FINAL ENVIRONMENTAL ASSESSMENT

Upper Hoh River Road Project
Jefferson County, Washington

Prepared for:

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
WESTERN FEDERAL LANDS HIGHWAY DIVISION
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WA JEFF 91420

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Upper Hoh River Road Project
Jefferson County, Washington
Environmental Assessment

WA JEFF 91420

Submitted
Pursuant to Public Law 91-190
National Environmental Policy Act

U.S. Department of Transportation
Federal Highway Administration
Western Federal Lands Highway Division

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Date Approved

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Executive Summary

The Western Federal Lands Highway Division (WFLHD) of the Federal Highway Administration (FHWA), in partnership with Jefferson County, plans to construct bank stabilization and bridge and culvert improvements in six locations along the Upper Hoh River Road (UHRR).

One Build Alternative for bank stabilization and bridge or culvert replacement is analyzed in this Environmental Assessment (EA). The proposed project will develop and implement bank stabilization solutions at three locations along the UHRR, and will replace or improve three existing bridge or culvert locations. The purpose of the project is to prevent the road from washing away at these locations due to storms and flooding, and to provide safe and consistent access to residents, businesses, and Olympic National Park (ONP) visitors.

Table ES-1 summarizes direct, indirect, and cumulative impacts associated with the Build Alternative, for each environmental resource.

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Table ES-1. Summary of Impacts – No Action and Build Alternatives

Environmental Resource	No Action Alternative	Build (Selected) Alternative Direct Impacts	Build (Selected) Alternative Indirect Impacts	Build (Selected) Alternative Cumulative Impacts
Transportation and Access	• Continued delays, access difficulties, and closures related to maintenance and emergency repair of the road and river bank	Construction • 50 construction-related trips/day at each site • 2-week road closure in winter • Lane closures 30 minutes to 4 hours Operation • Improved access and reliability on UHRR	• Increased long-term reliability of UHRR • Fewer emergency repairs affecting access and traffic	• More reliable and consistent access • Fewer traffic delays • Increased safety
Land Use	• No change to land use	Construction • Potential need for easements or ROW acquisition • Temporary use of 157,000 square feet of vegetated areas as staging or access routes Operation • Conversion of small amounts of right-of-way to transportation use	• No impact	• Potential conversion of small amounts of right-of-way to transportation use
Recreation	• Continued unplanned, intermittent road closures and traffic delays related to emergency and maintenance work on the UHRR • Temporary solutions during unplanned road closures (1) ONP residents temporarily relocated outside ONP; or (2) ONP vehicle staged on east side of road work	Construction • Temporary, minor disruption to recreationists due to construction traffic • Potential 2 percent decrease in annual Hoh District visitors during 2-week UHRR closure Operation • Increased long-term travel reliability for recreationalists	• Increased road reliability and safety for recreationists	• Temporary traffic delays for recreationists and possible decrease in use due to construction impacts • Increased road reliability and safety encouraging recreation use
Hydrology and Hydraulics	• Ongoing maintenance and monitoring activities along river banks and at stream-crossings • Continued placement of riprap along river banks as emergency measure, resulting in riverbed scour and diminished habitat value • Risk of more expanded riprap revetment along the riverbank that could increase bank erosion on private property downstream or across from the armored revetments • Continued incising and channel shortening at Tower Creek	Construction • Temporary, localized turbidity releases Operation • Increased local accumulation of woody debris and sediment at sites • Higher water velocities (0.1-3.0 ft^2/s) along the thalweg of the river near and downstream of treatment sites would alter sediment transport conditions by scouring bed materials and redepositing them downriver as gravel bars • Up to 0.5 ft localized increase of 100-year floodplain elevation • Reduced need for maintenance	• Increase in aquatic habitat availability and diversity	• Enhanced shoreline and aquatic habitat
Vegetation	• Continued damage to riparian areas adjacent to the river from riverbank failure and emergency repair work • Potential removal of riparian plants, mature forest, or early and mid-successional forest due to avulsive changes in the river channel	Construction • Removal of riparian vegetation from riverbank and adjacent upland areas involving over 187,000 ft^2 for staging, access, and construction layout • Removal of approximately 325 trees, including 20 conifers Operation • Replanting of riverbank and upland vegetation disturbed from construction	• No impact (vegetation to be restored after construction)	• Minor removal and replanting of riparian bank vegetation • Minor loss of upland vegetation including mature forest
Fish	• Continued emergency riprap placement, with incremental adverse impacts to fish habitat, including increased toe scour, erosion at downstream and upstream edges of riprap, and decreased habitat diversity • Reduced available spawning and foraging habitat quality for fish including Chinook salmon and steelhead	Construction • Temporary displacement or minor reductions of fish populations during in-water construction • Temporary increases in turbidity and suspended sediment could adversely affect foraging efficiency and cause delays or alterations in daily migration patterns • Work area isolation at bridges would temporarily disrupt local fish populations Operation • Approximately 48,000 ft^2 of river bottom would be permanently replaced by ELJ/dolosse units potentially displacing Chinook and steelhead spawning and migration habitat; bull trout migration habitat also would be altered • Creation of improved fish rearing habitat consisting of eddies, pools, and slack water refuge areas; spawning habitat would be redistributed downriver where scoured gravels from treatment sites accumulate	• Potential formation of eddies and pools within and downstream of ELJ/dolosse units which could improve resting and foraging habitat for salmonids	• Decreases in fish habitat at locations where emergency repairs have installed rip rap for bank stabilization • Increases in fish habitat from removal of fish passage barriers and implementation of other future in-water habitat improvement projects

Environmental Resource	No Action Alternative	Build (Selected) Alternative Direct Impacts	Build (Selected) Alternative Indirect Impacts	Build (Selected) Alternative Cumulative Impacts
Wildlife	• Ongoing temporary disturbances to wildlife species, including marbled murrelet and northern spotted owl, at sites where emergency bank failure repairs or storm-related damages occur • Potential individual population decreases to wildlife (especially birds and amphibians) in ongoing maintenance/emergency repair areas	Construction • Pile driving at bridges would temporarily disrupt wildlife populations • Temporary loss of habitat due to construction-related clearing Operation • Disturbed areas re-vegetated to re-establish habitat value in the long run	• Potentially improved mobility of amphibians in streams that feed into Hoh River • Noise created by driving of piles to support proposed bridge foundations at Sites C3 and C5 would cause short-term disturbance to wildlife species occurring in close proximity to project construction.	• Temporary, localized disruption to wildlife during construction
Cultural and Historic Resources	• No impact	Construction • No impact Operation • No impact	• No impact	• No impact
Noise	• Intermittent noise from emergency repair projects would continue to occur and affect human receptors and wildlife.	Construction • Temporary increased noise levels would occur at closest sensitive receptors but would be below federally regulated thresholds • Loudest temporary noise source would result from pile driving (at bridge locations) Operation • No impact	• Temporary increased noise levels would extend beyond immediate construction areas	• Potential temporary noise from concurrent construction activities involving the Dismal Pond work (or other sites) and proposed project areas
Visual Quality	• Continued reduction in visual quality along the Hoh River and UHRR resulting from an ongoing expansion of riprap revetment and further vegetation loss	Construction • Temporary reduction in visual quality from construction equipment and vegetation removal Operation • Introduction of new contrasting forms and materials (dolosse) to the visual environment	• No impact	• Visual quality changes resulting from alterations of the landscape caused by past and future bank stabilization projects
Utilities	• Continued temporary service interruptions or facility relocations due to storm damage and emergency repairs • Continued potential service interruptions due to storm damage or emergency work	Construction • Potential temporary service interruptions • Potential need for relocation or replacement of utilities Operation • No impact	• Potential decreases in service interruptions or conflicts	• Fewer future utility service interruptions as the frequency of emergency repair work along the UHRR decreases
Social and Community	• Continued sudden and temporary disruptions to community due to loss of access, unexpected traffic delays, and other temporary construction-related impacts related to emergency road work	Construction • Temporary traffic delays, increased noise, access changes, and other construction-related disruptions to residents, ONP staff/visitors, local businesses, emergency vehicles, and school bus traffic traveling along UHRR east of proposed construction sites Operation • Increased long-term reliability of UHHR	• Better quality of life for local residents, business owners, employees, and ONP users due to improved road reliability and safety and fewer road washouts and traffic delays from emergency repair work	• The frequency of cumulative temporary disruptions, noise, and traffic delays would decrease as proposed bank stabilization and bridge/culvert improvements more effectively abate bank failure and storm damage along UHRR
Economy	• Emergency repairs would continue to result in unexpected delays and other temporary disruptions to businesses • Continued intermittent and temporary demand for labor and materials for emergency projects	Construction • Proposed construction would provide temporary income for local or regional workers and businesses • Potential temporary decrease in patronage of local businesses affected by traffic delays and 2-week road closure Operation • Increased long-term reliability of UHHR which would support the economic character of the local community, ONP, and regional tourism	• Indirect temporary economic benefits related to construction, including supplier and worker spending • Potential economic benefits related to increased use of area, resulting from increased road reliability	• Potential stronger economic base provided by more reliable travel along UHRR (increased spending from visitor trips and tourism)

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List of Tables[1]

[1] Tables labeled as "CR-" were added to the Final EA in response to comments on the Draft EA.

List of Figures[2]

[2] Figures labeled as "CR-" were added to the Final EA in response to comments on the Draft EA. Figures labeled "M-" pertain to mitigation.

List of Appendices[3]

[3] Refer to the Draft EA (July 2016) for Appendices A through H.

Acronyms and Abbreviations

ADT	average daily traffic
AINW	Archaeological Investigations Northwest, Inc.
AVE	area of visual effect
BA	Biological Assessment
BLM	Bureau of Land Management
BMP(s)	best management practice(s)
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
County	Jefferson County
DAHP	Department of Archaeological and Historic Preservation (Washington State)
dB	decibel
dBA	A-Weighted Sound Levels
dbh	diameter at breast height
DEA	David Evans and Associates, Inc.
EA	Environmental Assessment
Ecology	Washington State Department of Ecology
ELJ(s)	engineered log jam(s)
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency (Department of Homeland Security)
FLAP	Federal Lands Access Program
FHWA	Federal Highway Administration
FMP	Forest Management Plan
FONSI	Finding of No Significant Impact
HRT	Hoh River Trust
IWWW	In-water Work Window
JCPH	Jefferson County Public Health
JCSO	Jefferson County Sheriff's Office
km	kilometer
LWD	large woody debris
MP	mile post
NAC	noise abatement criteria
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
WOFM	Washington State Office of Financial Management
OHWM	ordinary high water mark
ONP	Olympic National Park
ONRC	Olympic Natural Resource Center
PUD	Public Utilities Department
SEPA	State Environmental Policy Act

SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
UHRR	Upper Hoh River Road
US 101	U.S. Highway 101
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
WDFW	Washington State Department of Fish and Wildlife
WDNR	Washington State Department of Natural Resources
WFLHD	Western Federal Lands Highway Division
WSDOT	Washington State Department of Transportation

1.0 INTRODUCTION

1.1 Background

The Western Federal Lands Highway Division (WFLHD) of the Federal Highway Administration (FHWA), in partnership with Jefferson County, plans to construct bank stabilization and bridge and culvert improvements in six locations along the Upper Hoh River Road (UHRR). The general project area[4] extends from mile post (MP) 3.6 to MP 10.2 including areas north and south of the road and the adjacent northern (right) bank and channel of the Hoh River.

The UHRR is located in western Jefferson County, Washington, between U.S. Highway 101 (US 101) and the Hoh Rain Forest Visitor Center. The road is used to access the Olympic National Park (ONP) and private properties along the road. The road was built in the 1930s, when the park was established, and is the primary western access to the park.

The UHRR extends in a generally east-west direction north of and in many places adjacent to the Hoh River, an approximately 56-mile-long river originating from glaciers on Mount Olympus and flowing through the Olympic Mountains, foothills, and emptying into the Pacific Ocean at the Hoh Indian Reservation. The Hoh River valley is relatively flat and broad with a complex channel migration zone that supports a braided river channel, and a wide variety of gravel bars, side channels, and backwater areas. The Hoh River is also characterized by a wide range of seasonal flow rates, with recorded annual peak flows of more than 60,000 cubic feet per second.

The road varies in proximity to the Hoh River and in certain areas is within approximately 5 feet of the river embankment. This has resulted in unstable banks and slides during high water or storm events. WFLHD and the County have constructed several bank stabilization projects in recent years along the road in order to prevent road closures due to loss of the roadbed or unstable slopes. WFLHD chose the locations for the proposed project as they had the highest risk of impending failure based on the Upper Hoh River Bank Failure Risk Reduction Study (WFLHD 2013). Without the proposed project, emergency repairs along the UHRR would be regularly required.

1.2 NEPA and SEPA Compliance

This Environmental Assessment (EA) was prepared by WFLHD, as the federal lead agency, for National Environmental Policy Act (NEPA) compliance. At the federal level, NEPA requires that an environmental analysis and public review process are completed if the proposed action would be implemented by a federal agency, requires a federal permit, or has federal funding. Similarly, under Washington's State Environmental Policy Act (SEPA), any agency that proposes to take an official action is required to perform an environmental analysis to ensure that minimal impacts will result from that action, unless the action is exempt from SEPA. As a result, the proposed project, a proposed federally- and locally-funded action that will require federal permits for construction, must follow federal and state environmental regulations as dictated by NEPA and SEPA. As the local project proponent, Jefferson County is the SEPA lead agency.

[4] The project area is refined for each environmental resource, according to where potential impacts could occur.

This EA describes the proposed project and the process WFLHD and Jefferson County used to develop and analyze project design concepts. It also analyzes potential direct, indirect, and cumulative impacts of the proposed project in the context of existing environmental conditions, and proposes mitigation measures to reduce or eliminate such impacts.

This EA analyzes a No Action Alternative and a Build Alternative. Bank stabilization activities are proposed at three locations. Bridge or culvert improvements are proposed at three additional locations.

This EA follows standard NEPA format and preparation guidelines, including Chapter 3, Environmental Stewardship, of the Project Development and Design Manual (USDOT 2012). Chapter 1 introduces and discusses the background of the project. Chapter 2 describes the purpose and need for the project. Chapter 3 presents the Build Alternative. Chapter 4 describes the existing social, economic, and environmental resources in the project area and potential impacts to these resources due to the No Action Alternative and the Build Alternative. This EA is organized into the following sections:

- Executive Summary;
- Introduction;
- Purpose and Need;
- Project Alternatives;
- Affected Environment and Environmental Consequences;
- Irreversible or Irretrievable Commitment of Resources;
- Permits and Approvals;
- Coordination and Consultation; and
- References.

In order for Jefferson County and other state and local agencies to issue permits and approvals for construction activities associated with this project, the project must first comply with SEPA. Jefferson County may choose to adopt this NEPA EA to satisfy SEPA requirements, as allowed by Washington Administrative Code 197-11-610. As lead SEPA agency, Jefferson County has final responsibility for SEPA compliance, and will issue the public notice for the public review process. The SEPA process works in concert with other laws, such as NEPA, to provide a comprehensive review of a proposed project. Combining the review processes of SEPA and NEPA reduces duplication and delay by combining evaluations and considerations for all aspects of a proposal at the same time. This EA may, therefore, be utilized by state and local governments in meeting SEPA requirements.

1.3 Proposed Project

The proposed project implements cost-effective, long-term bank stabilization solutions at three locations along the UHRR. The roadway at these sites is at risk of washing away in a large flood. The purpose of the proposed bank stabilization improvements is to eliminate or substantially reduce this risk at these three locations, and to assure safe and consistent access to residents, businesses, and ONP visitors via the UHRR. The project will also replace or improve three

existing bridge or culvert locations, the intent of which is also to assure safe and consistent access to residents, business, and ONP visitors via the UHRR.

1.4 Agency and Public Involvement

An integral part of the NEPA environmental review process is to engage the public. The goal of the public involvement process is to develop public awareness and understanding of the project, gain public input from potentially affected interests, and then appropriately identify public issues, concerns, and environmental resources for consideration in the project development process. Several federal, state, tribal, and local organizations participated in the project scoping process, as well as project area residents and other stakeholders. No agencies were formally named as cooperating or participating agencies.[5]

The following agencies have been involved in the project development and consultation process. They have received notices for the scoping meeting in October 2015, the Notice of Availability of the Draft EA in August 2016, and the comment period extension in September 2016. Many also attended at least one of the more than eight project meetings, commented on the project, or participated in project consultation:

- U.S. Fish and Wildlife Service (USFWS);
- U.S. Army Corps of Engineers (Corps);
- U.S. Department of the Interior, National Park Service (NPS) and Olympic National Park Olympic National Park (ONP);
- U.S. Department of Agriculture, Forest Service (USFS) and Olympic National Forest;
- Federal Emergency Management Administration (FEMA);
- U.S. Environmental Protection Agency (EPA);
- National Oceanic and Atmospheric Association National Marine Fisheries Service (NMFS);
- Washington Department of Archaeological and Historical Preservation (DAHP);
- Washington Department of Natural Resources (WDNR);
- Washington Department of Fish and Wildlife (WDFW);
- Washington Department of Ecology (Ecology);
- Cities of Port Townsend, Forks, and Sequim;
- Clallam County;
- Quillayute Valley School District No. 402; and
- Queets-Clearwater School District No. 20.

In addition, the Hoh Tribe has been involved throughout the alternatives analysis phase and in the development of mitigation concepts and environmental documentation. The Hoh Tribe is a co-manager of fisheries resources.

[5] NEPA defines cooperating agencies in 23 U.S.C. 139(d) as those (other than the lead agency) that have jurisdiction by law or special expertise with respect to any environmental impact involved in a proposed project. Participating agencies, as defined by SAFETEA-LU, are those with an interest in the project (FHWA 2017).

Stakeholder groups that have participated in the project planning and review process include the following:

- Project area residents;
- Project area businesses (Peak 6 Tours and Gift Shop and Hard Rain Café);
- Hoh River Trust;[6]
- Hoh Rainforest Enterprises;
- Olympic Environmental Council;
- Olympic Forest Coalition; and
- North Olympic Salmon Coalition.

Appendix A, the Scoping Report, describes the project in general, the goals of the project, and the public involvement process, which includes the scoping and meeting notices, dates, and locations. The Scoping Report also includes a summary of issues and concerns received from agencies and stakeholders that helped shape the scope of analysis to be reflected in the Draft EA.

Appendices B and C contain the March 10, 2016, Interagency Meeting Notes and the July 8, 2015, Corps Meeting, respectively. The purpose of the March 10, 2015, meeting was to introduce agency personnel to the project, describe activities leading up to the meeting, and for WFLHD to receive guidance or direction from the agencies regarding methods to address the issues along the Upper Hoh River Road. The purpose of the July 8, 2015, meeting was to review the scope of the project and the purpose and need for the project; identify points of coordination between WFLHD and the Corps; and to confirm the list of information needs for the Corps Section 404 permit application.

1.5 Funding

The Federal Lands Access Program (FLAP) will provide funding for the project. Jefferson County applied for FLAP funding after completing a Bank Failure Risk Reduction Study in 2013 (WFLHD 2013). The FLAP program provides funding to non-federal agencies to rehabilitate roadways that provide access to federal lands (in this case, the ONP). The program has a match requirement, meaning that a percentage of the funding has to come from a funding mechanism other than FLAP. The NPS Pacific West Region, through the Park Roads Program (Federal Lands Transportation Program), will provide the matching funds. Jefferson County is responsible for a portion of the match, for which it will use toll credits. The County will also provide funding for the culvert at MP 4.38 through the Public Lands Highway Discretionary Program.

The project may be advertised as one or two separate construction projects, depending on the estimated cost of construction. Bridge work may be more economical if advertised as a stand-alone construction project.

[6] Land within the project area formerly managed by Hoh River Trust was transferred in May 2017 to the Nature Conservancy management.

1.6 Status of the Environmental Process

WFLHD released the Draft EA on August 8, 2016, and the public review period was August 9 to September 23, 2016. After receiving comments on the Draft EA, WFLHD conducted additional analysis that is reflected in the Final EA.

WFLHD has determined in this Final EA that the project will have no significant impacts; therefore, WFLHD is publishing a Finding of No Significant Impact (FONSI) along with this Final EA. **Table 1-1** shows estimated dates for the project's environmental process.

Table 1-1. Environmental Process Timeline

Step	Expected Timing
WFLHD Publishes Draft EA	August 2016
Comment Period Ends	September 2016
WFLHD Addresses Comments	September 2016 – June 2017
WFLHD Prepares Final EA and FONSI, and signs FONSI	June 2017
Publish Notice of Availability in Federal Register	June 2017
Permits and approvals	2017-2018

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2.0 PURPOSE AND NEED

2.1 Purpose

The proposed project's purpose is to develop and implement cost-effective, long-term bank stabilization solutions at three locations along the UHRR in western Jefferson County, Washington. The project will also replace three stream-crossing structures (i.e., bridges or culverts). The UHRR at the bank stabilization and stream crossing sites is at risk of washing away in a large flood event. Key design objectives are to protect the UHRR at certain locations between MP 3.6 and MP 10.2 from erosion, and to provide safe and consistent access to residents, businesses, and ONP visitors between US 101 and the Hoh Rain Forest Visitor Center.

2.2 Need

The UHRR serves as the only access road for the residents and businesses located along this roadway and for visitors entering ONP from US 101 from the west. In 2014, over 82,000 vehicles entered the park using the UHRR. In August of 2015 alone, 24,000 vehicles entered the park using the UHRR. In recent years, visitor numbers at the park have averaged 3 million visitors per year. The UHRR leads to the Hoh Rain Forest Visitor Center, which is one of four year-round ranger stations in ONP and the only year-round ranger station with access to the western side of the park (NPS 2015).

Maintaining safe and consistent access along the UHRR has been increasingly difficult due to the dynamic character of the adjacent Hoh River, a low-gradient river with frequently-shifting braided channels. Additional challenges have recently exacerbated the conditions of the river corridor. For example, vegetation removal in the Hoh River drainage, combined with recent changes in weather patterns (warmer temperatures and less snow), have contributed to the magnitude and extent of the river's channel migration. Often, this has caused flows to be directed against the road embankment causing significant erosion and instability. Damage to the UHRR due to flooding has resulted in road or lane closures lasting several weeks in 1996, 1998, 2003, 2004, 2006, 2007, and 2014. A continuing trend of more frequent flooding will increase the potential for interrupted access to US 101 and ONP for local residents, business owners and patrons, and park users and other recreationists.

The cost to repeatedly maintain safe access on the UHRR has increased substantially due to the Hoh River's character and its proximity to the UHRR. Over the past decade, the County and WFLHD (through the Emergency Relief Program) have spent over $5 million on 13 projects to maintain safe access on the twelve-mile portion of the UHRR between US 101 and ONP.

Built in 1983, the Tower Creek Bridge does not meet current seismic and design standards and is in need of replacement. The Hoh River's migration toward the UHRR has shortened the Tower Creek channel length, which has caused the Tower Creek channel to incise and scour the bridge abutments. In addition to being undersized and requiring frequent maintenance to remove debris and sediment, the MP 4.38 and Canyon Creek culverts are barriers to fish passage at certain flows.

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3.0 PROJECT ALTERNATIVES

This section describes the project alternatives, including the No Action Alternative and the Build Alternative. Under the No Action Alternative, the proposed project would not be constructed and maintenance and emergency repairs of the UHRR would continue similar to existing conditions. Jefferson County would continue to install or replace riprap on the riverbank in response to emergency situations that primarily include washed-out sections of road, bank erosion, and slope failure. The Build Alternative would involve Hoh River bank stabilization at three locations, and construction of bridges or culverts at three stream crossings along the UHRR.

3.1 Project Area

The general project area[7] includes the UHRR between MP 3.6 and MP 10.2, including the areas north and south of the road, and the northern (right) bank and channel of the Hoh River. The project area includes transportation use (the UHRR), private residential and commercial properties, private forest land (owned and managed by the Nature Conservancy), and public forest land (managed by WDNR and the USFS). The UHRR extends generally east-west and parallel to the Hoh River in unincorporated western Jefferson County, Washington. The project area is a heavily forested and rural area west of ONP. **Figure 3-1** shows the locations where construction is proposed.

Public landowners and managers in the project area include the Nature Conservancy, Jefferson County, the NPS, USFS, and WDNR. Private land owners, Hoh Rainforest Enterprises LLC, R.D. Merrill Company, and the Discovery Timber Company also own land in the project area. **Figures CR-1a through CR-1d** show parcel ownership in the project area.

3.2 No Action Alternative

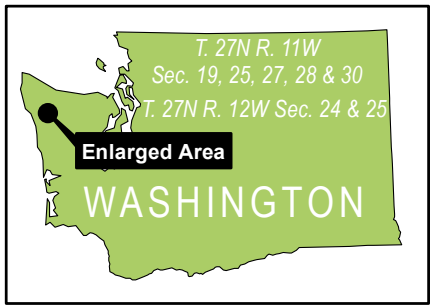
With the No Action Alternative, the proposed project would not be constructed and maintenance and emergency repairs along the UHRR would continue similar to existing conditions, on an as-needed basis in response to flood and storm event damages.

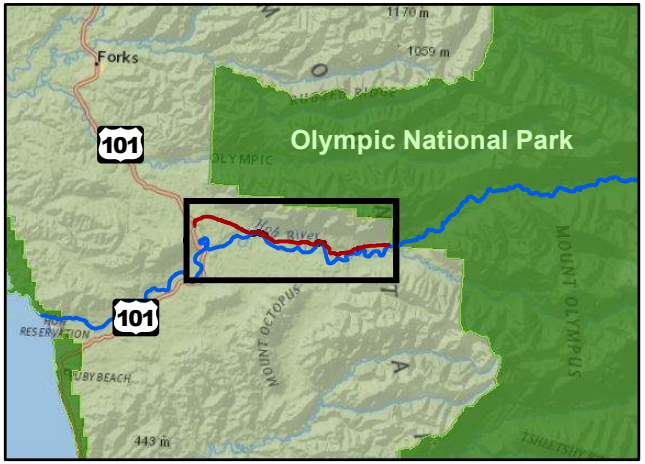
Continued maintenance of banks and slopes in the project area, including at project Sites C1, C2, and C4 (see **Figure 3-1**), would involve monitoring varying lengths of riverbank and riprap[8] revetment[9] for excessive bank erosion, channel movement, and riprap loss. Monitoring will allow assessment of potential remedial measures needed to prevent a road closure. While riprap can be an effective emergency measure to deflect hydraulic forces from eroding riverbanks, it is not a sustainable design concept because (1) it is known to degrade fish habitat, and (2) adverse hydraulic effects related to riprap have the potential to be less localized and therefore occur downstream.

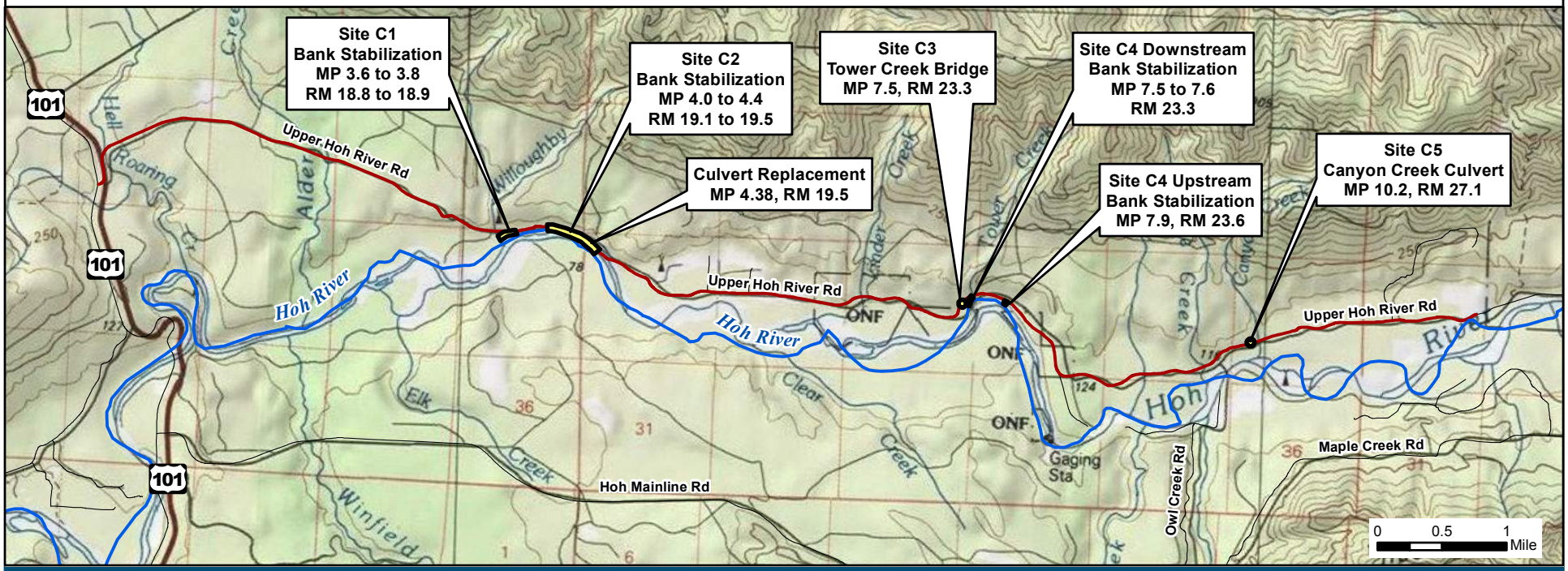
[7] The project area is refined for each environmental resource, according to where potential impacts could occur.

[8] Riprap is large, angular rock used to armor streambanks against erosion.

[9] A revetment is a retaining structure or barricade for providing protection.





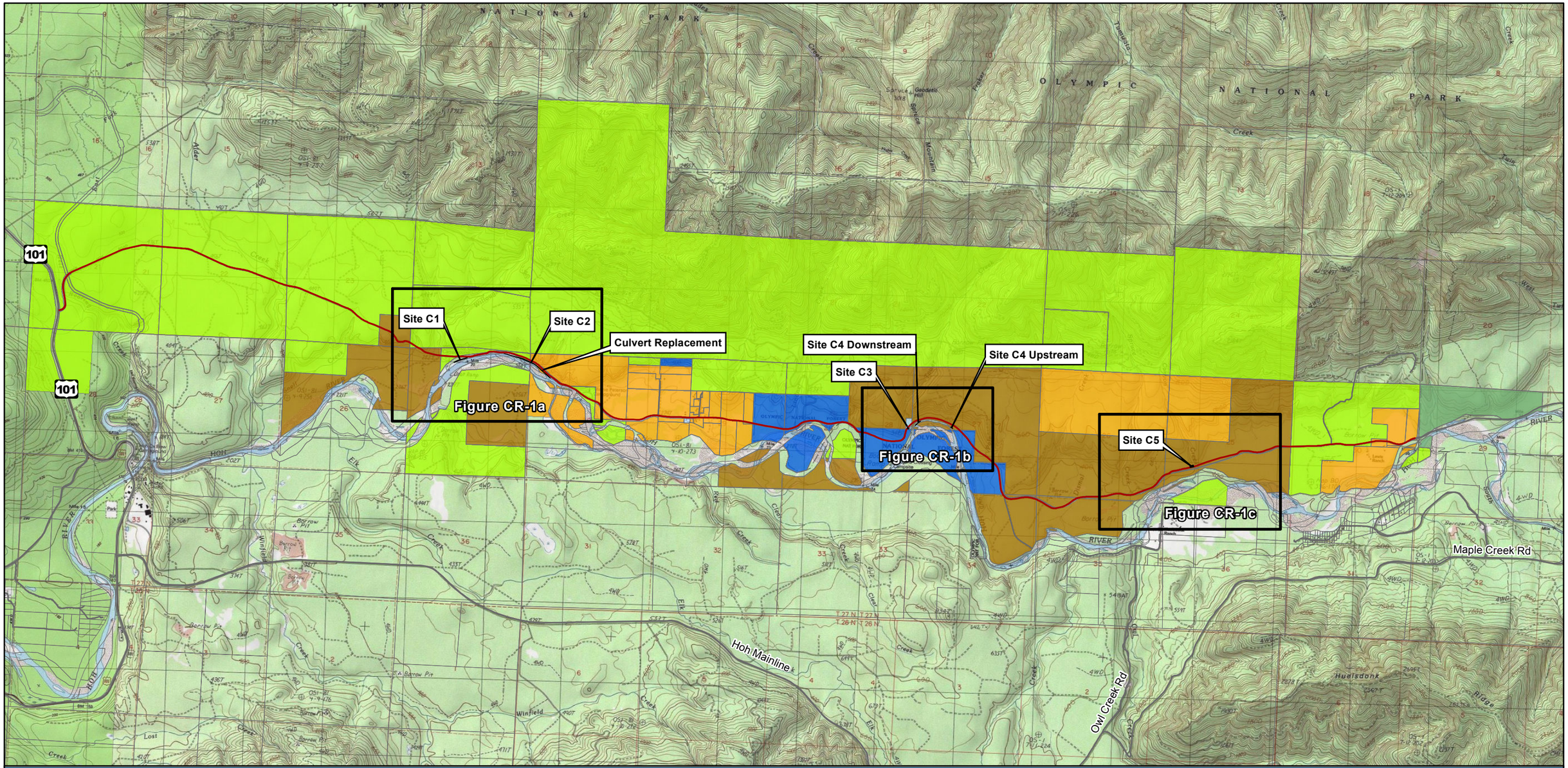


Upper Hoh River Road Project

Figure 3-1
Vicinity Map

Project Locations
Upper Hoh River
Upper Hoh River Road
Local Road

Data Sources: Jefferson County, Washington DNR.



