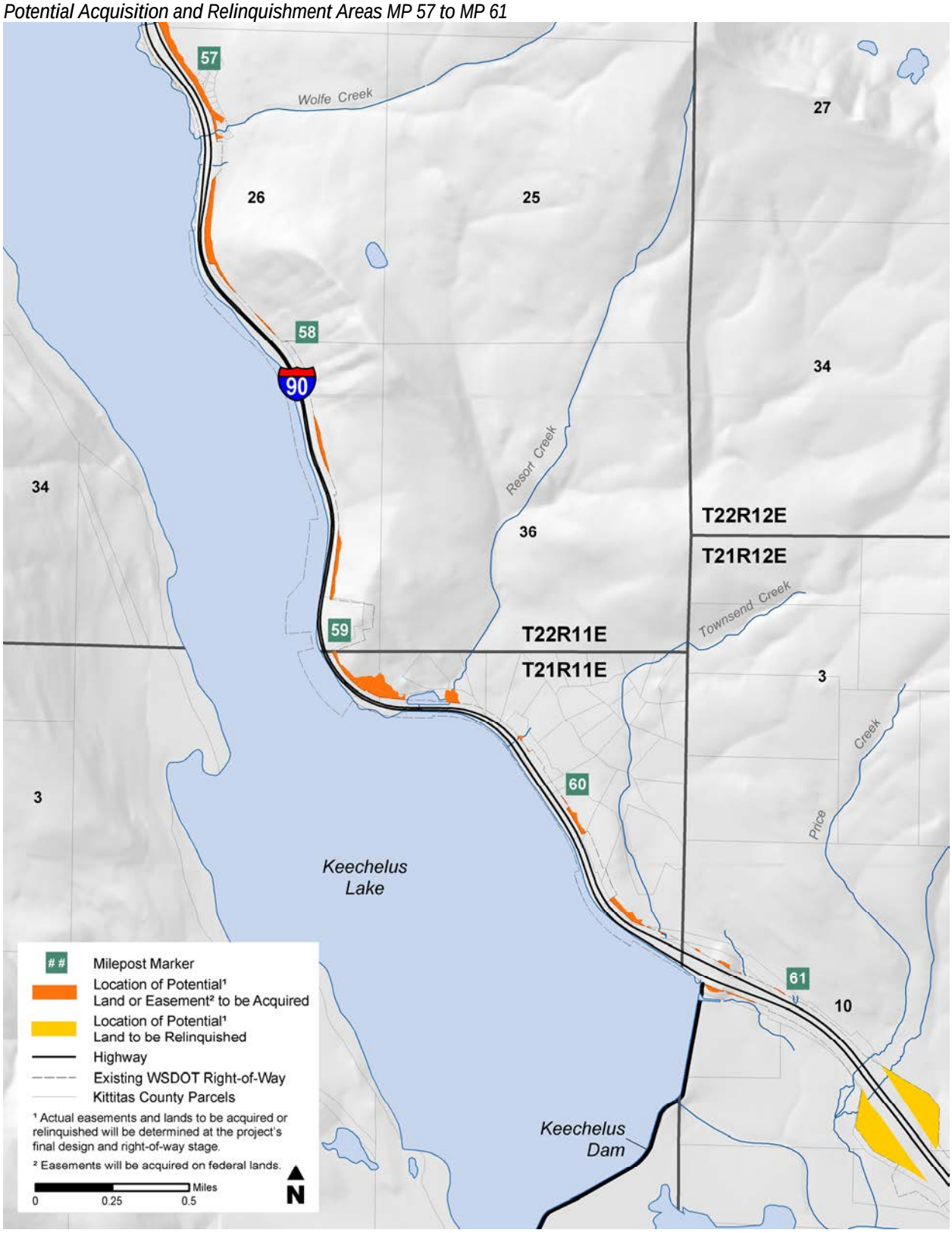


Exhibit 3-54
Potential Acquisition and Relinquishment Areas MP 61 to MP 65

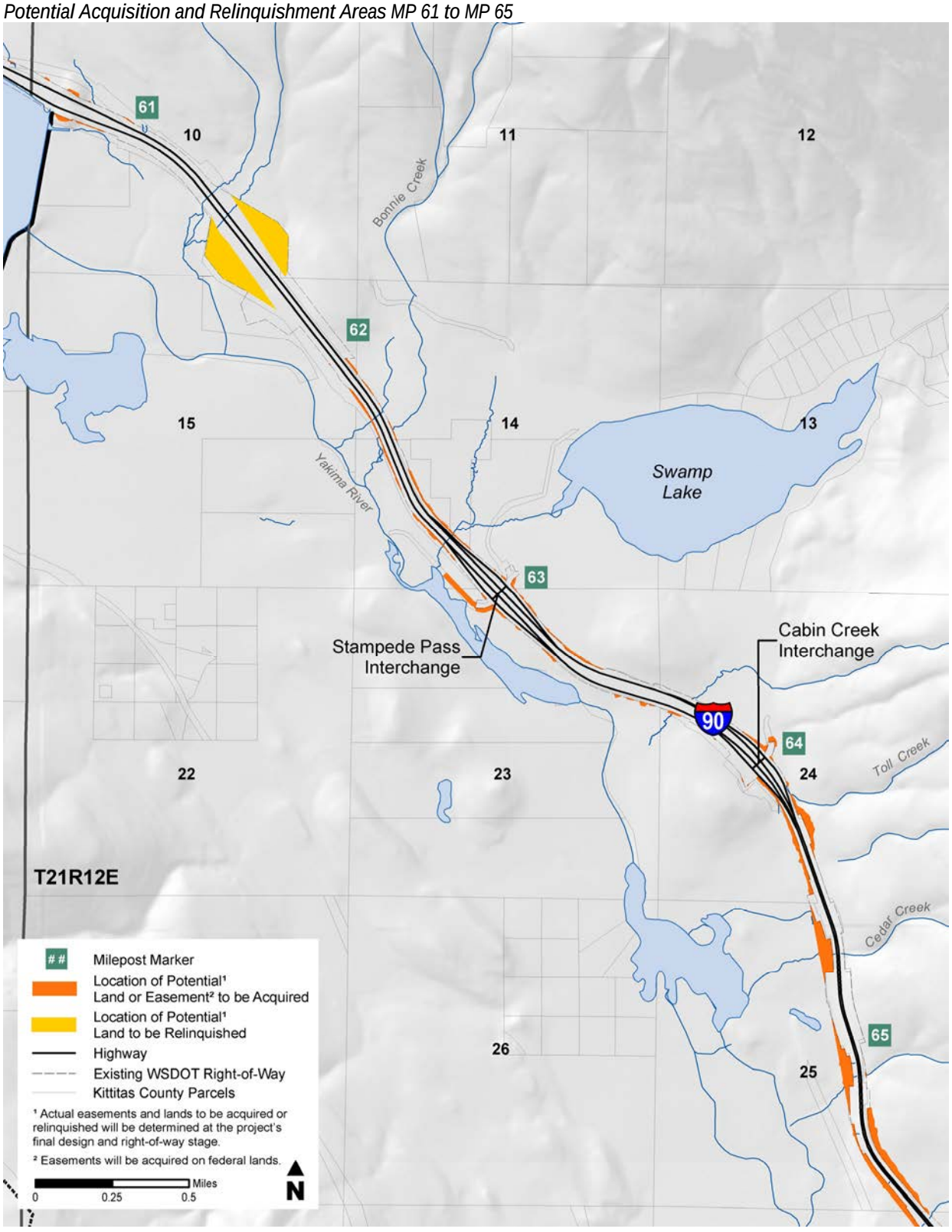


Exhibit 3-55
Potential Acquisition and Relinquishment Areas MP 65 to MP 68

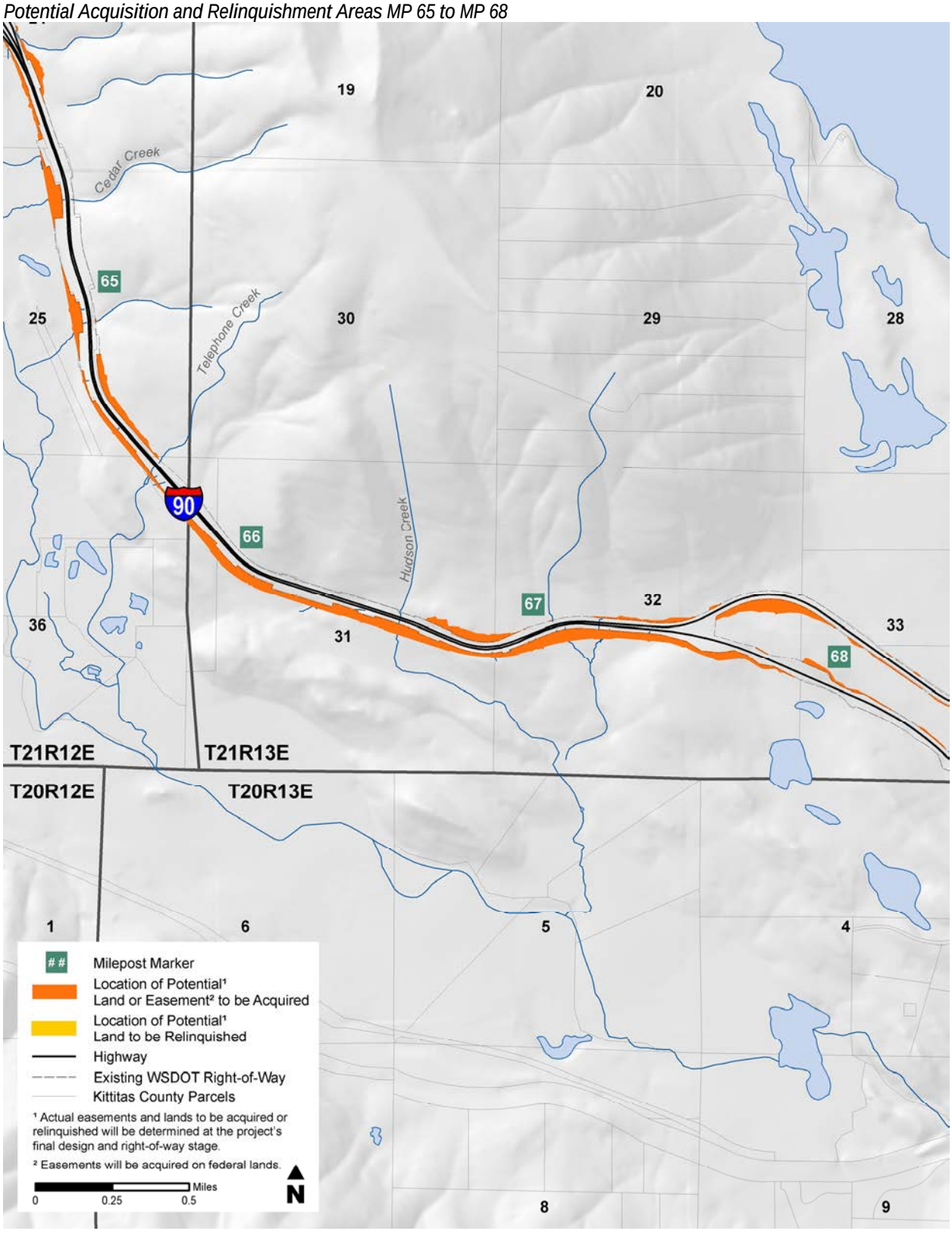
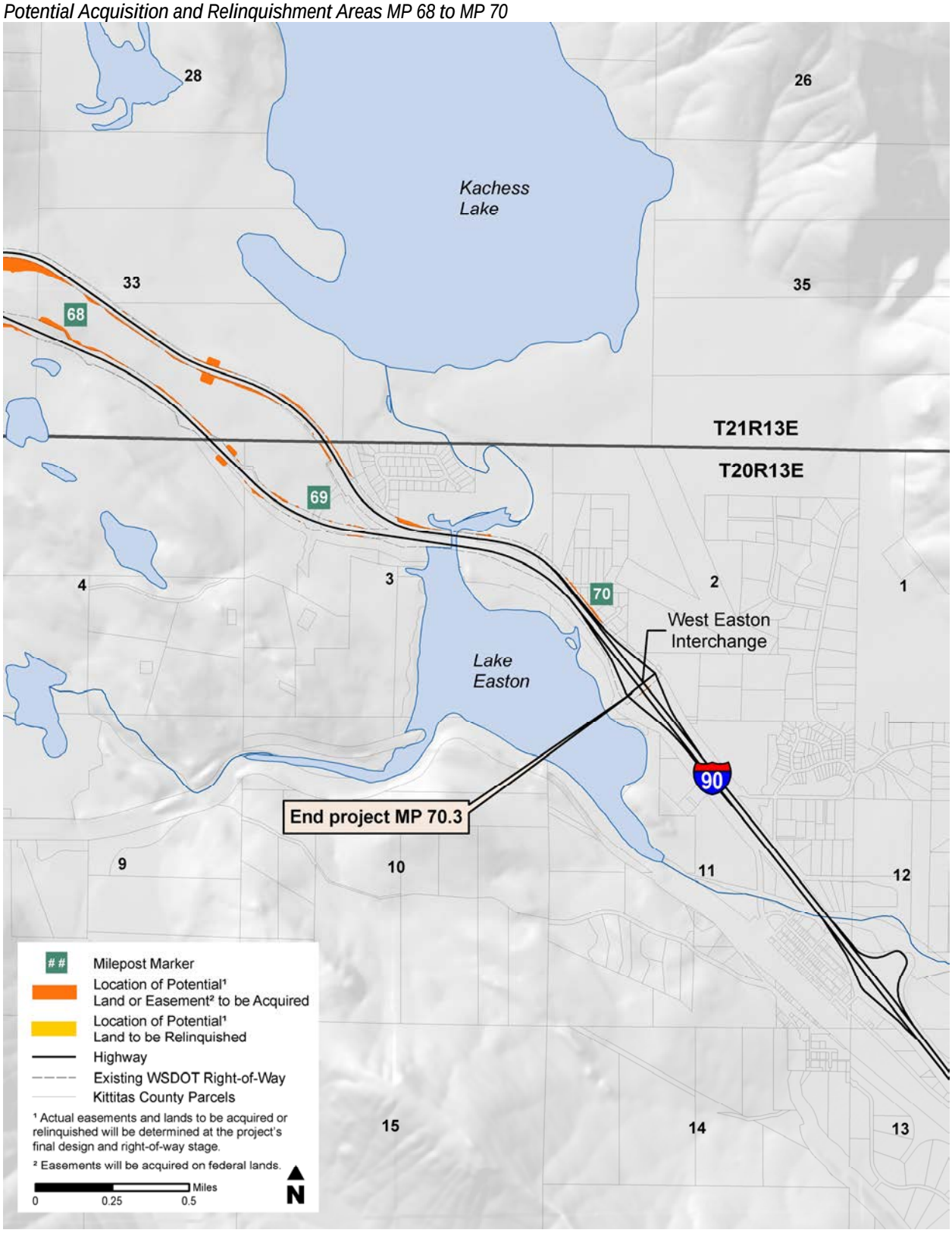


Exhibit 3-56
Potential Acquisition and Relinquishment Areas MP 68 to MP 70



Potential Compatibility with Existing Land Use Regulation

WSDOT also examined potential compatibility of the project with the regulation of surrounding lands, including public land and Kittitas County land.

The USFS will make a formal determination as to whether the project is consistent with USFS land management plans after FHWA and WSDOT complete the Final EIS and FHWA publishes the ROD. The lead agencies have worked cooperatively with the USFS throughout the process of planning and design, and believe that the project is consistent with these documents. Section 1.13, *What other actions are necessary to complete the project?*, describes some of the stipulations that would be included in transferring federal land for the new right-of-way.

Kittitas County will make a formal determination about whether the project is consistent with its land use regulations as part of project permitting. Some additional development could take place under existing private land use regulation, including building on vacant parcels, subdivision to existing minimum lot sizes, and development at the existing planned unit developments. WSDOT studied the amount of potential development under existing land use regulation in the *Land Use Technical Memorandum* (Appendix U), and FHWA and WSDOT concluded that if private land development continues to follow existing zoning and comprehensive plan designations, this development can be designed to be compatible with any of the build alternatives.

Adverse impacts to project connectivity investments could occur if Kittitas County rezoned project area lands to higher densities. Kittitas County has received rezoning applications in the project area, some of which are still pending. FHWA and WSDOT assume that Kittitas County will only approve rezoning applications if they are consistent with the Kittitas County *Comprehensive Plan* (Kittitas County 1996), Washington State Growth Management Act, and the SPAMA Plan Final EIS (USFS and USFWS 1997).

WSDOT has requested that Kittitas County recognize the work done on the I-90 project, including the science-based discipline reports and the *Mitigation Development Team Recommendation Package* (Appendix D), as representing best available science for wildlife connectivity in the project area, and to consider the project's CEAs in its Critical Areas regulations.