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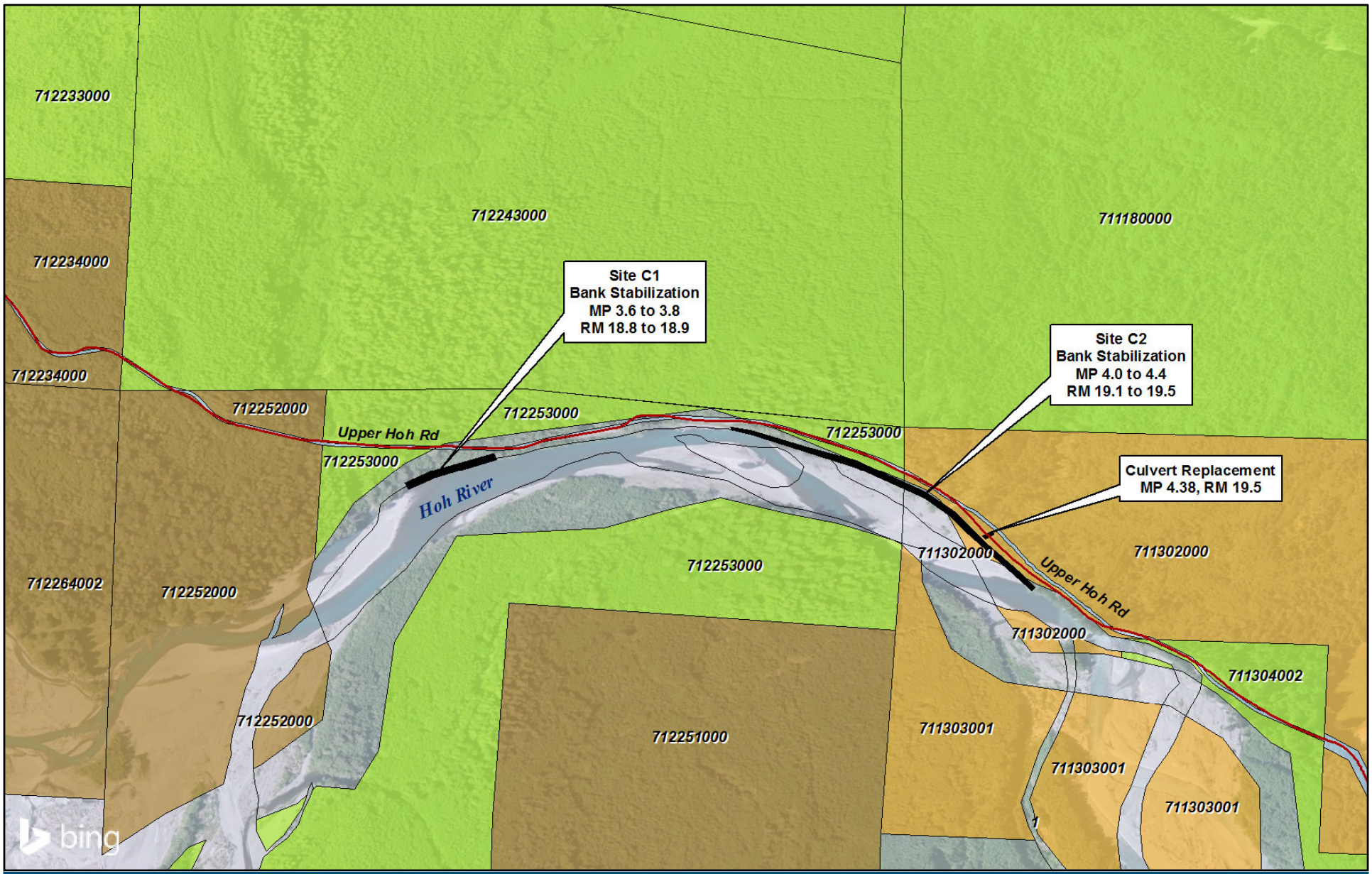

Upper Hoh River Road Project

N

Project Site
Upper Hoh Rd
Jefferson County Tax Parcel
Jefferson County
Private
Private - The Nature Conservancy
Washington DNR

Figure CR-1b
Parcel Ownership

0 0.1 0.2 Miles

Data Sources: Jefferson County, Bing Maps Aerial

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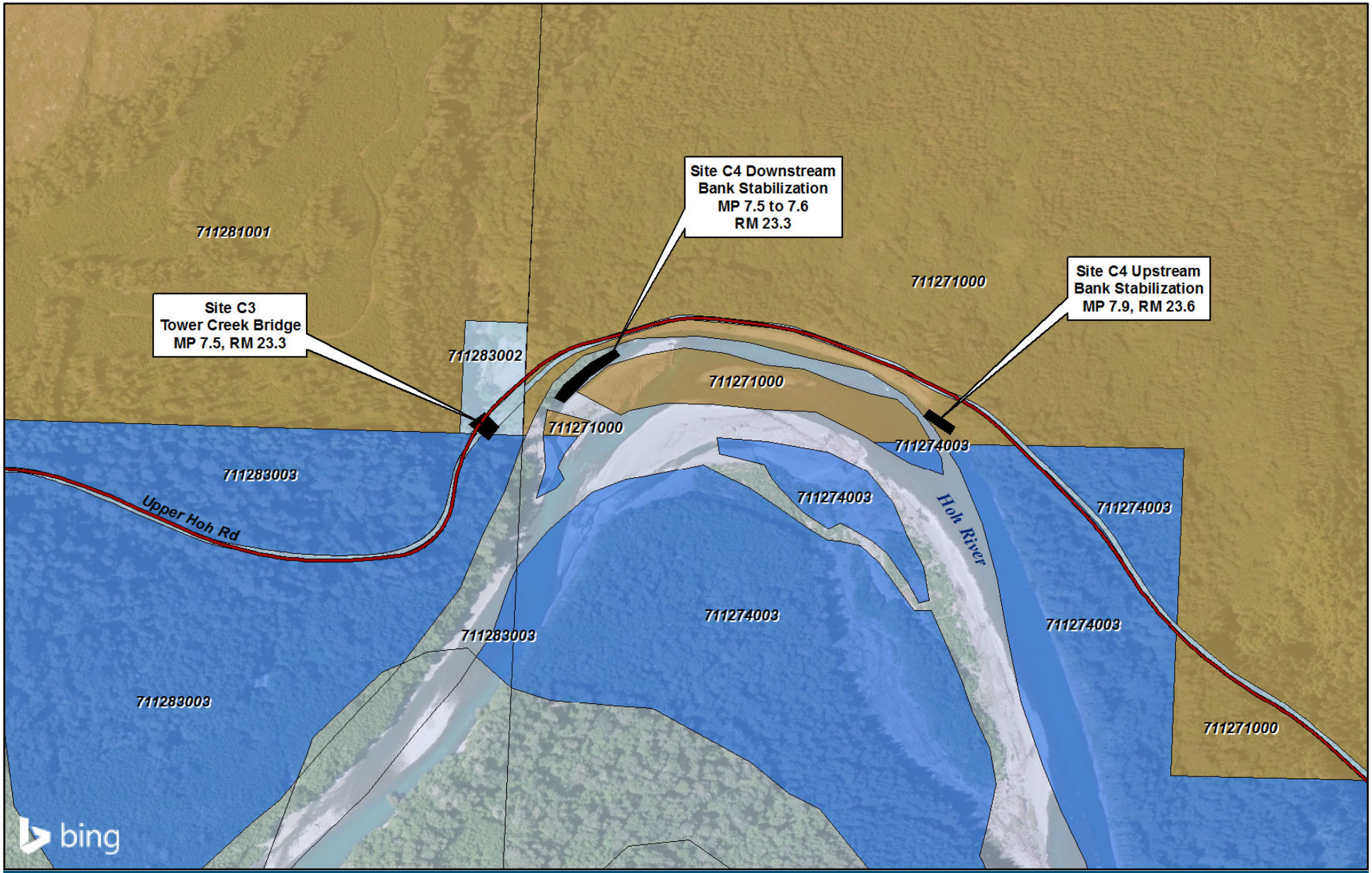

Upper Hoh River Road Project

N

Project Site
Upper Hoh Rd
Jefferson County Tax Parcel
Federal
Jefferson County
Private - The Nature Conservancy

Figure CR-1c
Parcel Ownership

0 0.05 0.1 Miles

Data Sources: Jefferson County, Bing Maps Aerial

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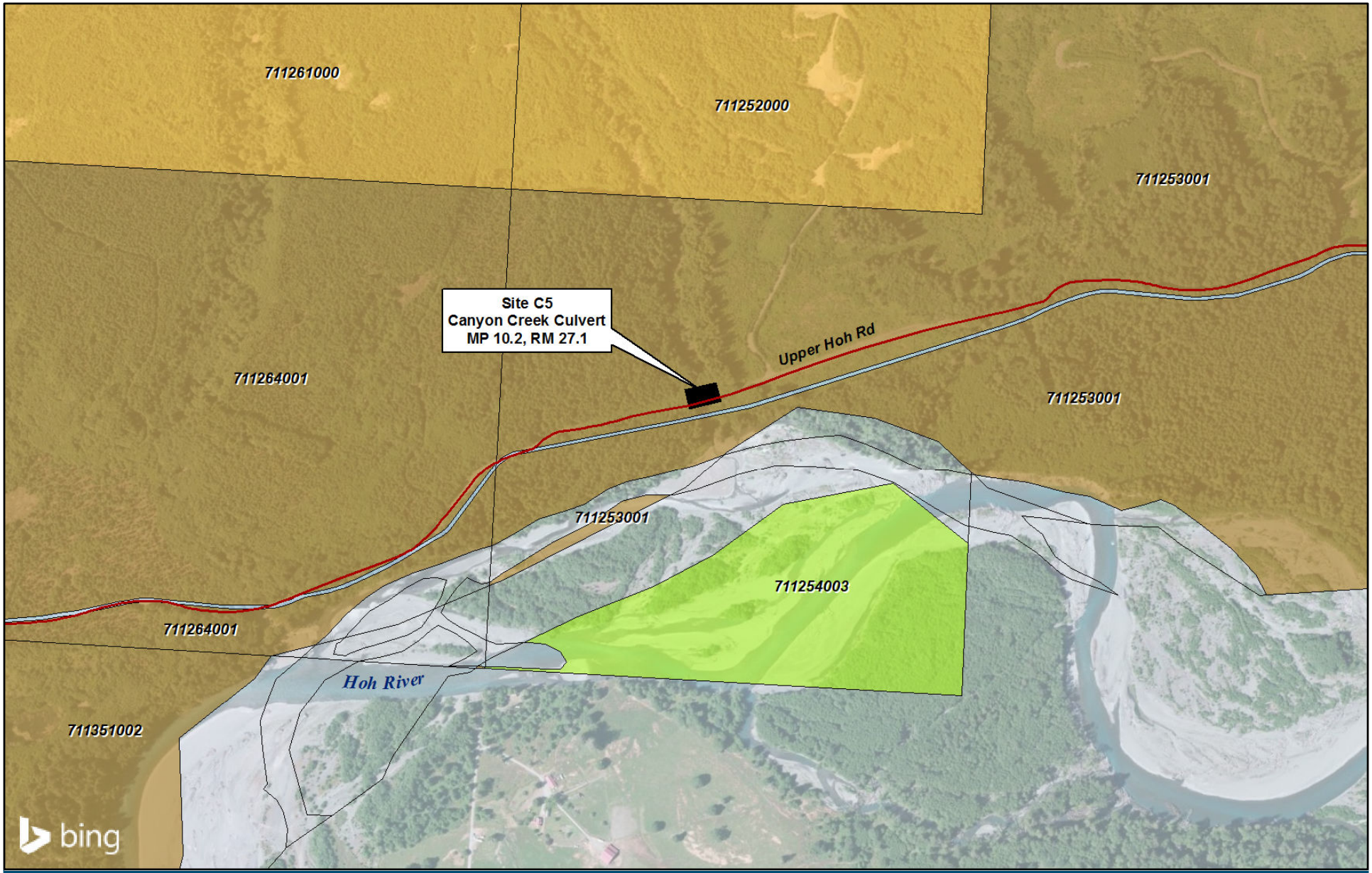

Upper Hoh River Road Project

N

Project Site
Upper Hoh Rd
Jefferson County Tax Parcel
Jefferson County
Private
Private - The Nature Conservancy
Washington DNR

Figure CR-1d
Parcel Ownership

0 0.1 0.2 Miles

Data Sources: Jefferson County, Bing Maps Aerial

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At the two culvert locations, MP 4.38 and Canyon Creek (Site C5), continued maintenance would involve inspecting for (1) debris accumulation at the inlet and inside the culverts, (2) possible cracking or separating joints inside the culverts, and (3) potential undercutting[10] at the outlets that cause the culvert to be suspended above the downstream discharge pool. Culverts that are completely blocked with debris during high flows can cause road flooding and pavement damage. Canyon Creek culvert currently has displaced and offset joints that can increase the accumulation of woody debris. Separation of culvert sections at joints also may allow surrounding groundwater or sediment to enter the culvert. Monitoring at Canyon Creek can be challenging because the bank is high and the interior portion of the culvert can only be accessed during low flow conditions.

Monitoring at Tower Creek Bridge (Site C3) includes inspecting for dislodged riprap, bed scour, and accumulation of debris that could adversely affect the discharge capacity at high flow. The northward migration of the Hoh River channel in this area has shortened the length of the Tower Creek channel between the bridge and the river, which has caused Tower Creek to incise.

With the No Action Alternative, emergency repair activities would continue, as needed, to prevent road closures. Jefferson County has constructed the majority of emergency repair activities along the UHRR. Typically, emergency repairs are undertaken immediately following the damage. This makes it difficult to conduct work during agency-approved in-water work windows established for fish protection.

Emergency repair work would likely require that one lane of the UHRR is temporarily closed for staging vehicles, backhoes, cranes, and other equipment while riprap is placed. The amount of riprap would depend on the extent and magnitude of damage to the roadway, its shoulder, or the adjacent embankment where erosion or riprap displacement has occurred. Some or all of this work could occur below the ordinary high water mark (OHWM). Best Management Practices (BMPs) employed to minimize silt and materials movement during roadway and embankment stabilization and riprap placement would reduce temporary impacts to water quality.

3.3 Build Alternative

The Build Alternative would stabilize the embankment along the UHRR in three locations. It also would replace one bridge and two culverts at three additional locations.

3.3.1 Bank Stabilization

The proposed method of bank stabilization would include placing engineered log jams (ELJ) with dolosse at Sites C1, C2, and C4. **Appendix I** includes 70% design plans for Sites C1, C2, and C4.

ELJs are collections of large woody debris (LWD) that when placed in a river or other water body, redirect flow, and increase stability to a bank or downstream gravel bar. Installation is patterned after stable, naturally-occurring log jams, which are usually formed by large trees with rootwads attached that stabilize and anchor other floating debris that accumulate against the trees.

[10] Undercutting is when river flow cuts into the bank below the culvert, exposing the culvert.

Dolosse are large, concrete jack-like structures with two approximately 8-foot-long octagonal and perpendicular appendages (approximately 3 feet diameter) (see **Figure 3-2**). Each dolos would be chained to approximately three logs; each dolos/log bundle would be attached to one large tree forming an ELJ/dolosse unit. Each ELJ/dolosse unit would be approximately 75 feet long and 20 feet wide, consisting of approximately 75 logs and 20 dolosse. The elevation of the top of the ELJ/dolosse units would be generally level with the UHRR.

Figure 3-2. Dolosse

An ELJ structure of this character and size, ballasted with dolosse, would be needed to resist a high range of flood flow conditions and expected woody debris accumulation. The log and dolosse bundles and units would be chained together to resist displacement during high flows, which can cause deep scouring of the riverbed. Such a configuration would also resist dislodgement caused from excessive accumulation of LWD. The individual dolos/log bundles that make up the ELJ/dolosse unit may be pre-fabricated (manufactured) and bundled off-site prior to on-site installation.

WFLHD, in partnership with the FHWA Turner-Fairbank Highway Research Center, conducted a flume analysis on the proposed project in June 2017, which showed that the 30% design would result in excessive scour at the ends of each ELJ/dolosse unit. Therefore, WFLHD has updated the design plans as follows, as shown in **Appendix I**, Design Plan Set (70%):

- The Design Plan Set (30%) included the placement of wood pins through each ELJ/dolosse unit, to a depth of 4 feet in the riverbed, to provide adequate resistance to buoyancy and displacement. The purpose of these pins was to initially stabilize the structure and allow it to have flexibility and limited movement as the ELJ/dolosse unit settles. The flume analysis found that the pins were not needed to secure and initially stabilize the units; therefore, the pins are not part of the Design Plan Set (70%).

- The ELJ/dolosse units were previously designed so that a single unsecured dolos would be placed at the end of each ELJ/dolosse unit. The flume analysis results indicated that the singular dolos would become unattached to the unit itself. Therefore, the current design does not include a singular dolos at the end of each ELJ/dolosse unit.

- In the Design Plan Set (30%), dolosse would be placed at the upstream end of each ELJ/dolosse unit, directly adjacent to the bank. The flume analysis found that this design and configuration of dolosse within each ELJ/dolosse unit would not suffice to secure the

ELJ/dolosse to the riverbank. Therefore, the current design (Design Plan Set [70%]) includes the placement of trees and logs (instead of dolosse) at the upstream end of each ELJ/dolosse unit. The trees and logs would be secured to the riverbank with slash and willow tree poles, similar to a picket fence.

Construction will take place on the bank of the Hoh River and within the active flow channel. ELJ/dolosse installation would require excavation and fill in the riverbed and at the toe of the embankment. Assuming construction occurs at low flow periods during the proposed in-water work window (July 15 to August 31), a temporary increase in turbidity would occur within the mixing zone that extends downriver. **Table 3-1** shows anticipated amounts of excavated and fill material below the OHWM and in total.

Table 3-1. Engineered Log Jams/Dolosse Installation – Units, Fill, and Excavation

Location	Number of ELJ/ Dolosse Units	Fill (cubic yards)		Excavation (cubic yards)	
		Total	Below OHWM	Total	Below OHWM
Site C1, MP 3.6-3.8	6	8,000	850	3,000	3,000
Site C2, MP 4.0-4.4	23	31,700	3,400	11,800	11,800
Site C4, MP 7.5-7.6, MP 7.9	4	15,000	1,600	14,000	5,600

As necessary and appropriate, WFLHD proposes constructing a temporary flow diversion structure near the upper end of each site (e.g., sheet pile installed with a vibratory hammer or similar method) that would direct the thalweg away from the work areas along the riverbank. In-water work, therefore, would occur under low velocity conditions. Dry areas or elevated bars would be excavated down to lay the first layer of dolosse with ELJ stacked on top. In areas that have flowing water, the first layer of dolosse would be installed on the bed of the river. All shoreline work would be accessed from the bank, working outward toward the river.

The typical construction work sequence for installation of ELJ/dolosse units would involve the following:

- Establish and flag construction and clearing limits and grade controls. One primary staging area would serve all six sites. On-site secondary staging and laydown areas will occur along the bank at each individual site, as required;
- Install BMPs for erosion control (e.g., sediment fencing, silt curtains, and temporary flow diversions);
- Mobilize, stage, and stockpile equipment and materials at the primary staging area. This will include construction and servicing equipment, timber (piles, logs to attach to dolosse, and slash material), racking material, dolosse, and chain for attaching logs to dolosse;
- Assemble ELJ/dolosse bundles at primary staging area;
- Implement temporary traffic controls in the work area for delivering equipment and materials from primary staging area to on-site staging and work area;[11]

[11] In more constrained work areas such as Site C2, the closed lane may be used to place cranes or excavators for materials placement into river.

- Locate site-specific staging and work areas; mobilize a crane or large excavator for the purpose of placing ELJ/dolosse unit into the river;
- Clear and grub vegetation and debris within the site-specific staging and work area; perform temporary access grading between the UHRR and the staging/work area, limiting vegetation removal to the minimum necessary to support construction;
- Excavate and grade embankment (above the OHWM) as necessary to provide a stable equipment operating platform;
- Excavate the riverbed to the depth necessary for placement of the ELJ/dolosse unit;
- Install temporary flow diversion and install ELJ/dolosse unit;
- Place slash and woody material on surface and within interstitial areas of the units;
- Compact bank using alluvial and topsoil fill; restore temporary access road;
- Install riparian vegetation plantings, including willow poles and fascines, above the OHWM;
- Move equipment to next ELJ/dolosse unit and repeat steps 5 through 13;
- Finish grade and repave the UHRR where needed;
- Revegetate areas disturbed along the UHRR and upper embankment as a result of construction; and
- Document post-construction conditions.

Construction is expected to last two seasons during the period of June 1 through October 31. Certain construction activities would take place concurrently as determined by the contractor. Construction would require flaggers, pilot cars, and temporary stoplights to manage traffic. Temporary one-lane closures of UHRR and related short-term delays are anticipated, although emergency vehicle access would be provided at all times. While typical delays would be about 30 minutes, longer periods up to 4 hours are possible during certain construction activities. Neither a road detour nor a detour bridge would be required for bank stabilization activities.

In-water work (below the OHWM) is proposed between July 15 and August 31 subject to permit approvals. Construction work outside of the in-water work window (IWWW) would only occur in upland areas (areas above the OHWM).

Construction equipment would include one to two large cranes, one vibratory pile driver, two to three large track-mounted excavators, a medium track-mounted excavator, dump trucks, rollers, pavers, and a loader. Noise during construction would be generated from private and commercial vehicles and equipment, including vibratory pile drivers. No blasting is anticipated. Some private and public property acquisition would be required, and access to all properties along the UHRR would be maintained at all times.

Vegetation in the project area primarily consists of the following: western hemlock, Sitka spruce, and red alder trees; salmonberry, vine maple, trailing blackberry, Himalayan blackberry, and red elderberry shrubs; and sword fern, Kentucky bluegrass, slough sedge, soft rush, and creeping buttercup in the understory. **Table 3-2** shows approximate areas of disturbance and numbers of

trees to be removed as part of the Build Alternative. Tree removal would be necessary to allow the installation of the bank stabilization units, as well as construction staging and access.

Table 3-2. Vegetation to be Removed and Areas to be Cleared, Bank Stabilization and Bridge/Culvert Project Components

Site	Approximate Number of Total Trees Removed	Approximate Number of Large Conifer Trees to be Removed[1]	Area of Land to be Cleared for Site-specific Access, Staging, and Storage (square feet)
C1	30	3	42,000
C2/MP 4.38 Culvert	175	3	100,000
C3 – Tower Creek	30	10	40,000
C4 West	2	0	10,000
C4 East	10	4	5,000
C5 – Canyon Creek	40	0	30,000
Total	325	20	187,000

[1] Large conifer trees defined as greater than 18 inches in diameter

After ELJ/dolosse units are installed, disturbed areas, including stream buffers, would be restored at a 1:1 impact-to-restoration ratio. Restoration would include re-planting vegetation salvaged from the site, supplemented by plantings from native nursery stock. Site restoration would be subject to performance monitoring for a minimum of five years to ensure efforts have been successful based on performance standards established in permit approvals.

Site C1 is located between MP 3.6 and 3.8, parallel to an outside bank of a bend in the Hoh River (see **Figure 3-3**). The area to be stabilized at this site (involving approximately 600 lineal feet) is experiencing bank failure due to toe scour[12] and undermining of the riverbank. Approximately six ELJ/dolosse units would be installed at Site C1, beginning at the east end and moving westward. The ELJ/dolosse units at Site C1 would displace approximately 9,000 square feet of the riverbed (below the OHWM) along the Hoh River.

Site C2 is located between MP 4.0 and 4.4, upstream from Site C1 and includes the culvert at MP 4.38 (see **Figure 3-4**). Approximately 2,100 lineal feet would be stabilized due to toe scour and riverbank undermining that has caused bank failure. An expected 23 ELJ/dolosse units would be installed at Site C2. ELJ/dolosse placement at Sites C1 and C2 would last about 100 days, 75 days of which involve in-water work. The ELJ/dolosse units at Site C2 would displace approximately 35,000 square feet of the Hoh riverbed (below the OHWM).

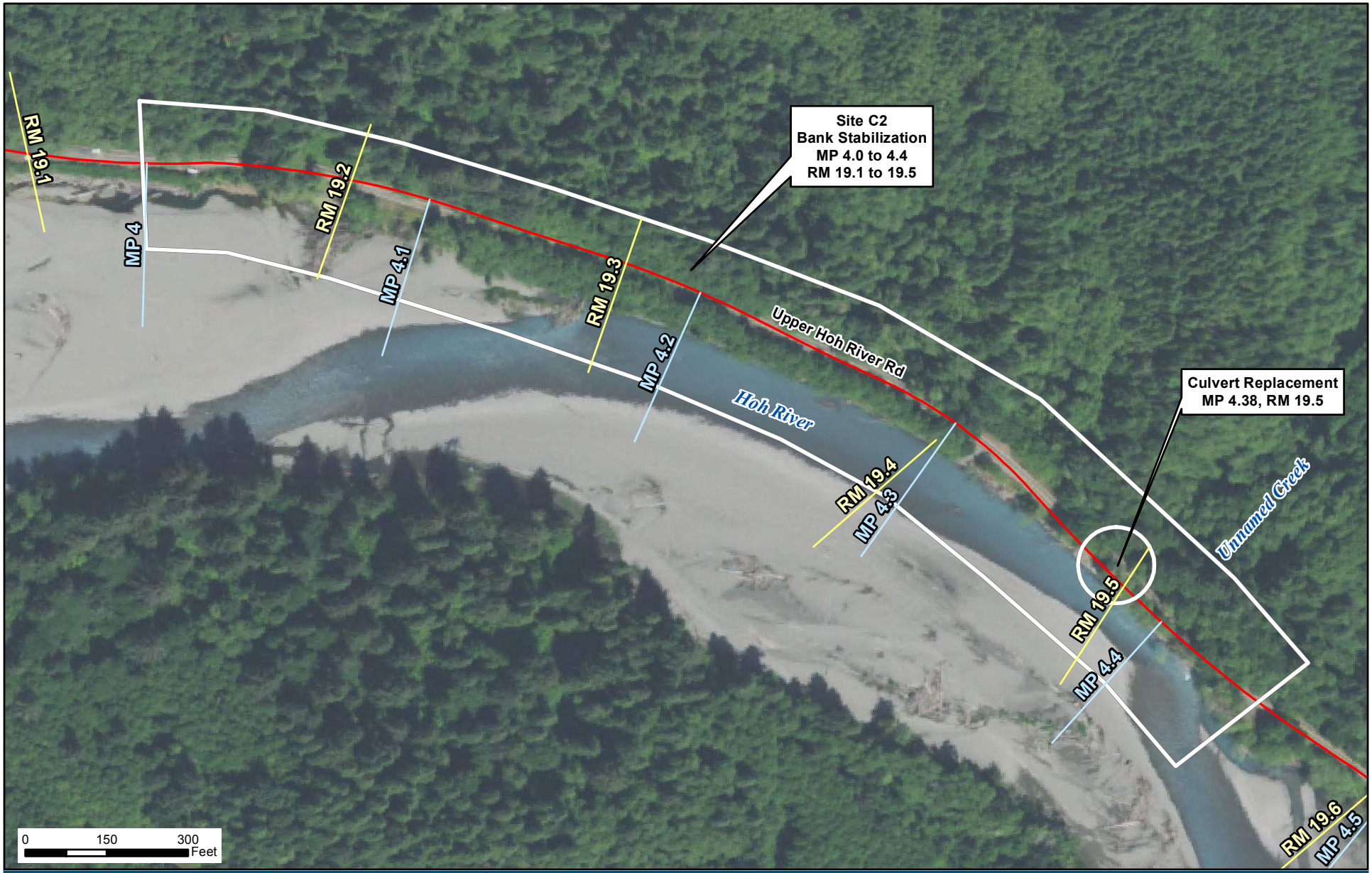
[12] Scour is caused by the erosive force of water on the riverbed or bank, which can be intensified by the volume and rate of water movement.

Upper Hoh River Road Project

Figure 3-3
Site C1 Bank Stabilization

- Project Location
- Upper Hoh River Road
- Milepost (Upper Hoh River Road)
- Rivermile (Hoh River)

Data Sources: USDA 2015 NAIP, David Evans and Associates, Inc., Jefferson County.



Upper Hoh River Road Project

N

Project Location
Upper Hoh River Road
Milepost (Upper Hoh River Road)
Rivermile (Hoh River)

Figure 3-4
Site C2 Bank Stabilization and MP 4.38 Culvert Replacement

Data Sources: USDA 2015 NAIP, David Evans and Associates, Inc., Jefferson County.

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Site C4 is located between MP 7.5 and 7.6 (a 400-foot segment) and at MP 7.9 (a 100-foot segment), on either end of an approximately 1,300-foot-long riprap revetment Jefferson County installed in 2007 (see **Figure 3-5**). Four ELJ/dolosse units would be installed at Site C4: three units downstream of the western end of the revetment where a large gravel bar has formed and one unit upstream of the eastern end of the revetment. This would result in a total of 1,800 linear feet of bank stabilization at this location. The ELJ/dolosse units would be the same size and composition as at Sites C1 and C2. ELJ/dolosse placement at Site C4 would last approximately 45 days, of which 30 days would involve in-water work. The ELJ/dolosse units at Site C4 would displace approximately 6,000 square feet of the Hoh riverbed below the OHWM. Depending on the river stage, riffles[13] may develop near Site C4 once the project is completed.

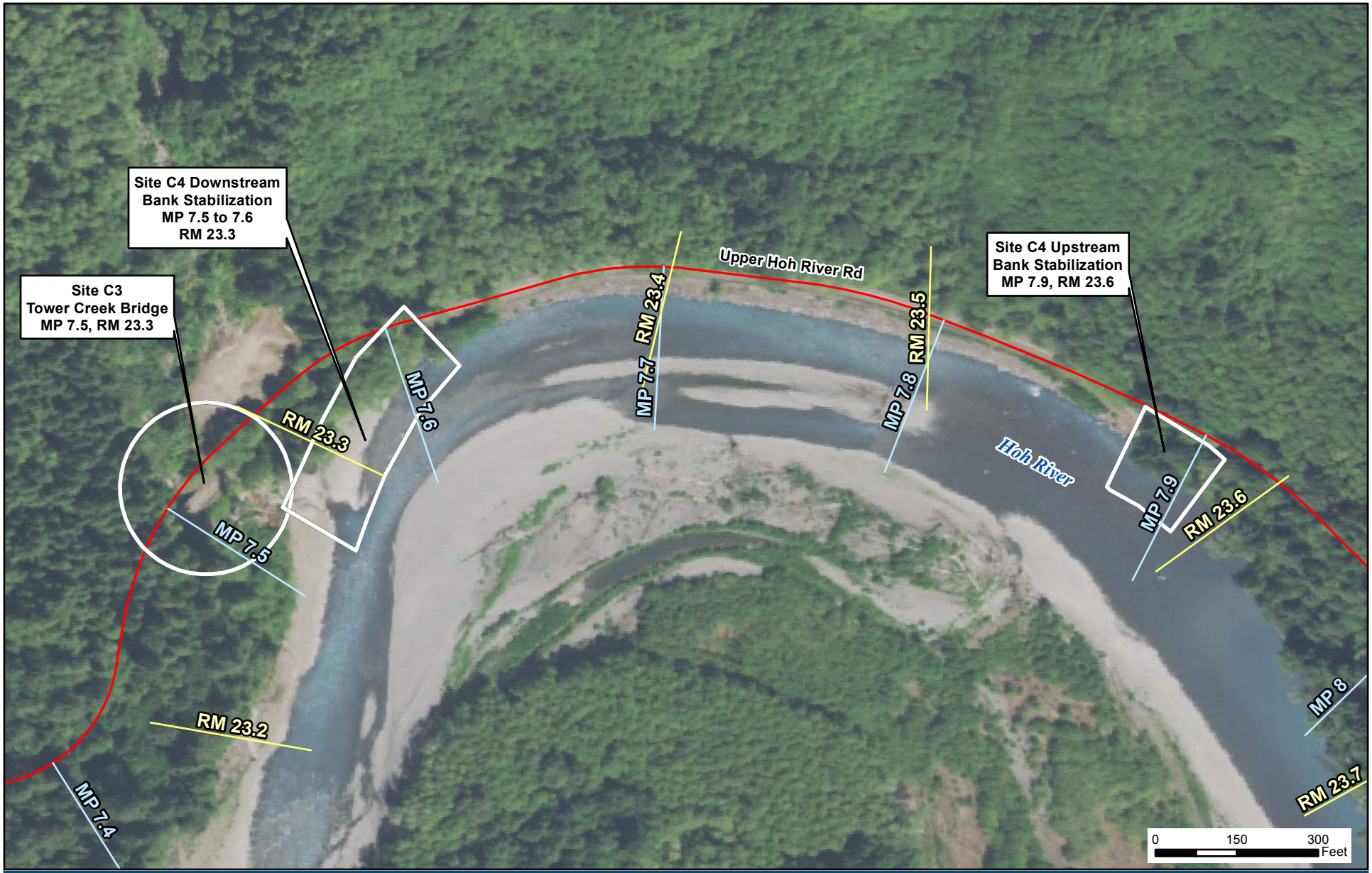
3.3.2 MP 4.38 Culvert

The Build Alternative includes replacing the culvert at MP 4.38 within Site C2 (see **Figure 3-4**). **Appendix I** contains the design plans for the new MP 4.38 culvert. The existing 72-inch diameter corrugated steel culvert conveys flows from an unnamed tributary to the Hoh River, and is located just upstream of the tributary's confluence with the river. The culvert is in poor condition, has a history of debris blockages during high flows that have caused the roadway to be overtopped. The culvert needs to be upgraded to increase its flow capacity and improve fish passage.

Once BMPs for stormwater and erosion control have been installed, a temporary water bypass may be constructed, if needed, upstream from the culvert to divert tributary flows around the work area. However, this tributary is not perennial and is therefore expected to be dry during construction. If a temporary bypass is necessary, sheet piling would be manually driven into soft soils (to install a temporary cofferdam[14]) so construction can be undertaken "in the dry." Alternatively, a vibratory hammer would be used to install the cofferdam depending on soil conditions.

[13] A riffle is a shallow section of a river with rapid current and a surface broken by gravel, rubble or boulders. Riffles are instrumental in the formation of meanders.

[14] A cofferdam is a nearly watertight temporary enclosure that, once installed, can be pumped dry to permit construction below the OHWM. It is often used when constructing bridges, culverts, or other structures in or along streams or other waterbodies.



Upper Hoh River Road Project

N

Project Location
Upper Hoh River Road
Milepost (Upper Hoh River Road)
Rivermile (Hoh River)

Data Sources: USDA 2015 NAIP, David Evans and Associates, Inc., Jefferson County.

Figure 3-5
Site C3 Tower Creek Bridge Replacement; Sites C4 Bank Stabilization

Subsequently, the existing culvert would be removed, the streambed would be re-graded, and two new sections of a 16- by 16-foot concrete box culvert would sequentially installed. The new culvert sections would be installed using a crane, excavator, bulldozer, and roller. **Table 3-3** shows the volume of riprap, fill, and excavation material (in total and below the OHWM) associated with replacing the culvert at MP 4.38 and at the Tower Creek and Canyon Creek bridge replacement projects, as described below. Vegetation removal for culvert construction would be accomplished as the same time as Site C2 construction. Quantities are shown in **Table 3-2**.

Table 3-3. Culvert and Bridges – Riprap, Fill, and Excavation (cubic yards)

Location	Riprap Below OHWM	Fill		Excavation	
		Total	Below OHWM	Total	Below OHWM
MP 4.38 Culvert	0	4,000	500* 1,500	4,500	2,000
Tower Creek Bridge MP 7.5	1,500	3,500	1,000*	6,000	4,000
Canyon Creek Bridge MP 10.2	1,000	2,500	500*	10,000	2,000

*denotes streambed simulation material

As an initial element of construction, traffic would be diverted to one side of the two-lane UHRR to temporarily convert the work corridor to a single-lane roadway. Active traffic control would be maintained until the first culvert section is constructed. Once this initial culvert section is installed and back filled, the overlying roadway would be resurfaced so that traffic could resume along its former route. The same work sequence would then be undertaken to construct the second section of the culvert.

Throughout the duration of construction, traffic would be subject to delays lasting 30 minutes to 4 hours. Culvert construction activities would be coordinated with the Site C2 bank stabilization efforts, which would be undertaken within a similar timeline. Signage and other public notices would be used to advise travelers of current and upcoming construction and the timing of traffic delays.

Approximately 30 days of the 45-day construction period would involve work below the OHWM.

3.3.3 Site C3 Tower Creek Bridge

The Build Alternative includes replacing the existing bridge at Tower Creek (Site C3 [see **Figure 3-5**]) with a new bridge. **Appendix I** includes the 70% design plans for Tower Creek Bridge. The existing bridge is a single-span steel girder bridge, approximately 70 feet long and 30 feet wide. The bridge has 18 feet of clearance from the streambed to the bottom of the support girders. The bridge abutments that support the structure have been scoured out, to the point where piles and wingwall foundations are exposed. In addition, the existing riprap that was installed to provide scour protection is overly steep at this site.

The new bridge would be at least 120 feet long and 29 feet wide and constructed of precast, pre-stressed girders with concrete decks. Abutment foundations would be supported by six 18-inch-diameter hollow steel pipe piles that would extend below the anticipated scour depth of the creek.

As currently planned, steel piles would be driven primarily using a vibratory hammer. An impact hammer would also be used, on a limited basis, for proofing the piles for load bearing. Assuming that six piles would be driven 50 feet deep at each of the two abutments, and that 30 strikes per foot are required for proofing, approximately 18,000 strikes of an impact pile driver would be required (WSDOT 2016a). To the extent contractors are able to effectively use vibratory equipment, the number of impact hammer strikes would be less than 18,000. Impact pile driving is expected to occur over seven days, at most, including two days at the start for driving one test pile at each of the abutments.

The bridge approaches would be constructed using concrete slabs. The girders would be installed using cranes located on the banks of the channels. Curb cuts would be installed in the shoulder approach of the bridge to capture pavement runoff flowing toward the bridge and direct it toward road shoulders.

The bridge replacement would also involve approximately 100 lineal feet of stream improvements. Prior to this particular work, a water bypass would be installed to dewater approximately 120 lineal feet of the creek (1,800 square feet). Existing riprap that was installed to provide scour protection at the abutments of the existing bridge would be removed to allow room for stream channel widening and bank reshaping. After rough grading is completed, new riprap revetments, approximately 5 feet in depth, would be installed to provide scour protection on both streambanks upstream and downstream of the new bridge abutments. Streambed material, a variable-size mixture of cobbles and gravels, would then be placed over the riprap and along the new channel configured in a manner that provides suitable fish passage under low-flow and high-flow conditions.

If the final bridge alignment would overlap the existing bridge structure, one lane of the existing bridge would be closed and traffic would be diverted to the open lane at both approaches and across the bridge. For safety purposes, a concrete barrier would be installed in the center of the existing bridge to restrict traffic to one lane of travel. The closed portion of the existing bridge would then be demolished so the new bridge section can be constructed. After the first section of the bridge is completed, traffic would be diverted onto the newly constructed lane, so demolition and construction can proceed on the other side. If it is determined the final alignment of the new bridge would be separate from the existing bridge alignment, it may be possible to construct the new structure without disrupting traffic on the existing bridge. Demolition of the existing bridge would then take place after traffic is diverted to the new bridge.

Construction staging and access, bridge construction and realignment, and grading adjacent to the newly constructed bridge would require approximately 40,000 square feet of land disturbance and removal of approximately 30 trees, as shown in **Table 3-2**.

Bridge construction would involve the following typical sequence:

- Establish project limits, clearing limits, and grade controls;
- Mobilize equipment, materials, and personnel at the site;
- Implement temporary traffic controls;
- Install BMPs for erosion control;

- Clear and grub to remove vegetation and debris along the chosen bridge alignment and road approaches;
- As necessary, install stream diversion to re-route water flow and conduct fish exclusion and relocation;
- Position equipment;
- Excavate streambanks to design conditions;
- Excavate and install shoring as appropriate to stabilize abutment locations;
- Drive pipe piles for abutment foundations;
- Install forms for abutments and wingwalls;
- Pour concrete for abutments and wingwalls;
- Perform streambed work, including grading riprap installation, and placement of streambed material for new channel configuration;
- Install girders and abutment connections;
- Install decking, approach slabs, curb cuts, stormwater facilities, and other features of the bridge;
- Remove stream diversion;
- Erect guardrails and signs in designated areas;
- Restore vegetation in areas disturbed by construction; and
- Clean up and demobilize site.

Table 3-1 shows the volume of riprap, fill, and excavation material in total and below the OHWM associated with replacing the Tower Creek Bridge.

Construction would occur from June 1 to October 31, and possibly during a 10-day period in January or February (when a full road closure could occur). Approximately 10 days of the summer construction period would involve work below the OHWM; this work would occur within the proposed IWWW, July 15 through August 31. A combination of a minor bridge alignment shift and staged bridge removal would allow traffic to be maintained on at least one lane of the existing bridge.

Stormwater runoff would be directed to the road shoulders and dispersed into the vegetated roadside ditch for infiltration, similar to existing conditions. Stormwater from the new bridge would be collected and routed to the edges of the bridge where it would disperse and infiltrate. Temporary erosion and sediment control (TESC) measures would be installed prior to and during construction to minimize pollutants from entering area waterbodies.

3.3.4 Site C5 Canyon Creek Bridge

Table 3-1 shows the volume of riprap, fill, and excavation material in total and below the OHWM associated with replacing the Canyon Creek culvert (see **Figure 3-6**) with a bridge. Construction would be completed in one season, June 1 through October 31, and possibly during a 10-day period in either January or February (when a full road closure could occur).

Upper Hoh River Road Project

Figure 3-6
Site C5 Canyon Creek Culvert

N

Project Location
Upper Hoh River Road
Milepost (Upper Hoh River Road)
Rivermile (Hoh River)

Data Sources: USDA 2015 NAIP, David Evans and Associates, Inc., Jefferson County.

The Canyon Creek Bridge is expected to provide additional fish passage opportunities and improved access to approximately two miles of fish habitat in Canyon Creek.

With this option, the existing culvert would be demolished and a bridge constructed in its place. The bridge would be approximately 120 feet long and comprised of precast, pre-stressed girders with concrete decks and approach slabs (see **Figure 3-6** and **Appendix I** for design plans). Culvert demolition sequencing, bridge construction sequencing, and stormwater runoff and diversion would be similar to the Tower Creek Bridge.

Semi-integral abutments[15] set on deep foundations with cantilevered wing walls would support the bridge. Abutment foundations would be supported by six 18-inch diameter hollow steel pipe piles extending below the anticipated scour depth of the stream. The girders would be installed using cranes, located on the banks of the channels. Curb cuts would be installed in the shoulder approach of the bridge to capture pavement runoff flowing toward the bridge.

While maintaining traffic in the existing alignment, WFLHD would construct the south portion of the new bridge, offset from the existing alignment. Then, a permanent bridge rail on the south bridge edge would be constructed, and a temporary concrete barrier would be installed along the north edge of the bridge. Traffic would then be diverted onto the completed south portion of the new structure. The existing fill and culvert would then be removed (completely or partially) to yield enough space to construct the remaining north portion of the new bridge. The existing embankment and culvert would be utilized at Canyon Creek to grade a detour during construction. Temporary shoring may be needed for abutment construction. Stormwater runoff during construction would be directed to the road shoulder and dispersed into the vegetated roadside ditch for infiltration.

New riprap revetments approximately 5 feet in depth would be installed on both streambanks upstream and downstream of the new bridge. Streambed material would then be placed to cover the riprap and along the new channel, configured in a manner that provides suitable fish passage underlow-flow and high-flow conditions. Approximately 80 lineal feet of Canyon Creek would have streambed improvements. Approximately 100 lineal feet of Canyon Creek (1,000 square feet) would be dewatered and isolated. Workers would install approximately six 18-inch-diameter hollow steel piles using vibratory equipment, and then an impact hammer to proof piles for load bearing. Similar to the Tower Creek Bridge, 18,000 strikes would be required, at most; fewer strikes would be required to the extent vibratory equipment can be used instead of an impact pile driver. Pile installation would occur seven days at most. Curb cuts would be installed in the shoulder approaches of the bridge to capture pavement runoff flowing toward the bridge in the long run.

Work below the OHWM would occur during the proposed IWWW, July 15 through August 31. Construction staging and access, bridge construction and realignment, and grading adjacent to the newly constructed bridge would require approximately 30,000 square feet of land disturbance and removal of approximately 40 trees, as shown in **Table 3-2**.