Potential Indirect Impacts

East of the project area, residential development is proceeding rapidly. Part of this development appears to be second homes, and some of the owners commute to Western Washington for work. According to the 2000 US Census, 1,341 workers commuted from Kittitas County to Western Washington. It is possible that the I-90 project could make commuting from these areas easier, by increasing safety and capacity and reducing congestion through the project area. However, there is no evidence that the existing level of congestion is impeding residential growth in developments such as Suncadia. Any impacts from decreased congestion would not be felt until project construction was complete: six years for Phase 1 and seven to 15 additional years for the remaining project area. Further, the incentive to commute between Eastern and Western Washington depends on fuel prices, which are likely to continue to rise. The lead agencies' best judgment is that the I-90 project by itself is unlikely to lead to substantial additional development or population growth east of the project area.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

The project has avoided impacts to existing land use patterns by adjusting the location of the build alternatives to avoid the use of private property wherever possible.

WSDOT has designed connectivity improvements to be consistent with USFS land management plans.

WSDOT will use eminent domain and condemnation procedures only as a last resort.

Eminent Domain: The power of the state to take property for public use, usually with payment to the owners.

Condemnation: The formal act of exercising eminent domain to transfer title of private property.

Best Management Practices

No BMP-related commitments have been made. Construction BMPs will avoid and minimize impacts to adjacent private property.

Compensatory Mitigation

In the event that residents or businesses are relocated, WSDOT will comply with the terms of the federal Uniform Relocation Act of 1970, as amended.

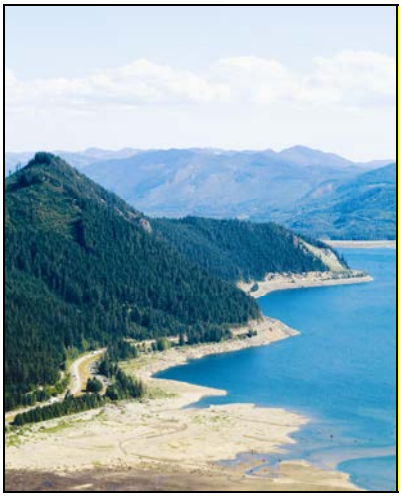
3.12 Visual Quality

This section discusses the expected impacts of the project alternatives to visual resources, focusing on views from key viewpoints. The study area for visual resources consists of the I-90 corridor from the Hyak Interchange to the West Easton Interchange. More detail on visual quality can be found in Section 3.12 of the Draft EIS and the *Visual Impact Assessment Discipline Report* (WSDOT 2004c).

What new information has been developed since the Draft EIS?

After publishing the Draft EIS, WSDOT prepared a *Visual Discipline Report Supplement* (Appendix V) to address highway design changes that were made subsequent to the Draft EIS. WSDOT also developed project-specific *Architectural Design Guidelines* (Appendix X).

Comments from the public and reviewing agencies have been incorporated into this section.



I-90 can be seen from many vantage points near Snoqualmie Pass.

What are the major characteristics of the affected environment?

The project area is within the Mountains-to-Sound Greenway National Scenic Byway, which is designated as a Washington State Scenic Byway. This designation is based on the route's outstanding scenic character and environmental experiences. Because this project is within a State and National Scenic Byway, visual quality of all components of the project is especially important, and any changes in the corridor must retain those qualities as much as possible. FHWA and WSDOT are coordinating with the Mountains-to-Sound Greenway Trust to ensure visual elements of the project will complement this status. The National Scenic Byway Program is managed by FWHA as a grass-roots collaborative effort established to help recognize, preserve and enhance selected roads throughout the US.

The project area runs through public lands that are managed for multiple objectives, including habitat, ecological connectivity, recreation, and resource production. The principle land manager throughout the project corridor is the USFS. The USFS manages the I-90 corridor as a scenic viewshed, among other uses.

Landscape Units

For analysis purposes, WSDOT divided the project area into four landscape units based on topography and viewsheds with similar characteristics. The locations of key views were established to analyze the change in visual quality between current and proposed conditions for three viewer groups: travelers on I-90 trying to reach a destination, people viewing I-90 from across Keechelus Lake while on the Iron Horse Trail or nearby USFS roads, and people traveling to the mountains for the scenery on this National Scenic Byway. WSDOT performed the visual analysis following the *Visual Assessment for Highway Projects* guidelines (FHWA 1981).

Landscape Unit 1 – MP 55.1 to MP 60.8. Landscape Unit 1 has an open character and runs from the western project limits along the entire eastern shore of Keechelus Lake. The view from the highway is of a sharp rise to the east, the lake, and distant mountains. This is the only landscape unit with extensive views toward the highway. There are several rock cuts in this unit that are visible from the Iron Horse Trail. The snowshed in Exhibit 3-57 is visible when there is snow on the roof. When there is no snow, the snowshed blends into the slope because of its color and the vegetation growing above it.

Landscape Unit 2 – MP 60.8 to MP 64.4. Landscape Unit 2 is defined by broad, relatively flat topography as the highway runs along the eastern side of the narrow valley formed by the Yakima River. The landscape here allows a wide median between the eastbound and westbound lanes of traffic. Exhibit 3-58 shows typical topography.

Exhibit 3-57
View of Topography at MP 58 (the Snowshed) in Landscape Unit 1

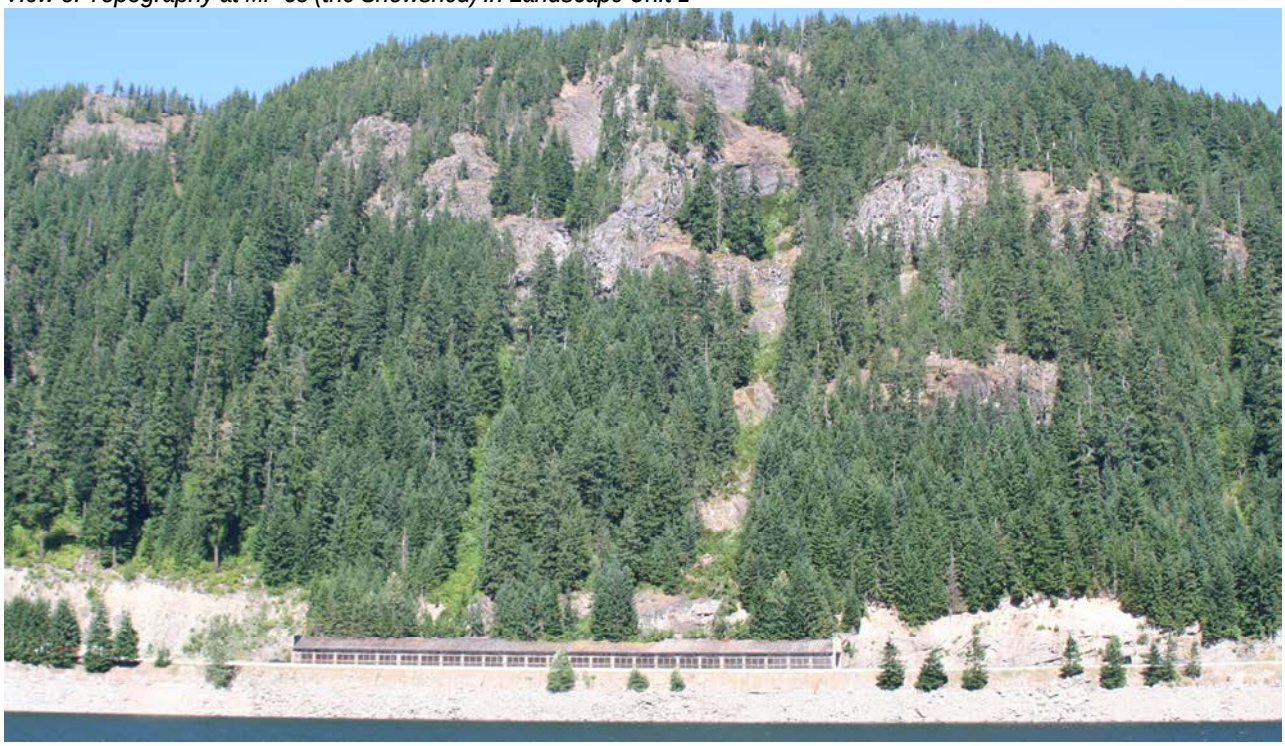


Exhibit 3-58
View of Topography in Landscape Unit 2

Landscape Unit 3 – MP 64.4 to MP 67.5. Landscape Unit 3 runs along the southwestern flank of Amabilis Mountain before it descends to the Yakima River. The topography is similar to Landscape Unit 1, with a rise to the northeast and a valley to the southwest. Large trees screen much of the view of the Bonneville Power transmission lines (Exhibit 3-59).

Exhibit 3-59
View of Topography in Landscape Unit 3

Landscape Unit 4 – MP 67.5 to MP 70.3. Landscape Unit 4 runs along a plateau south of Kachess Lake. There is room for a wide median, which forms a heavily forested hill between the two directions of traffic. Exhibit 3-60 shows a typical view of this landscape unit.

Exhibit 3-60
View of Topography (Eastbound I-90) in Landscape Unit 4

Selection and Rating of Key Views

WSDOT selected 31 total key views within the four landscape units to examine the visual conditions of the existing project corridor and to assess the visual quality of the project alternatives. Key views both from and toward the highway were selected according to visibility of the project, accessibility to the public, frequency of public use, and their representation of the overall impacts within the project area. Views were rated for visual quality based on vividness, intactness, and unity. WSDOT rated recently-harvested slopes as they appear; however, ratings for these areas are expected to improve as the forests mature.

Vividness: The memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.

Intactness: The integrity of visual order in the natural and human-built landscape, and the extent to which the landscape is free from visual encroachment.

Unity: The degree to which the visual resources of the landscape join together to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony or inter-compatibility between landscape elements.

What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would not result in any beneficial effects to visual resources.

Build Alternatives

Once construction has been completed and the area has been re-vegetated, the use of appropriate design elements would result in improvements to visual quality ratings for most views. Although these improvements would not reach WSDOT's threshold for visual impacts, they still can be considered beneficial.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any adverse impacts, either direct or indirect.

Build Alternatives

Temporary Impacts

Under any of the build alternatives, construction would result in temporary visual impacts. Construction activities for any of the build alternatives would temporarily affect visual quality because of vegetation removal, earth-moving equipment, cranes for rock scaling, paving operations, installing bridge girders, temporary haul roads, staging and stockpiling sites, and occasional lighting for night work.

Under the Preferred Alternative, temporary visual impacts would occur during the approximately six construction seasons required for Phase 1. However, WSDOT would begin roadside restoration once each subsection of the project is completed, and WDOT anticipates

that visual impact from construction could be successfully eliminated.

Permanent Impacts

Permanent impacts would include:

- The rock cuts at MP 57.0, which would be larger than they are now
- Travelers in the new, larger snowshed would lose their view of the mountains, lake, and forest; however, a vehicle traveling 65 miles per hour would be in the tunnel for only 13 seconds
- Removing large trees in the area near MP 66 would expose the transmission towers sooner for the traveling viewer; however, new trees will be planted and in time will screen the transmission towers in a manner similar to the existing conditions

WSDOT analyzed the impacts to visual quality, and concluded that changes to visual quality in the project area because of the rock cuts, larger snowshed, and wider highway would not have a substantial impact on visual quality ratings. WSDOT considers a total visual quality rating change of 1.0 or greater to be a visual impact for the purposes of this analysis. WSDOT does not consider a total visual quality rating change of less than 1.0 to be a visual impact.

Only Keechelus Lake Alignment Alternative 1 had a visual rating decrease of 1.0 or greater from the view of the highway. For Alternative 4 (the Preferred Alternative), 71 percent of views have a total visual quality rating of either the same as existing ratings or increased ratings following construction. Twenty-nine percent had lower total visual quality ratings than the existing views; however, none reached WSDOT's standards for visual impacts.

WSDOT compared the build alternatives and concluded that visual impacts are not substantially different between the build alternatives, nor do any of the build alternatives create an impact to visual resources based on WSDOT's visual quality criteria.