[15]Abutments support the ends of bridges and transfer the loads from the superstructure into the ground. Semi-integral abutments completely encase the ends of the bridge support beams in the upper part of the abutment and isolate the upper section of the abutment from the lower with expansion joint material, which allows the upper part of the abutment to slide and rotate during earth movement.

3.3.5 Best Management Practices

BMPs typical for roadway improvements, bridge or culvert replacements, and riverbank stabilization projects would be employed during the construction and restoration phases of work, and are described for each resource, in Chapter 4.0.

Potential impacts to listed species would be avoided and minimized by timing certain aspects of construction to avoid critical spawning, rearing, migration, and breeding periods. A TESC Plan and Stormwater Pollution Prevention Plan (SWPPP) would be implemented that would include specific measures to protect water quality. Additional conditions of approval for key permits will contain specific additional BMPs to be implemented during construction.

3.4 How the Build Alternative Satisfies the Purpose and Need

The purpose of the Build Alternative is to develop and implement, at six locations, cost-effective, long-term bank stabilization and stream crossing solutions to lessen the probability of road washouts and assure safe and consistent access along the UHRR. The need for the project stems from historic and ongoing damages to the UHRR, and its embankment, from flooding and erosion along the Hoh River. Such conditions have caused access along the UHRR to be unreliable for local residents, businesses, ONP visitors, and others traveling this sole route that connects US 101 with the ONP's Hoh Rain Forest Visitor Center. The Build Alternative would accomplish the purpose of and need for the project while providing fish habitat benefits, including fish passage and in-stream habitat.

3.5 Alternatives Considered but Dismissed

3.5.1 Bank Stabilization

Selection of the three bank stabilization sites was based on observations along the river and UHRR and represent locations most in need of stabilization. Methods considered for stabilizing banks, other than ELJs with dolosse, include riprap, log crib walls, and stream barbs and groins.

3.5.1.1 Riprap

Riprap is the most common and highly effective form of bank protection in the Pacific Northwest. It consists of armoring the bank with large angular rock that deflects hydraulic forces from treated sites, and is used for long-term erosion control. Using riprap at the three bank stabilization sites would meet the purpose and need of the project, as it would stabilize the bank and result in long-term increased reliability and safety along the UHRR. However, riprap can permanently displace and adversely affect fish habitat, result in erosion at other untreated sites, and reduce the recruitment of LWD and sediment recruitment. Riprap not installed properly tends to (1) create downstream scour at the transition to the natural bank, and (2) undermine the toe of the slope downstream of the installed riprap. Existing riprap revetments along the Hoh River may be responsible for some observable downstream scour and channel changes, although the dynamic nature of the river's migrating channel may also be a contributing factor. The riprap option was dismissed from further consideration due to the risks associated with improper installation and the long-term potential for adverse impacts related to fish habitat, LWD, and sediment transport.

3.5.1.2 Log Crib Walls

Log crib walls are large rectangular log boxes filled with rocks and soil, oriented parallel to the direction of streamflow. Planting spaces are formed in the wall by stacking the wall logs in alternating fashion. This solution would meet the purpose and need of the project—to stabilize the bank and create increased reliability and safety for residents, businesses, and ONP visitors using the UHRR. These structures are typically used where streambanks are experiencing mass failure or significant erosion from subsurface drainage. Bank failure along the Hoh River is caused by river scour at the toe of slope, not by erosion from subsurface drainage. As vertical structures, log crib walls are susceptible to hydraulic and gravitational forces that cause undermining and settling of soils within and behind the wall; therefore, this may not be a sustainable option, given the dynamic and forceful attributes of the Hoh River flow regime. Installing log crib walls along the banks of the Hoh River could result in the toe of the structure remaining vulnerable to scour and subsequent undermining, settling, and collapse. Therefore, log crib walls as a treatment option were also dismissed from further consideration.

3.5.1.3 Stream Barbs and Groins

Stream barbs and groins extend from the bank into the flow of a water body, and are typically constructed of rock, LWD, or a combination of both. They are used for bank protection, to create lateral sand bars, to divert stream flow in a mid-channel direction, and to change depositional patterns of sediment. The height of groins usually extend above the high-flow water surface elevation. This tends to change the cross-section of the stream more than barbs, by deepening and narrowing the channel. Each type has the potential to provide pool habitat for fish. Although trees or LWD can be added into barbs or groins to increase habitat value, they increase the risk of voids in the rock fill, result in poor foundation conditions, and may cause buoyancy that affects the stability of the structure (NRCS 2013). Groins constructed of LWD typically allow more water to flow through them, which tends to create less scouring of the adjoining streambed than a rock groin.

Although both groins and barbs would meet the project's purpose and need of increasing bank stabilization and related reliability and safety of the UHRR, they can cause more significant changes to downstream and upstream hydraulic and erosion patterns. Stream barbs and groins were dismissed from further consideration because any additional downstream or upstream erosion they might cause could exacerbate current bank erosion conditions.

3.5.2 MP 4.38

The water conveyance/stream crossing improvement at MP 4.38 was initially envisioned as a bridge to minimize the level of disturbance to the UHRR at this site. During the design process, the Hoh River migrated closer to the existing roadway. Consequently, the anticipated detour route planned for construction was no longer feasible because there would be limited area for the contiguous footings and piers needed for construction. While the bridge option would have met the purpose and need for the project, the design layout at this site was no longer feasible. WFLHD, therefore, decided to only carry forward the culvert option for this site.

3.5.3 Tower Creek Bridge

Steel girders were considered as an option at the span length required for Tower Creek. Replacing Tower Creek Bridge (with steel girders or girders made from another material) meets the purpose and need for the project, in that a new bridge supports the long-term reliability of the UHRR. Concerns were expressed that steel girders could require a cast-in-place concrete deck and that the girders would be susceptible to corrosion and create new maintenance issues. Therefore, steel girders were dismissed from further consideration for the Tower Creek Bridge.

3.5.4 Canyon Creek Culvert

A three-span bridge arrangement was initially evaluated for Canyon Creek. A three-span structure would use shorter and more cost-effective bridge girders, yet the cost saving from the superstructure could be offset by the cost of the additional foundation and piers and the required in-water work for the intermediate piers. Although the multiple span arrangements would help minimize the structural depth and reduce the cost of the bridge superstructure, the bridge piers would have potential problems due to added requirements for dewatering, cofferdams, and equipment access. The additional piers and shorter spans would combine to catch and retain debris, and provide another mechanism for scour to form under the bridge. The three-span arrangement was therefore dismissed from further consideration, even though it would have met the purpose and need for the project as part of a new bridge, which would have increased the long-term safety and reliability of the UHRR.

3.5.5 Road Relocation

Relocating the UHRR north of the existing alignment was initially considered. This preliminary alternative would have required removal of mature vegetation and critical habitat for the marbled murrelet, resulted in impacts to undisturbed wetlands, and required excavation on very steep slopes with geologic hazards. Retaining walls could have been required. Slopes begin at the UHRR and generally become steeper moving north toward the 3,018-foot summit of Spruce Mountain, approximately 2.5 miles from Sites C4 and C5. With this alternative, WFLHD would have had to acquire large amounts of private and public property for conversion to transportation use. In addition to more extensive road demolition and construction that would have disrupted traffic for a considerably longer duration and extensive right-of-way acquisitions, substantial efforts and costs also would have been required to relocate several stream crossing structures (bridges and culverts) and restore vegetation and the river embankment sections along the original roadway.

In 2013, WFLHD documented its examination of the UHRR relocation option in the Upper Hoh River Road Bank Failure Risk Reduction Study (WFLHD 2013). Major findings of the study included the following:

- The required length of the relocated UHRR would have been 3,000 to 4,000 feet;
- This option would have required the relocated road cross the 260-foot high terrace slope immediately north of the UHRR. Observed slumping[16] on the terrace slope suggested geotechnical instability, meaning that a relocated road could have caused landslides and

[16] A slump is a mass movement slope failure in which a mass of rock debris or unconsolidated material slips downward, along a concave surface.

debris flows, potentially blocking and damaging the UHRR. Road relocation would therefore have required significant efforts to stabilize the road foundation, in order to reduce the potential for landslides and debris flows; and

- Road relocation would have allowed removal of the existing riprap revetment and reconstruction of an area of riverbank approximately 80 to 100 feet wide by 1,800 feet long. Bank stabilization techniques and newly planted vegetation would have been required on the reconstructed riverbank and upland area to prevent lateral bank erosion and migration of the channel to the north. Techniques and vegetation would have been subject to performance monitoring, similar to the proposed project.

More recent evaluation of UHRR relocation considered two main options: (1) relocating the UHRR to the north between MP 3.0 and MP 11.0, and (2) relocating shorter segments of the UHRR that are closest to the road, including either the segment from MP 3.0 to MP 5.5, MP 7.0 to MP 9.0, or MP 9.0 to MP 11.0.

Relocating the UHRR for 2.5 miles, between MP 3.0 to MP 5.5, would have moved the road away from Sites C1 and C2 and required demolition and replacement of two large bridges, relocation of two to three large-diameter fish-passable culverts, construction of major retaining walls on the north side of the UHRR, and clearing approximately 20 acres of ROW. The first bridge would have been approximately 600 feet long and 100 feet above ground. The second bridge would have been approximately 100 feet long. As the road length increased and the alignment differences grew, this preliminary alternative would have increasing risks, including steep slopes and unstable soils on the north side of the UHRR. WFLHD estimated that the total capital cost of relocating the road, not including addressing erosion and road washouts at Site C4, would have been ranged from $13 million to $17 million, based on these two options. Additional funds could have been required to stabilize the UHRR and surrounding area if landslides were to occur. Based on the greater magnitude of environmental consequences, a more extended construction timeline, and higher costs, relocating the UHRR was dismissed from further consideration.

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4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter presents an analysis of potential impacts to the environment due to the proposed project. The following environmental resources potentially affected by the project were confirmed during the public scoping process and are discussed in this chapter:

- Transportation and Access;
- Land Use;
- Recreation;
- Hydrology and Hydraulics;
- Vegetation;
- Fish and Wildlife;
- Cultural and Historic Resources;
- Noise;
- Visual Quality;
- Utilities; and
- Socioeconomics.

For the purpose of this EA, the general project area includes the UHRR between MP 3.6 and MP 10.2, including areas north and south of the road and the northern (right) bank and channel of the Hoh River. The project area includes areas where direct impacts of the proposed project would occur, but is refined somewhat for each environmental resource. As defined below, the affected environment, direct impacts, indirect impacts, cumulative impacts, and mitigation measures are analyzed for each resource in the following section.

Affected Environment. The affected environment is the existing condition for a specific environmental resource. Each affected environment is the existing social, economic, or environmental setting described at a level of detail commensurate with the magnitude, duration, likelihood, and extent of potential impacts of the proposed project. It also identifies environmentally sensitive features in the project area. Each environmental resource section describes the geographical area analyzed for that specific resource.

Direct Impacts. Direct impacts typically result from construction or long-term operation of a proposed project within the project footprint, or in areas immediately adjacent. These impacts can occur at a variable intensity (or magnitude). While they often may be short-term in nature, they could persist over longer durations or may be permanent. Direct impacts may also occur within a common, important, or unique context relative to various environmental and regulatory considerations (e.g., environmentally sensitive habitats or species).

Indirect Impacts. Indirect impacts are generally delayed or occur much later in time or at distance from direct impacts (i.e., downstream or downwind). In the case of this project, indirect impacts would include improvements in future years along the entire UHRR corridor and in local tributaries extending beyond the immediate project area (i.e., extending from US 101 to ONP). These indirect impacts are expected to result from increased safety and reliability of the future

roadway, fewer emergency response or repairs needed due to floods or storms, and improved fish passage conditions that provide more favorable or extended access to upstream spawning and rearing habitats.

Cumulative Impacts. The Council on Environmental Quality (CEQ) defines cumulative impacts on the environment as those that result from the incremental impact of a proposed action when added to other past, present, or reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over short or extended periods of time (CEQ 2016).

When identifying other past, present, and reasonably foreseeable future actions, temporal and geographic limits are taken into consideration. For the purpose of identifying projects considered for the cumulative impact analysis, the geographic limits involved the UHRR corridor from US 101 to ONP because the properties and ongoing activities along the UHRR between US 101 and ONP depend on the exclusive access the UHRR provides to the project area. Therefore, impacts that occur anywhere along the UHRR will likely affect other locations and properties along the road. For example, a washout at MP 1.0, near US 101, would have effects not only within the proposed project area, but throughout the UHRR corridor between US 101 and ONP, as well as within the Hoh District of ONP.

The temporal limits selected for this analysis are 2000 to 2025. This timeline is chosen because information about projects was found to be less available and specific prior to 2000. In addition, projects and plans beyond 2025 are more likely not to be reasonably foreseeable and more likely to be generally and preliminarily described, thus, impacts would have been more difficult to evaluate. To gather information about past, present, or reasonable foreseeable future projects within the cumulative impacts geographic limits, the Hoh Tribe, the Hoh River Trust (HRT), WDNR, and ONP were contacted.

The Hoh Tribe's 2014 Forest Management Plan (FMP) plans for general forestland management, maintenance, and development activities that provide clean water and habitat conditions conducive to thriving fish and wildlife species. The Hoh Tribe's planned timber harvest methods primarily include individual trees, commercial thinnings, or small patch cuts (less than 10 acres). The FMP does not list any future projects planned along the UHRR between US 101 and the ONP (Hoh Tribe 2014).

Jefferson County designated approximately $2.2 million for capital improvement in their 2017, 3-year review. The county has no plans at this time for projects along the UHRR, other than their work in partnership with WFLHD for this proposed project (Jefferson County 2009; 2014; 2015; 2017).

ONP recently completed a $1.3 million improvement at the Hoh Rainforest Visitor Center and is currently working on apartment rehabilitation ($200,000) in the Hoh District. Both projects have created vehicle traffic on the UHRR and demand for construction materials and equipment. Upcoming transportation projects in ONP's Road Project Plan include work on roads within park boundaries, including the road at Lake Crescent, trails and trail bridges, beach roads, as well as the UHRR. The ONP's UHRR work within the park involves constructing bank stabilization methods along the Hoh River, similar to the proposed project, and is scheduled to be completed in 2018 (Turecek, *pers. comm.* 2016b).

Land within the project area formerly managed by HRT was transferred to the Nature Conservancy in May 2017. HRT's main goals were to manage its approximately 7,000 acres of former industrial timberland along the Hoh River floodplain using the principles of forestry and fisheries restoration. The HRT keeps its lands open to the public for river recreation and hunting, and expects to produce old growth-like forests faster than if naturally grown. HRT has pre-commercially thinned about 3,300 acres of forest as of 2016, and is beginning to commercially thin overcrowded older stands that need diversification. Big game projects have included creating small open areas (0.5 to 1.5 acres) in conifer forests for elk pasture and edge-dependent species. HRT did not have specific future projects planned at the time research was conducted, in 2016 (HRT 2016; Hagen, *pers. comm.* 2016).

Although WDNR has planned funding for future projects and studies, no reasonably foreseeable, specific future projects were identified on the UHRR, according to the WDNR 2017-2019 Biennium Budget Decision Package and the 2015-2017 WDNR Budget Request (WDNR 2015b; WDNR 2017).

Table 4-1 lists past, present, and reasonably foreseeable future projects involving the UHRR, effects of which were considered in combination with those of the proposed project for the cumulative impacts analysis. **Figure 4-1** shows the locations of these projects.

Mitigation Measures. The CEQ regulations define mitigation as the following:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- Compensating for the impact by replacing or providing substitute resources or environments.

Mitigation measures for the proposed project are described in detail in Sections 4.1 through 4.11.

Table 4-1. Cumulative Impacts – Past, Present, and Reasonably Foreseeable Future Projects along UHRR

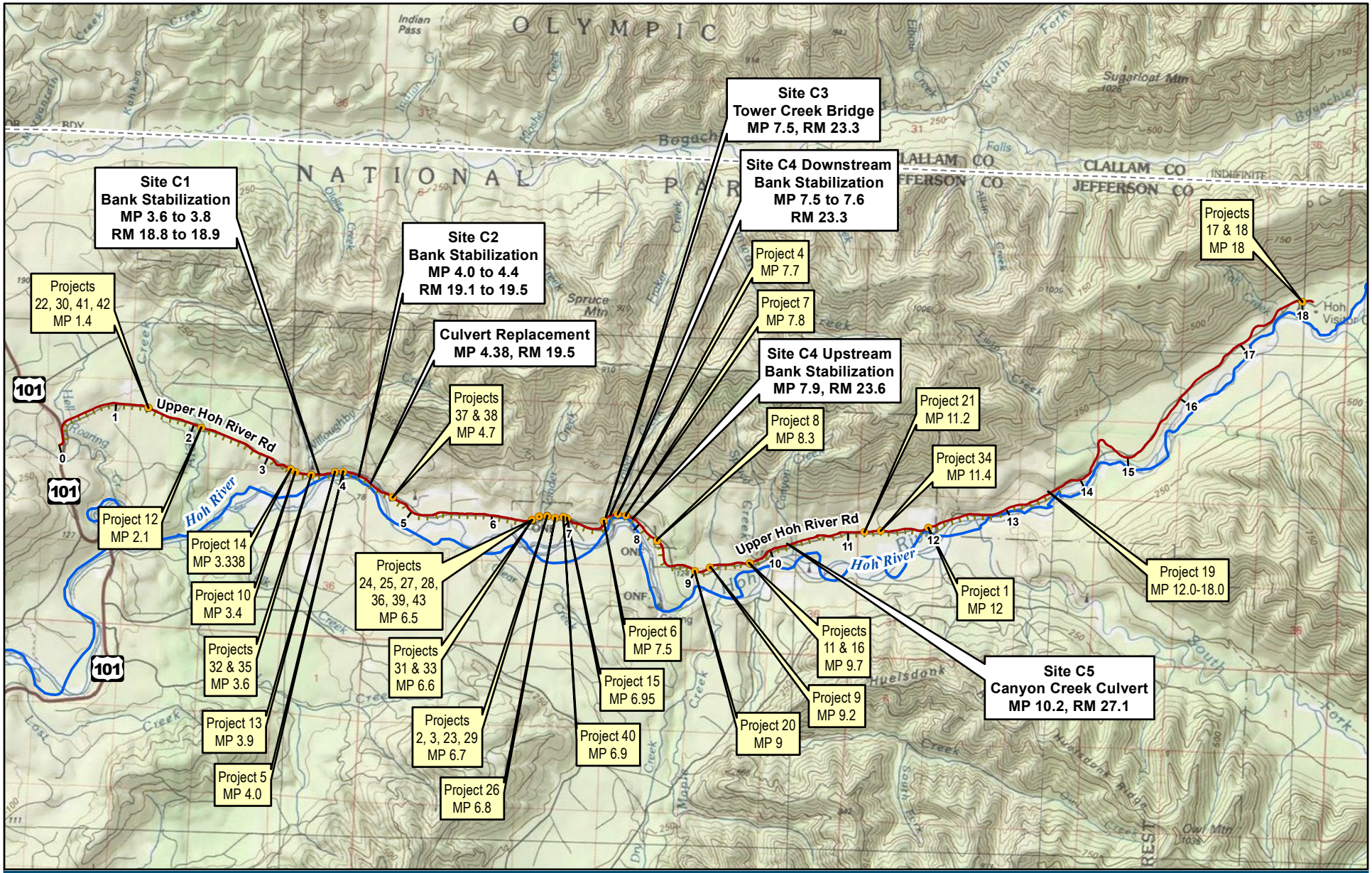
No.	Owner/Agency	Project Name	Mile Post	Year	Mitigation Project?	Description of Repair/Project
1	Jefferson County	Upper Hoh Road Emergency - MP 12	12.0	1996	No	Road relocated to north, ~7,000 cubic yards of heavy loose riprap installed to rebuild road; repair included riprap "barbs." LWD was incorporated into structure as required by permits for mitigation.
2	Jefferson County	Upper Hoh Road Washout - MP 6.7	6.7	1998	No	Constructed 600 lineal feet of heavy loose riprap bank armor.
3	Jefferson County	Upper Hoh Road Washout - MP 6.7 - Mitigation ELJs	6.7	2003	Yes	As mitigation for a 1998 repair project at MP 6.7, four very large ELJs were constructed just upstream from riprap; ELJs were up to 5 feet diameter by 60 feet long.
4	Jefferson County	Upper Hoh Road - MP 7.7	7.7	2004	No	Reconstructed eastbound lane using approximately 3,500 cubic yards of heavy loose riprap and armor stone.
5	Jefferson County	Upper Hoh Road - MP 4.0 Emergency Restoration	4.0	2006	No	Reconstructed eastbound lane using ~3,500 cubic yards of heavy loose riprap and armor stone; upper 10 feet of embankment reconstructed with "bioengineered" bank protection methods using natural erosion mats and willow cuttings.
6	Jefferson County	Tower Creek Bridge No 7W	7.5	2006	No	Sheet pile wall installed to shore up the bridge approach on the west end; riprap bank armor replaced under the bridge to protect foundation from scour and approaches from erosion and failure.
7	Jefferson County	Upper Hoh Road - MP 7.8	7.8	2007	No	Reconstructed eastbound lane using ~7,500 cubic yards of heavy loose riprap and armor stone.
8	Jefferson County / Hoh River Trust	Pole Creek Culvert Replacement	8.3	2010	No	Replaced 5-foot-diameter steel culvert (barrier) with 35-foot concrete bridge; temporary road bypass installed with signals during construction.
9	Jefferson County	Dismal Creek Culvert (Mitigation)	9.2	2011	Yes	Removed barrier culvert and replaced with bridge.
10	Jefferson County	Willoughby Creek Bridge Repair	3.4	2011	Yes	Installed tied-back sheet pile wall to shore up bridge approach embankment on west end; replaced riprap embankment protection; installed LWD upstream to protect outside of creek bend above road and as project mitigation.
11	Jefferson County	Spruce Creek Culvert Replacement	9.7	2012	Yes	Replaced damaged culverts with 24-foot concrete bridge; project was self-mitigating as it replaced an existing partial fish passage barrier.
12	Jefferson County	Alder Creek Trib. Culvert (Mitigation)	2.1	2013	Yes	Removed barrier culvert and replaced with bridge.
13	Jefferson County	Upper Hoh Road - MP 3.9 ER	3.9	2014	No	Reconstructed eastbound lane using ~2,500 cubic yards of heavy loose riprap and armor stone.

No.	Owner/Agency	Project Name	Mile Post	Year	Mitigation Project?	Description of Repair/Project
14	Jefferson County	MP 3.338 Access Preservation: Hoh Rainforest, Olympic National Park	3.338	2015	No	Replacement of substandard failing culvert.
15	Jefferson County	MP 6.95 Access Preservation: Hoh Rainforest, Olympic National Park	6.95	2016	No	Replacement of substandard failing culvert.
16	Jefferson County	Emergency riprap placement MP 9.7 at Spruce Creek	9.7	2016	No	Placed 350 lineal feet (3,500 tons) of riprap to stabilize bank.
17	NPS / ONP	Hoh Rainforest Visitor Center Improvements	18	2016	No	Improvements.
18	NPS / ONP	Hoh Rainforest Visitor Center - Apartments Rehabilitation	18	2016	No	Apartment rehabilitation.
19	NPS / ONP	Upper Hoh River Road	12.0-18.0	2018	No	Bank stabilization along Hoh River, within ONP.
20	Hoh River Trust	Dismal Pond Outlet to Hoh River	9	2016	No	Complete a new outlet to the Hoh River from Dismal Pond.
21	WDNR	Lewis Ranch Off-Channel Habitat	11.2	1990s	No	WDNR partnered with WDFW in creating off-channel habitat near Lewis Ranch, known as Lewis Ponds.
22	WDNR	H-3100 Road Decommissioning	1.4	1999	No	H-3100 road decommissioning.
23	WDNR	Culvert Replacement	6.7	2002	No	Replace culvert with fish passable culvert, tributary to Tower Creek; H-3100.
24	WDNR	Culvert Replacement	6.5	2003	No	Replace culvert with 12-foot-diameter stream simulation culvert for fish passage at Dismal Creek.
25	WDNR	Slide Clean-up	6.5	2007	No	Clean up slide debris on H-3100 from road failure on H-3160 during November 2006 storm, including limited public works contracts.
26	WDNR	Tower Creek Bridge Repairs	6.8	2008	No	Repairs to Tower Creek Bridge, H-3100.
27	WDNR	Road Repairs H-3160 and H-3100	6.5	2009	No	Road repairs from debris flows and road failures on H-3160 and H-3100; install temporary bridge.

No.	Owner/Agency	Project Name	Mile Post	Year	Mitigation Project?	Description of Repair/Project
28	WDNR	Linder Creek Bridge Replacement	6.5	2012	No	Bridge replacement to replace bridge destroyed in January 2009 storm.
29	WDNR	H-3160 Road Reconstruction	6.7	2012	No	Repair road failure on the H-3160 road; washed out in November 2006 storm.
30	WDNR	Alder Creek Bridge Deck	1.4	2013	No	Re-deck bridge over Alder Creek, H-3100.
31	WDNR	Rock Creek Bridge	6.6	2014	No	Replace culvert with bridge for fish passage.
32	WDNR	Close Willoughby Creek Campground	3.6	2015	No	Closed Willoughby Creek Campground.
33	WDNR	Hoh Down Thin Timber Sale	6.6	2015	No	Timber sale - "Hoh Down Thin," on the H-3100.
34	WDNR	Willy's Peak Timber Sale	11.4	2015	No	Timber sale - "Willy's Peak," on the H-3900.
35	WDNR	Restroom Removal	3.6	2016	No	Removal of pre-fabricated restroom (installed in 2015) at Willoughby Creek Campground, at time of storm.
36	WDNR	Re-permit Rock Pit	6.5	2016	No	Re-permitting of rock pit near Spruce Creek.
37	WDNR	Culvert at Minnie Peterson Campground	4.7	2016	No	Minnie Peterson Campground, fish-passable culvert #1.
38	WDNR	Culvert at Minnie Peterson Campground	4.7	2016	No	Minnie Peterson Campground, fish-passable culvert #2.
39	WDNR	Willy Thinner Timber Sale	6.5	2016	No	Timber sale in process - "Willy Thinner," on the H-3100.
40	WDNR	Goat Trail Timber Sale	6.9	2016	No	Timber sale in process - "Goat Trail," H-3100.
41	WDNR	Roaring Men Timber Sale	1.4	2016	No	Timber sale in process - "Roaring Men," on the H-3100.
42	WDNR	Timber Sale	1.4	2016	No	Planned timber sale.
43	WDNR	Culvert Maintenance and Replacements	6.5	varies	No	Culvert maintenance and replacements 2002, 2003, 2007, 2009, 2010, 2012, 2014.

Notes: Projects Jefferson County constructed were in response to damage to 2,550 lineal feet of the UHRR. Jefferson County repairs required an estimated 23,000 cubic yards of riprap.

Sources: Allison, *pers. comm.* 2016
Hagen, *pers. comm.* 2016
Reinders, *pers. comm.* 2016a
Tryall, *pers. comm.* 2016
Turecek, *pers. comm.* 2016a



Upper Hoh River Road Project

N

Cumulative Project Location
Upper Hoh River
Upper Hoh River Road
12 Milepost
Milepost (tenth)
County Boundary

0 0.75 1.5 Miles

Figure 4-1
Projects Analyzed for Cumulative Impacts

Data Sources: Jefferson County, Washington DNR, USGS NHD, ESRI Base Maps
Cumulative Projects: Hoh River Trust, Hoh Tribe, Council on Environmental Quality, National Park Service, Jefferson County

\\Pdxfs1\project\F\FHAX00000242\0600\INFO\GS\Maps\Biological Assessment Maps\Fig_4-1 Cumulative Impacts Analysis.mxd

4.1 Transportation and Access

This section describes existing conditions and potential impacts of the proposed project alternatives related to transportation and access. For the analysis, the evaluated UHRR corridor (i.e., the transportation project area) extends from the intersection of US 101 to the eastern terminus of the UHRR at the ONP Hoh Rainforest Visitor Center. The construction limits for the proposed project are within this corridor extending from MP 3.6 to MP 10.2. The UHRR is the single ingress and egress along the Upper Hoh River, including the Hoh Rainforest in ONP.

4.1.1 Affected Environment

This section describes existing transportation and access within the project area. Information on transportation and access was gathered from existing documentation and references, and communications with Jefferson County, NPS, and WSDOT.

4.1.1.1 Road Conditions

The existing UHRR is an 18-mile, two-lane asphalt and aggregate-surfaced road with traveled way widths (per lane) between 10 to 12 feet (see **Figure 4-2**). The UHRR intersects with US 101 at US 101 MP 178.49 and travels generally east, terminating at the existing Hoh Rainforest Visitor Center and parking area at UHRR MP 18.0.

The road is managed and maintained by Jefferson County and the NPS, depending on the location. There are no established pedestrian or bicycle facilities along the UHRR corridor. Roadway shoulders vary in width, from 0- to 8-foot paved and from 0- to 10-foot unpaved, but are typically narrow (approximately 2 feet wide). Guardrails are located in several areas, primarily where the horizontal alignment does not meet design standards or where the river nearly abuts the roadway.

Cement concrete barriers have also been installed at certain locations between the Hoh River and the UHRR. Some areas of the road surface are uneven, and potholes exist. The intersection with US 101 is a stop-controlled T-intersection. Both northbound and southbound lanes along US 101 have turn pockets for vehicles turning onto the UHRR.

Jefferson County has rated the asphalt surface of UHRR fair to good, but the ride quality in some areas as poor (Reinders, *pers. comm.* 2016b). The geometry does not meet current County design standards in many locations for horizontal alignment, vertical profile, and width. Multiple clear zone hazards exist along the UHRR, including large trees and steep drop-offs. No weight restrictions are currently in place on the UHRR.

Private, single-family residences along the UHRR are clustered near the center of the proposed project construction limits (MP 3.6 to MP 10.2). One full-time private resident lives along the UHRR east of the eastern project limits, and one full-time park ranger lives along the UHRR within ONP boundaries (see Section 4.1.1.3 below). Although the project area does not contain formal parking areas, the widened unpaved shoulders adjacent to the road are often used by travelers. These areas are unmarked and unsigned.

Figure 4-2. UHRR Typical Roadway Conditions

4.1.1.2 Road Uses

The UHRR provides access to ONP and Hoh Rainforest Visitor Center, WDNR campgrounds, and private residences. Private residences are either adjacent to the UHRR or are accessed from the UHRR via private driveways or public roads. Owners and land managers in the area include WDNR, the Nature Conservancy, Jefferson County, NPS, USFS – Olympic National Forest, and private owners. Recreational, residential, and two commercial uses operate year-round. No transit services exist along the UHRR corridor.

Seton Construction owns and operates a quarry just east of Site C5 in support of its construction projects. WFLHD, Jefferson County, and the Corps have used material from this quarry for repairs on the UHRR, Oil City Road, and at the Hoh and Quillayute Indian reservations. The quarry generates very limited volumes of truck traffic that periodically increase when materials are transported for specific construction projects. Tractors, excavators, and dump trucks with or without trailers are typically used at the quarry and to haul quarry materials (Reinders, *pers. comm.* 2016b).

4.1.1.3 Olympic National Park Access

The UHRR is the sole access route to the Hoh District of ONP. The Hoh District includes the Hoh Rainforest Visitor Center, the Hoh Rainforest Ranger Station, an 88-site campground, a picnic area, hiking trails, and the Hoh Rainforest (NPS 2016a). One full-time, year-round park ranger is stationed at the Hoh Rainforest Ranger Station. Up to 12 residents may be located in ONP at any one time during the summer months of operation, May through September (Turecek, *pers. comm.* 2016b).

4.1.1.4 Traffic Volumes

Jefferson County average daily (one-way) traffic (ADT) counts (**Table 4-2**) on the UHRR during summer months (July and August) are over twice the levels documented in late spring (May and June). The road remains open in the winter except during emergency repair work; however, traffic counts were not available for winter months.

Table 4-2. UHRR Average Daily Traffic (Number of Vehicles)

Milepost	May and June	July and August
MP 0.14	334-667	Up to 1,295
MP 6.15	236-576	Up to 1,209
MP 12.04	222-560	Up to 1,148

Source: Reinders, *pers. comm.*, 2016b

The NPS has visitor trip data for ONP for the period 2000 to 2015, based on the number of vehicles entering ONP through the Hoh District Entrance Station.[17] During this period, the highest annual traffic volumes generally occurred in August, averaging 1,158 vehicles per day (**Table 4-3**). This is consistent with Jefferson County traffic counts.

Table 4-3. Number of Vehicles Entering ONP at Hoh District Entrance Station

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	1,378	2,837	4,378	5,421	9,987	14,326	22,489	24,601	19,898	0	10,002	1,182
2014	1,490	2,133	3,174	3,470	10,334	10,714	13,690	20,354	9,911	4,011	1,610	1,149
2013	1,277	2,116	3,746	2,135	10,712	8,667	9,609	8,456	9,899	1,812	1,626	1,102
2012	960	1,742	2,837	3,012	10,856	4,525	18,418	10,653	9,642	3,028	1,277	1,215
2011	877	1,761	3,086	3,034	4,833	8,256	13,174	14,659	9,235	5,568	1,430	1,360
2010	1,394	2,997	3,556	3,311	4,959	9,353	16,018	15,812	9,633	3,684	1,394	1,072
2009	0	1,406	2,497	3,060	4,913	8,509	13,617	11,214	8,493	2,848	2,068	1,087
2008	0	0	2,830	2,315	4,746	6,964	11,834	13,394	7,467	2,848	2,610	492
2007	0	0	0	0	3,750	6,920	11,928	11,792	5,662	3,640	1,379	0
2006	1,118	1,585	2,568	2,658	3,722	6,970	12,186	11,450	2,524	3,140	0	0
2005	3,184	980	4,986	2,627	4,386	6,852	11,741	12,412	5,394	1,403	1,338	1,500
2004	404	2,867	2,813	3,250	4,739	7,894	9,397	10,457	6,896	6,968	567	710
2003	1,200	1,796	4,986	4,104	5,028	8,100	15,000	17,500	9,500	4,500	500	1,181
2002	1,567	1,976	5,080	5,102	4,203	7,380	13,472	47,424	8,000	4,111	1,652	1,181
2001	896	1,976	3,017	3,676	4,463	7,696	36,123	40,253	13,571	3,640	2,068	975
2000	896	1,976	3,017	3,676	5,003	9,369	24,922	16,769	9,207	3,640	2,865	1,222
Month Enter Avg	1,280	2,011	3,505	3,390	6,040	8,281	15,851	17,950	9,058	3,656	2,159	1,102

[17] NPS data is incomplete where counts are not available due to count machine malfunctions or missing data.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Month Total	2,560	4,021	7,009	6,780	12,079	16,562	31,702	35,900	18,117	7,312	4,318	2,204
ADT	83	144	226	226	390	552	1,023	1,158	604	236	144	71

Source: NPS 2016d; additional calculations performed by David Evans and Associates, Inc. (DEA).
Note: "Month Total" is twice "Month Enter Avg" to account for trips both into and out of the park.

Based on Jefferson County and NPS traffic data, vehicle counts remain fairly constant west to east on the UHRR, as the majority of trips (ADT) are traveling to and from the ONP Hoh District recreational areas. ADT counts from Jefferson County indicate that only about 15 percent of trips are related to residential or commercial uses along the UHRR.

WSDOT has basic daily traffic data for US 101 just north of the intersection with the UHRR. These counts indicate that ADT along US 101 was 1,300 vehicles in 2011 and 1,400 vehicles in 2014 (WSDOT 2016b).

4.1.1.5 Accident History

Based on Jefferson County accident data for the period 2011 to 2016, most of the seven accidents that occurred along the UHRR involved vehicle damage only, a wet roadway, daytime hours, or eastbound travel. Nearly all of the collisions identified were associated with poor weather conditions or the horizontal alignment of the roadway (i.e., curves). Six of the seven accidents occurred between MP 3.160 and MP 3.842 (primarily within the MP 3.6 to MP 10.2 construction limits of the proposed project), while the seventh accident occurred at MP 9.134 (Reinders, *pers. comm.* 2016b). The following summarizes road and weather conditions associated with these accidents:

- Severity: no fatalities, 3 injury, and 4 property damage only;
- Surface conditions: 5 wet road, 1 dry road, and 1 icy road;
- Light conditions: 4 light, 2 dark, and 1 dusk; and
- Direction: 6 eastbound, 1 westbound.

4.1.2 Environmental Consequences

This section describes direct, indirect, and cumulative impacts to transportation and access due to the project alternatives.

4.1.2.1 No Action Alternative

With the No Action Alternative, the proposed project would not be constructed. Residents, employees, recreationists, and ONP visitors would continue to use the UHRR for access. Maintenance of the road and sections of the adjoining riverbank would continue. Construction vehicles and equipment would continue to be required for maintenance and emergency repairs thereby contributing to UHRR traffic levels. Intermittent emergency repair work would continue to cause periodic traffic delays and access interruptions along the UHRR.

4.1.2.2 Build Alternative

Direct Impacts

Direct impacts on transportation and access would be minor and result from periodic temporary detours, delays, and closures affecting traffic mobility along the UHRR corridor.

Construction equipment, vehicles, and temporary traffic control devices would be required for project construction. Based on previous Jefferson County repair projects within and near the project corridor, each of the six construction sites would generate at least 50 construction-related trips per day (Reinders, *pers. comm.* 2016b). Eastbound trucks and other construction traffic traveling from the US 101 corridor would deliver equipment and supplies to the primary staging area. In addition, some trips may originate from a local quarry and other locations along the UHRR. The main disruption to traffic patterns would result from the movement of materials and equipment to the primary staging area and among individual construction sites.

Detours, delays, and lane or road closures along the UHRR would occur during construction. Anticipated closures likely would be limited to a two-week period in January or February. This would temporarily reduce traffic mobility in the UHRR corridor. Temporary traffic controls, including signage, barriers, and flaggers, would be used to manage traffic throughout construction. Temporary delays and closures would last 30 minutes to 4 hours. To the extent the proposed design improves the roadway's horizontal alignment, the number of accidents along curves may decrease after construction.

Indirect Impacts

The proposed project would improve long-term reliability, access, and safety along the UHRR by reducing the locations, number, and frequency of emergency repairs required to control future flood or storm damage on the roadway and along its adjacent river embankments and drainages. This would provide long-term benefits to private residents, recreationists, and ONP residents and visitors. No indirect adverse impacts are anticipated.

Cumulative Impacts

The proposed incremental improvements to bank stability along the Hoh River corridor and at bridge or culvert crossings complement other past projects in the watershed of a similar nature. Combined, these efforts will improve road reliability and access by reducing future risks of damages from stormwater and flooding. Such improvements would also help establish conditions that better accommodate anticipated future projects in the Hoh River watershed, such as the future ONP project in **Table 4-1**.

Mitigation Measures

WFLHD recommends the following mitigation measures to offset transportation- and access-related impacts during construction:

- Signage installed and public notices locally advertised in advance of and during traffic changes to inform the public;
- Installation and coordination of temporary traffic control devices to minimize the impacts to motorists;

- Placement and positioning of equipment in order to maintain local and area-wide access;
- Use of flaggers and temporary battery- or solar-powered traffic signals to maintain access during long-term road closures; and
- Use of pilot cars to guide residents or ONP visitors through construction zones, as may be appropriate during temporary lane closures.

4.2 Land Use

This section describes existing and planned land uses in the project area and summarizes Jefferson County's land use plan, adopted in 2009 and updated in 2014 (Jefferson County 2009; 2014), and policies and policies relevant to the proposed project. Potential impacts on land use attributable to the project alternatives are also described. For land use, the project area is defined as the area north of the Hoh River, along both sides of the UHRR corridor between MP 3.6 and MP 10.2 (i.e., the limits within which construction activities are proposed).

4.2.1 Affected Environment

This section describes existing land use within the project area. Information was gathered from the Jefferson County Code, Jefferson County Comprehensive Plans, and the Washington Office of financial management. In addition, site reconnaissance was conducted in spring 2016.

4.2.1.1 Existing and Planned Land Uses

The project area is within a rural, relatively isolated, and unincorporated section of Jefferson County that includes a mixture of land uses: forest and recreational lands, the Hoh River, and rural residential and commercial development. The project area, which lies east of US 101 and west of ONP, is outside of Jefferson County's urban growth boundary in the western part of the County, referred to as the "West End." Although the West End land use plan does not show any designated commercial land, some local businesses exist. The West End has very low projected growth (43 people) over the 20-year planning period (2014 to 2034) (Jefferson County 2009; 2014). Tourism and recreational attractions in the West End associated with ocean beaches, streams, forests, fishing, and hiking result in a seasonal influx of visitors to the area. The Hoh and Quinault Indian Reservation communities are concentrated population centers in the West End.

Existing designated land uses in the project area include the following, as shown on **Figure 4-3:**

- National forest land (USFS);
- State-managed timberlands (WDNR);
- NPS land;
- Private/commercial timberland;
- Residential homes and outbuildings;
- Open space agricultural use;
- Commercial uses (Jefferson County Maintenance Shop, Hard Rain Café, Peak 6 Tours & Gift Shop, and Seasonal RV lodging/parking area; and
- Transportation (UHRR).

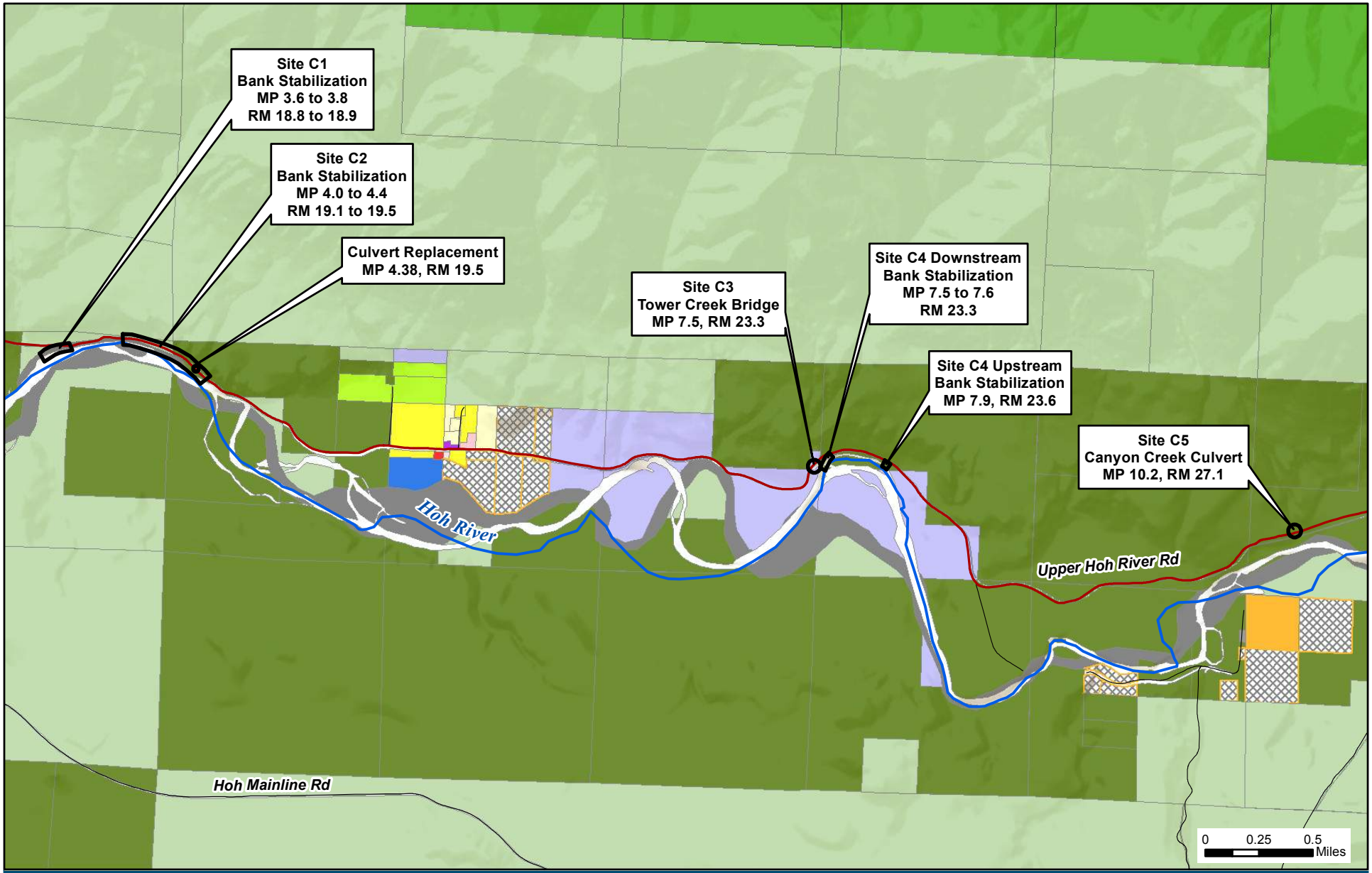


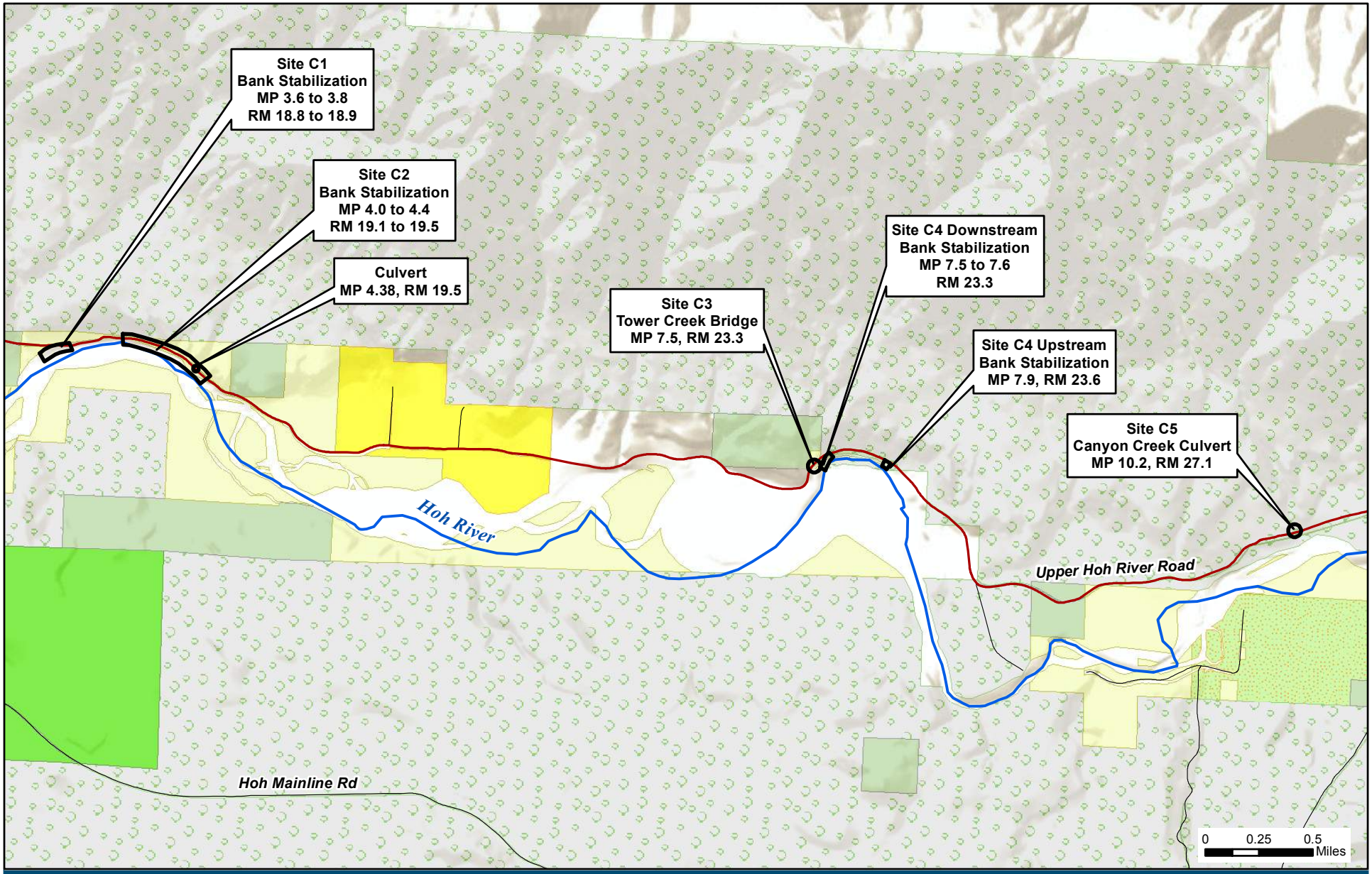
Figure 4-3
Existing Land Use

Residential and commercial uses are clustered on large parcels between MP 5 and MP 7, historically referred to as the Schmidt Ranch and Fisher Ranch residential areas. **Figure 4-4** shows a community gathering area adjacent to the Hard Rain Café, within the proposed construction limits and between Sites C2 and C4. Just outside the project area, Seton Construction operates a quarry that produces backfill materials (gravel and rocks).

Figure 4-4. Community gathering space near Hard Rain Café

According to the updated 2014 Jefferson County Comprehensive Plan (Jefferson County 2014), zoning and planning designations for the project area include the following and are shown in **Figure 4-5**:

- Rural Residential on 20-acre lots (RR-20): single-family residential, located in an area with similar development patterns; adjacent to Urban Growth Area, Resource Production Land or State/National Forest Land; parcels are in coastal areas of similar size; includes land affected by critical areas; includes private timberlands and agricultural lands;
- Rural Residential on 10-acre lots (RR-10): single-family residential, located in an area with similar development patterns; adjacent to the Urban Growth Area, transition density between Rural Residential 1:5 (one home per 5 acres) and 1:20 (one home per 20 acres); parcels in coastal areas of similar size; includes land affected by critical areas;
- Rural Forest Lands (RF-40): minimum parcel size is 40 acres, with parcels smaller than the minimum included when the acres of at least the minimum size are contiguously owned and the land is in a deferred forest or exempt tax status; and
- Commercial Forest (CF-80): minimum parcel size is 80 acres with parcels smaller than the minimum included when acres of at least the minimum size are contiguously owned and the land is in a deferred forest or exempt tax status (Jefferson County 2014).



Upper Hoh River Road Project

N

Project Location
Upper Hoh River
Upper Hoh River Road
Local Road

Zoning
AL-20 Local Agriculture
CF-80 Commercial Forest
IF-20 Inholding Forest
RF-40 Rural Forest
RR-10 Rural Residential
RR-20 Rural Residential

Data Sources: Jefferson County, Washington DNR.

Figure 4-5
Jefferson County Zoning and Comprehensive Plan Designations

I:\gis\projects\FHWA00000228\0600\NEPA\GIS\Maps\Public EA maps\Fig_4-5_JC Zoning and Comp Plan Designation.mxd

4.2.1.2 Plans and Policies

This project would comply with the Jefferson County Comprehensive Plan, updated in 2014 (Jefferson County 2014), and Jefferson County codes and ordinances. Elements of the Comprehensive Plan relevant to this project include the Land Use and Rural Element, the Natural Resource Conservation Element, the Environment Element, and the Transportation Element. The proposed project would support the following goals and policies of the Comprehensive Plan.

Environment Goal

14.0 Preserve the functions and values of critical environmental areas and protect development from the risks of environmental hazards.

Policies:

14.1 Ensure that land use decisions are based on land use ordinances which are in compliance with the Critical Areas Ordinance and all applicable state and federal environmental laws.

14.2 Allow residential, commercial, and industrial development in a manner that minimizes risk from flooding, earth movement, shoreline erosion, and other natural hazards.

14.3 Support cooperative ecosystem and habitat management processes between stakeholders and local, state, federal, and tribal governments.

14.4 Ensure that land use decisions along Jefferson County shorelines protect the shoreline environment, facilitate public access, recognize the needs of water-oriented activities and cooperate with regional plans for protection and management of shorelines. In areas of the County under the jurisdiction of the Shoreline Management Act (Chapter 90.58 RCW), activities which are water-oriented will be preferred over those activities which are not, all other factors being equal, consistent with the Shoreline Management Act and the land use designations, goals, and policies of this Comprehensive Plan.

Highways and Arterials Goal

1.0 Provide a safe, convenient, efficient and integrated highway and arterial system for the movement of people and goods; one that is functionally well maintained, reflects local environment, and meets the demands of the future.

Policies:

1.3 Minimize life cycle costs of the County transportation system by preserving and maintaining both the adequacy and operating condition of the existing transportation system.

Intergovernmental Coordination Goal

7.0 Ensure that the Jefferson County Transportation Plan reflects public desire and is coordinated and consistent with the plans of state, regional, and local governments.

Policies:

TRP 7.1 Ensure efficient management of all transportation resources through cooperation in planning and project development with federal, state, regional, and local jurisdictions.

TRP 7.3 Reduce duplication of services, program costs, and increase the quality of service.

TRP 7.4 Coordinate planning for transportation improvements and projects with the facilities/utility planning activities of other agencies and utilities in order to ensure that per-project costs are reduced, environmental impacts minimized, and community inconvenience and disruption lessened.

TRP 7.5 Comply with the Americans with Disabilities Act of 1990 (ADA) in all transportation projects.

4.2.2 Environmental Consequences

This section describes direct, indirect, and cumulative impacts to land use due to the project alternatives.

4.2.2.1 No Action Alternative

With the No Action Alternative, the proposed project would not be constructed. Land uses would not change. Residential and commercial uses along the UHRR would continue to be affected by temporary road and lane closures due to emergency repair activities.

4.2.2.2 Build Alternative

Direct and Indirect Impacts

In general, forest, residential, commercial, open space agricultural, and transportation land uses would remain the same as existing conditions during and following construction. Minor amounts of forest (within or outside the existing right-of-way) may be converted to transportation use for the project. Of the approximately 157,000 square feet of land that would be cleared of vegetation to provide construction access and equipment and materials storage and staging areas near Sites C1, C2, and C4, a portion would be forested area. For example, portions of the Hoh River that are privately owned would require new easements or land acquisitions before construction begins. These areas, along with portions of the bank and upland area between the UHRR and the Hoh River, would be cleared to provide temporary construction access, staging, and equipment storage. Once construction is completed, such areas would be revegetated with grasses, shrubs, or trees. No significant direct or indirect adverse impacts to land use (or impacts to access associated with such land uses) would result from the proposed project.

Cumulative Impacts

The proposed project, together with past and reasonable-foreseeable future projects along the UHRR, would result in no significant changes to land uses. Past project along the UHRR listed in **Table 4-1** include ten bank stabilization projects and at least 15 culvert or bridge projects whose purpose was to maintain the safety and reliability of the roadway by improving and repairing

sections of the road embankment, culverts beneath the road, bridges, and the road surface and its foundation. To the extent future repairs or improvements would involve easements or acquisitions, conversion to transportation use may occur. Cumulative impacts to land use are expected to be minimal; property owners and amount of land area affected will be confirmed during final design.

Mitigation Measures

WFLHD will justly compensate property owners for temporary construction easements or permanent ROW acquisitions, according to the Uniform Relocation Assistance and Real Property Acquisition Policies for Federal and Federally Assisted Programs (42 USC Chapter 61).

4.3 Recreation

This section describes existing recreational uses and opportunities within the project area and impacts to recreation attributable to the project alternatives. For this resource, the project area is defined as the corridor north of the Hoh River and along either side of the UHRR within the construction limits that extend from MP 3.6 to MP 10.2.

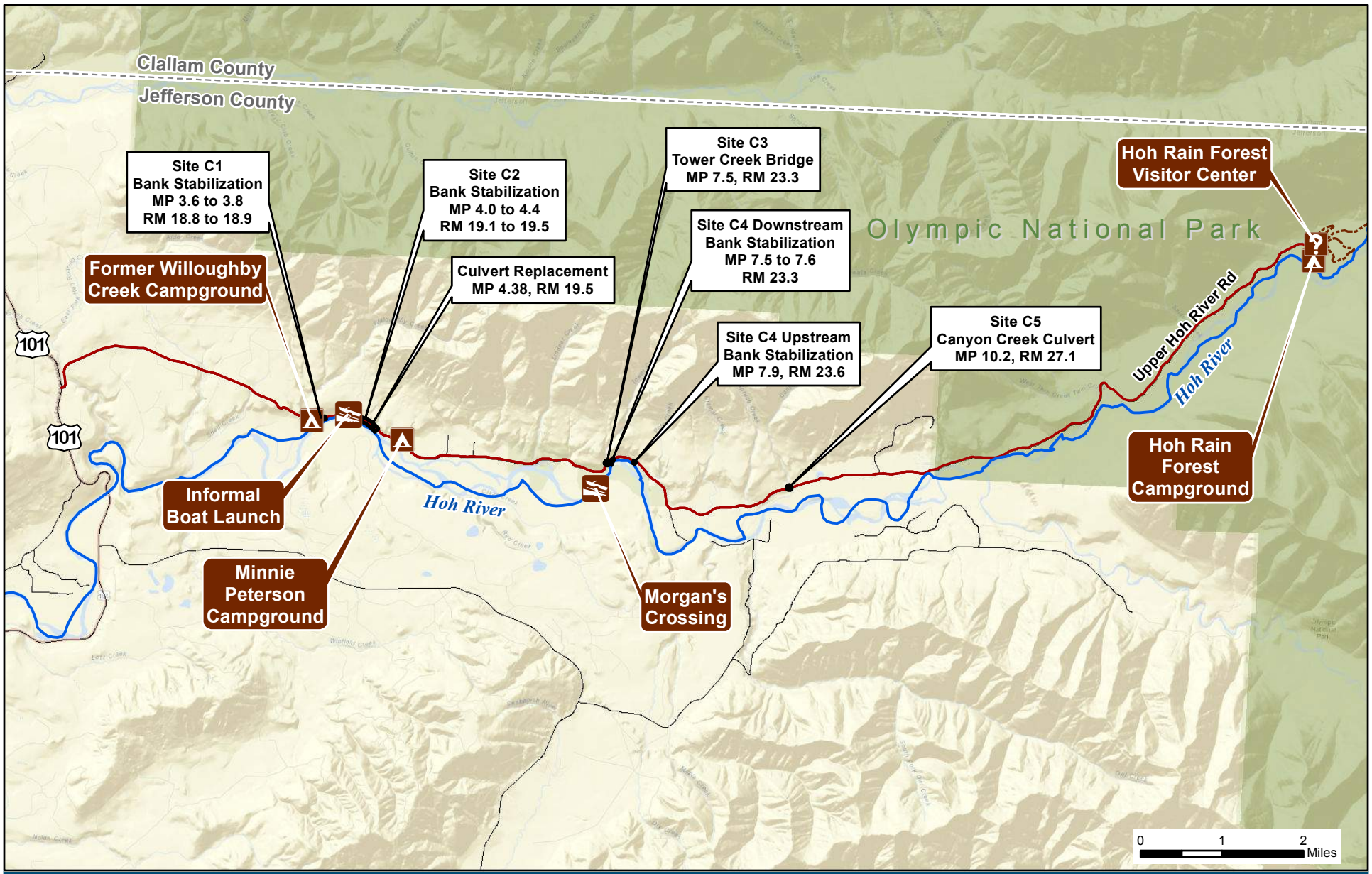
4.3.1 Affected Environment

This section describes existing recreational opportunities within the project area. Sources of information included NPS, ONP, and WDFW, as well as a spring 2016 site visit. Recreation in and near the project area includes camping, backcountry hiking and backpacking, fishing, boating, swimming, climbing, sight-seeing, picnicking, skiing, snowshoeing, environmental education, and other activities. These activities occur within the Hoh District of ONP, along the Hoh River corridor, and on lands adjacent to the UHRR as described below.

4.3.1.1 Hoh District of Olympic National Park

The eastern terminus of the project is located approximately 1.8 miles west of the Hoh Rainforest entrance to ONP at MP 12.0. From the entrance, the UHRR extends approximately six miles into the park before reaching the Hoh Rainforest Visitor Center (see **Figure 4-6**).

The Hoh Rainforest Visitor Center is open April through June, Friday through Tuesday, and daily from June until September. Interpretive exhibits, educational items, and wilderness camping permits are available at the Visitor Center. From the Visitor Center, visitors can access the Hoh campground and several trailheads, including the Hall of Mosses, the Hoh River Trail, and the Spruce Nature Trail. These trails provide hiking access to additional areas including backcountry wilderness trails within ONP. The Hoh campground has 88 campsites in the old growth forest along the Hoh River and is open year round. The campground has fire pits with grates, picnic tables, potable water, accessible restrooms, animal-proof food storage lockers, and a recreational-vehicle dump station.



Upper Hoh River Road Project

N

Project Location
Upper Hoh River
Upper Hoh River Road
Local Road
County Boundary
Olympic National Park
Hoh River Trail
Campground
Visitor Center
Water Access

Data Sources: Jefferson County, Washington DNR.

Figure 4-6
Recreational Areas

During fiscal year 2015, approximately 300,000 visitors entered ONP through the Hoh Rainforest entrance. Also in 2015, the number of visitors to the Hoh District ranged from approximately 3,000 in December to approximately 64,000 in August (NPS 2016b). As shown in **Table 4-4**, based on data from the period 2010 to 2015, the number of visitors typically peaks from May through September, with the lowest number of visitors occurring from November to January. The ability of the public and ONP staff to access the Hoh Rainforest area of ONP depends entirely on whether the UHRR is passable. Although ONP rangers' residences and work places are not located within the project area, ONP rangers use the UHRR exclusively for access. ONP has one year-round resident ranger who needs daily access to the UHRR, and up to 12 summer residents (Turecek, *pers. comm.* 2016b).

Table 4-4. Olympic National Park Hoh District Visitors

Month	2010	2011	2012	2013	2014	2015
January	3,624	2,280	2,496	3,320	3,874	3,583
February	7,792	4,579	4,529	5,502	5,546	7,376
March	9,246	8,024	7,376	9,740	8,252	11,383
April	8,609	7,888	7,831	5,551	9,022	14,095
May	12,893	12,566	28,226	27,851	26,868	25,966
June	24,318	21,466	11,765	22,534	27,856	37,248
July	41,647	34,252	47,887	24,983	35,594	58,471
August	41,111	38,113	27,698	21,986	52,920	63,963
September	25,046	24,011	25,069	25,737	25,769	51,735
October	9,578	14,477	7,873	4,711	10,429	0*
November	3,624	3,718	3,320	4,228	4,186	26,005
December	2,787	3,536	3,159	2,865	2,987	3,073

* = No data available.

Source: NPS 2016c

ONP, as a whole, includes almost one million acres and three distinct ecosystems: mountains; 70 miles of coastline; and the Hoh Rainforest, an old-growth temperate rain forest. Ninety-five percent of ONP is designated as wilderness. Established in 1938, with an additional area of Pacific coastline added in 1953 (NPS 2016e), ONP offers day and backcountry hiking, camping, backpacking, climbing, fishing, viewing, picnicking, skiing, snowshoeing, and environmental education. In 2014, 3.2 million people visited ONP for recreational purposes. Visitor numbers peaked in 1997 at 3.8 million, decreased slightly in the early 2000s, and have been generally on the rise since 2006 (NPS 2016c).

4.3.1.2 Hoh River

Vehicle pull-out locations along the UHRR are used informally to access the Hoh River for recreational fishing, swimming, boating, tubing, or viewing. An informal boat launch is located at MP 4.31 within the construction limits of the proposed project. In addition, Morgan's Crossing Boating Site, on USFS land and co-managed by USFS and WDFW, is located approximately 2,200 feet downstream of Site C3 at Canyon Creek. It is used for launching both motorized and

non-motorized watercraft for fishing and other water-related activities. **Figure 4-6** above shows these two informal boat launches.

According to the Washington State Sport Catch Report (WDFW 2013), 1,771 salmon were caught in the Hoh river system's freshwater fishery between April 1, 2013 and March 31, 2014. This represented 3 percent of the total Washington State freshwater salmon harvest in coastal river systems. For the same period, 732,850 salmon were caught in the sport fishery in all of Washington's freshwaters (including non-coastal areas) with the harvest in the Hoh river system representing approximately 0.2 percent of the statewide harvest (WDFW 2013).

Washington State 2011 expenditures related to recreational freshwater fishing were approximately $690 million (USFWS 2011; U.S. Census 2011). Approximately 30 percent of this was related to food, lodging, boating costs, equipment rental, guide fees, access fees, heating and cooking fuel, ice, and bait. Based on the Hoh river system's contributing 0.2 percent of Washington's 2011 freshwater sport salmon catch, the estimated annual spending related to this fishery was $1.5 million per year, a portion of which likely occurred near the project area.

The Hoh River is eligible for designation as a Wild and Scenic River, under the Wild and Scenic Rivers Act of 1968, for the following Outstandingly Remarkable Values: scenery, recreation, geology, and fish. The portion of the river within the ONP was designated as wild and scenic in 1993. The Act protects selected rivers that possess remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values; and states that these rivers shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit of present and future generations (American Rivers 2016; NWSRS 2017). **Figure 4-7** shows the mainstem Hoh River near Site C1.

The Wild and Scenic Rivers Act also states that uses compatible with management goals of a Wild and Scenic River are allowed. When Congress designates a river as Wild and Scenic, the designation:

- Protects existing uses of the river;
- Prohibits development of federally-licensed dams, and any other federally-assisted water resource project if it would negatively impact the river's outstanding values;
- Establishes a quarter-mile protected corridor on both sides of the river; and
- Requires the creation of a cooperative river management plan that addresses resource protection, development of lands and facilities, and user capacities (American Rivers 2016).

Figure 4-7. Mainstem Hoh River near Site C1

4.3.1.3 Camping

WDNR operates Minnie Peterson Campground at approximately MP 5.0 with nine primitive campsites, in the Olympic Experimental State Forest. WDNR's Willoughby Creek Campground, formerly at approximately MP 3.6, was closed in January, 2016 due to a storm and washout. The Huelsdonk Campground is just outside the project area, at approximately MP 10.3.

No formal trailheads exist in the project area. A privately-owned area near MP 5.5 has been used recently for temporary placement or storage of recreational vehicles (see **Figure 4-6**).

4.3.2 Environmental Consequences

This section describes direct, indirect, and cumulative impacts to recreation uses and opportunities related to the project alternatives.

4.3.2.1 No Action Alternative

With the No Action Alternative, the proposed bank stabilization and bridge and culvert replacement projects would not be constructed. Unplanned, intermittent road closures and delays associated with storm damage and emergency repairs would continue to affect recreational uses in the project area and affect access to ONP by the public and ONP staff.

During unplanned road closures from storm or flood damage and emergency repairs, ONP has implemented temporary solutions to maintain access to and from the park. This has involved either (1) relocating ONP residents outside ONP, or (2) staging an ONP vehicle east of the

construction zone so ONP personnel can park their vehicles west of the work area and walk to the staged vehicles that would then be driven to ONP. ONP reports that the duration of the last episode of road damage and subsequent repair lasted approximately six months. With the No Action Alternative, similar impacts that would affect access to ONP and other recreational uses along UHRR would continue to occur.

With the No Action Alternative, if the portion of the Hoh River eligible under the Wild and Scenic Rivers Act for a wild, scenic, or recreational classification becomes classified as such, additional steps may be required to implement future improvements on the UHRR. However, the Act is meant to "safeguard the special character of these rivers, while also recognizing the potential for their appropriate use and development...(t)he Act purposefully strives to balance dam and other construction at appropriate sections of rivers with permanent protection for some of the country's most outstanding free-flowing rivers." For classified rivers, the Act prohibits federal support for actions such as the construction of dams or other instream activities that would harm the river's free-flowing condition, water quality, or outstanding resource values.

4.3.2.2 Build Alternative

Direct Impacts

During the five-month construction period that would extend from June 1 to October 31, recreationists traveling through the project area along the UHRR would periodically experience temporary traffic delays. Such access limitations would result from temporary road or one-lane closures, establishment of staging areas, and delivery, storage, or use of construction equipment. This would disrupt or discourage access to recreational uses within the Hoh District of ONP, along the Hoh River, and in the vicinity of the project work corridor. This five-month construction period coincides with the ONP's summer-fall season when the highest number of visitations typically occur. During construction, traffic typically would experience delays of about 30 minutes, although certain activities could result in delays up to 4 hours. Construction of the bridges and culvert may also occur over 10-day periods in January and February should road closures be required.

The informal boat access at MP 4.31 would be maintained to the extent possible; although temporary access disruptions could occur during construction at Sites C1 or C2.

To the extent Hoh District recreationists decide to delay or forego visits due to anticipated construction delays, use of ONP recreation areas likely would decrease. In January 2016, for example, 13,700 recreation visitors accessed the Hoh District of ONP using the UHRR. Using this measure, an estimated 6,850 recreation visitors (two percent of annual Hoh District visitation) would not have access to the Hoh District were there a full road closure during a two-week construction period in January.

Using the estimate of $1.5 million in annual spending related to Hoh River recreational fishing, if access to recreational fishing were blocked for 2 weeks of the year, approximately $50,000 in spending related to recreational fishing could be foregone or delayed.

In addition, summer and fall visits planned by recreationists could be delayed or canceled if substantial traffic delays were anticipated during construction. The potential decrease in ONP visitation during summer and fall, due to proposed project construction and related anticipated

delays, would not likely be significant due to the varying traffic volumes on the UHRR and the varying length of delays.

In the long run, the ELJ/dolosse units would represent an additional river feature seen by recreationists on the Hoh River. Fishing recreationists could use the ELJ/dolosse units to access mid-channel locations from the riverbank, similar to the lower Hoh River. Drift boats in the river would need to navigate around the ELJ/dolosse units. The presence of the ELJ/dolosse units in the river are not expected to adversely affect recreational opportunities on the Hoh River.

As the Hoh River channel changes in shape and direction, and its flow adjusts seasonally, new natural small-boat launch locations may develop. Although the project does not propose any modifications to the Morgan's Crossing informal access and boat launch area, the addition of the ELJ/dolosse units upstream may result in slight modifications to the Morgan's Crossing sand bar. Morgan's Crossing will likely remain in use as a boat launch location. WFLHD will evaluate locations within the project construction limits, as required; to create other potential boat launches concurrent with project construction.

The proposed project would result in permanent increased reliability and safety for the recreational community. Adverse impacts to recreational uses from temporary one-lane and full-road closures would not be significant.

Indirect Impacts

Having a more reliable and safe route to recreation areas in and around the project area, including the Hoh District of ONP, would encourage recreation uses in these areas. To the extent that bank stabilization structures provide additional access to the river or viewing opportunities, recreational use could increase slightly, as an indirect result of the project. During construction, temporary access limitations along UHRR could result in a minor reduction in recreational visitations to sites beyond the project area's construction corridor including the ONP, the Hoh River, and nearby state and national forest lands. However, significant adverse indirect impacts to recreation are not expected.

Cumulative Impacts

Historic adverse impacts to recreational uses from the projects listed in **Table 4-1** are similar to those expected from the proposed project. These largely are associated with temporary traffic delays for motorists resulting in reduced access to recreational uses. Because of the immediate nature of emergency repair projects, recreationists typically are unable to receive advanced notice regarding the timing or duration of traffic delays. Construction of the proposed project is not expected to occur concurrent with other projects in the UHRR corridor (although work at two or more of the six sites within the project area may occur concurrently). As a result, few and potentially shorter traffic delays are planned, compared to the frequency of delays that might occur if several projects were under construction at the same time. The proposed project, together with projects listed in **Table 4-1**, would result in greater cumulative reliability and safety on the UHRR for recreational users.

Mitigation Measures

The following mitigation measures are recommended to minimize potential impacts to recreation. Mitigation measures related to transportation and access along the UHRR also would be applicable to maintaining recreational uses.

- WFLHD would coordinate with ONP so that notices regarding UHRR delays and closures can be posted on ONP's website, in newspapers, etc.; and
- WFLHD will evaluate locations within the project's construction limits for development of potential boat launches concurrent with project construction.

4.3.3 Section 4(f) of the U.S. Department of Transportation Act of 1966

Section 4(f) of the U.S. Department of Transportation Act of 1966 (Transportation Act) provides for consideration of park and recreation lands, wildlife and waterfowl refuges, and historic sites during transportation project development. The law is implemented by the FHWA through the regulation 23 Code of Federal Regulations (CFR) 774. Section 4(f) applies to projects that receive funding from, or require approval by, an agency of the U.S. Department of Transportation. This project will be funded in part by WFLHD, a division of FHWA, therefore it is addressed for Section 4(f) applicability.

Use of a Section 4(f) property occurs when:

- Land is permanently incorporated into a transportation project;
- There is a temporary occupancy of land that is adverse in terms of the statute's preservation purpose; or
- There is a constructive use (a project's proximity impacts are so severe that the protected activities, features, or attributes of a property are substantially impaired).

For this project, the UHRR may be closed for two weeks in winter to construct the Tower Creek Bridge and the Canyon Creek Bridge. During this potential closure, the Hoh District of ONP would be inaccessible to the public. If this closure occurs, an estimated 6,850 recreation visitors would temporarily lose access to the Hoh District.

The closure would meet the criteria for a Section 4(f) temporary occupancy, a designation that does not constitute a use within the meaning of Section 4(f). These criteria as defined in 23 CFR 774.13(d) include the following:

- The duration of the closure would be less than the duration of project construction;
- No change in ownership of ONP land would occur;
- No change to the Section 4(f) property would occur; and
- No permanent adverse physical impacts or interference with the protected activities, features, or attributes of ONP are anticipated.

Based on the above evaluation, a 4(f) evaluation would not be required.

4.4 Hydrology and Hydraulics

Hydrology and hydraulics are the science of water movement through the environment. Hydrology is the study of evaporation and precipitation, characterizing the quantity and frequency of rain and snow events. Hydraulics characterizes the movement of water on the ground and through streams or rivers. The science of hydraulics can determine floodplain widths and depths, water velocities within a channel, and scour potential of the channel flow.

This section presents existing hydrologic and hydraulic conditions in the project area, which are used for analyzing the Hoh River and its floodplain. The section also evaluates the potential impacts of the proposed project on the Hoh River floodplain, erosion and deposition (channel character change and movement), and water quality.

4.4.1 Affected Environment

This section presents the existing hydrologic and hydraulic conditions in the project area. Sources of information included the Western Regional Climate Center, existing hydraulic literature pertaining to the project area, United States Geological Survey (USGS), and FEMA.

4.4.1.1 Background

The Hoh River originates at the Hoh Glacier on Mount Olympus and flows west through the Olympic Mountains of ONP, the Olympic National Forest, and private land. The broad and flat river valley allows for active meandering and dynamic channel migration. The Hoh River ends at the coast, where the river discharges into the Pacific Ocean through the Hoh Indian Reservation.

The Hoh River's watershed is 299 square miles, roughly one-sixth the size of Jefferson County. The river's streamflow varies considerably, with summer streamflow averaging about one-third of winter streamflow. The highest stream flows are typically in the spring due to annual snowmelt. The Hoh River is a glacial river fed by Mount Olympus glaciers. Glacial powder and coarser sediments settle onto the broad and flat valley in the lower river, creating gravel bars, meanders, and a sinuous or braided channel configuration. Logs are recruited from forested shorelines adjacent to the Hoh River upstream of and within the project area. These logs accumulate as logjams that can become very large. Typically, natural logjams provide refuge habitat and pools important to fish and other aquatic species. They also may create hazardous conditions for those traveling the river by boats or rafts.

4.4.1.2 Regional Climate

The Hoh Rainforest, as one of the few temperate rainforests in the northern hemisphere, receives the most intense precipitation in the continental United States. Moist air from the Pacific Ocean can bring 70 to 100 inches of rain per year to the coastal plains, an area that includes the Hoh River watershed. Inland, along the higher elevation windward slopes of the Olympic Mountains, annual rainfall can reach 150 inches. Winter snowfall ranges from 10 to 30 inches in lower elevations and 250 to 500 inches in higher elevations. In midwinter, the snowline in the Olympic Mountains fluctuates between 1,500 and 3,000 feet above sea level.

Project area year-round temperatures are generally mild, with summer highs rarely over 80°F, and winter snows in the lowlands infrequent and short-lived. The average maximum temperature in July is near 70°F along the coast and 75°F in the foothills; minimum temperatures are near 50°F.

In winter, the coastal, lower-elevation areas are generally warmer than inland, higher areas. Maximum temperatures in January range from 43°F to 48°F, and minimum temperatures range from 32°F to 38°F (WRCC 2016).

Climate science predicts that over the next century, heavy rains will become more intense, and less precipitation will fall as snow (Mauger *et al.* 2015). Currently, the Hoh River flow regime follows a general pattern of rising in the fall and dropping in the winter, when snow begins causing the mountains to retain precipitation. In spring, flows increase again as snow melts with low-flow periods typically occurring in the summer. As the snowline elevation rises, flow patterns will begin to mirror rainfall patterns more closely with the most intense flows occurring in fall, tapering off slowly throughout the winter and spring, and continuing to decline into the summer months (Mauger *et al.* 2015).

4.4.1.3 Hydrology

Each project site is associated with the Hoh River or one of its tributaries. How the proposed structures interact with the river system would depend on the individual designs used and methods of construction. **Table 4-5** shows return period[18] flow values at each site, calculated using an on-line interactive tool, StreamStats, developed by the USGS. For reference, **Table 4-5** also shows values from a flow-measuring gage near US 101.

Table 4-5. Return Period Flow Values

Site	River	Drainage Area (square miles)	10-year (cubic feet per second)	25-year (cubic feet per second)	50-year (cubic feet per second)	100-year (cubic feet per second)
C1/C2	Hoh River	223	46,500	54,700	61,700	69,400
Culvert 4.38	Unnamed Creek	0.45	113	133	150	168
C3	Tower Creek	1.51	365	428	484	541
C4	Hoh River	221	44,700	52,500	59,300	66,700
C5	Canyon Creek	1.37	339	399	450	504
USGS Gage 12041200	Hoh River	253	51,100	59,700	65,700	71,400

Source: USGS 2016.