WSDOT would avoid any impacts throughout the project area by using the Cascadian design theme described in the *Architectural Design Guidelines* (Appendix X) and by using the mitigation measures discussed below.

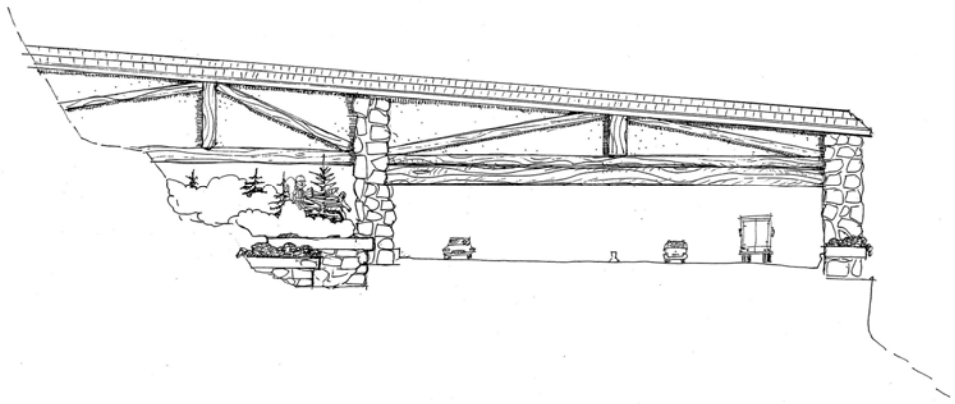
How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT will design structures, including bridges and retaining walls, using the *Architectural Design Guidelines* (Appendix X). These guidelines recommend using the Cascadian style design theme developed by the project team in conjunction with the USFS and the Mountains-to-Sound Greenway Trust. The Cascadian theme uses native rock, or the appearance of native stone texture, on walls, barriers, piers, and tunnel portals (Exhibit 3-61). It may incorporate arches on the bridge piers, and large tapered columns with rock texture and rock-patterned barriers. The consistent use of this design theme is intended to help unify the look of the I-90 corridor, and improve the visual quality ratings from existing ratings.

The Cascadian theme will be carried through the I-90 project. (Design Visualization)

Exhibit 3-61
Concept for Snowshed after Project Completion



Best Management Practices

BMPs for visual resources will be designed to meet applicable commitments and performance standards, including:

- WSDOT's Integrated Vegetation Management Program
- *Roadside Classification Plan* (WSDOT 1996), which specifies the restoration of native forest communities using small plant material, as well as soil restoration, hydroseeding, fertilizing, and mulching

Some example BMPs that WSDOT could use to comply with these standards include:

- Minimize the number of trees cut
- Carefully select roadside plantings and design features
- Minimize vegetation clearing that would open undesirable views such as to power lines
- Design stormwater facilities to minimize visual impact
- Color avalanche fencing to blend with the adjacent rock where it would be highly visible, or plant screening vegetation where possible
- Use directed lighting to minimize adverse impacts from glare
- Plant shrubs in the median to soften the face of visible walls, provide visual screening between lanes, and provide visual interest and color

The Roadside Vegetation Program is a "how to" guide for the best way to manage roadsides in any given area. Washington State has diverse climates and the highways have many neighbors, so the plans vary depending on location. The plans determine the right tool or combination of tools, for the right plant at the right place and time. WSDOT often uses the term **Integrated Vegetation Management** in reference to this process.

Compensatory Mitigation

WSDOT will meet the terms of the project *Architectural Design Guidelines* (Appendix X) and project roadside master plan.

3.13 Social and Economic Resources

This section discusses the expected impacts of the project alternatives on the local and regional economy and related resources. The primary study area for social and economic resources is Kittitas County, including the communities of Hyak and Easton. Because social and economic impacts are expected to extend well beyond the project area, the study area also includes King and Pierce Counties. For more information, see Section 3.13 of the Draft EIS and the following four discipline reports: *Socioeconomics* (WSDOT 2003g), *Environmental Justice* (WSDOT 2003h), *Public Services* (WSDOT 2003i), and *Utilities* (WSDOT 2003j).

What new information has been developed since the Draft EIS?

No new issues were introduced and WSDOT did not conduct any new analysis beyond that which was done for the Draft EIS.

Comments from the public and reviewing agencies have been incorporated into this section.

The I-90 project is just east of the ski area at Snoqualmie Summit (Shown: Summit West Ski Area)

What are the major characteristics of the affected environment?

Socioeconomic Resources

The project area is a sparsely populated rural area immediately east of Snoqualmie Pass. The 2000 Census indicated that the area contains 64 residences, of which nine are occupied full time. The rest are either vacant or have seasonal, recreational, or occasional uses. However, subdivision and building activity since the 2000 Census suggests that the area is increasingly being developed, with potential for additional permanent residents.

Land within the project area is mostly undeveloped National Forest managed by the USFS, with more intensely used outdoor recreation opportunities near the highway and dispersed recreation activities

located some distance from the highway. Recreation and tourism are a leading economic activity in the area year-round. The few commercial and retail businesses that currently operate along the I-90 project corridor generally are related to outdoor recreation and motorists.

Median annual family income in Kittitas County was $40,148, compared with a statewide average of $57,114 during the first quarter of 2001 (Washington Department of Labor and Industries 2001).

Cost of I-90 Road Closures

Closures of I-90 due to avalanche control, landslides, or bad weather can result in costs to the regional economy. Unexpected closures of I-90 interfere with commerce, disrupt travel, delay delivery of freight, and increase uncertainty for manufacturers and shippers. Closure-related effects on commercial trucking operations may include violation of mandated curfew hours, increased overtime costs, and missed shipping connections.

Freight trucks at a standstill due to an avalanche control closure.

WSDOT estimated these costs in the Draft EIS using two methods: the Cross-Cascades Corridor Method and the WSDOT Method. These methods are described further in the *Socioeconomics Discipline Report* (WSDOT 2003g). The Cross Cascades method is based on a study that was not finalized, and WSDOT has not revised its findings here. For the Final EIS, WSDOT updated these results from the WSDOT method based on current estimates for traffic counts, percentage of trucks, and current costs for wages and truck operations (Exhibit 3-62).

Exhibit 3-62
Estimated Opportunity Cost of I-90 Closure

Alternate Route Available			No Alternate Route Available
1 hour	3 hours	24 hours	24 hours
$29,500	$88,500	$708,000	$7,962,000

Opportunity costs include a multiplier for the additional delay caused by traffic backup as a result of pass closure. These cost estimates are not exact, since factors such as fuel costs and labor rates change over time. However, they are useful for describing the magnitude of the problem and comparing proposed solutions. WSDOT did not include secondary economic losses from closures, such as lost business opportunities.

Public Services and Utilities

Public Services. The project area falls within two public school districts and three fire districts. The nearest hospital is in Cle Elum. The Kittitas County Sheriff's Department provides law enforcement countywide. There are no churches, cemeteries, or other social organizations within the project area.

Water. The Snoqualmie Pass Utility District provides water in the project area. An eight-inch-diameter water line crosses I-90 at MP 55.1, then turns west parallel with I-90 along the frontage road until reaching WSDOT's Hyak maintenance site.

Sanitary Sewer. The Snoqualmie Pass Utility District provides sanitary sewer management in the project area. A 10-inch cast iron sewer line crosses I-90 at MP 55.2, then turns west parallel with I-90 along the frontage road until reaching WSDOT's Hyak maintenance site.

Electric Power. Puget Sound Energy provides electric power in the project area. Overhead power lines cross I-90 at five locations: near MP 61.4, MP 62.8, MP 64.1, MP 65.5, and MP 67.6. There are two buried power line crossings of I-90 at approximately MP 55.0 and MP 69.0. Between MP 62.6 and MP 66.6, the power line enters and leaves the I-90 right-of-way at several locations along the highway. There are approximately 20 buried power vaults along this segment of I-90. A Bonneville Power Administration high voltage transmission line (345 kilovolts) crosses I-90 at approximately MP 65.8.

Telecommunications and Fiber Optics. Qwest Communications provides telecommunication services in the project area. Buried telephone lines cross I-90 at MP 62.6, MP 62.9, MP 63.5, MP 68.6, and MP 69.0. Two buried high-density polyethylene conduits of fiber optic lines cross I-90 at MP 64.0.

What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would not result in any beneficial effects to social and economic resources, either direct or indirect.

Build Alternatives

Constructing any of the build alternatives would result in social and economic benefits.

Reliability Improvements. WSDOT designed the build alternatives to reduce the frequency of road closures, and increase the reliability of travel between eastern and western Washington. This would have a positive economic impact by reducing the economic costs of highway closures and congestion.

Construction-Related Employment. The project would create substantial amounts of construction-related employment. Section 3.13 of the Draft EIS contains estimates of the number of jobs that the project would create. These estimates were based on the estimated project costs, along with multipliers developed by Washington State. As with opportunity costs, job creation estimates are inherently imprecise, although they are useful primarily for comparing alternatives and describing the general magnitude of the employment that would be created.

Direct employment of construction workers will create jobs in the project area.

FHWA and WSDOT did not update job creation estimates for the Final EIS. However, the number of jobs created would be directly proportional to the project costs. Based on these costs, Keechelus Lake Alignment Alternative 1 would create the most employment,

and Alternative 4 would create the least for this part of the project. Of the CEA Improvement Packages, the Preferred Alternative would create the most employment, and Improvement Package C would create the least.

The Preferred Alternative would create fewer jobs than other alternatives, since it is not the most expensive alternative. However, the employment effects of the more expensive alternatives are probably overstated, since the cost of these alternatives would likely have exceeded the project's available funding. Although job creation is not part of the project's purpose and need, any of the build alternatives would create a substantial amount of construction-related employment. The Draft EIS estimated that the combination of Keechelus Lake Alignment Alternative 4 and CEA Improvement Package A would result in approximately 12,100 total jobs (4,800 direct jobs and 7,300 indirect jobs) over the entire life of the project.

Indirect economic benefits will result from the purchase of goods and services from local, regional, and statewide businesses.

Economic Benefits to Recreation. Fish and wildlife resources provide a substantial economic benefit to Washington State through hunting, fishing, and other recreational activities. Improving ecological connectivity would maintain and enhance wildlife and fish populations, and help sustain the economic role of these resources.

Benefits to Public Services. Operating the new highway may have a beneficial impact on police, fire, emergency medical response, and hospital operations through reduced traffic delay, fewer highway closures, and improved traffic safety.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any direct impacts to social and economic resources. This alternative would result in indirect impacts as increasing traffic congestion affects the movement of goods and services and the response time for emergency services.

Build Alternatives

Temporary Impacts

The build alternatives would have temporary construction impacts.

Employment. Potential economic impacts on local businesses near Hyak and Easton would include construction noise, dust, and temporary disruption to access. WSDOT will take measures to minimize construction noise and dust, work with business owners to maintain adequate access, and provide signage indicating that businesses are open during construction as needed.

Housing. In order to live reasonably near their job sites, construction workers on large projects often rent housing in the local market and temporarily move to the area. Because of Kittitas County's relatively inexpensive housing cost, workers on the I-90 project would have an incentive to look for housing east of Snoqualmie Pass rather than in the more expensive Seattle-Tacoma-Everett metropolitan area. Workers on the project could occupy some of the vacant housing units in Kittitas County, which would reduce housing vacancy rates in the county temporarily and could lead to increases in rental rates. However, some workers may choose to use trailer or recreational vehicle parks due to the seasonal nature of the work of this project.

Public Services. The build alternatives would not have substantial effects on public services. Water, sewer, and power lines would remain in service except for brief periods during relocation. WSDOT would use detours and route contingency plans to assure continued access for emergency service providers.

Utilities. Utilities are located in the I-90 right-of-way by franchise or other agreement. The build alternatives would require utility relocation. WSDOT would use a utility locater service prior to construction to locate underground utilities. WSDOT would require all utilities to relocate prior to or during project construction, and to comply with applicable project permits.

Permanent Impacts

The build alternatives would have few permanent economic impacts.

Additional crews will be needed to maintain the added lanes and bridges after construction. (Shown: WSDOT plow crews climbing Snoqualmie Pass eastbound)

Employment. The build alternatives would require WSDOT to hire additional maintenance staff in order to maintain the increased number of bridges and plow the additional lanes during the winter. The number of additional staff would be higher (up to 50) for Keechelus Lake Alignment Alternatives 1, 2, or 3 since these alternatives have tunnels, and much smaller for Alternative 4 (the Preferred Alternative), since it does not have a tunnel.

Once built, operating and maintaining the new highway would have no negative impact on overall employment trends within Kittitas County or the state.

Housing. FHWA and WSDOT anticipate that the build alternatives would have no permanent impacts to housing patterns. Please see Section 3.11, *Land Use.*

Urban Quality. There are no urban areas within the project area; consequently there would be no impacts to urban quality.

Land Acquisition. The project would require acquisition of both public and private land for additional easement, as described in Section 3.11, *Land Use.* FHWA and WSDOT do not expect these easement acquisitions to affect employment, the economy, or the social fabric of the communities near the study area.

Displacement. FHWA and WSDOT believe that the build alternatives would not result in displacement of any businesses or residences. However, if any displacement occurs, the lead agencies would comply with the requirements of the federal Uniform Relocation Act of 1970, as amended.

Environmental Justice. *Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (US Department of Housing and Urban Development 1994), states that people of all races, incomes, and

cultures are to be treated fairly with respect to development impacts. According to the 2000 Census, all 20 persons living in the census blocks that include the project construction area are white and non-Hispanic. This is similar to Kittitas County's overall racial composition, where 91.8 percent of the population is white. A total of 13.3 percent of Kittitas County's population lives below the poverty level, compared with 10.2 percent for the state. No income data is available for the specific resident of the project area, but the project area does not appear to support a low-income population based on the small number of permanent residences (nine) located within a matrix of second homes and relatively high-value real estate.

Because there is no minority or low-income population in the project area and the project would have little to no impact to private property owners, the build alternatives would not disproportionately affect low-income or minority populations. In addition, the project would comply with:

- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994)

- FHWA Order 6640.23, FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1998)

- Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (1997)

Public Services. Operation of the new highway would not affect police, fire, emergency medical response, or hospital operations. Improvements to traffic flow and transportation safety could have a positive effect on emergency services response times.

Utilities. FHWA and WSDOT do not anticipate that operation of the highway will have any direct or indirect effects on utilities.

Social. The build alternatives would not affect community cohesion or divide the communities near the project area. The two communities near the project area, Hyak and Easton, are located sufficiently far from construction activities that there should be no impacts.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

The lead agencies have avoided and minimized social and economic impacts by:

- Designing the project to avoid acquiring private property wherever possible
- Designing the project so that land owners can have access during construction
- Avoiding utilities during design

WSDOT will use a utility location service to provide available utility locations. Utility relocation will be included in project permits.

Best Management Practices

No BMP-related commitments have been made.

Compensatory Mitigation

Since there will be no permanent adverse impacts to social and economic resources, no compensatory mitigation will be required.

3.14 Hazardous Materials and Waste

Accidents and spills on I-90 can release hazardous materials.

This section discusses the potential release of hazardous materials or wastes as a result of the project alternatives. The study area for potential sources of hazardous materials and wastes is one mile on either side of I-90. Potential environmental risk from hazardous materials and waste associated with past land use appears to be low. No identified National Priority List sites are located within the study area. Additional information can be found in Section 3.14 of the Draft EIS and the *Hazardous, Toxic, or Radiological Waste Discipline Report* (WSDOT 2002j).

What new information has been developed since the Draft EIS?

No new issues were introduced, and WSDOT did not conduct any new analysis beyond that which was done for the Draft EIS. There were no comments to the Draft EIS concerning hazardous materials.

What are the major characteristics of the affected environment?

There are five hazardous waste sites near the project area, all of which are underground fuel storage tanks. None pose a potential threat to workers or travelers on I-90. Exhibit 3-63 details the known sites that contain hazardous, toxic, or radiological waste within the study area.

What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would not result in any beneficial effects to hazardous materials and waste.

Exhibit 3-63
Known Hazardous, Toxic, or Radiological Waste Sites

Site Name	Vicinity	UST or LUST	Status	Tank Capacity	Impact Potential
WSDOT Hyak Maintenance Facility	At Hyak, approximately 200 feet south of I-90	3 USTs	Operational	Unknown	Low
Summit West	Approximately 0.5 mile northwest of Hyak, north of I-90	1 UST	Operational	Unknown	Low
Summit Central	Approximately 0.5 mile southeast of Hyak	1 LUST	Cleanup underway	Unknown	Low
RV Town	Near Easton, approximately 500 feet south of I-90	3 USTs	Operational	5,000 – 19,999 gallons	Low
C.B.'s General Store and Service Station	At west end of Easton, approximately 0.25 mile south of I-90	4 LUSTs	Closures in process for all tanks	111 – 4,999 gallons	Low

UST – undersground storage tank
LUST – leaking underground storage tank

Build Alternatives

Accidents are the primary potential source of contamination in the project area, and reducing accident rates should lower the potential for contamination. Improving traffic safety is a major part of the project's purpose and need, and the lead agencies expect that accident rates would go down as a result of constructing any of the build alternatives.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any adverse hazardous materials or waste impacts, either direct or indirect.

Build Alternatives

Temporary Impacts

The lead agencies do not anticipate any temporary impacts to or from hazardous materials and waste sites from constructing any of the build alternatives, because of the distance of these sites from the area of construction.

The only other potential temporary adverse impacts would come from spills during construction. These would be controlled through appropriate BMPs, as described below.

Permanent Impacts

The lead agencies do not anticipate that any of the build alternatives would result in permanent direct or indirect impacts related to hazardous materials and waste.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

There are no known hazardous waste sites within the proposed area of construction. WSDOT planned the location of materials staging and stockpiling sites to avoid known hazardous materials locations.

Best Management Practices

BMPs for hazardous materials will be designed to meet applicable commitments and performance standards, including:

- Spill Prevention, Control and Countermeasure Plan
- Applicable parts of the *Implementing Agreement between the Washington State Department of Ecology and the Washington State Department of Transportation* (Ecology and WSDOT 1998), or as revised
- The project health and safety plan and Occupational Health and Safety Administration regulations

Some example BMPs that WSDOT could use to comply with these standards include:

- Using documents and guidance materials to assist contractors in developing Spill Prevention, Control and Countermeasure Plans
- Conducting health and safety monitoring on work sites with potentially hazardous materials

- Implementing a WSDOT construction compliance program

Compensatory Mitigation

Since there will be no permanent adverse impacts to hazardous materials and waste, no compensatory mitigation will be required.

3.15 Energy

This section discusses energy consumption requirements for construction of the project alternatives. The study area is the project corridor. For more information see Section 3.15 of the Draft EIS and the *Energy Discipline Report* (WSDOT 2002k).

What new information has been developed since the Draft EIS?

No new analysis was conducted beyond that which was done for the Draft EIS. There were no comments on the Draft EIS from the public or reviewing agencies specific to energy.

What are the major characteristics of the affected environment?

The primary energy use in the area is fuel consumption from the vehicles that use the project corridor. No construction or manufacturing activities in the study area involve major energy consumption.

What are the expected environmental consequences?

What beneficial effects would result?