4.4.1.4 Floodplains

The Department of Homeland Security – FEMA's mapping of the Hoh River floodplain[19] in 1982 is the current legally-defined floodplain boundary. The Hoh River 100-year floodplain covers most of the valley floor. The 100-year floodplain varies in width from approximately 700 feet to over 4,700 feet near the project. The FEMA Flood Insurance Study from 1982 categorizes this 100-year floodplain as a Zone A floodplain, which means floodplain elevations have not been established.

[18] A return period is an estimate of the likelihood of an event, such as a particular river flow, based on historic data. Water-related structures often are designed to withstand hydraulic forces from a flow event with a certain return period.

[19] An area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.

Figure 4-8 shows the FEMA floodplain boundaries for the 100-year flood event (100-year floodplain boundaries). All of the proposed project sites are within the mapped 100-year floodplain except for Site C5. The Hoh River tributaries, including Tower Creek, Canyon Creek, and the unnamed tributary at MP 4.38, do not have mapped floodplains.

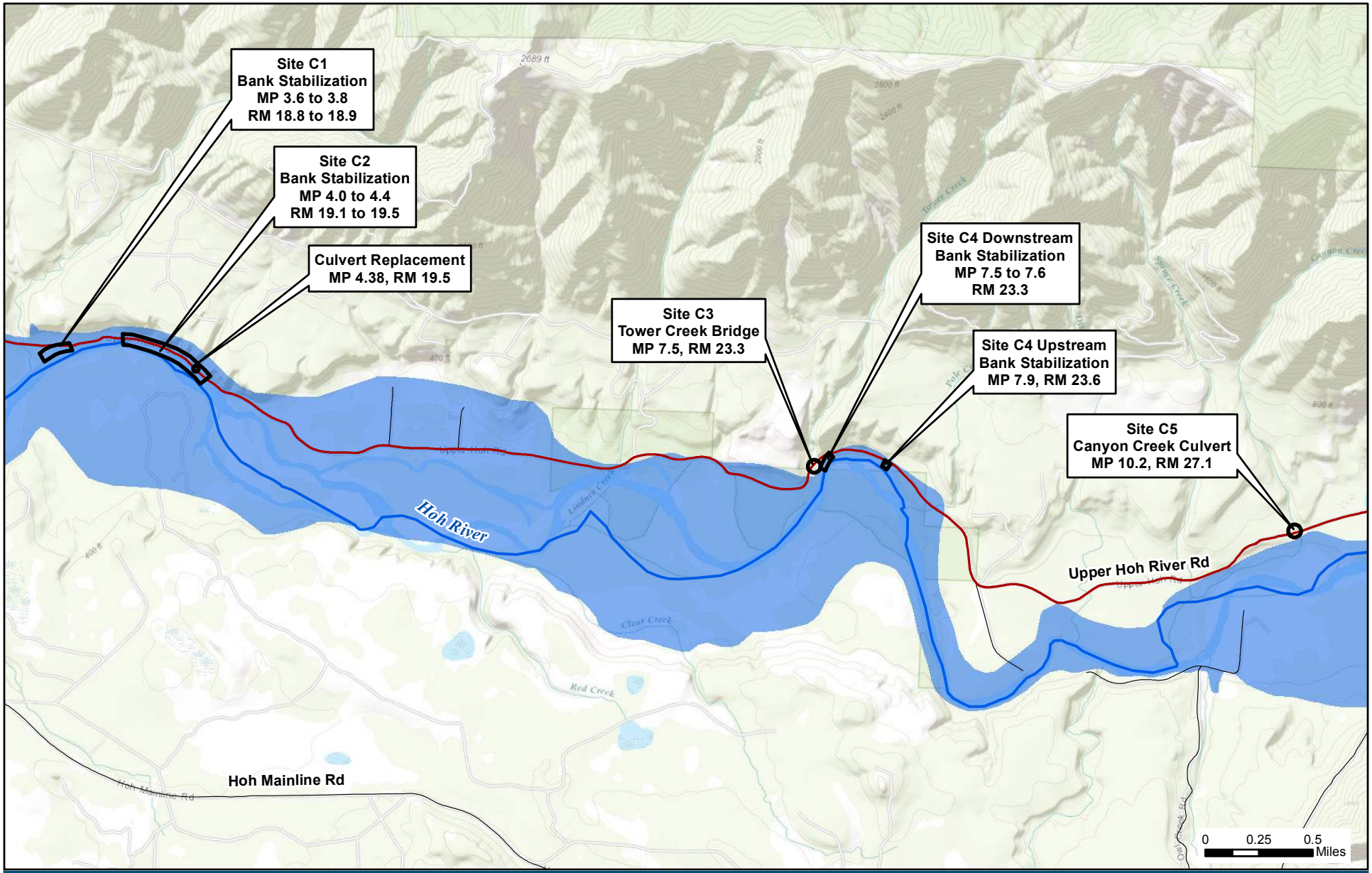
The Hoh River's frequent floods vary in intensity. **Table 4-6** lists the ten highest floods on record (since January 15, 1961), as recorded by the USGS 12041200 stream gage near US 101.

Table 4-6. Top Ten Flood Events on the Hoh River from USGS Stream Gage 12041200

Date	Flow (cubic feet per second)
Oct. 17, 2003	62,100
Nov. 6, 2006	60,700
Dec. 3, 2007	55,700
Nov. 24, 1990	54,500
Dec. 17, 1979	51,600
Dec. 26, 1980	51,100
Oct. 16, 1988	49,300
Nov. 23, 1986	48,600
Dec. 3, 1982	47,900
Nov. 29, 1995	47,600

Source: USGS 2016.

The Hoh River channel meanders across the floodplain, which is typical for low-gradient, mainstem channels in flat river valleys. Large flood events transport sediment and LWD downstream, scour channels and riverbanks, and deposit gravel along bars. This, in turn, leads to changes in the channel's migration pattern and form over time. As glaciers on Mount Olympus recede, the quantity of sediment transported to downstream depositional areas along the river channel is expected to increase (Mauger *et al.* 2015). Over time, this will intensify the braided character of the lower Hoh River's main channel.



Upper Hoh River Road Project

N

Project Location
Upper Hoh River
Upper Hoh River Road
Local Road

Floodzone Type A
100-yr Flood

Figure 4-8
Floodplains

Data Sources: Jefferson County, Washington DNR.

4.4.1.5 Water Quality

Neither the Hoh River nor the tributaries affected by the proposed bridge and culvert replacements are listed on Ecology's 303(d) list of impaired waters. The quality of these waters, therefore, is very good. Three other Hoh River tributaries near the project but not affected by the project are on the 303(d) list due to elevated temperature.

4.4.1.6 Groundwater

No significant groundwater withdrawal wells have been documented in the project area; therefore, no well-head protection areas are known to occur.

4.4.2 Environmental Consequences

This section describes direct, indirect, and cumulative impacts to hydrology and hydraulics from the project alternatives.

4.4.2.1 No Action Alternative

Under the No Action Alternative, the proposed project would not be constructed and ongoing maintenance activities would continue. Where the river abuts the road embankment, existing riprap revetments would be monitored for stability, undermining, and scour. Riprap previously installed at various locations along the riverbank, including the toe of road embankments, experience high water velocities. They do not dissipate energy or inhibit scour at nearby unprotected sections of the river channel or riverbank. When floods threaten or damage the UHRR, Jefferson County places additional protective riprap along the road embankment as an emergency measure. This practice would continue with the No Action Alternative.

Riprap revetments harden the riverbank in localized areas by preventing channel erosion. Flows deflected from riprap revetments may cause scouring or failure of nearby riverbanks or roadbed. Although riprap provides excellent scour protection, it diminishes habitat value along riverbanks. In addition, a continuous riprap revetment along a riverbank could increase bank erosion on properties immediately downstream. Revetments do not appear to affect current trends in mid-channel and floodplain sediment deposition.

The proposed bridge and culvert structures at MP 4.38 and Sites C3 and C5 would not be replaced with the No Action Alternative. Maintenance activities would continue to be required to keep the existing structures free of debris and potential blockages during high flows. Regular inspections would continue to ensure that scour protection around the structures remains intact. At Site C3 (Tower Creek), monitoring for scour would continue to be required because the Hoh River channel in this area has continued to migrate to the north. This has caused significant incising and shortening of the length of the Tower Creek channel between the bridge and the river.

4.4.2.2 Build Alternative

Direct Impacts

Bank Stabilization Sites C1, C2, and C4

The bank stabilization portion of this project would complete two continuous linear segments of bank protection in areas where the UHRR is threatened by bank erosion. Construction and installation of the ELJ/dolosse units would first require bank excavation above the OHWM to create a work area adjacent to the river for staging the ELJ/dolosse bundles and placing the crane or excavator. After this, the bed and bank of the active river channel would be excavated to install the ELJ/dolosse units. Flow diversion to fully isolate the in-water work area is not anticipated during construction. As a result, turbidity releases from the proposed in-water work would occur to a limited extent and duration during the proposed IWWW, July 15 through August 31. This would coincide with the summer low flow period to minimize water quality impacts.

Hydraulic analysis conducted for the bank stabilization work consisted of two-dimensional river modeling that provided river flow velocities in a vector matrix. The analysis examines changes to two channel characteristics: the height of the 100-year floodplain and the intensity of flow velocity across the river channel.

The ELJ/dolosse units would displace a portion of the river channel capacity, thereby compressing the active flow area and causing localized, minor rises to the 100-year floodplain elevation. The estimated local rise in overall floodplain elevation was calculated to be roughly one inch, with a maximum increase of up to six inches at Sites C1 and C2. **Table 4-7** shows the hydraulic model results for the proposed project relative to floodplain elevation rise.

Table 4-7. Hydraulic Model Results

Hydraulic Measure	Bank Stabilization Site	
	C1/C2	C4
100-year Floodplain Elevation Rise Near Bank (feet)	0.5	<0.1
100-year Floodplain Elevation Rise Across Floodplain (feet)	0.1	<0.1
Velocity Increase (feet/second)	0.1 – 3.0[1]	1.0

[1] The highest velocity increase is near the bank stabilization structure.

Water velocity from a given rate of discharge (flow) is a direct indication of scour potential. Higher flows generate higher velocities with greater scour potential. Installing ELJ/dolosse units would dissipate and redirect water velocities from the bank, thereby reducing erosion. The hydraulic analysis demonstrates this "hydraulic shadow" impact by showing that high-velocity areas are moved out and away from the bank toward the front of the ELJ/dolosse units. The resulting higher velocities along the front of the ELJ/dolosse units may induce scour along the toe of the structures; however, this effect would be lessened by the self-settling of the design that allows the structures to become more integrated into the changing riverbed. This ultimately prevents the structures from undermining dislodgement. The Corps is expected to require long-term monitoring of dolosse positions to ensure potential hazards are not created.

As a result of the spacing of ELJ/dolosse units and the hydraulic shadow effect along the riverbank, areas with lower water velocities would tend to accumulate fine-texture sediments.

Woody debris also would accumulate at the ELJ/dolosse units as fallen logs washed away during flood flows are recruited to the river. Higher water velocities that become redirected waterward from the riverbank along the ELJ/dolosse units would tend to scour bed materials and deposit the sediments at gravel bars downriver. Mid-channel and floodplain sediment deposition, however, would not be expected to change significantly. Except for the riverbank segments protected by existing riprap revetments and the proposed bank stabilizations, erosion and migration of the natural, active channel would continue.

Culvert at MP 4.38

The existing 72-inch culvert at MP 4.38 periodically plugs with debris, forcing water up and over the top of the UHRR (see **Figure 4-9**). The project would replace the culvert with a 16- by 16-foot box culvert, which would pass water and debris more freely, reducing the need for maintenance and the risk of water overtopping the road. The concrete segments of the new culvert would be fabricated off-site, avoiding the need to pour concrete near the stream channel, thereby eliminating the risk of potential adverse water quality impacts to the tributary or river.

The new culvert's configuration and dimensions would allow the natural width of the unnamed tributary to be unconstrained within the culvert, and would provide a structure with water depth and velocity conditions more suitable to successful fish passage. It would also reduce backwater impacts that may currently exist, and in turn benefit the unnamed tributary's floodplain. The new culvert is not expected to increase downstream flooding effects to the Hoh River floodplain. With implementation of proposed standard BMPs during construction and operation, potential impacts to hydrology and hydraulics would be negligible.

Figure 4-9. Existing Culvert at MP 4.38, Downstream End

Site C3 Tower Creek Bridge

The proposed project would include replacing the existing Tower Creek Bridge with a new, longer bridge with the same vertical clearance as the existing bridge (approximately 18 feet from the creek bed to the bridge soffits). Maintaining this clearance would continue to allow the unrestricted passage of flood flows under the bridge. The new bridge would be approximately the same height and almost twice as long as the existing bridge. The proposed bridge would not cause any backwater conditions or result in higher levels of flow downstream; therefore, no adverse impacts to the floodplain upstream or downstream from the structure are anticipated.

As part of construction, the Tower Creek stream channel would be restored near the bridge. Riprap installed to protect the existing bridge would be removed, and approximately 50 feet of the stream channel bed would be restored. Riprap to protect the new bridge foundation would be buried under streambed material to isolate the heavy rock from the channel.

The bridge would be constructed upstream of the current location, where the wider channel may necessitate a longer bridge to cross the channel. The new location of the bridge also would require an adjustment to the road alignment.

Stormwater from the proposed bridge and its approaches would be collected, dispersed, and allowed to infiltrate along the shoulder of the UHRR, similar to existing conditions. Road runoff would not be directly discharged to Tower Creek or the Hoh River.

Impacts from construction of the Tower Creek Bridge would be the same as for MP 4.38. With standard BMPs and off-site fabrication of the structure's concrete components, significant adverse impacts would be avoided.

Site C5 Canyon Creek Bridge

Canyon Creek currently crosses underneath the UHRR through an approximately 96-inch culvert. The project would replace this culvert with a bridge. As a result, the hydraulic cross-sectional area that the creek currently passes through would be increased. This would eliminate or reduce flow constraints and upstream backwater conditions associated with the existing culvert because the new bridge would fully span the channel. In general, bridges are better at passing floodwaters than culverts installed using former culvert design standards. Under current design guidelines for culverts, backwater conditions and related upstream flooding would be uncommon.

Stormwater from the proposed bridge and its approaches would be collected, dispersed, and allowed to infiltrate along the shoulder of the UHRR, thereby avoiding any direct discharges of untreated stormwater to Canyon Creek.

Potential adverse impacts from construction of the Canyon Creek Bridge would be similar to those for the Tower Creek Bridge. Such impacts would be minimized through the use of standard construction BMPs and the off-site fabrication of concrete bridge components.

Indirect Impacts

Over time, ELJ/dolosse units tend to recruit additional debris at the point where they have been installed along the riverbank. As the logjams further develop in the project area, they would cause the aquatic habitat availability and diversity to increase along the river channel.

The hydraulic analysis reviewed potential upstream and downstream effects that could result from the project and determined that channel or riverbank erosion would not increase beyond the project limits.

Indirect impacts to hydrology and hydraulics are not anticipated at any of the bridge or culvert sites.

Cumulative Impacts

The proposed project, together with the projects listed in **Table 4-1**, would result in further hardening of the north bank of the Hoh River. Past projects have hardened the bank with riprap, which has diminished shoreline habitat. The proposed project's ELJ/dolosse units would enhance shoreline habitat as a beneficial substitute to the former practice of installing riprap for erosion protection.

Agencies have been constructing projects since the 1990s (and likely prior to the 1990s) that protect and repair the UHRR. These projects are either riprap bank stabilization projects or culvert or bridge repairs or replacements. Each bank stabilization project has incrementally contributed to hardening the north bank of the Hoh River. The projects have been installed where the Hoh River threatens the integrity of UHRR in the general vicinity of MP 4 and MP 7. Over time, the riprap at these locations has restricted the river migrating laterally toward the road and, by doing so, has reduced the extent of aquatic habitat along the shoreline. The proposed project's ELJ/dolosse units, however, would restrict river migration toward the road, but in a manner that also benefits aquatic habitat along the shoreline.

Continued hardening of the channel banks in these areas is necessary to protect the UHRR. If the proposed ELJ/dolosse methods are not implemented, local agencies would continue emergency riverbank stabilization repairs using riprap with adverse consequences to aquatic habitat. Over time, proposed bank stabilization combined with reasonably foreseeable future bank stabilization projects using similar methods would help restore aquatic habitat along the riverbank and prevent further degradation.

Over the past ten years, more than ten stream crossing structures (culverts and bridges) along UHRR have been repaired or replaced. Some of the replaced culverts eliminated fish passage barriers, improving the availability of aquatic habitat. The proposed project would replace three more stream crossing structures. Stream crossings are now constructed with greater cross-sectional area than in the past. This allows water to pass during most flows without restricting the channel's configuration or ability to transport sediment and with more favorable fish passage conditions. In general, culvert and bridge replacements are beneficial to the aquatic and hydraulic environment. The three stream-crossing structure replacements, together with past and reasonably foreseeable future structure replacement projects, would contribute to improving aquatic habitat conditions and fish passage in the Hoh River tributaries along the UHRR.

Mitigation Measures

Standard stormwater BMPs would be employed at all project sites during construction as required by the project's National Pollution Discharge Elimination System (NPDES) construction stormwater permit. BMPs would minimize the release of turbid water from the construction site, thereby protecting water quality, and would follow current permit requirements for erosion and

sediment control. A long-term monitoring program would be implemented to track the settling and potential dislodgement of the ELJ/dolosse unites over time, to avoid creation of potential navigational hazards.

FEMA has not established base flood elevations along the Hoh River or its tributaries; therefore, compensatory mitigation for fill is not required.

Two mitigation projects are proposed that would improve aquatic impact conditions in the project areas. The primary mitigation project would be constructed in the area between approximately MP 6.7 and MP 7.3 of the UHRR, west of Site C3 (Tower Creek). In this area, a large side channel meander of the Hoh River has formed where the mainstem was formerly located prior to approximately 2010. Lindner Creek and several other creeks flow into this large side channel. Lindner Creek, the large main channel, and the high-water channels on the 'peninsula' comprise a side channel complex. In order to preserve the side channel complex, WFLHD would install approximately 24 ELJs in an arc configuration, extending approximately 0.8 mile south and west from MP 7.3 of the UHRR, crossing the lower section of the side channel complex.

The second proposed mitigation project would involve installing four ELJs in front of the existing riprap from just upstream of the Hoh River confluence with Spruce Creek to MP 9.8. Because the riprap is stacked steep, removing it would remove the buttress effect the riprap currently has on the UHRR roadbed. Placing the ELJs in front of the riprap would reduce local flow velocity. The ELJ design would be similar to the ELJ/dolosse units installed as part of the proposed project. Section 4.6.2.2 contains further details about these projects and their fish and wildlife habitat benefits.

4.5 Vegetation and Special Status Plants

This section addresses existing vegetation and special status vascular and non-vascular plants in the project area and provides an assessment of potential direct, indirect, and cumulative impacts on vegetation from the project alternatives. For the purposes of assessing impacts on vegetation, the project area includes a 100-foot-wide corridor along either side of the UHRR from approximately MP 3.6 to MP 10.2, and the adjacent Hoh River bank where bank stabilization work is proposed.

4.5.1 Affected Environment

This section includes information about vegetation in the project area. Information sources include previously existing studies, records of coordination with state and federal agencies, and field reconnaissance conducted by biologists in July 2016 and April 2017. Further information on background resources and methods for gathering this information is included in the Biological Survey Report (David Evans and Associates [DEA] 2015a), Wetland Delineation Report (DEA 2015b), Biological Assessment (BA) (DEA 2016), and Wetland Addendum (DEA 2017) for the project, which are included as **Appendices E, F, G, and J** respectively.

4.5.1.1 Vegetation

The project area is located in the Westside Lowland Conifer-Hardwood Forest habitat type, as described in *Wildlife-Habitat Relationships in Oregon and Washington* (Johnson and O'Neil 2000).

Native forest in the project area is dominated by trees such as Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*) in lower elevations, and silver fir (*Abies amabilis*) at higher elevations. Early successional and riparian forest is dominated by red alder (*Alnus rubra*) and bigleaf maple (*Acer macrophyllum*). Understory areas include salmonberry (*Rubus spectabilis*), vine maple (*Acer circinatum*), swordfern (*Polystichum munitum*), devil's club (*Oplopanax horridus*), and red elderberry (*Sambucus racemosa*) (see **Figures 4-10a and 10b**).

The project area ranges in elevation from approximately 250 feet to 400 feet. Although much of the project area has been previously logged, which has reduced structural complexity and habitat diversity across the lower Hoh River watershed, the portion of the upper Hoh River watershed within ONP is protected, and therefore remains in pristine condition.

The majority of the project area is occupied by native upland and wetland forest vegetation, except for the ditches and cleared areas adjacent to the roadside. In ditches and cleared areas, non-native species such as Himalayan blackberry (*Rubus armeniacus*) and creeping buttercup (*Ranunculus repens*) are present.

Vegetation near Site C1 is a mixture of disturbed and mature wetland and upland forest, indicated by slight changes in topography, groundwater movement, and the presence of berms created by past digging of ditches adjacent to the UHRR. Soils are primarily silty clay loams, and trees in the vicinity of Site C1 are on average 75 feet to 100 feet tall. A few trees reach approximately 125 feet in height. Upland areas near Site C1 contain western hemlock and swordfern. A narrow band of riparian vegetation between the UHRR and the Hoh River has eroded somewhat, and resulted in the road dropping steeply to the river. A section of bank near the east end of Site C1 has undergone emergency repair.

Site C2 is similar to Site C1 in terms of vegetation, although the forest near Site C2 is somewhat younger and topography much steeper. Soils are derived primarily from sandstone, which is visible in cut banks and results in much better drainage than soils found near C1. Similar to Site C1, a narrow band of riparian vegetation is present intermittently between the UHRR and the Hoh River, except where it has eroded away. This area varies between 30 and 80 feet wide and is composed almost entirely of young deciduous trees and shrubs. Forest upslope of the UHRR on the west end of Site C2 is mature conifer forest.

Figure 4-10a. Typical Vegetation near the Project

Figure 4-10b. Typical Vegetation near the Project

The area surrounding the culvert at MP 4.38 (which is located within Site C2) contains largely disturbed roadside vegetation. Upstream of the road, the unnamed tributary flows through a riparian zone dominated by young- to middle-successional forest containing mainly red alder, with surrounding mid-successional upland forest containing mainly Sitka spruce.

The forest near Site C3 (Tower Creek Bridge) is older than near other sites, with greater cover by Sitka spruce, and taller trees (approximately 100 feet to 125 feet tall, on average), particularly west of the creek. Fewer red alder are present, but they are older and covered by moss and lichen, similar to the few big-leaf maple (*Acer macrophyllum*) trees present in this area. The understory contains dense sword fern as well as relatively fewer wetlands and less salmonberry and vine maple cover, when compared to other areas in the project area as a whole. LWD and snags are relatively large and abundant near Site C3. Vegetation surrounding the adjacent Jefferson County storage area is disturbed.

Vegetation near Site C4 is very similar to Site C1, but with larger, mossy red alder and more cover by slough sedge in the wetlands. Several large spruce and alder snags are present, but LWD is limited, especially within wetlands. Tower Creek, a tributary to the Hoh River, flows into the river at the west end of Site C4. Forest adjacent to the east end of Site C4 is mostly large conifer trees with a deciduous understory.

Site C5 (Canyon Creek culvert) is characterized generally by younger forest, dominated by deciduous red alder along the stream with young conifer forest on the adjacent slopes. Canyon Creek is a tributary to the Hoh River, but the UHRR crossing of Canyon Creek is approximately 1,500 feet north of the river. Swordfern is the dominant species in the understory near Site C5, and recent clear-cut areas exist directly east of Site C5. A few patches of older hemlock forest are located southwest and southeast and Site C5. No wetlands exist near Site C5.

4.5.1.2 Special Status Plants

No federally-listed vascular plants, bryophytes, fungi, or lichens are documented or suspected to occur in the project area (USFWS 2015a; USFS/BLM 2015).

The WDNR identifies 32 rare plant species with known or historical occurrences in Jefferson County (WDNR 2016). The USFS identified 22 plants, bryophytes, fungi, or lichens that are listed as "sensitive" within the Washington region and documented within the Olympic district. Of these WDNR and USFS special status plant species known to occur near the project area, the species found in **Table 4-8** were determined to likely exist within the project area, based on documented occurrences in the Hoh River watershed or in the Calawah River watershed (USFS 2014).

The Calawah River watershed is located two drainages and less than 10 miles north of the Hoh River, and contains low-elevation forest habitat similar to the project area. Based on this similarity and given the presence of suitable habitat, species present in the Calawah River watershed were assumed to also be present in the Hoh River watershed. However, surveys conducted by the USFS in May through September of 2012 of the Calawah River watershed did not detect the presence of suitable habitat (USFS 2014). Further, whether any plant species surveys have been conducted within the Hoh River project area is unknown.

Table 4-8. Special Status Plant Species Potentially Occurring in the Project Area

Common Name	Scientific Name	USFS / State Status	Habitat Requirements	Potential Occurrence in the Study Area?	Project Impacts?
Pacific lance-leaved spring beauty	*Claytonia multiscapa ssp. pacifica*	S / ST	Vernally moist areas. Flowers spring to early summer.	Yes	May Impact
Spleenwort-leaved goldthread	*Coptis asplenifolia*	S / SS	Moist woods and bogs. Flowers April through May.	Yes	May Impact
Pink fawn lily	*Erythronium revolutum*	– / SS	High precipitation areas within 100 km of the coast; in moist soil in open or moderately shaded forests, but requires full light at ground level.	Yes	May Impact
Quinault fawn lily	*Erythronium quinaultense*	S / ST	Openings and rocky ledges in coniferous forests. Flowers in May.	Yes	May Impact
Branching montia	*Montia diffusa*	S / –	Moist woods at low elevations. Flowers April to July.	Yes	May Impact
Northern grass-of-Parnassus	*Parnassia palustris var. tenuis*	S / SS	Riparian areas, moist meadows and bogs; at or near seeps, springs, and roadside ditches. Flowers July to August.	Yes	May Impact
Loose-flowered bluegrass	*Poa laxiflora*	– / SS	Moss-covered rocks and logs, along streams and rivers, and on edges of wet meadows in moist, shady woods.	Yes	May Impact
Great polemonium	*Polemonium carneum*	S / –	Thickets, woodlands and forest openings, from near sea level to moderate elevations in the mountains. Flowers May to August.	Yes	May Impact
Iwatsukiella moss	*Iwatsukiella leucotricha*	S / SE	On trunks, twigs, and branches of conifers along exposed, fog-drenched, high-elevation coastal ridges.	No	No Impact

Source of Habitat Requirements: USFS 2014. Source of Habitat Requirements: WDNR 2015a.

State Status: SC = State Species of Concern; SE = State Endangered; SS = State Sensitive; ST = State Threatened
USFS Status: S= Sensitive or Strategic

4.5.2 Environmental Consequences

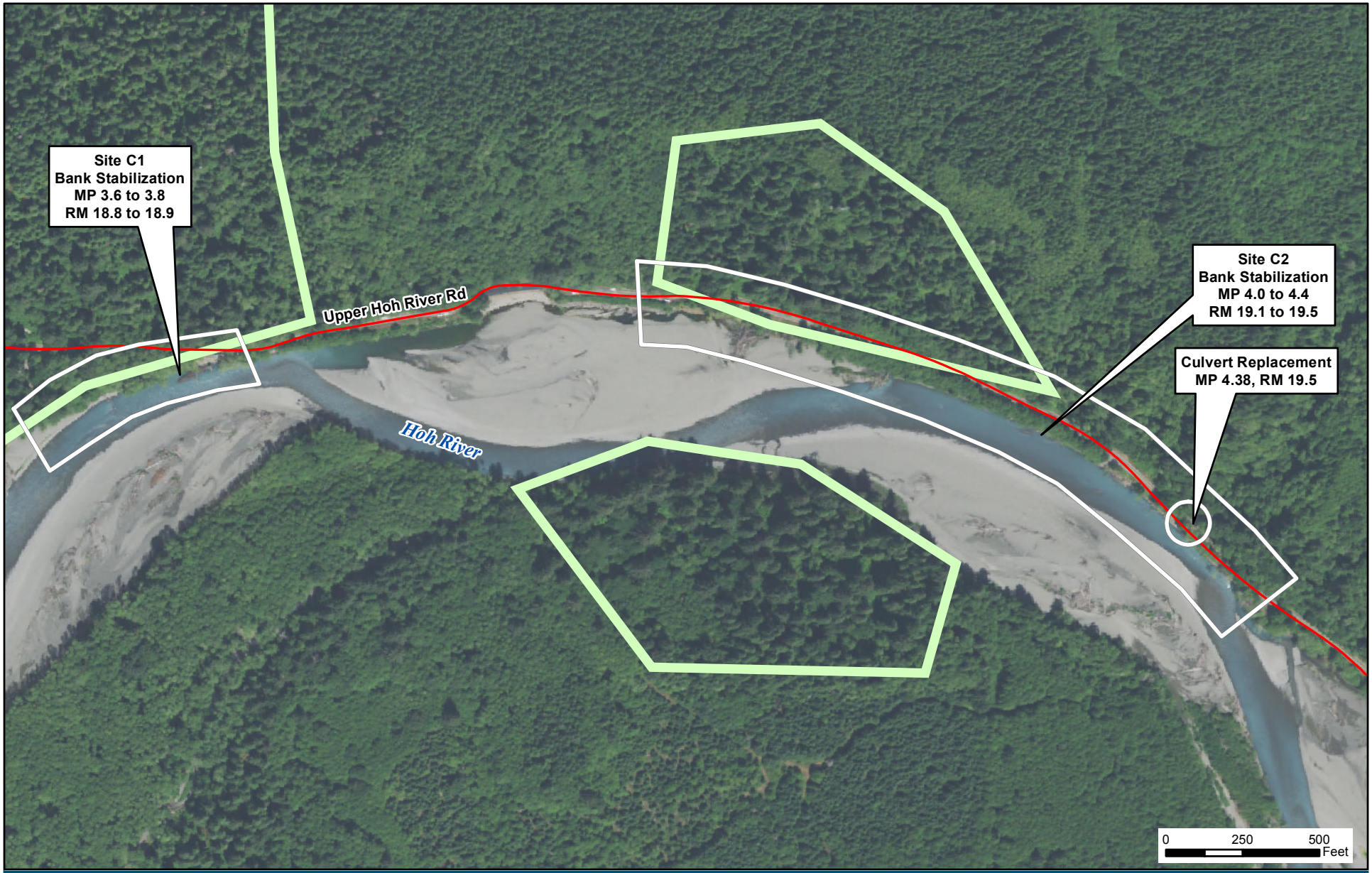
This section describes direct, indirect, and cumulative impacts to vegetation and special status plants from the project alternatives.

4.5.2.1 No Action Alternative

With the No Action Alternative, ongoing maintenance, monitoring, and emergency bank stabilization projects would continue to occur along the UHRR, as necessary, to maintain UHRR access. Emergency bank stabilization projects would continue to adversely affect immediately-adjacent riparian areas through the removal of vegetation for the purpose of providing staging and equipment storage for emergency placement of riprap.

No impacts to special status plant species are anticipated. Although no specific surveys have been conducted, emergency actions are not likely to affect potential suitable habitat for rare plants.

Several stands of potentially mature forest that could provide habitat, including nest platforms for marbled murrelets or northern spotted owl, are found along the UHRR (**Figures 4-11a through 11c**). Early and mid-successional forest is also used by these species for foraging and dispersal. Depending on the location and extent of emergency repair work, impacts to vegetation could include removal of riparian plants, mature forest, or early and mid-successional forest.



Upper Hoh River Road Project

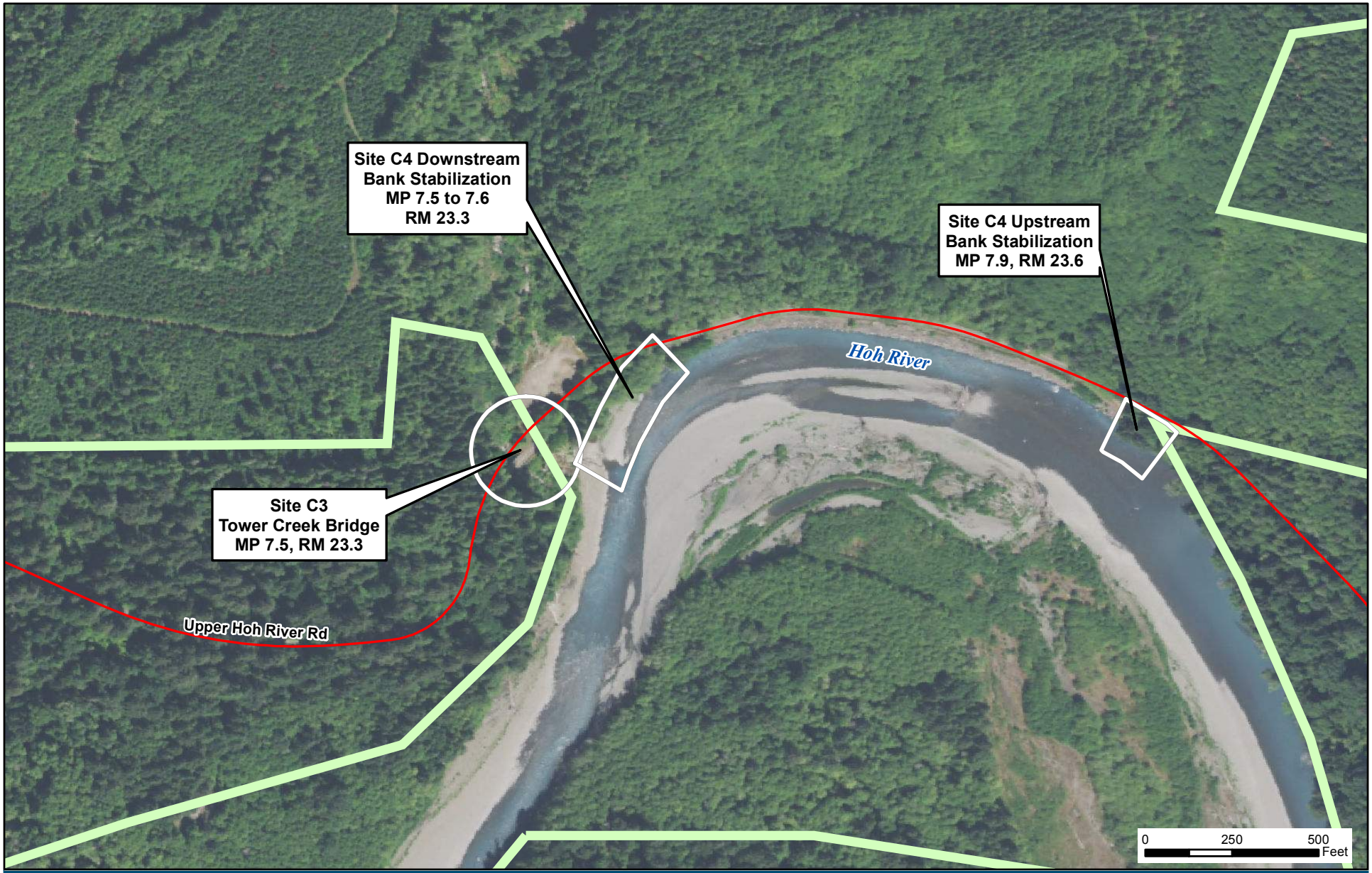
N

Project Location
Upper Hoh River Road
Mature Forest

Disclaimer: Mature forest stands delineation based on aerial photography. No ground-truthing conducted. Stands within Olympic National Park not delineated.

Figure 4-11a
Mature Forest

Data Sources: USDA 2015 NAIP, Jefferson County. Washington DNR.



Upper Hoh River Road Project

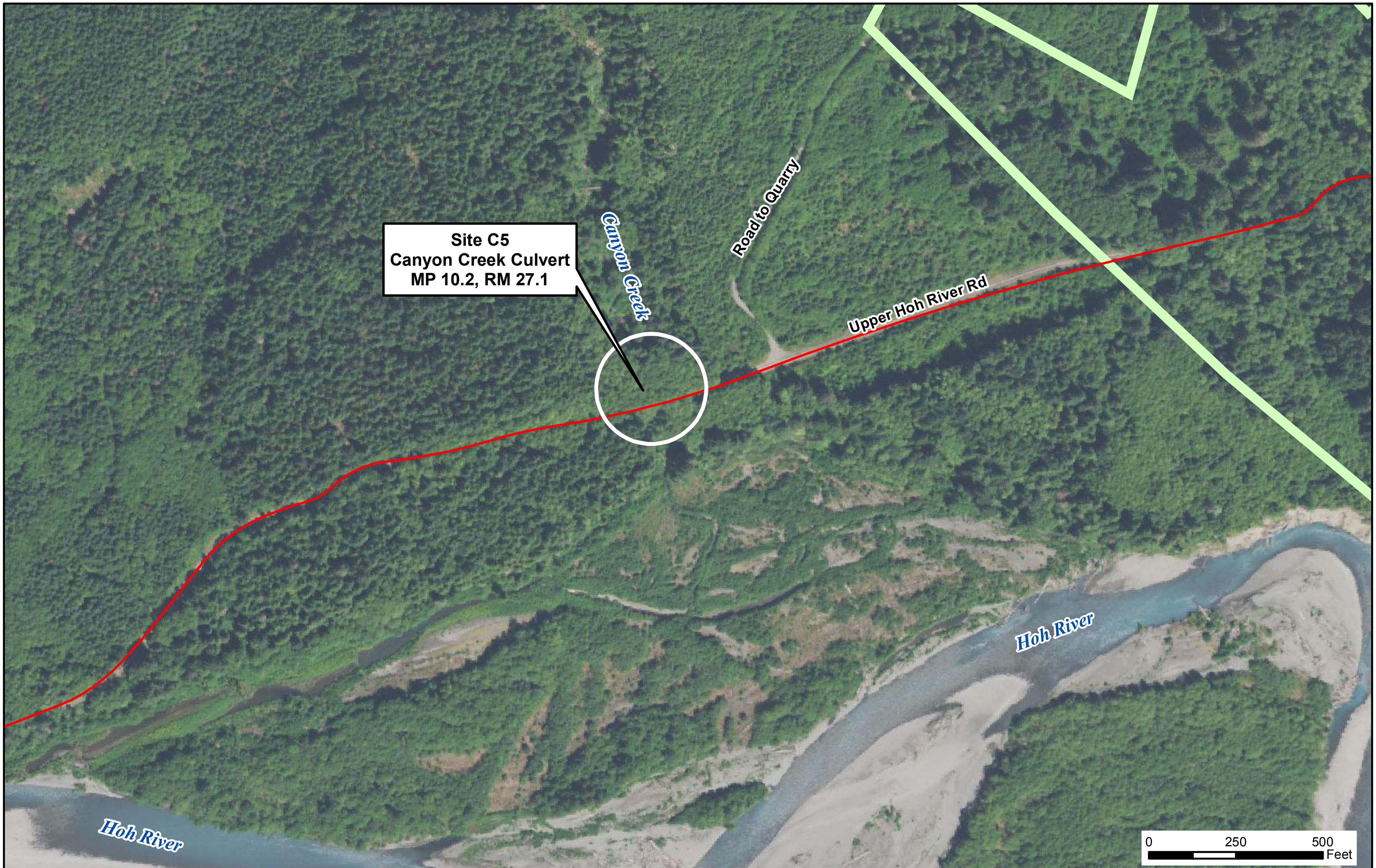
N

Project Location
Upper Hoh River Road
Mature Forest

Disclaimer: Mature forest stands delineation based on aerial photography. No ground-truthing conducted. Stands within Olympic National Park not delineated.