No-Build Alternative

The No-Build Alternative would not result in any beneficial energy effects.

Build Alternatives

Any of the build alternatives would increase the efficiency of traffic flow and reduce congestion, which would reduce energy consumption.

What adverse impacts are expected?

No-Build Alternative

The No-Build Alternative would not result in any adverse impacts to energy, either direct or indirect.

Build Alternatives

Temporary Impacts

The primary temporary impact to energy consumption would be the energy needed for construction. This would include manufacture of materials, transportation of materials, and operation of construction machinery.

Energy consumption during construction is difficult to calculate precisely, but is directly proportional to construction cost. Consequently, the Preferred Alternative would consume the lowest amount of energy of the Keechelus Lake Alignment Alternatives, since it is the least costly alternative. For the CEA Improvement Packages, the Preferred Alternative would use the most energy of the alternatives considered, since it is the most expensive.

Permanent Impacts

None of the build alternatives would result in permanent adverse impacts to energy use, either direct or indirect.

In some cases, building new highways can result in increased traffic demand and the resulting energy use. However, as discussed in Section 3.11, *Land Use*, traffic growth in the I-90 project area is driven almost entirely by regional and statewide trends. The project would not, by itself, result in increased traffic demand.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

Several project design choices would result in lower energy consumption during construction, primarily by reducing the amount of construction material and the distance that materials would be transported.

Some of these choices are:

- Choosing the Common Route over construction of a new alignment in a location where no highway currently exists
- Identifying Alternative 4 as the Preferred Alternative for the Keechelus Lake Alignment
- Modifying the Preferred Alternative to eliminate the long viaduct bridges in Keechelus Lake
- Using Crystal Springs Sno-Park, located in the center of the project corridor, as the primary materials storage and processing site

Best Management Practices

No BMP-related commitments have been made.

Compensatory Mitigation

Since there will be no permanent adverse impacts to energy, no compensatory mitigation will be required.

3.16 Cumulative Effects

This section discusses the cumulative effects of the alternatives within the context of past actions, present actions, and reasonably foreseeable future actions.

What does the National Environmental Policy Act require?

NEPA requires FHWA and WSDOT to consider the cumulative effects of the I-90 project, by looking beyond the project area to other planned actions whose impacts could combine with those of the project. Cumulative effects generally cannot be determined precisely. Therefore, the analysis in this chapter is qualitative rather than quantitative.

Cumulative effects are: "*…the summation of impacts on a resource resulting from the proposed project, when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes those actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time"* (40 CFR Section 1508.7).

The analysis of cumulative effects requires the consideration of both direct and indirect impacts. Direct impacts are effects caused directly by the project, at the same time, and in the same place as the project itself. Indirect impacts are effects caused by the project that occur later in time or at some distance from the project. Indirect impacts are more difficult to quantify and more open to discussion.

How did FHWA and WSDOT analyze cumulative effects?

The I-90 project area has unique characteristics and history that have shaped its present and future conditions. Much of the surrounding land is in federal ownership and development is not possible. Consequently, there are not many traditional "reasonably foreseeable future actions," such as large construction projects or land developments, that would add substantial amounts of traffic to the highway or create impacts to the same resources as the I-90 project within the project area. However, there are visible trends in land use and management, whose effects may be consistent or inconsistent with the project.

The study area for cumulative impacts is the area within 10 miles of the project area, but includes a larger area when discussing state-wide trends. Because of the unique nature of the project area, the time frame for the cumulative impacts discussion covers the entire history of the use of the corridor for transportation and resources.

FHWA and WSDOT considered the effects of reasonably foreseeable future actions on all of the elements of the environment. However, the discussion concentrates on wetlands and related habitat impacts, since this is the primary area where the I-90 project would have unavoidable adverse impacts. The discussion also includes the beneficial effects of the project, since these beneficial effects would combine with the ongoing land management by public agencies, which focuses on restoring landscapes and wildlife connections.

What past, present, and reasonably foreseeable future actions are relevant to determining cumulative effects?

Future actions in and near the project area are likely to be shaped by its history as a transportation corridor and the use of the surrounding area for recreation, timber harvest, and irrigation reservoirs, which has had the largest impacts on the project area environment. This history has created the dominant trends that should continue into the future.

The lands in and near the project area were ceded to the United States government as a result of 1855 Yakima Treaty. The first private land holdings in the project area were a result of land grants to the Northern Pacific Railroad beginning in 1864, which established the “checkerboard” pattern of public and private land in the area (see Section 3.11, *Land Use)*. The federal government owns the majority of the remaining land in the project area. The USBR began water storage operations at Keechelus Lake in 1907, and the Wenatchee National Forest, which comprises the majority of the project area, was established in 1908.

Between the 1940s and early 1990s, land use in the project area was dominated by timber harvest. On both federal and railroad lands, the

original old-growth forest was replaced in much of the project area lands by even-aged managed timber stands, with a lower diversity of species. Clear-cutting and construction of an extensive network of forest roads led to considerable habitat fragmentation. During the same period, the area began to be used for year-round recreation, and this use has grown steadily. Private railroad lands began to be sold and developed for seasonal or year-round residential use.

The I-90 corridor has been used for transportation since pre-historic times. European settlers used an existing Native American trail over Snoqualmie Pass beginning in the 1850s, and motorized traffic began crossing the pass in 1905 on what was then State Road 7. Year-round operations began in the winter of 1931/1932. The existing snowshed was built in 1950, when construction began on a four-lane road. Further improvements were made when the highway (then US Highway 10) was added to the Interstate Highway System in 1977, and additional improvements were made in the 1980s. Throughout this period, improvements to the highway changed surface water flow and created barriers to fish passage. As I-90 became the primary east-west corridor across the Cascades, growth in traffic volumes began to affect the ability of wildlife to move across the highway. At the same time, development of private land east and west of the federal lands caused the project area to have more importance as a wildlife corridor.

In the 1980s and 1990s, federal planning documents began reflecting awareness of the barrier effect of the highway. As described in Section 3.11, *Land Use*, in the 1990s federal agencies changed the management direction within the project area to favor wildlife connectivity and restoration of old-growth conditions. Large-scale timber harvest, which had affected much of the project area, largely ceased. Private groups and the USFS engaged in a program to re-acquire some of the historic railroad lands for conservation purposes.

This complex history led to trends that continue in the present and are expected to continue into the future (Exhibit 3-64 and Exhibit 3-65). Such trends are part of the “reasonably foreseeable future actions” in the project area, even when no specific project proposals have been made. Firm dates do not yet exist for all future actions.

Exhibit 3-64
Relevant Past, Present, and Reasonably Foreseeable Future Actions

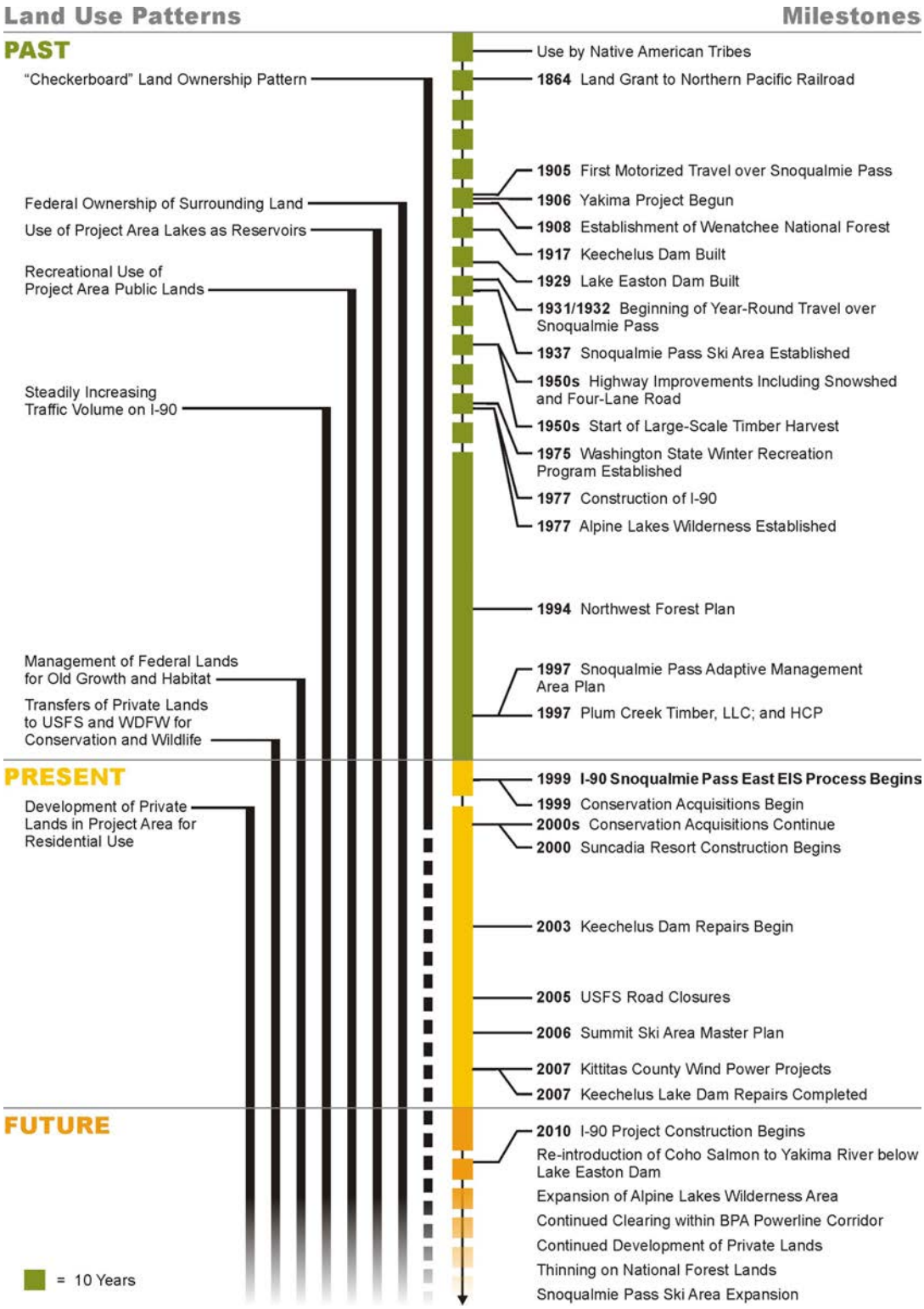


Exhibit 3-65
Description of Project Area Past, Present, and Reasonably Foreseeable Future Actions

Date	Action	Description
1855	Treaty with the Walla Walla, Cayuse, and Umatilla 1855	The treaty of 1855 ceded more than 6.4 million acres in what is now northeastern Oregon and southeastern Washington. In exchange, the Walla Walla, Cayuse, and Umatilla retained a permanent homeland on the reservation in Mission, Oregon.
1864	Land grant to Northern Pacific Railroad	The US government granted large tracts of land, in a "checkerboard pattern," to Northern Pacific Railroad to encourage railroad development. Some land has been transferred to other private ownership.
1906	Yakima Project begins	Dams and water reservoirs were developed to provide water for irrigation in south-central Washington.
1908	Establishment of Wenatchee National Forest	Establishment of the Wenatchee National Forest created the pattern of land use for the federal lands surrounding the project area.
1917	Keechelus Dam construction	Construction of the Keechelus Dam by USBR allowed the use of the lake as a reservoir for irrigated agriculture. This action blocked fish passage within the Yakima River at the dam.
1929	Lake Easton Dam construction	Construction of the Easton Dam by USBR allowed the use of the lake as a reservoir for irrigated agriculture.
1931-32	Beginning of year-round travel over Snoqualmie Pass	This year marked the beginning of the use of Snoqualmie Pass as a year-round connection between Eastern Washington and Western Washington.
1937	Snoqualmie Pass Ski Area established	From this time forward, the Snoqualmie Pass area has grown as a major recreation area.
1950s	Highway improvements including snowshed and four-lane road	The highway was steadily improved throughout the 1950s, becoming a more reliable route for east-west travel.
1975	Washington State Winter Recreation Program	Establishment of the Washington State Winter Recreation Program led to the establishment of sno-parks statewide, including in the project area.
1977	Construction of I-90	Construction of the modern I-90 as part of the Interstate Highway System established the project area as the main east-west corridor for freight and passengers in the state.
1994	Northwest Forest Plan	The USFS Northwest Forest Plan established goals and standards for protecting and enhancing habitat for late-successional and old-growth forests.
1997	Snoqualmie Pass Adaptive Management Area EIS and Plan	The USFS established goals for the Adaptive Management Area, including management for wildlife habitat connectivity and restoration of late-successional conditions.
1999	Conservation acquisitions begin	Congress approved a major land trade between the USFS and Plum Creek Timber, to begin to eliminate the "checkerboard" land use pattern. This effort was followed by private initiatives to purchase land for inclusion in the National Forest and other protected status.

Exhibit 3-65
Description of Project Area Past, Present, and Reasonably Foreseeable Future Actions

Date	Action	Description
2000	Suncadia Resort construction	Construction began on Suncadia Resort, a master planned community that would eventually have 2,000 residences, three golf courses, restaurants and shops. By 2007 construction had taken place on many parcels. Construction is still underway and is a major source of employment in Kittitas County.
2000s	Conservation acquisitions continue	Non-profit groups continued the process of purchasing private land for transfer to public ownership to further habitat connectivity. Groups include the Mountains-to-Sound Greenway Trust, Cascades Conservation Partnership, and the Cascades Lands Conservancy.
2005	USFS road closures	USFS closed roads on lands acquired from Plum Creek Timber Company. Road closures in the National Forest will continue until USFS road density standards are reached and maintenance of existing roads is within budget constraints.
2006	Summit Ski Area Master Plan	This plan governs the development of the alpine ski facility at Snoqualmie Pass, including improvements to ski lifts; construction of new trails; improvements to base area transit service; updates to support services, restaurants, and shops; and improvements to base area parking.
2007	Kittitas County Wind Power Projects	Permitting and development of major power generation facilities near Ellensburg. (The Kittitas Valley Wind Power Project is already under development.)
Ongoing	Thinning activities on National Forest lands	The USFS Roaring Thin project will treat approximately 8,000 acres on the southwest side of Keechelus Lake, beginning in 2007. Following this project, a subsequent project will treat National Forest lands in all of the drainages that are crossed by I-90. The project will include commercial and pre-commercial thinning and road closures; the goal is to improve watershed and ecological conditions in the project area.
Ongoing	Clearing the Bonneville Power Administration corridor	Bonneville Power Administration owns a 150-foot easement across National Forest lands, and expects to keep approximately 30–40 feet cleared or in an immature forest condition. Clearing will occur on the north side of the I-90 right-of-way.
Ongoing	Sale and development of former Plum Creek lands	New owners of Plum Creek property may manage these lands for residential and commercial development.
TBD	Snoqualmie Pass Ski Area expansion	Expansion of the Snoqualmie Pass Ski Area would add 400 acres of National Forest land in the Mill Creek Drainage to the ski area.
Ongoing	Reintroduction of Coho salmon to the Yakima River	Introducing Coho salmon may include building acclimatization facilities. WSDOT does not anticipate that Coho will be reintroduced above Keechelus Lake Dam.
TBD	Rocky Run Creek (FSR 4832) and Gold Creek Bridge Replacement	Replacement of the existing narrow bridges with longer bridges by USFS.

Exhibit 3-65
Description of Project Area Past, Present, and Reasonably Foreseeable Future Actions

Date	Action	Description
TBD	Wolfe Creek culvert upgrades	Increase the size of the Wolfe Creek culvert by USFS.
TBD	West-Wide Energy Corridor	Designate corridors on federal land for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities. A proposed corridor would pass within five miles of the Pacific Crest Trail and the Mountains to Sound Greenway.

EIS – environmental impact statement
FSR – Forest Service Road
TBD – to be decided
USBR – US Bureau of Reclamation
USFS – US Forest Service
WSDOT – Washington State Department of Transportation

In addition to the more specific actions listed above, the following trends are likely to continue for the foreseeable future:

- Federal ownership of surrounding land will continue, and the focus of federal land management will continue to be restoration of old-growth habitat and restoration of connectivity for wildlife.

- The density of National Forest roads will decline. The USFS will continue to close roads until recommended road density standards of 2.0 miles per square mile are met.

- Project area lakes will continue to be used as reservoirs. Passage for anadromous fish, including Coho salmon, most likely will not be restored to Keechelus Lake.

- I-90 will continue to be the state's major east-west transportation route, and traffic volumes will continue to increase at projected rates.

- State population will continue to grow, and recreation pressure on public lands will continue to increase.

- Kittitas County will continue to designate the majority of the private land in the project area as commercial forest land. Some private land in the project area may be developed for higher

density uses based on environmental review consistent with the GMA and existing Kittitas County zoning regulation.

- Kittitas County will take the project's investments in ecological connectivity into consideration when evaluating any proposed changes to zoning or land use, and will include the CEAs in the County Critical Areas regulations, based on the research completed for the project which represents the best available science for ecological connectivity in the project area.

- The "checkerboard" private land pattern will slowly diminish as private land acquisitions continue, and this land is managed for conservation or transferred to public ownership.

- East and west of the project corridor beyond the National Forest boundary, private land development will continue to decrease the permeability of the landscape to wildlife and thus increase the importance of the project area for wildlife passage.

What are the expected environmental consequences?

Direct vs. Indirect Effects

The lead agencies have determined that almost all of the adverse effects of the I-90 project would be direct rather than indirect. This determination is true for all of the build alternatives, including the Preferred Alternative, based on the following:

- The location of the I-90 project, almost completely within the Okanogan-Wenatchee National Forest, will prevent the project from leading to housing growth or traffic growth

- The unavoidable adverse impacts of the project will be limited to the area of construction and will not result in adverse impacts either away from the project area or later in time

Where indirect effects would occur, they would be positive. For instance:

- The increased level of safety and capacity from the new highway would have positive economic effects continuing for many years throughout the state

- The project's ecological connectivity improvements would result in a gradual increase in wildlife gene flow between the North and South Cascades, as wildlife use the new crossing structures

- Increased permeability of the highway to groundwater and surface water would have a beneficial effect on water quality and habitat over many years

The impacts of the reasonably foreseeable future actions are mostly indirect, and based on longer-term trends. As discussed in Section 3.11, *Land Use*, there are few planned development projects inside the project area, and those that have been identified would have little direct impact.

Greenhouse Gas Emissions

Any of the build alternatives would have potential implications for greenhouse gas emission and global climate change, since vehicles are a major source of greenhouse gas emissions. Greenhouse gasses associated with transportation are the result of combustion, and include carbon dioxide (CO_2), methane, and nitrous oxide.

National estimates show that transportation accounts for almost 30 percent of total domestic CO_2 emissions. However, in Washington State, transportation accounts for nearly half of such emissions because the state relies heavily on hydropower for electricity generation, unlike other states that rely on fossil fuels to generate electricity.

State-Level Efforts to Control Greenhouse Gas Emissions

Washington State efforts to address greenhouse gas emissions include the following:

- In February 2007, the Governor issued Executive Order 07-02 requiring state agencies to find ways to reduce greenhouse gas emissions and adapt to the future that climate change may create.