Figure 4-11b
Mature Forest

Data Sources: USDA 2015 NAIP, Jefferson County. Washington DNR.



Upper Hoh River Road Project

N

Project Location
Upper Hoh River Road
Mature Forest

Disclaimer: Mature forest stands delineation based on aerial photography. No ground-truthing conducted. Stands within Olympic National Park not delineated.

Figure 4-11c
Mature Forest

Data Sources: USDA 2015 NAIP, Jefferson County. Washington DNR.

4.5.2.2 Build Alternative

Direct Impacts

Bank Stabilization Sites C1, C2, and C4

The installation of ELJ/dolosse units at Sites C1, C2, and C4 would affect vegetation. These impacts would include the removal of riparian bank vegetation to allow for installation of ELJ/dolosse units. As shown in **Table 3-2**, approximately 157,000 square feet of land would be cleared of vegetation to provide construction access and equipment and materials storage and staging areas near Sites C1, C2, and C4. Vegetation clearing would include removing a total of 217 trees, 10 of which are large conifer trees.

Most of the vegetation to be removed is located in a narrow corridor between the UHRR and the Hoh River along Site C2. In this location, vegetation experiences a relatively high level of disturbance from repeated high water scour events and human activities. Loss of riparian vegetation associated with ELJ/dolosse installation would be partially offset by proposed revegetation, including alder and cedar tree planting and willow pole planting at each bank stabilization site (see design plans in **Appendix I**). To the extent practicable, and depending on the size of trees and on river conditions at the time of construction, trees removed will be placed into the river to contribute to the naturally occurring LWD.

MP 4.38 Culvert

The proposed project would include replacing the existing undersized 72-inch culvert at MP 4.38 with a much larger 16- by 16-foot concrete box culvert that would pass flood flows and debris without plugging. Construction would be coordinated with construction of the bank stabilization units at Site C2, which surrounds the MP 4.38 culvert location. Vegetation removal for this culvert is anticipated to be minimal. Up to three large conifers, greater than 18 inches in diameter, would be removed during construction.

Site C3 Tower Creek Bridge and Site C5 Canyon Creek Bridge

Installation of the new bridges would result in removal of a variety of trees. As shown in **Table 3-2**, approximately 70,000 square feet of land would be cleared of vegetation to provide for access, staging, construction activity, and storage near Sites C3 and C5. Vegetation clearing would include removing a total of 70 trees, 10 of which are large conifer trees. All 10 conifers would be removed from Site C3, Tower Creek Bridge. Few conifers exist near Site C5, Canyon Creek; therefore, no removal of conifers near Site C5 would occur.

More tree removal would occur on the west side of Tower Creek Bridge, along the north edge of the existing UHRR, as opposed to the east side, due to the revised alignment. Various deciduous shrubs within the Tower Creek and Canyon Creek riparian zones would be removed in order to widen the existing creek channels. After construction, riparian vegetation would be partially restored by planting native shrubs and trees.

Overall, construction of Tower Creek Bridge is likely to remove the most large conifers of any of the sites (**Table 3-2**) but relatively little overall vegetation.

Indirect Impacts

In general, the proposed project would have limited indirect adverse impacts to vegetation in the long term because vegetation would be restored after construction. Culvert and bridge replacements would provide improved long-term hydraulic connectivity, allowing riparian areas to become restored over time.

Cumulative Impacts

Agencies with jurisdiction in and around the UHRR have completed over 40 projects in the project area since the 1990s. Approximately 20 of these 40 projects were in response to emergencies such as a shifting river channel contributing to bank failure or debris falling into the river, which in turn compromised the road. Projects in **Table 4-1** include 10 bank stabilization projects and over 10 culvert or bridge repair or replacement projects.

In general, these projects have had minor impacts to vegetation. Some riparian bank vegetation was likely removed during each project, but in some cases, all bank vegetation had already been lost to natural bank avulsion. Also, many of these projects were conducted for the express purpose of improving or restoring native vegetation and aquatic conditions, which provide a long term cumulative benefit to native plant communities.

The proposed project would have a minor adverse cumulative impact to vegetation along the UHRR because only about four acres (**Table 3-2**) of native plant communities would be temporarily disturbed. Such impacts would be mitigated by revegetating the riverbank in disturbed construction areas and by the long-term development of vegetation along the riverbank at Sites C1, C2, and C4, which would be protected from future disturbance by the ELJ/dolosse units.

Mitigation Measures

The following mitigation measures are recommended to offset impacts to vegetation:

- Remove mature trees greater than 21 inches diameter at breast height (dbh) only if absolutely necessary for project construction;
- Use logs procured outside the project area for the ELJs;
- Utilize larger trees when planting the riparian zone (at least 5-gallon size) to speed up establishment; and
- Stabilize cleared ground as necessary to prevent erosion, particularly on slopes adjacent to the Hoh River or its tributaries.

The contractor will employ the following BMPs to reduce the potential for introduction or spreading of noxious weeds during construction:

- Inspect materials and equipment for noxious weeds or seed material prior to bringing them on-site;
- Clean equipment as needed;
- Retain shade on imported materials to suppress weeds to the extent practicable;
- Retain native vegetation to the extent possible;

- Use native plants and certified weed-free products for re-vegetation;
- Incorporate weed prevention into final vegetation restoration plan; and
- To the extent feasible, place in the river trees removed due to the project.

Two mitigation projects would be constructed to benefit the long-term development of vegetation in the project area. The primary mitigation project will be constructed in the area between approximately MP 6.7 and MP 7.3 of the UHRR, west of Site C3 (Tower Creek). Lindner Creek, the large main channel, and the high-water channels on the 'peninsula' comprise a side channel complex. Long-term preservation of the side channel complex would (1) protect the remaining mature forest stand south of the UHRR, and (2) encourage riparian forest development in the area surrounding the side channel complex, by preventing a future channel avulsion.

In order to preserve the side channel complex, approximately 24 ELJs would be installed in an arc configuration, extending approximately 0.8 mile south and west from MP 7.3 of the UHRR, crossing the lower section of the side channel complex. Each ELJ would consist of approximately 10 dolosse/log bundles, each comprised of one dolos connected to two or three logs. Between the ELJs, the bank would be planted with cottonwood, bank willow, and emergent willow. In addition, the bank would be stabilized using a mixture of gravel and cobble.

Installation of the ELJs would require use of an existing side road off the UHRR that is currently used for drift boat access to the river. The extended portion of the road would be replanted with dense native shrubs and trees once ELJ installation is complete. Vegetation clearing for the newly extended access road would be primarily limited to young alders and willows.

The second proposed mitigation project will involve installing four large ELJs in the Hoh River adjacent to and upstream of the confluence of Spruce Creek, to MP 9.8. The ELJs would be placed in front of the existing riprap and would be similar in design to the ELJ/dolosse units previously described for the proposed project. They would preserve existing riparian vegetation at this location, where the river is actively scouring upstream of the riprap installation (installed by Jefferson County in an emergency).

4.6 Fish and Wildlife

This analysis addresses general fish and wildlife resources, as well as special status fish and wildlife, in accordance with NEPA and the federal Environmental Species Act (ESA). This section also provides an assessment of the potential direct, indirect, and cumulative impacts of the project alternatives on these resources. For the purposes of this analysis, the project area surrounds the UHRR from approximately MP 3.6 to MP 10.2 and includes the areas of the adjacent Hoh River where bank stabilization work is proposed.

4.6.1 Affected Environment

This section describes the existing fish and wildlife resources within the project area. Information on biological resources was gathered from existing documentation and references, coordination with state and federal agencies, and field reconnaissance conducted by biologists in 2015 and 2016. Further information on background resources and methods for gathering this information is included in the Biological Survey Report (DEA 2015a), Wetland Delineation Report (DEA 2015b), and BA (DEA 2016), which are included as **Appendices E, F, and G**, respectively.

4.6.1.1 Fish

The project area includes a portion of the upper Hoh River, which is located on the west side of the Olympic Mountains and drains a watershed area of 345 square miles. It originates from the glaciers of Mount Olympus at approximately 4,000 feet in elevation and flows west for approximately 57 miles to the Pacific Ocean.

Much of the Hoh River watershed lies within ONP, and has therefore been protected from human impacts. Downstream of the park, riparian and in-stream habitats within the watershed have been adversely affected by nearby roadway operations and timber harvest practices. Key problems include reduced river recruitment of LWD; poor riparian conditions from vegetation loss along roadways; and scoured, incised side channels that lack spawning and rearing habitat. Reduction in the quantity and quality of off-channel habitat connected to the main river channel has been observed. Timber management practices in some areas resulted in decreased levels of LWD, increased landslides, and increased sedimentation in off-channel habitat (Smith 2000).

The Hoh River supports populations of coho salmon (*Oncorhynchus kisutch*), sockeye salmon (*O. nerka*), fall Chinook salmon (*O. tshawytscha*), spring/summer Chinook salmon, chum salmon (*O. keta*), pink salmon (O. *gorbuscha*), winter and summer steelhead (*O. mykiss*), cutthroat trout (*O. clarkii*), and bull trout (*Salvelinus confluentus*). Other fish species present in the Hoh River and its tributaries include mountain whitefish (*Prosopium williamsoni*), shorthead sculpin (*Cottus confusus*), torrent sculpin (*C. rhotheus*), reticulate sculpin (*C. perplexus*), prickly sculpin (*C. asper*), coast range sculpin (*C. aleuticus*), riffle sculpin (*C. gulosus*), longnose dace (*Rhinichthys cataractae*), three-spine stickleback (*Gasterosteus aculeatus*), Pacific lamprey (*Lampetra tridentada*), and western brook lamprey (*L. richardsoni*) (Mongillo and Hallock 1997).

Coho salmon are the most abundant fish species in the watershed; however, their populations have declined since 1992 (Smith 2000). According to the Hoh River Tribe, coho salmon stocks declined sharply in 2015, leading to a tribal fishery closure for that species (Hoh Tribe 2016). This observation is consistent with WDFW salmon abundance trend data (**Table CR-1** below), which shows 2015 had the lowest coho population levels since 2006. Fall and spring/summer Chinook salmon as well as winter steelhead stocks have shown similar downward trends for some recent years prior to 2015 (**Table CR-1** and **Figure CR-2**). Bull trout, chum salmon, pink salmon, and summer steelhead likely have the smallest salmonid populations in the watershed, with the least known about population abundance and distribution.

Table CR-1. WDFW Salmonid Stock Abundance Estimates for Hoh River Salmon Populations (1973-2015)

Year	Coho Salmon	Fall Chinook	Spring/Summer Chinook	Winter Steelhead
1973	N/A	2,100	817	N/A
1974	N/A	1,936	791	N/A
1975	N/A	2,028	546	N/A
1976	2,300	2,500	621	1,290
1977	2,400	2,100	1,015	2,786
1978	2,100	1,900	1,351	3,002
1979	5,000	1,700	1,442	1,723

Year	Coho Salmon	Fall Chinook	Spring/Summer Chinook	Winter Steelhead
1980	1,700	2,200	842	2,660
1981	1,900	3,100	1,498	2,224
1982	3,600	4,500	1,553	3,984
1983	1,735	2,500	1,696	4,593
1984	7,400	1,900	1,430	3,670
1985	2,218	1,725	978	3,228
1986	4,270	4,981	1,248	3,000
1987	3,516	4,006	1,710	2,908
1988	2,350	4,068	2,605	2,906
1989	3,321	5,102	4,721	2,808
1990	2,094	4,236	3,894	2,390
1991	4,129	1,420	1,078	2,783
1992	4,045	4,003	1,018	2,061
1993	1,345	2,280	1,411	2,053
1994	1,161	3,967	1,699	2,239
1995	4,710	2,202	1,132	2,204
1996	4,858	3,022	1,372	2,304
1997	1,386	1,773	1,826	3,008
1998	4,418	4,257	1,287	3,689
1999	4,594	1,924	1,027	3,095
2000	6,772	1,749	492	3,162
2001	10,773	2,560	1,159	2,767
2002	9,009	4,497	2,466	2,811
2003	6,273	1,681	1,228	1,616
2004	4,702	3,237	1,786	2,268
2005	4,711	4,180	1,193	1,480
2006	1,310	1,422	904	3,547
2007	3,020	1,655	750	3,026
2008	2,461	2,849	671	2,419
2009	6,595	2,081	880	2,256
2010	N/A	N/A	N/A	2,234
2011	5,933	1,293	827	3,499
2012	4,046	1,937	915	3,221
2013	2,899	1,269	750	2,302
2014	4,565	1,933	744	1,786
2015	1,794	1,955	1,070	2,227

N/A = Data not available.
Source: WDFW 2016.

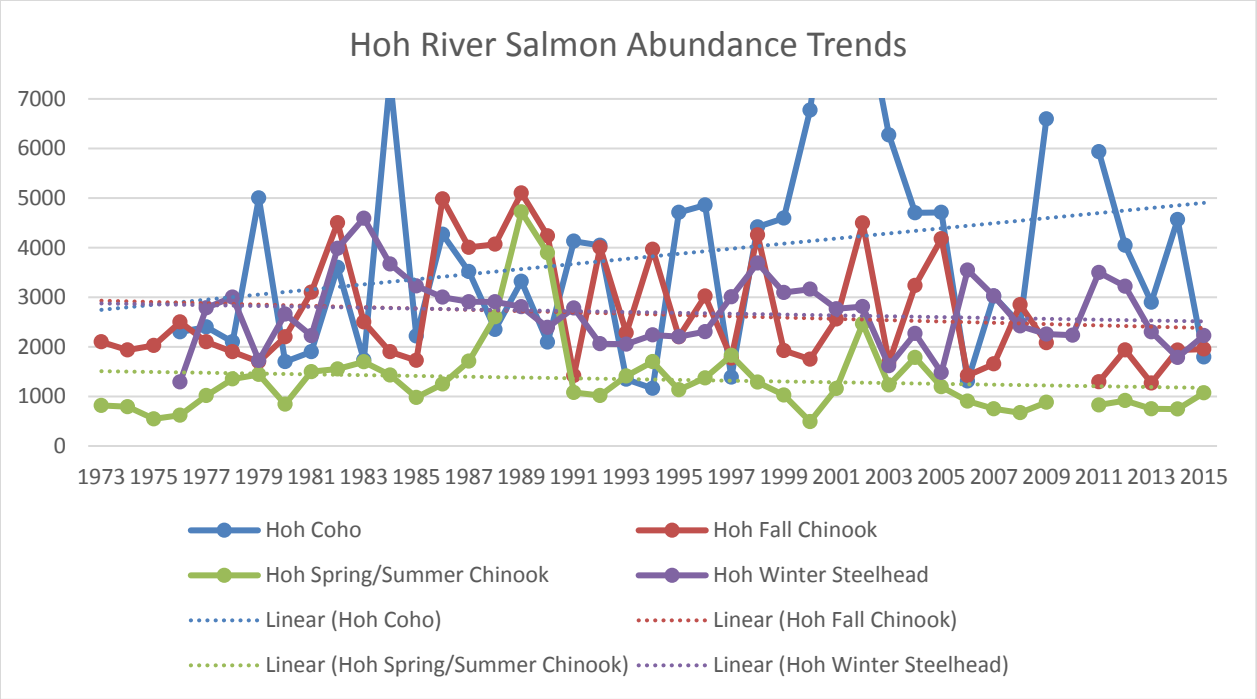


Figure CR-2. Hoh River Salmon Abundance Trends

Source: WDFW 2016.

In the project area, Chinook salmon (fall and spring/summer runs) and winter steelhead are the predominant species, followed by bull trout. Fall Chinook salmon spawn between October and December, while spring/summer Chinook spawn during September and October **(Figure CR-3).** Juvenile Chinook salmon begin their seaward migration in the spring; fall Chinook outmigrate after only a short residence time in the mainstem Hoh River. Winter steelhead spawn in the springtime, after spending several months in the mainstem Hoh River and its tributaries. Juvenile steelhead can spend one to three years rearing in freshwater before beginning their seaward migration. Therefore, steelhead can be present in the Hoh River year round.

Bull trout also migrate through and rear within the project area on an extended, year-round basis. They spawn in the fall after temperatures drop below 48ºF, in streams with abundant cold, unpolluted water, clean gravel and cobble substrate, and gentle stream gradients. Typically, characteristic spawning habitat occurs in the upper watershed, outside the project area. Rearing bull trout could access the unnamed tributary at MP 4.38 during high water; however, the culvert may be unpassable at such times. Bull trout could likely access Canyon Creek up to the culvert (see **Figure 4-12**), and possibly Tower Creek as well, depending on the ability of the fish to navigate several step pools with significant LWD downstream of the bridge.

Overall, the standard Hoh River IWWW established for fish protection avoids spawning periods that are critical for sustaining salmonid populations. However, rearing life stages for certain species, e.g., bull trout or steelhead, could occur in the project vicinity during in-water construction. Also, spring/summer Chinook spawning begins shortly after the IWWW ends (see **Figure CR-3**). In-water construction will not occur at night.

Figure CR-3. Hoh River Critical Time Periods

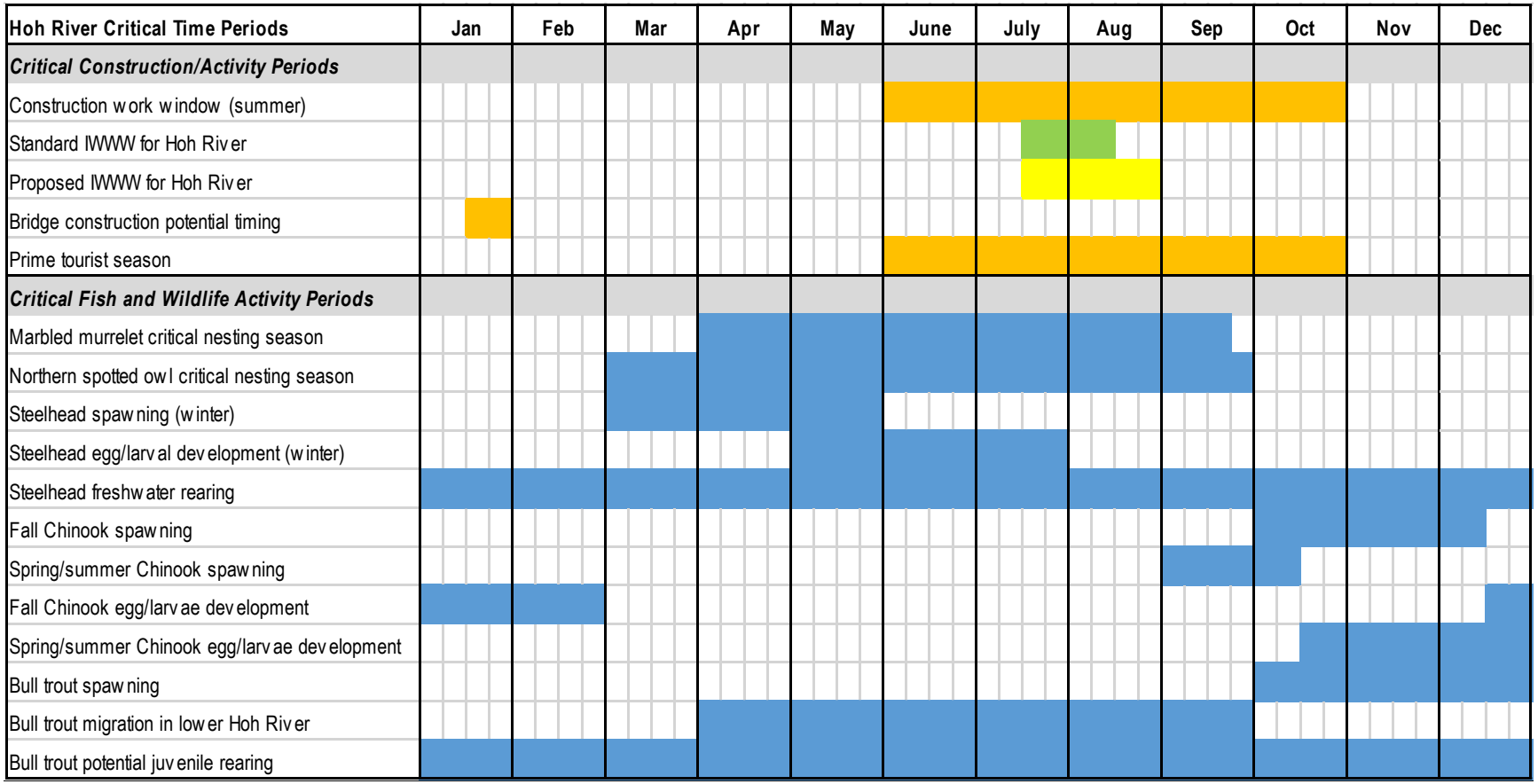
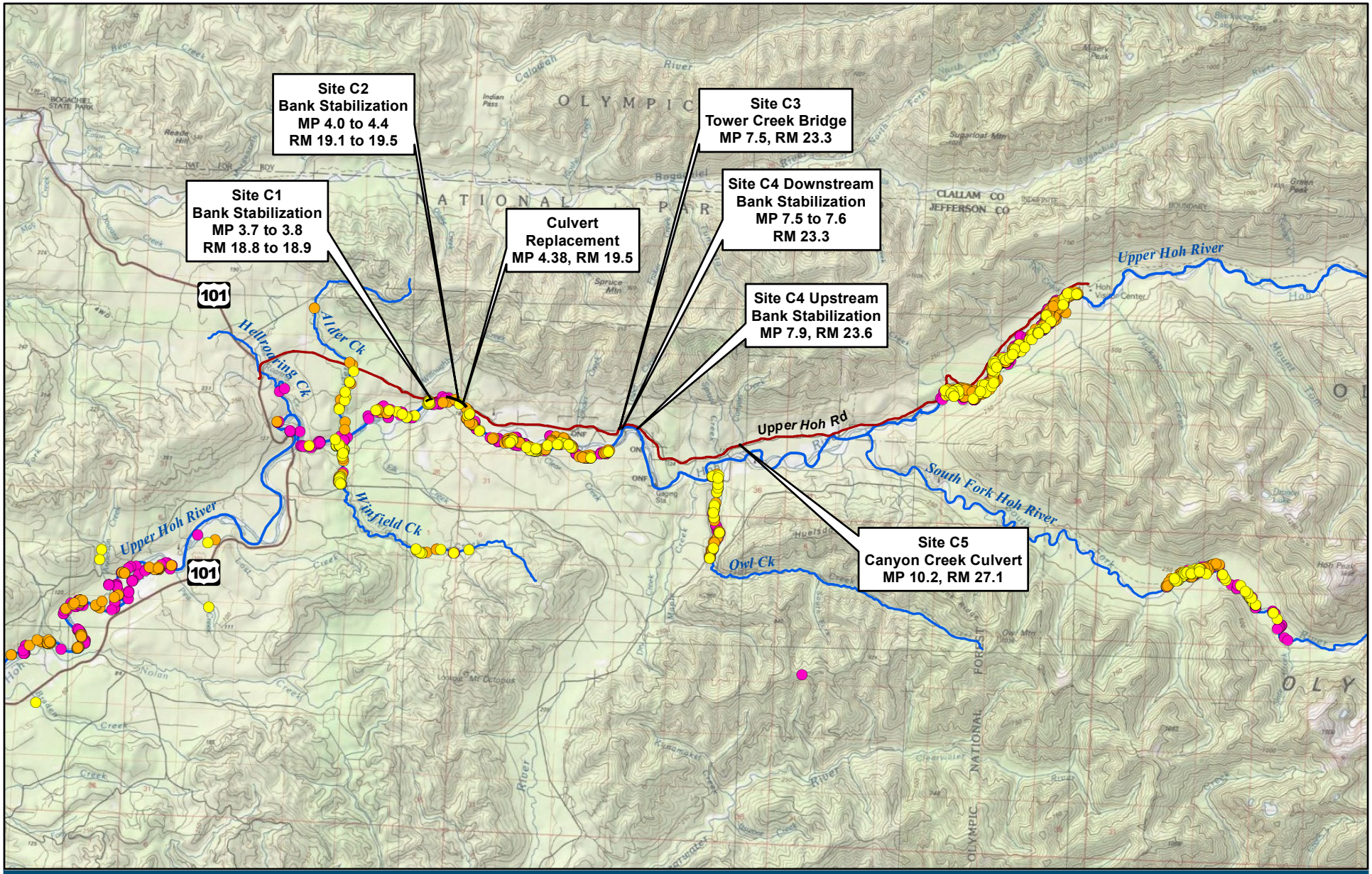


Figure 4-12. Canyon Creek Scour Pool, Downstream of Existing Culvert

WFLHD proposes an IWWW beginning July 15 and ending August 31. Prior to initiating in-water work, sheet piles or bladders will be temporarily placed in the river to deflect flow away from work sites.

WDFW provided spawning data on steelhead trout in the Hoh River for the period 2014 to 2016. This information is displayed in **Figures CR-4a through 4b**. Index reaches for this study included Sites C1 and C2, but not Sites C3 or C4. While these spawning results have not been incorporated into a published study, several conclusions can be drawn:

- There is significant variation in the distribution of steelhead spawning from year to year in certain reaches;
- These differences appear to be related to the distribution of microhabitats in the river, which can change dramatically through time depending on the frequency and magnitude of flows, movements of LWD and associated changes in river morphology;
- Certain reaches tend to have a higher abundance of spawning activity. For example, of the four primary spawning index reaches, three on the mainstem Hoh River and one on South Fork Hoh River, the highest redd density occurred between river mile (RM) 32 and 36 within ONP. Redd density per mile in this reach averaged 33.9 between 2014 and 2016, which was approximately twice the average density of other index reaches; and
- There appears to be limited spawning occurring in the deeper, higher velocity water channels that are adjacent to Sites C1 and C2.



Upper Hoh River Road Project

N

* Note: Steelhead redds varied in position according to seasonal changes in river position. WDFW did not conduct spawning surveys in the vicinity of Sites C3 and C4.

- Project Site
- Upper Hoh Road
- Upper Hoh River
- Perennial Creek/River
- 2016 Steelhead Redds*
- 2015 Steelhead Redds*
- 2014 Steelhead Redds*

Figure CR-4a
Steelhead Spawning Locations

0 1 2 Miles

Data Sources: USDA 2015 NAIP, Jefferson County. Washington DNR, WDFW Salmon Data, Hoh River Tribe, USGS NHD

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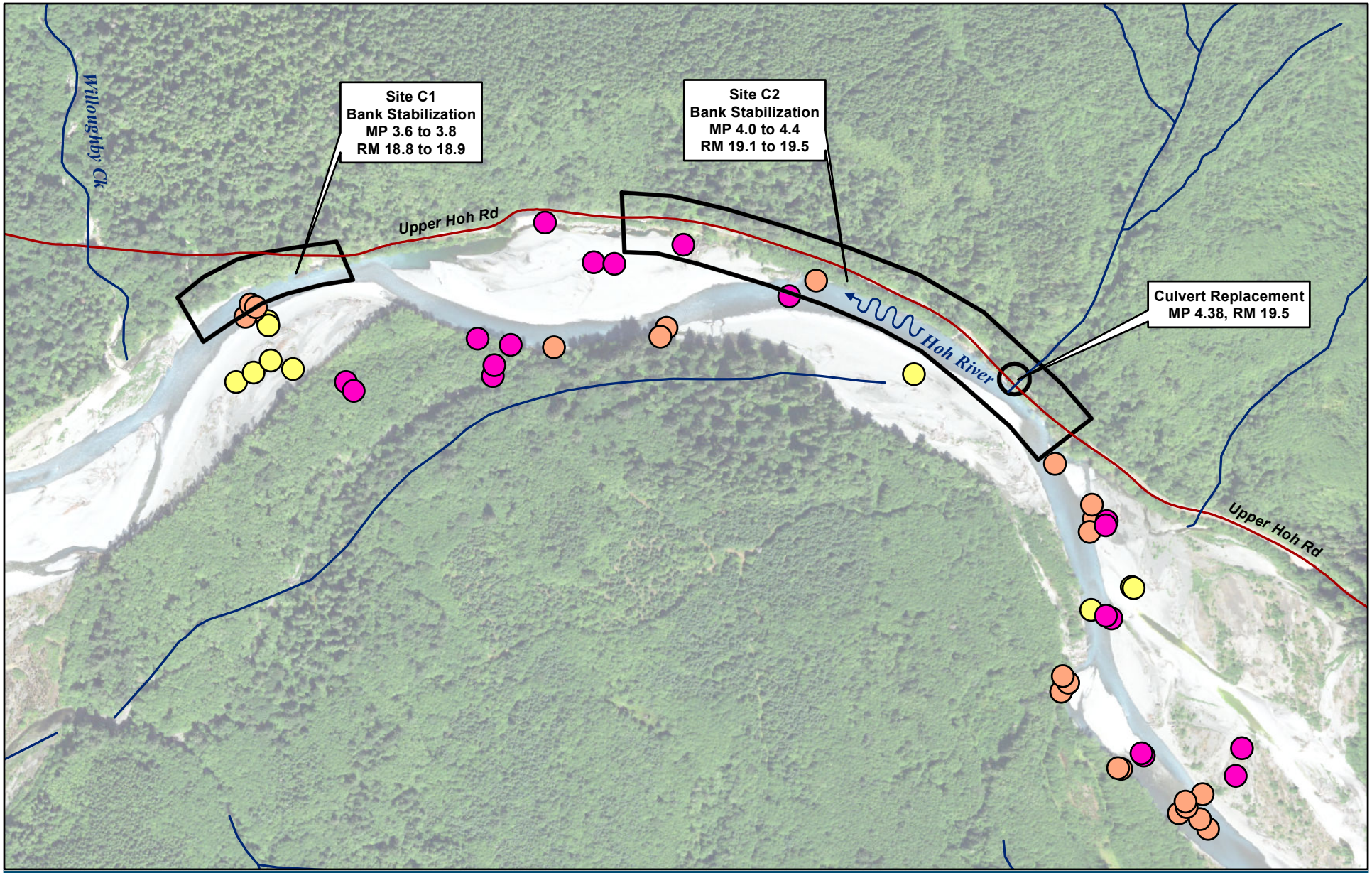

Upper Hoh River Road Project

N

* Note: Steelhead redds varied in position according to seasonal changes in river position.

Project Site
Upper Hoh Road
Perennial Creek

2016 Steelhead Redds*
2015 Steelhead Redds*
2014 Steelhead Redds*

Figure CR-4b
Steelhead Redds - 2014-2016

0 250 500 Feet

Data Sources: USDA 2015 NAIP, Jefferson County. Washington DNR, WDFW Salmon Data, USGS NHD

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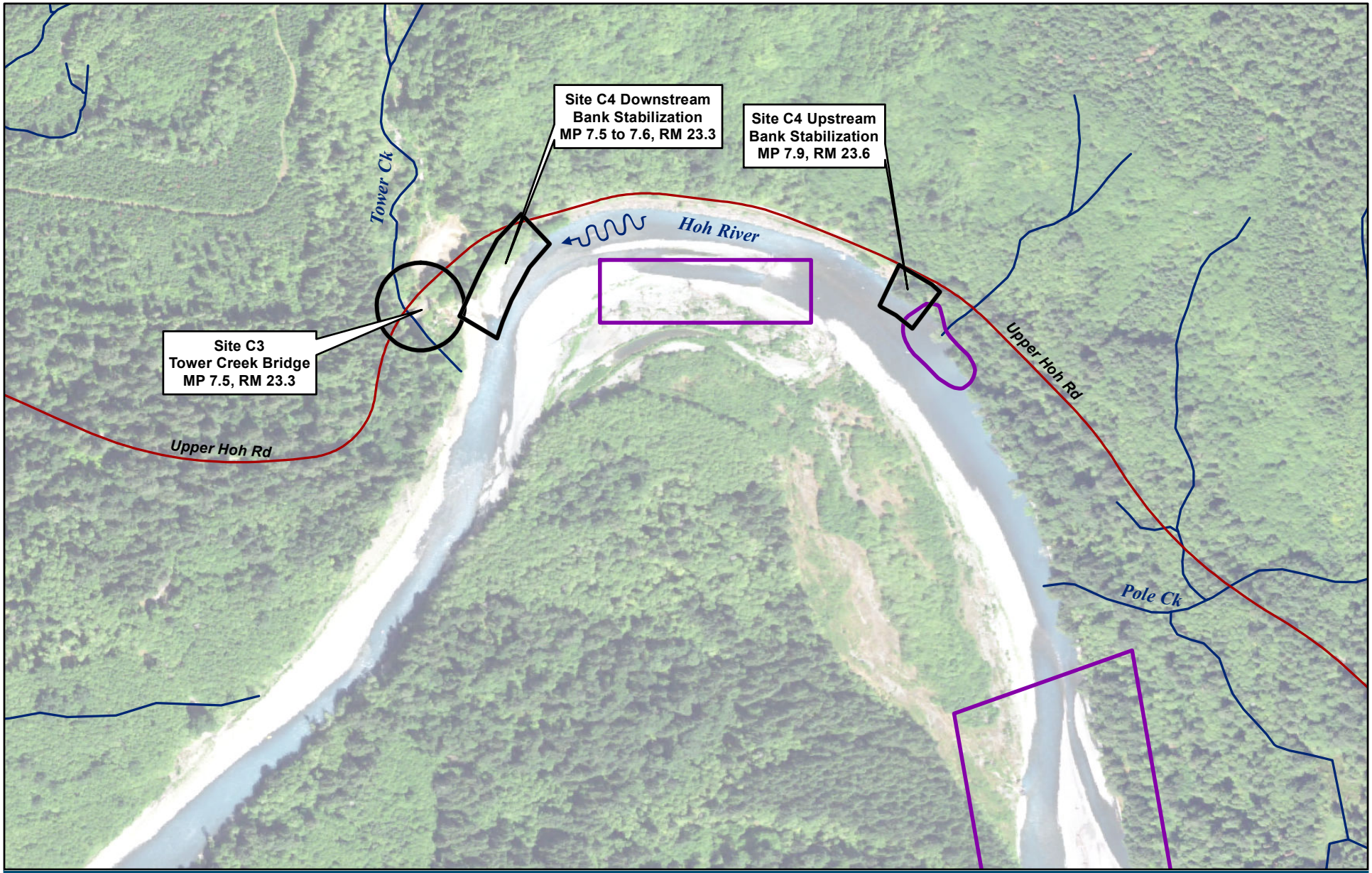
The Hoh River Tribe provided additional data describing important Chinook spawning areas in the vicinity of Site C4. Specifically, the Tribe described the area immediately across the river from Site C4 and immediately upstream of Site C4 as particularly important spawning areas (see **Figure CR-5**). According to tribal fishery managers, this area, including the Pole Creek reach immediately to the south, is one of the most important spawning reaches in the lower Hoh River. **Table CR-2** summarizes escapement data on steelhead and Chinook populations in the project area, provided by the Hoh River Tribe.

Table CR-2. Average Redd Density, Escapement, and Overall Reach Contribution for Winter Steelhead, Spring Chinook and Fall Chinook in the Project Area (2010-2016).

Reach	Average Redds/Mile	Reach Escapement (Observed Fish)	Reach Contribution to the Hoh River Mainstem Escapement (percent)	Reach Contribution to the Hoh System Total Escapement (percent)
Winter Steelhead				
Morgan's Crossing to Willoughby Creek (RM 18.8 to 23.0)	21.5	195	11.2	7.4
ONP Boundary to Morgan's Crossing (RM 23.0 to 29.7)	25.8	178	10.3	6.8
Spring Chinook				
Morgan's Crossing to Willoughby Creek (RM 18.8 to 23.0)	5.3	22	4.9	2.8
ONP Boundary to Morgan's Crossing (RM 23.0 to 29.7)	5.6	37.5	6.4	4.4
Fall Chinook				
Morgan's Crossing to Willoughby Creek (RM 18.8 to 23.0)	12.7	136.7	15.7	8.9
ONP Boundary to Morgan's Crossing (RM 23.0 to 29.7)	16.1	268.8	29.6	13.7

Source: Hoh Tribe, 2016.

This data from the Tribe indicates that two reaches are relatively similar in fish production, except that the upstream reach (including the Pole Creek area) is more productive for fall Chinook than the downstream reach. Furthermore, the reach between Morgan's Crossing and the ONP Boundary contributes a higher percentage of both the Hoh River Mainstem and overall Hoh River System escapement for fall Chinook (29.6 percent and 13.7 percent, respectively). This data seems to support the Tribe's claim that the Pole Creek reach is one of the most productive spawning reaches in the lower Hoh River for Chinook salmon.



Upper Hoh River Road Project

N

* Note: WDFW did not conduct spawning surveys in the vicinity of Sites C3 and C4. Chinook spawning area polygons were provided by the Hoh Tribe.

Project Site
Upper Hoh Road
Perennial Creek
Important Chinook Spawning Area*

Figure CR-5
Site C3/C4 Chinook Spawning Areas

0 250 500 Feet

Data Sources: USDA 2015 NAIP, Jefferson County. Washington DNR, Hoh River Tribe.

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Table 4-9 below lists special-status fish species in the project area that have been documented or are considered likely to occur in the project area. The list includes both bull trout and Dolly Varden because of their similarity in appearance.

Table 4-9. Special-status Fish Species with the Potential to Occur In or Near the Project Area

Common Name	Scientific Name	USFWS or NMFS Status	Habitat Requirements	Potential Occurrence in the Project Area
Bull trout	*Salvelinus confluentus*	Threatened	Deep pools in cold rivers and large tributary streams	Present within Hoh River and some runs in Tower Creek
Dolly Varden	*Salvelinus malma*	Threatened (similarity of appearance)	Deep runs and pools of creeks and small to large rivers	Present within Hoh River and some runs in Tower Creek

Source of Habitat Requirements: USFS 2014; NatureServe 2015.

According to the Hoh Tribe, other special status fish species that may occur in the Hoh River, include Pacific lamprey (*Entosphenus tridentatus)*, southern green sturgeon (*Acipenser medirostris*), and eulochon (*Thaleichthys pacificus*) (Hoh Tribe 2016). However, no documented occurrences of these species could be verified in the Hoh River; therefore, these species are not considered likely to occur in or near the project area (Gustafson 2016; NMFS 2015; USFWS 2015b).

Of all native salmonids in the Pacific Northwest, bull trout generally have the most specific habitat requirements (Rieman and McIntryre 1993). Bull trout are known to require a habitat of clean water less than 54ºF with deep pools, overhanging banks, LWD, and connectivity between spawning and rearing areas and downstream foraging, migration, and wintering habitats. Bull trout are an ESA-listed threatened species (**Table 4-9**).

4.6.1.2 Wildlife

Large mammal species likely present in the project area include black bear, cougar, bobcat, coyote, red fox, mule deer, and Roosevelt elk. Small mammal species likely present in the project area include raccoon, beaver, Douglas' squirrel, ermine, fisher, long-tailed weasel, marten, mink, mountain beaver, porcupine, river otter, spotted skunk, opossum, eight different bat species, as well as various shrews, mice, voles, and other rodents (Johnson and Cassidy 1997).

According to a database of bird sightings developed by the Washington Ornithological Society, approximately 150 species of birds are considered "common" or "uncommon" in Jefferson County. Not all of these birds are likely to occur in the project area due to lack of certain types of unique habitats (e.g., prairie) and being outside documented range (e.g., Puget Sound) (Smith, Mattocks, and Cassidy 1997).

Eleven species of amphibians and two species of reptiles are documented to potentially occur in the project area, including two types of garter snakes, six salamanders, four frogs and toads, and the roughskin newt. These amphibian species most likely prefer the aquatic habitats adjacent to the six proposed sites, particularly wetlands and small tributaries and their adjacent riparian buffers (Dvornich, McAllister, and Aubry 1997).

Federally-listed threatened and endangered species are those animal species formally listed by the USFWS under authority of the ESA. **Table 4-10** lists federally-listed threatened and endangered species with the potential to occur in or near the project area (USFWS 2009; 2015). Information about these species is addressed in detail in the BA for the proposed project (**Appendix G**) and summarized below. Detailed information such as life history, habitat requirements, and documented occurrences is provided in **Appendix E** Biological Survey Report and **Appendix G** BA.

Table 4-10. Federally Threatened, Endangered, Proposed, and Candidate Species with the Potential to Occur In or Near the Project Area

Common Name	Scientific Name	USFWS or NMFS Status	Habitat Requirements	Potential Occurrence in the Project Area
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	Large or forked branches, deformities, mistletoe infections, or other similar structures	Yes
Northern spotted owl	*Strix occidentalis caurina*	Threatened	Canopy closure, multi-layered, multi-species canopy with large overstory trees with various deformities	Yes
Streaked horned lark	*Eremophila alpestris strigata*	Threatened	Large expanses of bare or thinly vegetated land	Not present due to lack of habitat
Yellow-billed cuckoo	*Coccyzus americanus*	Threatened	Deciduous riparian woodland, especially including dense stands of cottonwood and willow	Not present due to lack of habitat
Pacific fisher	*Martes pennanti*	Candidate	Mature forest cover and late-successional forests	Yes
Olympic (Mazama) pocket gopher	*Thomomys mazama melanops*	Candidate	Glacial outwash prairies of the higher Olympic Mountains	Not present due to lack of habitat
Taylor's checkerspot	*Euphydryas editha taylori*	Candidate	Dry prairies or prairie-like native grassland	Not present due to lack of habitat

Source of Habitat Requirements: USFS 2014; NatureServe 2015.

Marbled Murrelet

Marbled murrelets nest in coniferous trees with attributes that provide nesting platforms. These attributes include large or forked branches, deformities, mistletoe infections, "witches brooms," or other similar horizontal structures greater than 4 inches in diameter. They are generally found in old-growth and mature forests, but can also occur on remnant trees in younger forests (USFWS 1996). Suitable nesting habitat for marbled murrelet is assumed to be generally similar to nesting, roosting, and foraging habitat suitable for northern spotted owl. Dispersal habitat for northern spotted owl, however, is not suitable nesting habitat for marbled murrelet.

Marbled murrelets have been detected several times near all six sites. All of the sites lie within areas containing murrelet detections or within a 3/4-mile buffer of those areas. Site C3 provides a particularly suitable habitat for murrelets due to the presence of larger trees for nesting, compared to the other five sites. The project BA contains an extensive analysis of potential project impacts to marbled murrelet suitable habitat (**Appendix G**).

Northern Spotted Owl

Suitable habitat for the northern spotted owl supports the spotted owl's need to nest, roost, and forage. Nesting and roosting habitat generally includes attributes such as the following:

- A moderate to high canopy closure (60 to 80 percent coverage);
- A multi-layered, multi-species canopy with overstory trees larger than 30 inches dbh;
- Plentiful large trees with various deformities (e.g., large cavities, broken tops, and mistletoe infections);
- Snags larger than 30 inches dbh;
- Large accumulations of fallen trees and other woody debris on the ground; and
- Sufficient space below the canopy for owls to fly (Thomas *et al.* 1993).

A wider range of habitats with more general attributes is used for spotted owl foraging and dispersal. Habitat that meets nesting and roosting requirements also provides for foraging and dispersal (USFWS 1992). Dispersal habitat assists juvenile dispersal and breeding dispersal of adult spotted owls and also connects suitable habitat patches. The general rule for classifying dispersal habitat is to have a stand of trees with an average dbh of 11 inches within a canopy cover of 40 percent (Thomas *et al.* 1993).

Seven spotted owl activity centers are located within the project area, and are described in further detail in the BA. Both dispersal and nesting/roosting habitat is present in portions of the project area. In the absence of recent species surveys, it is assumed that suitable habitat may be occupied. The project BA contains an extensive analysis of potential project impacts to northern spotted owl suitable habitat (**Appendix G**).

Pacific Fisher

The Pacific fisher commonly occurs in landscapes dominated by mature forest cover, and has been categorized by some researchers as "closely-associated" with late-successional forests (Thomas *et al.* 1993). Until recently, the Pacific fisher was considered extirpated from the Olympic Peninsula. Reintroductions of the fisher to the Olympic Peninsula began in 2008, and all introduced Pacific fishers were radio-collared. Several different radio-collared fishers were documented in the Calawah River watershed from 2008 to 2010, while collars were still functioning (USFS 2014). Although no denning was documented in the Calawah River watershed, two drainages north of the Hoh River, it is assumed that fishers still periodically use the Calawah River watershed, and could conceivably migrate to the Hoh River watershed. Pacific fishers could be found in older tree stands adjacent to project sites, especially within the older forest near Site C3.

Other Federal and State Special Status Species

Table 4-11 lists wildlife species that (1) have other federal and state status, including federal species of concern, state listed species, and USFS sensitive species; and (2) could potentially exist in or near the project area.

Table 4-11. Other Special Status Species with the Potential to Occur in or Near the Project Area

Common Name	Scientific Name	USFS/ State Status	Habitat Requirements	Potential Occurrence in the Project Area?	Project Impacts?
Amphibians					
Tailed frog	*Ascaphus truei*	– / Smon	Fast, cold streams, sea level to approx. 5,000 feet, with cobble or boulder substrates	Yes	May Impact
Western toad	*Bufo boreas*	– / –	Ponds/shallow lakes, but may be found near streams during dry periods	Yes	May Impact
Van Dyke's salamander	*Plethodon vandykei*	S / SC	Seepages and streams, but can also be observed far from water	Yes	May Impact
Olympic torrent salamander	*Rhyacotriton olympicus*	S / Smon	Near the splash zone of cold, clear streams, seepages, or waterfalls	Yes	May Impact
Mollusks					
Puget Oregonian (snail)	*Cryptomastix devia*	S / –	Hardwood shrubs and trees, particularly big leaf maple and vine maple	Yes	May Impact
Burrington's (keeled) jumping slug	*Hemphillia burringtoni*	S / –	Hardwoods and large fallen logs may be found in forested areas	Yes	May Impact
Malone's jumping slug	*Hemphillia malonei*	S / –	Hardwoods and large fallen logs may be found in forested areas	Yes	May Impact
Blue-gray taildropper (slug)	*Prophysaon coeruleum*	S / SC	Hardwoods and large fallen logs may be found in forested areas	Yes	May Impact
Broadwhorl tightcoil (snail)	*Pristiloma johnsoni*	S / –	Hardwoods and large fallen logs may be found in forested areas	Yes	May Impact
Butterflies					
Johnson's hairstreak	*Callophrys johnsoni*	S / SC	Old-growth or more advanced age second-growth habitat that contains dwarf mistletoes	Yes	May Impact
Birds					
Northern goshawk	*Accipiter gentilis*	– / SC	Coniferous forests with open understories	Yes	May Impact
Olive-sided flycatcher	*Contopus cooperi*	– / –	Coniferous forests with uneven canopies, openings and wet areas, dead or partially dead trees	Yes	May Impact
Bald eagle	*Haliaeetus leucocephalus*	S / SS	Mature forest/snags within 1 mile of large bodies of water	Yes	May Impact
Harlequin duck	*Histrionicus histrionicus*	S / –	Winters along rocky Pacific coasts and moves inland to breed in the Olympic Mountains	Yes	May Impact

Common Name	Scientific Name	USFS/ State Status	Habitat Requirements	Potential Occurrence in the Project Area?	Project Impacts?
Bats					
Townsend's big-eared bat	*Corynorhinus townsendii*	S/ SC	Large trees and manmade structures can provide suitable roosting habitat	Yes	May Impact
Keen's myotis bat	*Myotis keenii*	S/ SC	Sloughing bark, most often found on old-growth trees and snags	Yes	May Impact
Long- eared myotis	*Myotis evotis*	– / Smon	Coniferous forests, tree cavities, rock crevices	Yes	May Impact
Long-legged myotis	*Myotis volans*	– / Smon	Coniferous forests, tree cavities, rock crevices	Yes	May Impact

Source of Habitat Requirements: USFS 2014; NatureServe 2015
State Status: SC = State Species of Concern; Smon = State Monitor; SS = State Sensitive
USFS Status: S= Sensitive or Strategic

4.6.2 Environmental Consequences

This section describes direct, indirect, and cumulative impacts to fish and wildlife resources from the project alternatives.

4.6.2.1 No Action Alternative

Fish

With the No Action Alternative, bank failures along the project corridor would continue to periodically occur, likely on an annual or near annual basis. Given that emergency bank stabilization projects are almost exclusively constructed with riprap, they are expected to result in incremental adverse impacts to fish habitat in the mainstem Hoh River over time. Impacts could include increased toe scour, erosion at the downstream and upstream edges of the riprap, and decreased habitat diversity at the locations where the riprap is used. The intensity and magnitude of these impacts would depend on the location and size of the bank stabilization areas.

The No Action Alternative would create incremental reductions in the quality of fish habitat at and downstream of the riprap installed for emergency bank stabilization, reducing available spawning and foraging habitat quality for fish, including Chinook salmon and steelhead.

Wildlife

With the No Action Alternative, emergency bank stabilization projects would continue along the UHRR as necessary to maintain year-round access. These unplanned projects would create permanent impacts of varying intensities to aquatic habitat in the Hoh River and immediately adjacent riparian areas. They would also create temporary disturbances to wildlife species using the immediate areas of construction. The removal of vegetation associated with these unplanned projects would incrementally decrease the amount of riparian habitat potentially utilized by wildlife species, including aquatic-associated amphibians and mammals. The extent of potential habitat impacts would be dependent on the extent of damage or threat to the UHRR and the nature of the emergency repair work.

Of the federally-listed species listed in **Table 4-10**, marbled murrelets nesting near the work areas could experience temporary adverse impacts from emergency repair work. Several stands of potentially mature forest that could support potential nest platforms for marbled murrelets exist along the UHRR (**Figures 4-11a through 11c**). If unplanned emergency work is conducted during murrelet nesting season (April through September), nearby nesting birds could be disturbed.

Similar to marbled murrelet, northern spotted owls nest and roost in mature forest stands. They also use early and mid-successional forest for foraging and dispersal. If emergency repair projects occur during spotted owl nesting season, and spotted owls are nearby, they could be temporarily disturbed. The No Action Alternative is not expected to adversely affect any other listed species. See the project BA (**Appendix G**) for a more detailed impact assessment related to listed species.

Of the other special status species described in **Table 4-11**, several bird species that could occur in the riparian zone of the Hoh River during construction, including harlequin duck and bald eagle, could experience potential adverse impacts with the No Action Alternative. Several active bald eagle nests are near the proposed project sites, including one documented nest within the Willoughby Creek area on the south side of the Hoh River, across from Site C2 (see **Appendix E**, Biological Survey Report). If emergency repair work were to occur outside the nesting season for bald eagle (January 1 to August 31), construction would not adversely affect the species. However, construction work occurring between January 1 and August 31 would necessitate nesting surveys, which entail direct observation of historic nests to determine occupancy. Aquatic conservation measures would ensure that no measurable adverse impacts to bald eagle prey species would occur.

The amphibians listed in **Table 4-11** are not likely to be affected because they are likely located in higher elevation tributaries and side tributaries to the Hoh River. However, any individuals in the mainstem Hoh River at the time of construction could be exposed to reduced water quality and increased stress from sedimentation. It is possible that any of the mollusk species could occur in the project area, but their distributions are not well documented.

Emergency repair projects would not affect the nesting habitat of the olive-sided flycatcher if Migratory Bird Treaty Act seasonal restrictions are observed. The nesting season for migratory birds is approximately March 1 to August 31, but should be coordinated with local biologists as the project progresses. Goshawks, if present and nesting within or near the project area, could be affected by emergency repair projects, and nest surveys may need to be conducted to determine their presence. Goshawk nests would need to be protected from disturbance if any were located near construction activities. Tree removal could also affect individual long-legged myotis and long-eared myotis if they are roosting in those trees.

Townsend's big-eared bat could be found roosting in snags or hollow trees, and tree removal associated with construction of emergency repair projects could potentially remove a roost tree; however, the likelihood of this impact occurring is low. Overall, potential adverse impacts would only occur at the individual level and would not impact the populations as a whole.

4.6.2.2 Build Alternative

Direct Impacts

Bank Stabilization Sites C1, C2, and C4

Fish

At the three bank stabilization sites, approximately 48,000 square feet of river bottom would become permanently occupied by ELJ/dolosse units. This would displace potential migration, spawning, and rearing habitat for Chinook salmon and steelhead, and migration habitat for bull trout. Some of this area would be replaced with new in-stream habitat structure that provides additional fish rearing habitat.

Installation of the ELJ/dolosse units would result in temporary, localized direct impacts on water quality in the Hoh River caused by increased turbidity and suspended sediment, which can reduce foraging efficiency, alter daily migration patterns, and in extreme cases, cause damage to gill tissues. Life stages of key fish species that are most likely to be affected by such impacts during construction include the following:

- Fry and young-of-year juvenile winter steelhead from spawning reaches near in-water construction areas;
- Rearing juvenile steelhead and bull trout;
- Adult spring/summer Chinook salmon migrating past in-water construction areas while enroute to spawning reaches; and
- Rearing and migrating juvenile and adult bull trout.

Implementation and monitoring of construction BMPs including the project TESC plan will reduce risks of temporary water quality impacts associated with these life stages of sensitive fish species.

In contrast to the temporary water quality and permanent habitat impacts discussed above, installation of ELJ/dolosse units would likely have long-term beneficial impacts to fish in the Hoh River by increasing in-stream habitat structure. Localized morphological changes to the river channel will consist of eddies, pools, and slack-water refuges, which in turn will improve the quality of these reaches for fish spawning and rearing.

As an example, Peters *et al.* (2012) documented an increase in habitat diversity at certain sites on the lower Hoh River after ELJs were installed at those sites. The ELJ units simulate the impacts of woody debris by creating pools and cover for salmon. They also collect nutrients and support benthic macroinvertebrate communities, which enhance the food web salmon depend on. WSDOT personnel making post-construction observations of ELJ installations along the Skagit River have anecdotally reported fish use of ELJs (Spahr, *pers. comm.* 2017).

Although the ELJ/dolosse units themselves will increase the amount of cover available for juvenile fish in these reaches, monitoring of the lower Hoh River ELJ sites found fewer than expected juvenile salmon under the ELJs (Peters *et al.* 2012). The study suggests that the high

levels of natural turbidity in the Hoh River provided natural cover from predators, and the ELJs lessened the amount of natural turbidity, which resulted in greater predation of juvenile salmon.

The increased hydraulic complexity and interstitial spaces between wood and dolosse within the ELJ/dolosse units would provide increased fish habitat along the north bank. In addition, reduced erosion (a result of the project) could allow for more mature bank vegetation to develop over the long term, which would increase cover and shading for fish. However, in the short term, there will be a reduction in potential LWD recruitment caused by the removal of several hundred trees along the river that will be cleared to install the ELJs (see Section 4.5.2 for more information).

Long-term impacts of bank stabilization at the three sites on the upper Hoh River can be reasonably expected to be similar to those documented on the lower Hoh River. Most long-term impacts of the ELJ/dolosse are expected to benefit fish populations, as the ELJ structures increase in size from the accumulation of additional mobile wood from upstream sources and create more favorable hydraulic impacts along the riverbank.

Construction and installation of the ELJ/dolosse units from the banks of the Hoh River would result in relatively fewer temporary adverse impacts to aquatic resources during construction. In addition, impact pile driving will not occur at any of the bank stabilization sites. This is in contrast to the lower Hoh River ELJ installation, which was constructed entirely from the river. The lower Hoh River installation work minimized bank disturbance and vegetation removal, while this project would minimize adverse aquatic impacts during construction.

The BA (**Appendix G**) provides more detailed information about the status and distribution of listed fish species and related impacts of the proposed project.

Wildlife

The vegetation to be removed in the strip of land between the UHRR and the Hoh River would reduce the land's value for wildlife; however, the habitat in this location experiences a relatively high level of human disturbance, decreasing the adverse impact to wildlife. **Table 3-2** shows the amount of area that would be cleared near each site for the purpose of construction, staging, access, and storage. Loss of riverbank vegetation would be partially offset by proposed planting of trees (alder and cedar) and willow poles at each site (see preliminary design plans in **Appendix I**). However, there would be a short-term loss of riverbank habitat as the mitigation plantings grow to maturity.

Construction activities would create elevated noise levels that would disrupt daily activities of wildlife in the vicinity of the project sites. The extent of disturbance would depend on the duration and magnitude of construction noise at each site. Construction noise is anticipated to last 45 days at Site C1 and C4 and 100 days at Site C2. As described in the BA, noise, particularly pile driving, has the potential to adversely affect nesting and foraging by northern spotted owls and marbled murrelets, if they occur in the immediate area (within 120 yards) during construction (**Appendix G**).

Overall, the proposed project would have minor, short-term adverse impacts to wildlife in the form of daily foraging decreases, avoidance of the construction area by birds, and potential disruption of spotted owl and marbled murrelet in occupied habitat due to construction noise. Following completion of construction, long-term impacts to terrestrial wildlife should be limited

to a minor reduction in available mature conifer trees that could be used by old-growth adapted species, such as marbled murrelet, northern spotted owl, and banded pigeon. The constructed ELJ/dolosse would provide additional perching and foraging opportunities for aquatic mammals such as otter and mink, as well as raptors such as eagles and osprey who use the river to hunt for food.

MP 4.38 Culvert

Construction of the culvert, together with Site C2 bank stabilization, would remove approximately three large conifers in the riparian zone (**Table 3-2**). Adverse impacts to wildlife habitat would be minor because most construction would be contained within the existing road prism. Construction noise would create short-term disturbance to wildlife in the immediate vicinity of the culvert, although the incremental addition of MP 4.38 culvert construction noise to Site C2 construction noise would be small. Fish passage and hydraulic connectivity would significantly improve with the larger culvert. No fish use of this unnamed tributary has been documented, but the proposed project would increase the likelihood of its use, particularly as rearing or resting habitat for juvenile salmonids.

Site C3 Tower Creek Bridge

Removal of upland and riparian vegetation associated with the Tower Creek Bridge replacement (40,000 square feet, as shown in **Table 3-2**) would create temporary loss of potential habitat for some wildlife species, such as northern spotted owl and marbled murrelet. Site C3 is adjacent to mature forest habitat that is potential suitable habitat for both of these federally listed species. Individual trees provide potential roosting habitat for bats and birds as well.

Construction activities in the Tower Creek channel, including stream diversion, bank excavation, and scour protection, could potentially affect stream-associated wildlife species, such as amphibians. These species could experience short-term disturbance and loss of habitat, but these impacts would be offset in the long run by improved floodplain connectivity under the wider bridge and restoration of riparian vegetation through planting of native shrubs and trees.

The bridge abutment foundations may be built on pilings, which would be driven by a combination of vibratory and impact pile driving. Pile driving would create the loudest noise of the entire project. The noise from pile driving could disturb wildlife in a wide area surrounding Site C3. Elevated noise levels could disrupt daily nesting, roosting, and foraging behaviors for a variety of wildlife. Similar to Sites C1 and C2, the project BA concludes that the project as a whole would meet the likely-to-adversely affect marbled murrelet and northern spotted owl at Site C3, where potentially suitable habitat is adjacent to project sites. See the project BA (**Appendix G**) for more information on noise levels produced by the project and their impacts on listed wildlife species.

The new bridge would provide enhanced fish passage and improved hydraulic connectivity by widening the channel and therefore increasing the available capacity to pass debris and flood flows.

Temporary increases in erosion and runoff from the construction sites may lead to temporary increases in turbidity and suspended sediment in Tower Creek. These sediment discharges could affect juvenile and adult fish in Tower Creek. However, sedimentation impacts are not expected

to reach the Hoh River, because the confluence is now approximately 3,300 feet downstream of the bridge as a result of the Hoh River shifting to the south side of the channel migration zone at the Tower Creek confluence.

These short-term temporary water quality impacts would be minimized by appropriate implementation of BMPs and TESC plans. Also, implementation of a stream diversion plan that provides a dry work area under the bridge would greatly reduce the risk of downstream water quality impacts.

Proposed project impacts to fish and wildlife would generally be (1) minor and adverse during construction, except for a moderate adverse impact during impact pile driving, and (2) beneficial in the long run due to improved hydraulic connectivity.

Site C5 Canyon Creek Bridge

Impacts to fish and wildlife would be similar to Site C3, except that impacts to fish populations at Site C5 would be greater in magnitude than at Site C3. Replacement of the existing culvert with a bridge would significantly improve floodplain connectivity and remove a partial fish barrier. The project would improve access to approximately two miles of upstream spawning and rearing habitat for fish, including sensitive species such as bull trout.

Indirect Impacts

Indirect impacts are caused by the proposed project, but occur later in time or farther in distance. Indirect impacts to wildlife due to the proposed project would be limited because most of the project's adverse impacts would be of a short-term duration. The culvert and bridge replacements would have long-term positive indirect impacts on hydraulic connectivity, which could improve the movement of low-mobility amphibians upstream and downstream in those tributaries. Noise created by driving of piles to support proposed bridge foundations at Sites C3 and C5 would cause short-term disturbance to wildlife species occurring in close proximity to project construction. See **Appendix G**, BA, for additional evaluation of noise impacts to listed species.

Indirect impacts of the proposed project on fish and fish habitat would be more substantial. The ELJ/dolosse units would create long-term hydraulic changes at and downstream of the units. The ELJ/dolosse units would be expected to form areas with lower water velocity close to shore, which would increase sediment deposition in those areas. Downstream eddy pools may also form, which could provide improved resting and foraging habitat for salmonids. These eddy pools were observed forming downstream of ELJs installed on the lower Hoh River (Peters *et al.* 2012).

The ELJ/dolosse units would also encourage the thalweg of the river to move away from the bank in areas where they are installed, increasing water velocity in the main channel, and potentially encouraging the formation of side channels opposite the stabilization areas. The new Tower Creek Bridge could improve bull trout passage near the bridge, but would not alter the downstream step pools. Replacement of the culvert with a bridge at Site C5 would have long-term, positive indirect benefits to fish migration and habitat access that are greater than potential negative impacts at this location.

Cumulative Impacts

Agencies have completed over 40 projects in the project area since the 1990s, approximately 20 of which have benefited the UHRR. These projects were primarily in response to emergencies such as a shifting river channel contributing to bank failure or debris falling into the river, which in turn compromised the road. Projects identified in **Table 4-1** include 10 bank stabilization projects, and more than 10 culvert or bridge repair or replacement projects. In general, these projects had minor impacts to fish and wildlife. Some riparian bank vegetation was likely removed during each project, but in some cases, all bank vegetation had already been lost to natural bank avulsion. Some localized disturbance to wildlife in the immediate vicinity of the projects was likely created. Most of the projects were completed relatively quickly, so this impact was short term.

The proposed project, in combination with past and future projects, would result in minor short-term adverse cumulative impacts to fish and wildlife due to noise and turbidity created by construction. However, in the long term, the project would result in a positive incremental cumulative impact due to improvements in hydraulic connectivity for fish and wildlife habitat between the Hoh River and adjacent tributaries.

Mitigation Measures

The following mitigation measures are proposed to offset impacts to fish and wildlife.

- Avoid construction during critical nesting times for sensitive species (murrelet, owl, etc.) where feasible. For instance, critical nesting season for marbled murrelet is April 1 to September 23, and for the northern spotted owl is March 1 to September 30;
- In-water work would be limited to the proposed IWWW (July 15 through August 31);
- Utilize stream diversions/bypasses at Tower Creek and Canyon Creek to minimize downstream sedimentation impacts;
- Implement all reasonable and prudent measures identified during ESA consultation; and
- Adhere to the design standards and conditions of approval specified in all construction permits (e.g., WDFW – Hydraulic Project Approval, Corps – Clean Water Act Section 404, Ecology – Clean Water Act Section 401), which may include maintenance and monitoring conditions.

In addition, two complementing mitigation projects would be constructed to improve long-term aquatic habitat conditions in the project area along the mainstem Hoh River.

Lindner Creek Side Channel Engineered Log Jams at MP 6.7 to 7.3

The primary mitigation project would be constructed in the area between approximately MP 6.7 and MP 7.3 of the UHRR, west of Site C3 (Tower Creek) (see **Figure M-1**). In this area, a large side channel meander of the Hoh River has formed where the mainstem was formerly located prior to approximately 2010. This large side channel is adjacent to a stand of mature forest and located on WDNR and USFS land. Lindner Creek and several other creeks flow into this large side channel.

Tributaries to the Hoh River, such as Lindner Creek, and the high-water channels that cross the 'peninsula' between the Hoh River upstream and the large side channel near MP 6.7 (see **Figure M-1**) provide important rearing and high-water refuge habitat for fish species such as steelhead, Chinook salmon, coho, and bull trout. Many of the high-water channels have emerged during relatively minor flood events (e.g., less than 10-year flood flow) since the 1990s, due to the increasingly erratic nature of the Hoh River's migration across the river meander belt. **Figure M-2** shows the finger- and overflow-channels that emerge on the 'peninsula' during a two-year flood event.

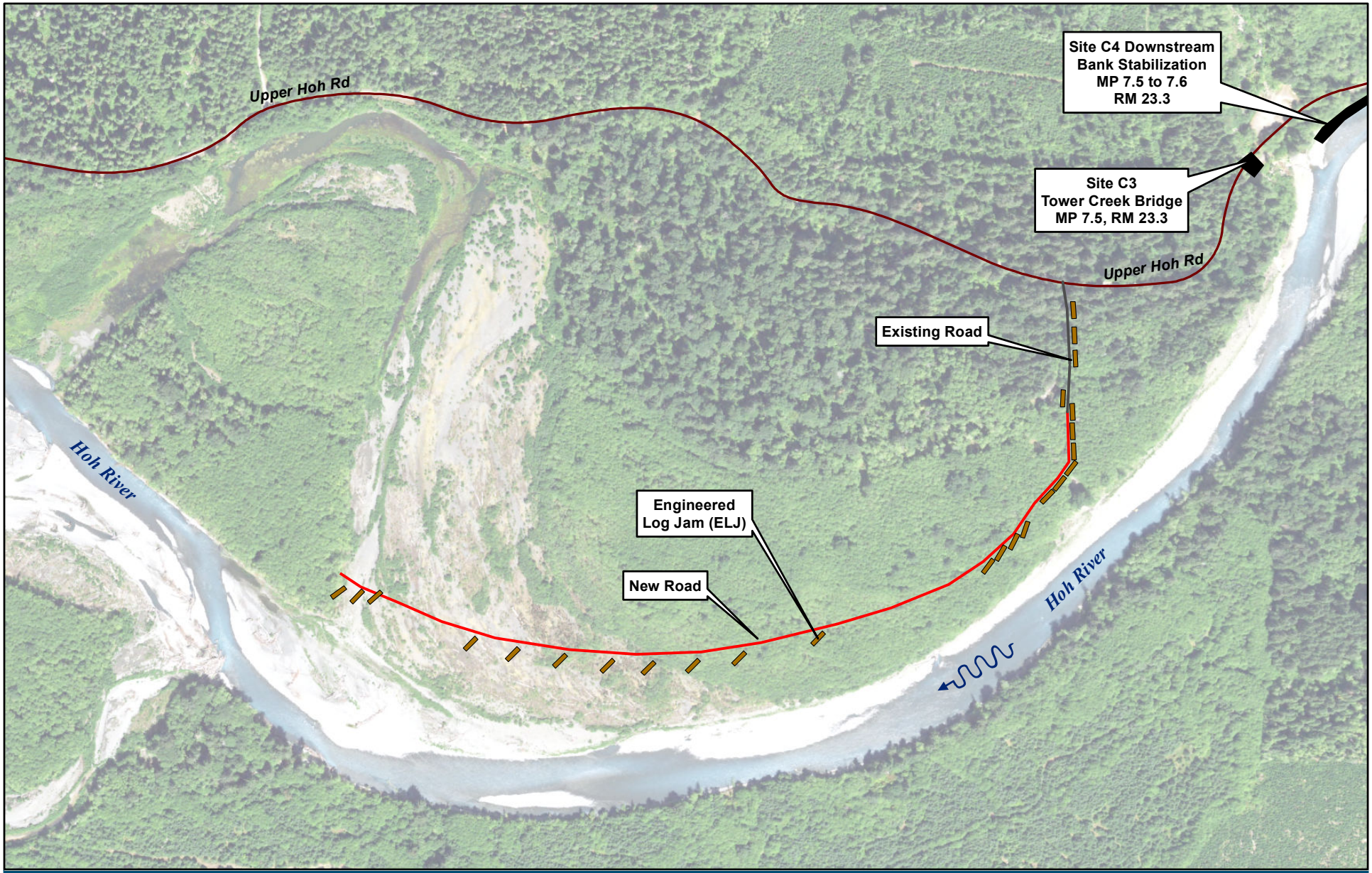
Lindner Creek, the large main channel, and the high-water channels on the 'peninsula' comprise a side channel complex. Long-term preservation of the side channel complex would result in the following benefits to aquatic and forest resources, which are important to stakeholders such as WDFW and the Hoh Tribe:

- Preservation and maintenance of vital rearing and high-water refuge habitat for steelhead, Chinook salmon, coho, and bull trout;
- Preservation of nearby priority steelhead spawning areas, which could potentially undergo modification during the next channel migration event;
- Protection of the remaining mature forest stand south of the UHRR;
- Encouragement of riparian forest development in the area surrounding the side channel complex by preventing a future channel avulsion; and
- Preservation of the small overflow 'peninsula' channels as small, finger- and overflow-channels, rather than having them develop into larger channels, or the main channel, if a river avulsion occurs.

In order to preserve the side channel complex, approximately 24 engineered log jams (ELJs) would be installed in an arc, extending approximately 0.8 mile south and west from MP 7.3 of the UHRR, crossing the lower section of the side channel complex (see **Figure M-1**). Each ELJ will consist of approximately 10 dolosse/log bundles, each comprised of one dolos connected to two or three logs. Sheet F.8 of **Appendix I**, Design Plan Set (70%) shows details of the dolosse/log bundle design. Between the ELJs, the bank would be planted with cottonwood, bank willow, and emergent willow. In addition, the bank would be stabilized with a mixture of gravel and cobble, as shown on Sheet H.13 (Gravel-Cobble Bank Stabilization Typical Sections of **Appendix I**, Design Plan Set (70%).

Installation of the ELJs would require use of an existing side road off the UHRR that is currently used for drift boat access to the river. This road segment would be extended beyond the existing terminus to provide temporary construction access. The extended portion of the road would be replanted with dense native shrubs and trees once ELJ installation is complete. Vegetation clearing for the newly extended access road would primarily involve young alders and willows.

In addition to the benefits listed above, this mitigation project would encourage long-term preservation of rearing and spawning habitat elsewhere on the mainstem Hoh River by increasing channel stability.



Upper Hoh River Road Project

N

Project Site
New Road
Engineered Log Jam (ELJ)
Upper Hoh Road
Existing Road

Data Sources: USDA 2015 NAIP, Jefferson County

Figure M-1
Proposed Aquatic Mitigation Concept - Lindner Creek Side Channel Engineered Log Jams, MP 6.7 to 7.3

0 250 500 Feet

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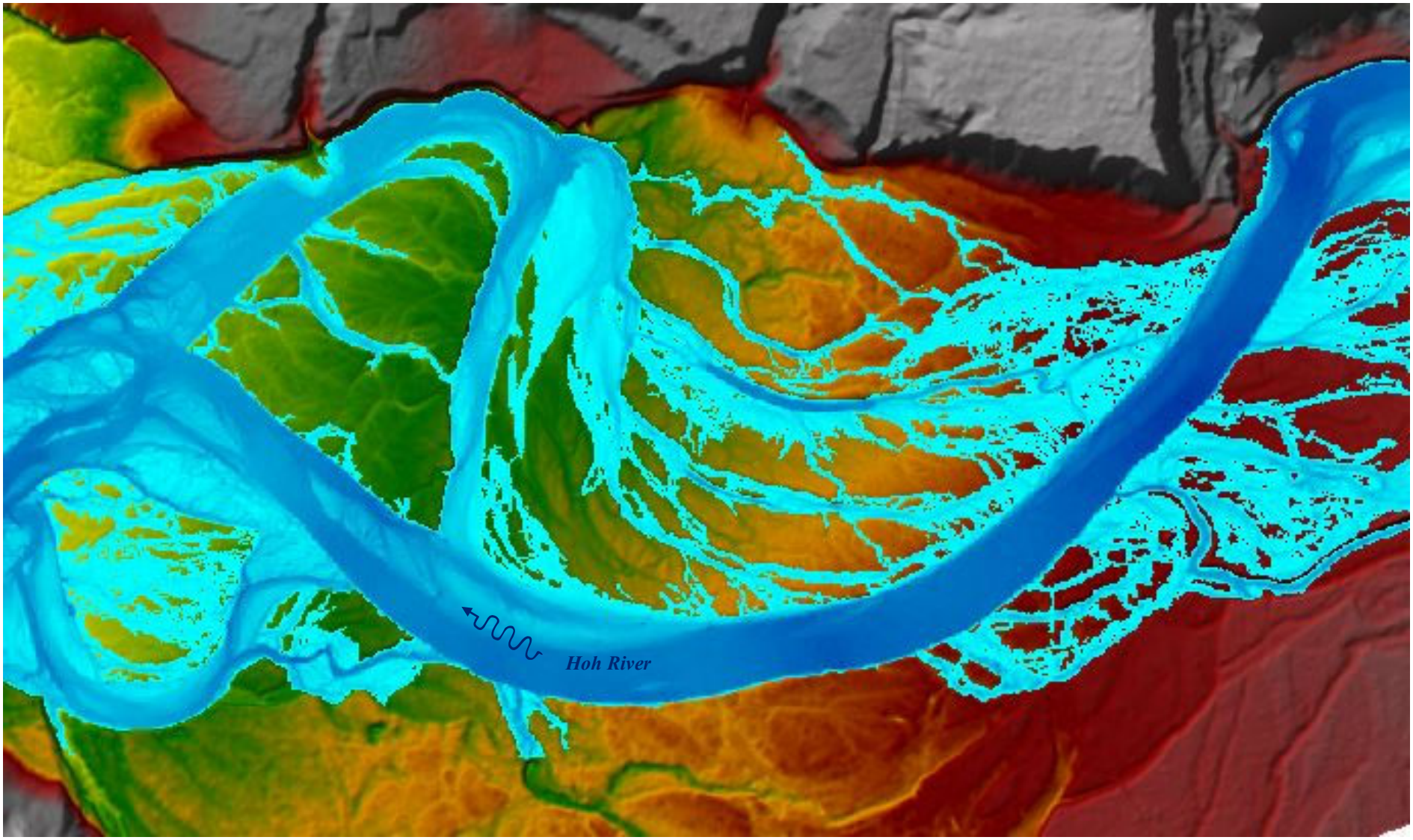


Upper Hoh River Road Project

N

0 250 500 Feet

Approximate Scale

Data Source: FHWA Turner-Fairbank Highway Research Center flume analysis, June 2017

Figure M-2
Lindner Creek Side Channel Finger Channels - Emerging During Two-year Flood Event, MP 6.7 to 7.3

Spruce Creek/Canyon Creek ELJ at MP 9.8

The second proposed mitigation project will involve installing four large ELJs in the Hoh River adjacent to and upstream of the confluence of Spruce Creek, to MP 9.8. The ELJs would be placed in front of the existing riprap that Jefferson County installed as part of emergency repair. They would be similar in design to the ELJ/dolosse units previously described for the proposed project (see **Figure M-3** and ELJ details in Sheet F.8 of **Appendix I**, Design Plan Set [70%]), and will provide the following benefits:

- Preserve the existing riparian habitat at this location, where the river is actively scouring upstream of the riprap installation;
- Improve channel roughness and complexity, which has decreased due to nearby riprap;
- Provide additional rearing habitat and cover for salmonids, through decreasing near-shore flow velocity at this important location near the mouth of Spruce Creek and the mouth of Canyon Creek (Canyon Creek flows through a large side channel and joins the mainstem upstream of this location); and
- Provide more favorable habitat for juvenile salmonids through (1) the use of the single ELJ itself as cover, and (2) creation of additional channel complexity including scour pools. (Post-construction monitoring studies of similar ELJ structures installed by WSDOT in the lower Hoh River and elsewhere have demonstrated this effect.)

When the above recommended mitigation measures are combined with the proposed mitigation projects at MP 6.7 and MP 9.8, the proposed project is anticipated to have a positive net benefit to fish and wildlife in the project area.

Upper Hoh River Road Project

N

0 150 300 Feet

Approximate Scale

Engineered Log Jam (ELJ)

Data Sources: Google Earth

Figure M-3
Proposed Aquatic Mitigation Concept - Spruce Creek/Canyon Creek Engineered Log Jams, MP 9.8

\\Pdxfs1\project\F\FHAX00000242\0600INFO\GS\Maps\Biological Assessment Maps\Fig_3_M-3 Spruce Creek Canyon Creek Mitigation ELJs - NEW2.mxd

4.7 Cultural and Historic Resources

This section discusses cultural and historic resources in the project area, and potential impacts to cultural and historic resources resulting from the project alternatives. The project area evaluated for cultural resources (Area of Potential Effect) is defined in **Appendix H**.

4.7.1 Affected Environment

Archaeological Investigations Northwest, Inc. (AINW) completed a cultural resource survey and records search related to Sites C1 through C5 (see **Appendix H** for complete reports) in April 2015. No evidence of cultural or archaeological resources were found during the pedestrian survey or records search, nor were any historic-period buildings or structures found to be present in the project area. Sites C1, C2, and C5 contain steep slopes and swampy areas outside the road corridor, and archaeological deposits are unlikely to be present. However, ground surface conditions found near Sites C3 and C4 were determined to have potential for containing subsurface archaeological deposits. As a result, AINW recommended shovel testing at Site C3 (Tower Creek Bridge) and Site C4 (proposed bank stabilization location) to determine if subsurface archaeological deposits exist.