- On May 3, 2007, the Washington State Legislature passed Senate Bill 6001 which, among other things, adopted Governor Gregoire's Climate Change goals into state law. The law aims to achieve 1990 greenhouse gas levels by 2020, a 25 percent reduction below 1990 levels by 2035, and 50 percent by 2050.

Achieving these state-level goals can be achieved primarily through:

- Creating more efficient driving conditions, including by reducing traffic congestion

- Introducing more fuel-efficient vehicles

- Reducing the amount of driving through mass transit, carpooling, telecommuting, and more efficient movement of goods and services

State efforts are included in Washington's 16-year plan to meet critical transportation needs. Improvements to maximize the efficiency of the system include:

- Low cost/high return efforts including active traffic management, ramp metering, incident response and transportation demand management such as commute trip reduction, park and rides, and local land use planning.

- Moderate to higher cost and benefit efforts including improvements to the efficiency of the road network. These include adding short lanes to connect interchanges, direct access

ramps for transit and high occupancy vehicles, and center turn lanes to allow better traffic flow.

- Higher cost, corridor-wide benefit from major investments in high occupancy vehicle lanes, high occupancy tolled lanes, transit, commuter rail, general purpose roadway lanes, interchange modifications, and bus access.

Additional efforts are underway, including improvements in land use patterns and more efficient transportation technology. In 2005 and 2007 the State Legislature mandated that vehicles sold in Washington starting with 2009 model years meet updated California emission standards. The new vehicle standards will reduce greenhouse gas emissions, and help reduce carbon monoxide and ozone pollutants.

Project-Level Efforts to Control Greenhouse Gas Emissions

The I-90 project would have positive effects on potential greenhouse gas emissions. Positive effects are the result of the lead agencies' choices during consideration of alternatives and project design.

Identification of the Preferred Alternative. Keechelus Lake Alignment Alternatives 1, 2, and 3 are more expensive than Alternative 4 (the Preferred Alternative), and would result in higher greenhouse gas emission of the alternatives considered. This is because for construction projects, energy consumption, fuel use, and other factors in greenhouse gas emissions are directly proportional to project cost. For the CEA Improvement Packages, greenhouse gas emissions would be very similar, since the only differences between these alternatives would be the type of stream crossing structures.

Construction Efficiency. WSDOT has identified materials and staging areas so as to minimize travel times, wait times, and engine idling. These measures will reduce fuel use and therefore greenhouse gas emissions. During construction, WSDOT will require BMPs that will further reduce emissions from vehicles and equipment, as noted in Section 3.2, *Air Quality*.

Operational Efficiency. The I-90 project would reduce emissions by reducing traffic congestion and pass closures. Under the project's roadside master plan, WSDOT will establish vegetation up to the pavement edge, rather than maintain an un-vegetated highway shoulder.

Design Efficiency. WSDOT has designed the project using materials with the longest available life. This includes replacing the existing pavement with Portland cement pavement rather than asphalt, and using bridges rather than highway fill at the stream crossings. These choices mean that the new highway would have a longer life before needing to be replaced, which would reduce overall emissions for highway reconstruction and replacing materials.

Preserving Vegetation. WSDOT and its partners have preserved land with vegetation from development, through purchases of private land for mitigation sites and to maintain wildlife corridors. Vegetation cover helps to reduce the effects of greenhouse gas emissions through absorption of CO_2. With the exception of identifying the Preferred Alternative, these actions and decisions would be similar for all of the build alternatives. The No-Build Alternative would not result in any direct increase in greenhouse gas emissions from construction, but would result in continued congestion and closures resulting from avalanches and rock fall.

What beneficial cumulative effects would result?

No-Build Alternative

The No-Build Alternative would not meet the project's purpose and need, and thus would not produce the beneficial effects of the build alternatives. There would be no cumulative beneficial effects.

Build Alternatives

As discussed throughout this EIS, the build alternatives were all designed to produce beneficial effects to traffic flow, public safety, and the natural environment. These beneficial effects would be greatest for the Preferred Alternative, which has been designed to best meet the project's purpose and need. These beneficial effects

would serve to mitigate for some of the adverse impacts of past actions, particularly the barrier effect of I-90 to wildlife passage, and the stormwater impact resulting from the lack of stormwater treatment on the existing highway.

The beneficial effects of the project also would create a cumulative beneficial effect when combined with the ongoing management direction on the surrounding National Forest lands. These would include:

- Compatible land management
- Reduction of road density
- Replacement of USFS bridges and culverts would be compatible with CEA objectives

What adverse cumulative impacts are expected?

No-Build Alternative

As discussed throughout this EIS, the No-Build Alternative would result in few to no direct adverse impacts, but would have indirect adverse impacts as traffic volumes continue to grow, the highway pavement continues to deteriorate, and the highway continues to function as a barrier to wildlife passage.

The adverse impacts of the No-Build Alternative would combine with the indirect impacts from some reasonably foreseeable future actions to create larger adverse cumulative impacts:

- As traffic demand increases, congestion and accident rates would become worse
- As statewide recreation demand increases, access would become more difficult
- As development continues on the private lands east and west of the project area, the project area would become even more important for wildlife passage

- As the USFS continues to manage the surrounding federal lands for late-successional conditions and restoration of wildlife passage, the No-Build Alternative would make accomplishment of these goals more difficult

Build Alternatives

Temporary Impacts

As discussed throughout this EIS, all of the build alternatives would create temporary impacts from construction. These impacts would not combine with the impacts of any of the reasonably foreseeable future actions to create an increased impact. None of the reasonably foreseeable future actions would create any type of similar impacts in the project area.

The only exception is the potential expansion of the Snoqualmie Pass ski area. No date has been announced for this project; however; this project may take place within the construction period for the I-90 project. In this case, traffic impacts from the two projects may take place simultaneously. However, impacts of the ski area expansion to traffic on I-90 are likely to be relatively minor since the ski area is located off the highway.

Permanent Impacts

As discussed throughout this EIS, the build alternatives would result in some permanent impacts, primarily related to loss of wetlands and terrestrial habitat from new highway fill. These adverse impacts would be slightly different for each of the build alternatives. These adverse impacts would be offset by the creation of additional habitat at the CEAs, as well as by more traditional mitigation.

Other potential projects, such as the Snoqualmie Pass ski area expansion, the SnoCadia development, the clearing of the Bonneville Power Administration power line corridor, or the West-Wide Energy Corridor proposal may affect mature forest and impact habitat for northern spotted owls and potentially marbled murrelets. The impact of these potential projects on mature forest and other resources has not been quantified. FHWA is currently consulting with the USFWS

on the potential effects of these projects in combination with the I-90 project.

Re-zoning to higher densities could create an adverse cumulative impact by reducing the effectiveness of both the transportation improvements and project investments at the CEAs. However, as discussed in Section 3.11, *Land Use*, FHWA and WSDOT assume that private land use development will be consistent with current zoning.

How will FHWA and WSDOT mitigate for adverse cumulative environmental impacts?

Since there will be no permanent adverse cumulative effects, no compensatory mitigation will be required.

3.17 Other Environmental Considerations

Irreversible and Irretrievable Commitment of Resources

NEPA regulations require environmental analysis to identify *"...any irreversible and irretrievable commitments of resources, which would be involved in the proposed action should it be implemented."* "Primary irreversible and irretrievable resource commitments" are defined as use of nonrenewable resources throughout a project that may be irreversible if: 1) resources are removed and cannot be replaced within a reasonable time frame (such as extinction of a threatened or endangered species), or 2) project completion will obstruct use of the resources (such as building over a cultural site).

Most impacts of the project are short-term and temporary, or longer-lasting but negligible. However, some resources may involve a possible irreversible or irretrievable commitment.

- All of the build alternatives would involve a long-term conversion of land resources. Reduction in wildlife habitat resulting from widening and realigning the I-90 corridor is considered an irreversible commitment of resources during the time period that the land is used for a highway. Wetlands would be filled where they cannot be avoided. Unavoidable wetland impacts could be offset by compensatory mitigation at other locations.

- The energy consumed during construction of the project would be an irreversible commitment of resources. This would consist primarily of fossil fuels used to power construction equipment and vehicles.

- Construction materials such as cement, aggregate, asphalt, sand, fill materials, lime, and steel would be expended on the road construction. Additional labor, non-renewable energy, and natural resources would be used in the fabrication and

preparation of construction materials. These materials are generally irretrievable. However, their use would not have any adverse impact upon continued availability of these resources.

- The project would require a substantial one-time irretrievable expenditure of both state and federal funds. The commitment of these funds is based on the conclusion that local, regional, state, and national residents will benefit by the improved quality of the overall transportation system. These benefits consist of improved efficiency, accessibility, and safety, as well as savings in time spent transporting goods or traveling along I-90.

Relationship between Local Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity

Pursuant to NEPA regulations, an EIS must consider *"…the relationship between short-term uses of man's environment, and the maintenance and enhancement of long-term productivity."* This section evaluates short-term benefits of the project compared to long-term productivity derived from not pursuing the project.

Short-term effects of the project include localized disruptions, higher noise levels, increased air pollution, and rerouting traffic during the construction period. These impacts would be relatively inconsequential in the long term.

The project has taken into account future population growth in Washington State, reasonably foreseeable future land use, and existing and future transportation needs.

Long-term productivity would be reduced in areas where habitat is used for highway expansion, new alignments, or road widening. The long-term use of these areas would be affected permanently.

Long-term productivity would be enhanced through the creation of additional habitat and the connection of habitat areas that are presently separated. FHWA and WSDOT believe that the beneficial

effects to long-term productivity will be larger than the negative impacts.

FHWA and WSDOT believe that constructing the project, including the local short-term impacts and the use of resources, is consistent with the maintenance and enhancement of the long-term productivity for the study area and the State of Washington.