The DAHP concurred with AINW's findings and recommendation. In September 2015, AINW excavated two shovel tests at Sites C3 and C4. No archaeological material or historic-period buildings or structures were identified during the field survey. As a result of the historic records review, the surface survey, and the subsurface excavation, AINW determined that archaeological deposits are unlikely to be located within the project area. AINW recommended that no further archaeological investigations related to the UHRR project were warranted and concluded their analysis with a finding of "No Historic Properties Affected" (AINW 2015). DAHP concurred with this finding in October 2015 (DAHP 2015). DAHP has also concurred on the Cultural Resources report for the culvert replacement at MP 4.38 (**Appendix H**; DAHP 2014).

4.7.2 Environmental Consequences

This section describes direct, indirect, and cumulative impacts to cultural resources from the project alternatives.

4.7.2.1 No Action Alternative

With the No Action Alternative, emergency repairs would continue, similar to existing conditions, but would not likely disturb or adversely affect cultural or historic resources, based on AINW's finding that archaeological material or historic-period buildings or structures are unlikely to exist in the project area.

4.7.2.2 Build Alternative

The proposed project would not result in disruptions or other adverse direct, indirect, or cumulative impacts to cultural or historic resources, based on the finding that no cultural resources are likely to exist in the project area. Future projects would need to comply with Section 106 of the National Historic Preservation Act and Executive Order 05-05, which address cultural and historic resources for federal and state funded projects.

Mitigation Measures

No mitigation measures are recommended because the proposed project would not result in adverse impacts to cultural or historic resources.

4.8 Noise

This section discusses existing noise sources and human receptors in the project area and noise that would be attributable to the proposed project. A traffic noise analysis is not required because this project would not involve new highway construction, significant realignment of an existing highway, vertical or horizontal road realignment, an increase in the number of through lanes, or a change in road topography. This federal aid project does not have the potential to increase traffic noise levels at nearby noise sensitive properties, and therefore, is classified as a Type III project. By definition, Type III projects do not require a noise analysis (WSDOT 2011). The project area for noise includes noise receptors along the UHRR between approximately MP 3.6 and MP 10.2.

4.8.1 Affected Environment

This section presents existing sound levels and noises in the project area.

FHWA defines noise as unwanted sound (FHWA 1996). Sound is measured using a logarithmic scale and is expressed in decibels (dB) of sound pressure. An increase of 10 dB causes a doubling of perceived loudness and represents a ten-fold increase in sound level. In other words, if the sound of one piece of construction equipment measures 70 dB, 80 dB would be the equivalent of 10 pieces of that same equipment (NPS 2016d).

Sound levels adjusted for human hearing are expressed as dB(A). These measurements are called A-Weighted Sound Levels, expressed in A-weighted decibels (dBA). **Table 4-12** illustrates the A-weighted levels of common sounds. When sounds exceed 110 dBA, there is a potential for hearing damage, even with relatively short exposures. Noise levels in the project area are generally very low, due to the rural and low-density uses and the undeveloped nature of the area. No sources of measured background noise were available for this analysis; therefore, ambient noise in this area is assumed to be 40 dBA, which is consistent with the estimated ambient noise level used in the ONP programmatic BA for undisturbed forested areas (see **Appendix G**, BA, for information on potential noise impacts to wildlife).

Table 4-12. Decibel Scale for Common Sounds

Category	Measure (dB)
Threshold of pain	140
Jet aircraft at 300 meters of altitude	90
Highway traffic at 30 meters away	75
Quiet restaurant	50
Residential area at night	40
Rustling of leaves	20
Threshold of hearing	0

Source: FHWA 2016a

The project area is considered soft ground, which is defined as "any highly absorptive surface in which the phase of the sound energy is changed upon reflection; examples include terrain covered with dense vegetation or freshly fallen snow" (FHWA 1996), meaning that sound is absorbed faster than if dense vegetation were not present.

Other factors such as climate, vegetation, topography, and our individual hearing sensitivity also contribute to the soundscape experience. For example, sound travels faster in warmer and more humid conditions. Sound also reflects off of very hard surfaces such as rock, water, or ice, and can travel great distances. Softer surfaces like leaf litter or duff tend to absorb sound (NPS 2016d).

Sounds in the project area include water rushing in the Hoh River and the streams that meet the Hoh River, birds and other wildlife, and general sounds related to a small rural community. Existing sources of noise in and near the project area include the traffic on the UHRR and occasional blasting at the Seton Construction quarry. Traffic noise is not prevalent because the UHRR is a two-lane highway, and traffic volumes are relatively low. Types of traffic on the UHRR include automobiles, large recreational vehicles, and medium and heavy trucks carrying stone and rocks from the Seton Construction quarry. Average daily traffic on the UHRR varies throughout the year from 71 vehicles per day in December, to 1,158 vehicles per day in August (see **Table 4-2**).

Noise-sensitive receptors in the project area include the homes and businesses between approximately MP 5.0 and MP 7.0 (between Sites C2 and C3), homes located south of the Hoh River at the end of Owl Creek Drive, and recreationists on and near the Hoh River. The homes and businesses are permanent receptors, while recreationists are present on an intermittent and seasonal basis. The permanent receptor closest to any of the six sites is a home at the end of Owl Creek Road, approximately 2,600 feet southwest of Site C5 (where impact pile driving would occur), south of the Hoh River.

4.8.2 Environmental Consequences

This section describes direct, indirect, and cumulative impacts resulting from noise generated by the project alternatives.

4.8.2.1 No Action Alternative

With the No Action Alternative, the proposed project would not be constructed and related construction noise would not occur. Noise related to emergency repair projects would continue to occur intermittently and without prior notice.

4.8.2.2 Build Alternative

Direct Impacts

Construction of the proposed project would result in temporary increases in noise levels in the project area. Equipment required to complete the project would include construction equipment typically used for many types of construction projects. **Table 4-13** lists equipment that could be used for this type of project, the activities for which the equipment would be used, and the corresponding maximum noise level as measured at 50 feet under normal use. To minimize the

temporarily higher noise levels, all equipment would be required to comply with FHWA's standard noise mitigation measures.

Based on the types of construction equipment proposed for the project, typical noise levels associated with construction are not expected to exceed 101 dBA, which is the average maximum noise level at 50 feet from an impact pile driver (FHWA 2016b).

The project will comply with Chapter 8.70 Noise Control of the Jefferson County Code (JCC 2016). For temporary night construction noise, a variance or exemption from the municipal or county codes could be required (WSDOT 2011).

Impact pile drivers are the construction equipment with the highest noise levels, and would be used to proof piles for the new bridge abutments at Sites C3 and C5. The pile drivers have a maximum noise level of 101 dBA at 50 feet, which equates to approximately 59 dBA at the closest sensitive receptor (2,600 feet southwest of Site C5). **Figure 4-13** shows the area surrounding Site C5, where pile driving would occur.

Table 4-13. Construction Equipment and Noise Levels

Equipment	Typical Expected Project Use[1]	Typical Noise Level at 50 feet in dBA[2]
Air Compressors	Used for pneumatic tools and general maintenance	78
Backhoe	General construction and yard work	78
Crane	Materials handling, removal, and replacement	81
Excavator	General construction and materials handling	81
Generators	Lighting and staging area	81
Haul/Dump Trucks	Materials handling, general hauling	76
Impact Pile Driver	Installing steel piles at bridge and culvert locations	101
Jackhammers/Vibratory Equipment	Pavement removal at bridge and culvert locations, installing wood piles at ELJ/dolosse locations	89
Loader	General construction and materials handling	79
Pumps	General construction use, water removal	81
Pneumatic Tools	Miscellaneous construction work	85
Service and Utility Trucks	Repair and maintenance of equipment and general project work	75

[1] Typical project uses
[2] Typical maximum noise level under normal operation as measured at 50 feet from the noise source
Source: FHWA 2016b

Typical construction noise, other than pile driving, would generate noise measuring 85 dBA at 50 feet from the construction site, and 43 dBA at the closest sensitive receptor. Assuming the noise level of a jackhammer at 50 feet (89 dBA), the closest sensitive receptor would hear noise measuring 47 dBA when jackhammers are used for demolishing the bridge and culvert sites. Based on **Table 4-12,** noise at the closest receptor would typically range from what is likely to be heard at a quiet restaurant and what is likely to be heard in a residential area at night. During impact pile driving, noise at the closest receptor would be similar to noise heard 30 miles from a highway. The nature of the local topography would contain the sound within the Hoh River valley to some extent, and the "soft" environment would absorb some of the noise.

Figure 4-13. Pile Driving Would Occur at Site C3 Tower Creek

CFR Part 772 establishes noise abatement criteria (NAC) for highway traffic noise impacts. FHWA established values for the NAC by attempting to balance the control of future increases in highway traffic noise levels and the economic, physical, and aesthetic considerations related to highway traffic noise abatement measures (FHWA 2016c).

Table 4-14 shows levels of impact at which noise abatement measures must be considered. These noise levels are expressed in Leq, which is the preferred method to describe sound levels that vary over time. For example, pile driving noise that can reach 59 dBA at a nearby home would result in a sound level over time at that home less than 59 Leq. The project area falls into the B category, which has a limit of 67 Leq(h), above which noise abatement criteria must be met. During construction, approximated maximum noise levels at sensitive receptors are not expected to result in noise levels above 59 dBA, which would result in Leq levels below the NAC threshold. Increases in noise related to project construction would not be significant.

Long-term operation of the proposed project, after construction is complete, would not change noise levels in the project area because traffic would not increase on the UHRR as a result of the proposed project.

Table 4-14. Noise Abatement Criteria

Activity Category	Activity Criteria (Leq)	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67	Exterior	Residential
C	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, and restaurants/bars; and other developed lands, properties, or activities not included in A–D or F.
F	–	–	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	–	–	Undeveloped lands that are not permitted.

Leq = a measure to describe sound levels that vary over time.
Source: FHWA 2016c

Indirect Impacts

No indirect impacts to noise levels would occur as a result of the proposed project. After construction, sound and noise levels would return to existing conditions. Noise impacts to sensitive fish and wildlife species are addressed in **Section 4.6**, Fish and Wildlife, and in the BA, **Appendix G**.

Cumulative Impacts

The proposed project, together with past and reasonably foreseeable future projects, would result in temporary noise impacts related to construction work, similar to impacts due to the proposed project alone. Past projects listed in **Table 4-1** will no longer have noise impacts because construction is finished. Only one future project is near the proposed project site—construction of a new outlet to the Hoh River from Dismal Pond at MP 9.0. This project is approximately 1.2 miles east of Site C4, and 1.2 miles west of Site C5. To the extent construction of the proposed project and this Dismal Pond occurs concurrently, temporary noise impacts would be higher than if construction were not concurrent.

Mitigation Measures

The following mitigation measures are recommended to offset noise impacts:

- All equipment would have sound control devices no less effective than those provided on the original equipment;

- All equipment would have muffled exhaust;
- All equipment would comply with pertinent noise standards of the EPA and with the Jefferson County Code; and
- No construction would be performed within 100 feet of any occupied residence.

Should a specific noise impact complaint occur during construction, one or more of the following measures may be required:

- Shutting off idling equipment when possible;
- Working with landowners who submit noise complaints;
- Notifying nearby residents when extremely noisy work would be occurring; and
- Installing temporary or portable acoustic barriers around stationary construction noise sources, if possible.

4.9 Visual Quality

Beneficial and adverse impacts to visual quality are considered when an agency plans and develops a highway project due to the public nature and visual importance of our highways. The project area for visual quality is the area of visual effect (AVE) and includes locations where views of the project would exist and would be influenced by the presence or absence of topography, vegetation, or structures.

4.9.1 Affected Environment

The project area is a combination of Hoh River views, natural forest lands, rural development, and the UHRR.

Views within the AVE are from (1) the roadway by the traveling public, and (2) those recreating on the river or the banks of the river. Certain areas along the UHRR show signs of the public repeatedly accessing the river, including informal pathways and damaged vegetation.

Figures 4-14, 4-15, and 4-16 show key viewpoints from the road at Sites C1, C2, and the downstream portion of C4, respectively. **Figure 4-17** identifies the viewpoint locations. Views from the road to the south include the Hoh River and forested, undeveloped land (**Figure 4-15**), primarily managed by public or semi-public agencies such as NPS and the Nature Conservancy. Views to the north from the road are mostly forest and land sloping upward. No officially designated scenic areas or attributes exist in the project area, although the USFS and NPS have determined the Hoh River eligible for Wild and Scenic designation due to its outstanding fisheries, wildlife, cultural, historical, and recreation values (American Rivers 2016). Views from the Hoh River include forested, mostly public land to the south, and the UHRR and forested land sloping upward to the north.

Views within the AVE are generally dynamic (experienced while moving) because the majority of viewers are traveling along UHRR.

UHRR drivers travel 30 to 40 miles per hour. Dynamic views are for a short duration and frequency and tend to result in low viewer sensitivity to visual change. The majority of views within the AVE are dynamic.

Figure 4-14a. Viewpoint 1 Looking Southwest

Figure 4-14b. Viewpoint 1 Looking Southeast

Figure 4-15a. Viewpoint 2 Looking Southeast

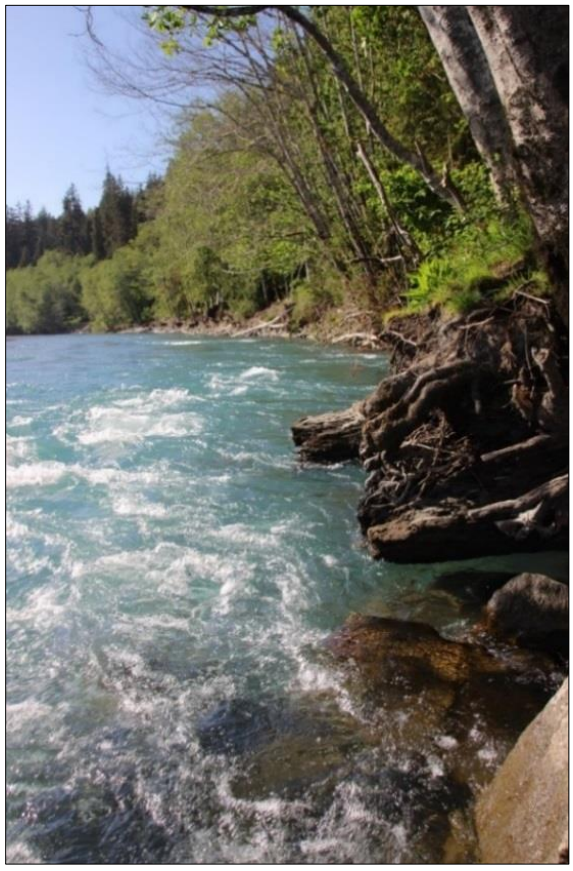
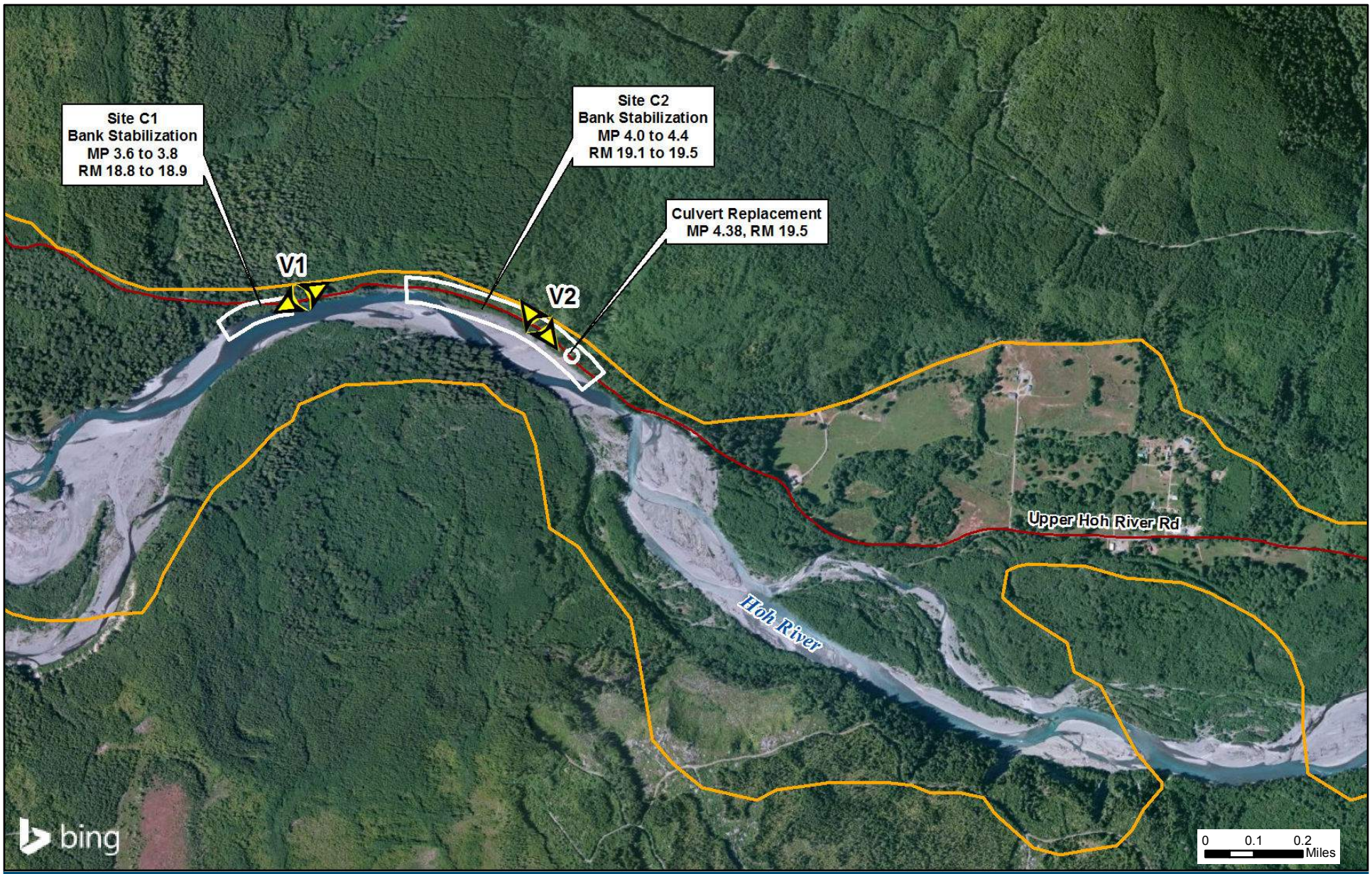


Figure 4-15b. Viewpoint 2 Looking Southwest

Figure 4-16. Viewpoint 3 Looking Southwest

Key existing viewpoints within the AVE are shown in **Figures 4-17a**, Viewpoints 1 and 2 and **Figure 4-17b**, Viewpoint 3. The viewpoints are from the UHRR or accessible pullovers because access to views from the river (i.e., a boat) was not available. As shown in **Figures 4-14**, **4-15**, and **4-16**, the viewpoints generally show vivid views of the riverbank in the foreground, the Hoh River in the middleground, and a forested background or horizon line. The existing views exhibit natural harmony between the roadway and the river, with vivid views of the Hoh River floodplain in the foreground and middleground with natural forested slopes in the background.



Upper Hoh River Road Project

N

Project Location
Area of Visual Effect (AVE)
Upper Hoh River Road

Viewpoint
V1 Viewpoint 1

Figure 4-17a
Viewpoints 1 and 2

Data Sources: Jefferson County, Washington DNR.

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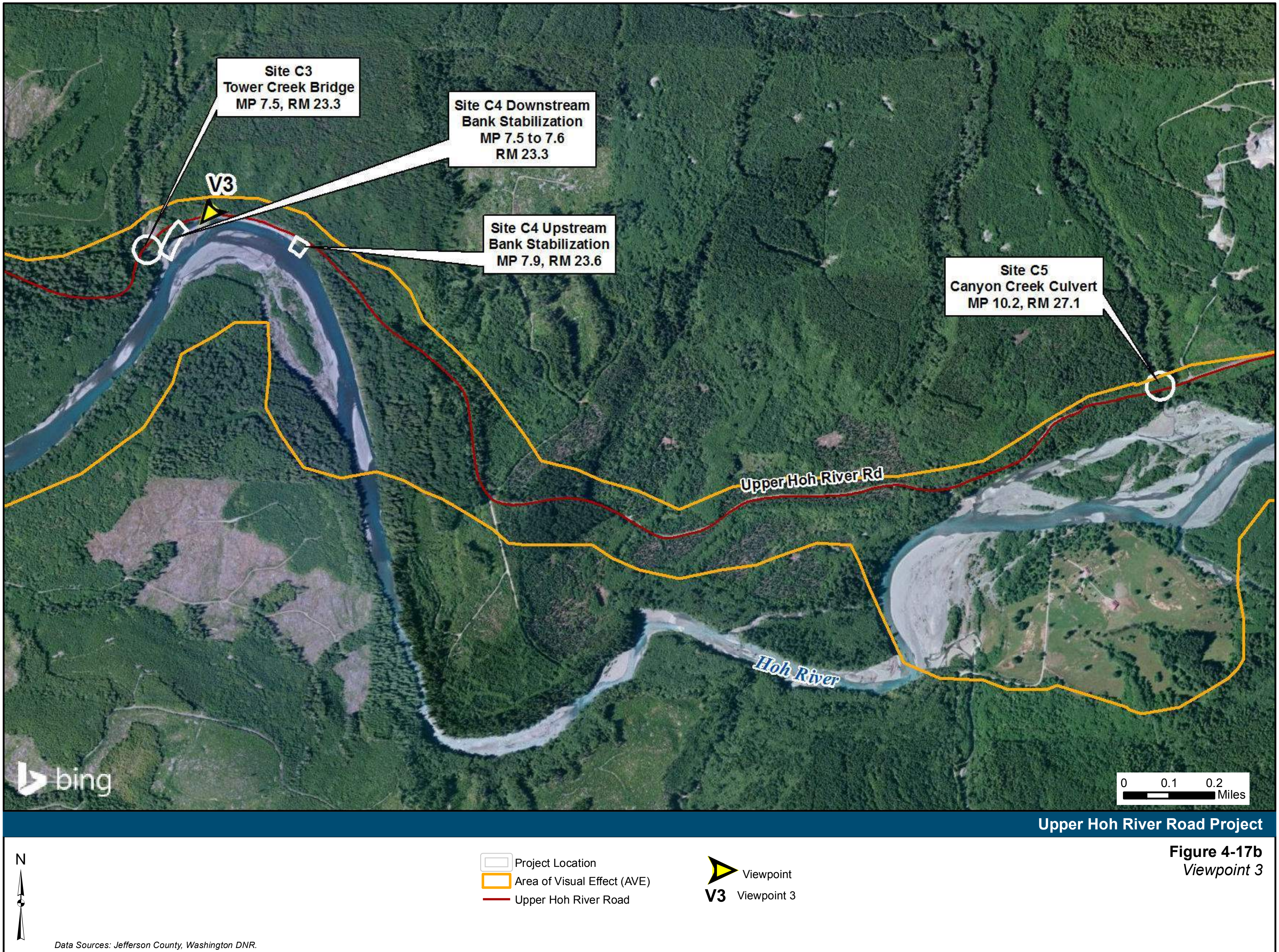

Upper Hoh River Road Project

Figure 4-17b
Viewpoint 3

4.9.2 Environmental Consequences

This section describes direct, indirect, and cumulative impacts to visual quality from the project alternatives.

4.9.2.1 No Action Alternative

With the No Action Alternative, the proposed project would not be constructed and maintenance along the UHRR would continue similar to existing conditions, on an as-needed basis and after flood and storm events. The visual quality in the project area would be reduced over time with more riprap revetment and further vegetation loss near Sites C1, C2, and C4, related to continuing unplanned, emergency repair projects.

4.9.2.2 Build Alternative

Direct Impacts

Bank Stabilization Sites C1, C2, and C4

Each individual ELJ/dolosse unit would be approximately 75 feet long, 20 feet high, and 20 feet wide; and would consist of approximately 75 logs and 20 dolosse. ELJs are log structures with multiple tiers of logs installed for protection along the riverbank and typically include some type of anchoring (**Figure 4-18**). The most visible anchoring would be dolosse. Dolosse are "jack-like" concrete structures with two approximately 8-foot-long octagonal and perpendicular appendages (approximately 3 feet diameter). Each dolosse would be chained to three logs; each dolosse/log bundle would be attached to one large tree; the bundles would be combined to form an ELJ/dolosse unit. **Table 4-15** shows the length of proposed bank stabilization and number of ELJ/dolosse units proposed at Sites C1, C2, and C4. Site C2 would be most visible due to its length of 2,100 linear feet and 23 ELJ units.

ELJs are comprised of wood, a natural material, and would therefore be more consistent with the existing visual character of the river and its surroundings than a riprap revetment typically used for emergency repairs. Although the concrete dolosse would introduce new contrasting unnatural forms and materials to the natural Hoh River viewshed, they would be intertwined with and partially covered by the ELJs. In addition, over time, as the logs that comprise the ELJs lose their bark and become bleached by the sun, they would become similar in color to the dolosse, causing the dolosse to be less discernible from natural materials by viewers.

Removal of vegetation, including mature trees, along the riverbank for installation of the ELJ/dolosse units would adversely affect views for recreational viewers on the river because the roadway (and vehicles traveling along UHRR) would be more visible. Conversely, this would likely be a beneficial impact for viewers on UHRR because it would provide more opportunities for expanded scenic views of the river.

Figure 4-18. Typical ELJ/Dolosse Installation

Table 4-15. Riverbank Stabilization Options Summary

Project Location	Length of Bank Stabilization (linear feet)	No. of ELJ/Dolosse Units
Site C1, MP 3.6 - 3.8	600	6
Site C2, MP 4.0 - 4.4	2,100	23
Site C4, MP 7.5 - 7.6, MP 7.9	400 (downstream segment), 100 (upstream segment)	4

The change in visual character due to the installation of the ELJ/dolosse units would be minor. The ELJ/dolosse units would not reduce the natural harmony, cultural order, and coherence between the roadway and the river when compared to existing views and, as a result, would have an overall neutral effect on long-term visual quality at Sites C1, C2, and C4.

Temporary construction-related visual impacts would occur due to the presence of large heavy equipment such as excavators and cranes during installation of the ELJ/dolosse units, which would occur over two construction seasons, from June through October.

Culvert and Bridge Sites

At MP 4.38, the project would replace the existing 72-inch-wide corrugated metal pipe culvert **(Figure 4-19)** with a 16- by 16-foot box culvert. Despite the increased size, the larger culvert would not likely be more visible to viewers from the UHRR than the existing culvert because the

culvert would be beneath the bridge. Views from the river would change minimally due to the larger culvert, and materials and forms would be consistent with the existing views.

Figure 4-19. Existing MP 4.38 culvert to be replaced

The project would replace the existing Tower Creek Bridge with a new, longer bridge (see **Figure 4-20**) and approximately 50 feet of the Tower Creek stream channel would be restored near the bridge. Riprap would be removed. The new bridge would consist of materials and forms compatible with the existing bridge, and would not introduce any new visual element to the visual character of the Hoh River viewshed. Therefore, this bridge would result in a negligible visual change. The project would replace the 96-inch Canyon Creek culvert (**Figure 4-21**) with a bridge, resulting in views that are wider and include more of Canyon Creek. The visual experience would likely improve slightly, although the clearest views of the new bridge would be from the banks of Canyon Creek, which are relatively inaccessible.

Figure 4-20. Tower Creek Bridge

Figure 4-21. Canyon Creek Culvert

Long-term changes in visual character due to the new culvert and bridges would result in a neutral impact to visual quality. Construction-related visual impacts would include temporary views of large, heavy equipment such as excavators and cranes, lasting approximately 90 days for two construction seasons.

Indirect Impacts

No indirect impacts to visual quality have been identified as a result of the proposed project.

Cumulative Impacts

The proposed project, together with the projects listed in **Table 4-1**, would result in visual changes to the viewshed of the Hoh River. The past projects have modified the banks with riprap. The ELJ/dolosse units would add a new visual element within the UHRR viewshed.

Without the proposed project, local agencies would need to continue the practice of emergency repairs to maintain UHRR. However, because the emergency repairs and proposed bank stabilization projects are in locations visible mainly to the traveling public, which generally have filtered and brief views from UHRR, they would likely result in a neutral cumulative impact to visual resources in these areas.

Over the past ten years, eight stream crossing structures (culverts and bridges) along the UHRR have been repaired or replaced. The proposed project would replace an additional three stream crossing structures. In general, culvert and bridge replacements would not affect views of the traveling public along UHRR or those recreating on the river or the banks of the river. The three structure replacements proposed with this project, together with past and reasonably foreseeable future structure replacement projects, would likely result in a neutral cumulative impact to visual quality along the UHRR.

Although views from the river have changed slightly, these projects do not represent a significant change in visual character as viewed from the river.

Mitigation Measures

The following mitigation measures are recommended to offset potential visual impacts.

- Impact Minimization: apply black cottonwood bark-like concrete form-liner texture to dolosse, instead of smooth finish. A textured concrete finish would help the structures blend into the environment.; and
- Riverbank and Streambank Restoration after Construction: revegetate all riverbanks, streambanks, and riparian areas temporarily disturbed by the installation of the bank stabilization option, with native coniferous and deciduous trees. Utilize larger trees when planting the riparian zone (at least 5-gallon size) to speed up establishment.

4.10 Utilities

This section presents information about utilities available in the project area and analyzes potential impacts due to project construction and ongoing operation. The project area for the assessment of impacts to utilities includes the UHRR and adjacent homes and businesses between MP 3.6 and MP 10.2.

4.10.1 Affected Environment

Utilities in the project area include electricity and telephone (see **Figure 4-22**). Clallam County Public Utilities Department (PUD) provides electricity service to the homes and businesses in the project area with overhead power lines originating from north of the project area. Century Link provides telephone service to project area residents and businesses. The phone lines are also above ground. The above-ground lines extend along the UHRR in certain areas, including near Site C5.

Century Link may also provide internet service to the project area. Satellite internet is available to the project area.

Figure 4-22. Power Pole on North Side of UHRR

No water service exists in the project area. Homes and businesses source their water from private wells. Jefferson County Public Health (JCPH) governs and monitors water quality in the project area, and sets performance standards for well water. JCPH reviews and approves applications for well construction, reconstruction, or decommissioning.

Homes and businesses in the project area use septic systems because sewer service is not provided. JCPH manages an Onsite Sewage Program, which includes setting performance

measures, adopting a Sewage Management Plan, and maintaining an Onsite Sewage Code. JCPH also offers inspection, monitoring, and education related to septic systems (JCPH 2016).

Jefferson County works with Skookum Environmental Service and DM Disposal for garbage and recycling pick-up. West Waste & Recycling, Inc. provides the following services to the Greater Forks area: residential and commercial curbside collection, drop box services, recycling and disposal services at a transfer facility, and commercial paper and cardboard collection routes.

4.10.2 Environmental Consequences

This section describes direct, indirect, and cumulative impacts to utilities from the project alternatives.

4.10.2.1 No Action Alternative

With the No Action Alternative, maintenance, monitoring, and as-needed emergency repair work would continue along the UHRR. Utility avoidance or relocation could be required, associated with future emergency repairs along the Hoh River bank and UHRR. Temporary service interruptions could occur in the future to the extent future repair work requires utility avoidance or relocation.

4.10.2.2 Build Alternative

Direct Impacts

Depending on the specific location of utility lines and structures, the proposed project could require avoidance or relocation of utilities. Lines are above ground; therefore, avoidance or relocation would be required when equipment movement or placement interferes with the utility structures. If avoidance is not feasible, WFLHD and Jefferson County would work with utility providers to temporarily relocate utility lines, poles, and other related structures.

When design plans for Sites C1 through C5 and MP 4.38 are final, WFLHD would coordinate with Jefferson County and Clallam County PUD to locate utility lines, poles, and other related structures; and either avoid or temporarily relocate utility structures to avoid damage and limit service interruptions. If temporary service interruptions are expected, WFLHD and Jefferson County would coordinate with the utility to make sure customers are notified in advance of the temporary outage. With these plans in place, temporary adverse impacts to utilities during construction are expected to be minimal. Utility service would not change in the long run, associated with the proposed project. As necessary, WFLHD will coordinate with private property owners to minimize impacts on wells and private septic systems and fields.

Indirect Impacts

To the extent the proposed project results in fewer incidences of damage to banks and emergency repairs on the UHRR, the number of utility service interruptions or conflicts with utility structures would decrease.

Cumulative Impacts

Together with past and reasonably foreseeable future projects that also improve the reliability of the UHRR, the proposed project would result in fewer interruptions in utility service related to emergency repair and construction work.

Mitigation Measures

The following mitigation measures are recommended to offset impacts to project area utilities.

- Power and telephone lines, poles, private buried septic systems and well fields, and related structures would be located and avoided during construction to the extent possible;
- If avoidance of utilities is not feasible, WFLHD and Jefferson County would work with utility providers to temporarily relocate utility lines, poles, and other related structures; and
- Outages would not last more than four hours.

4.11 Socioeconomics

This section presents the existing social and economic conditions in the project area, and analyzes the expected socioeconomic impacts on the community, attributable to the project alternatives.

4.11.1 Affected Environment

The project area for analyzing social and economic impacts is defined as the UHRR and surrounding properties between MP 3.6 and MP 10.2. Sources if information included the U.S. Census, Washington Office of Financial Management, Washington State Employment Security Department, Jefferson County, and public services agencies in Jefferson County. In addition, site reconnaissance was conducted in spring, 2016.

4.11.1.1 Population and Housing

The project area is located in unincorporated Jefferson County (**Figure 3-1**), a rural county on the Olympic Peninsula covering 1,801 square miles. Jefferson County is home to 30,880 residents (Census 2014); reflecting a population density of 17 persons per square mile, much less than the Washington State average population density of 106 persons per square mile. Port Townsend, the only incorporated city in Jefferson County, is located on the east end of the County and has 9,380 residents; the majority of Jefferson County residents live in unincorporated areas.

Between 2010 and 2015, Jefferson County's population grew by less than one percent per year (WOFM 2014), slower than Washington as a whole. The Washington Office of Financial Management expects Jefferson County's population to grow by over one percent per year in future years 2016 to 2040, slightly faster than Washington State as a whole.

The approximately 10 homes located in the project area north of the UHRR and the Hoh River between approximately MP 5 and MP 7 are accessed exclusively by the UHRR. These homes are single-family residences on relatively large lots. According to the 2010 census, the 28 census blocks that encompass the project area had 19 residents (U.S. Census 2010). The residences are

clustered around Oscar Peterson Road and Lindner Creek Lane, rural roads extending north from the UHRR.

4.11.1.2 Economy

Jefferson County jobs in 2013 were in government (28 percent), accommodation and food services (13 percent), retail trade (12 percent), and healthcare and social assistance (10 percent). The average wage earned was $34,497 in 2013, 35 percent less than the average wage in Washington State as a whole ($53,030) (WESD 2013).

The regional decline of the timber and commercial fishing industries over the last two decades has resulted in distressed economic conditions in the West End of Jefferson County where the project area is located, similar to some other rural and forested areas in the Pacific Northwest. The county has been working to diversify the economy by encouraging new employment opportunities in other economic sectors such as tourism and recreation.

Situated on US 101 between the Olympic Mountains and rainforest and the ocean beach portions of ONP, the West End serves visitors from the Puget Sound regional metropolitan areas, as well as national and international visitors. The Hoh and Quinault Indian Reservation communities are concentrated population centers that contribute to and rely upon the West End economy.

Jefferson County's Comprehensive Plan encourages diverse employment opportunities in the West End with policies that allow businesses serving tourists to carry a broader range of goods and services (Jefferson County 2009). In addition, policies related to home businesses and cottage industries allow for greater flexibility under criteria specific to the West End. Forest resource-based industries in the West End continue to support employment in a distressed economic sector that has long-term economic importance for Jefferson County, even though some employment decline has occurred (Jefferson County 2014).

The following privately-owned businesses are located along UHRR within the project area:

- Hard Rain Café, 5763 Upper Hoh River Road (see **Figure 4-23**); and
- Peak 6 Tours and Gift Shop, 4913 Upper Hoh River Road.

Figure 4-23. Hard Rain Café, Restaurant and Mercantile

The Jefferson County Public Works Maintenance Shop is also located along UHRR, at 5632 Upper Hoh River Road. Seton Construction operates a rock quarry north of the road, just east of Site C5. The quarry produces and supplies rock and backfill material.

The project area is unique in that the UHRR is the only road leading to ONP's western entrance. Visitors entering ONP from the west (traveling into the Hoh District of ONP) must travel along the UHRR to reach ONP entrance. The two businesses within the project area, the Hard Rain Café and the Peak 5 Tours and Gift Shop, rely heavily on tourism. In 2015, six percent of ONP visitors entered through the Hoh District (NPS 2016c), meaning they traveled along the UHRR to reach ONP. Applying this percentage to the visitor spending at ONP in 2014 (Cullinane *et al.* 2015), an estimated $15 million in visitor spending per year was attributable to Hoh District ONP visitors. This spending, and the jobs and income it supports, are spread across the jurisdictions and commercial centers located along the routes leading to US 101 and the UHRR. Tourism spending is a substantial part of the local project area economy and the West End economy.

4.11.1.3 Community Cohesion

The small residential community within the project area is home to those who value what the area has to offer, including the nearby ONP, a rural way of life, opportunities for larger parcels of land, forest resources, recreational opportunities, solitude and quiet, wildlife, and the nearby Hoh River. Community members include the residents near Oscar Peterson Road and Lindner Creek Lane as well as employees at the two businesses and the County maintenance shop.

Some residents have lived in the area for many years and are highly invested in the community. A small community such as this one tends to be close-knit, especially when isolated from services and goods typically found in more urban areas such as medical care and grocery stores. Community members rely on the UHRR to travel to work, to run errands, and to receive medical care.

4.11.1.4 Public Services

The Jefferson County Sheriff's Office (JCSO) provides law enforcement services to the unincorporated portion of the County, including the project area. Services include patrol of unincorporated areas, delivery of civil papers, execution of court orders, incarceration of offenders, supervision of parole and probation clients, organizing search and rescue operations, and preparing for and coordinating responses to man-made and natural disasters. The sheriff's office criminal division consists of 13 patrol deputies, 3 detectives, 2 patrol sergeants, 2 patrol captains, and an undersheriff. Resident deputies are stationed on the coastal portion of the County to serve communities west of ONP. The NPS is responsible for law enforcement services within the park (JCSO 2016).

The fire department closest to the project area is the Clallam County Fire Protection District No. 1, at 11 Spartan Avenue in Forks, approximately 20 miles northwest of the project area. District No. 1 is a volunteer district with 43 firefighters and two fire stations: one station in Forks (20 miles northwest of the project area), and one station in Beaver (30 miles north of the project area). Jefferson County Fire District No. 7 has a station in Clearwater, approximately 40 miles southwest of the project area.

Clallam County Hospital District No. 1 serves the residents of west Clallam and west Jefferson counties. The Hospital District includes Forks Community Hospital, the Bogachiel Medical Clinic and Women's Health, Clallam Bay Clinic, West End Outreach Services facility, and the Forks Ambulance Service. The hospital closest to the project area is the Forks Community Hospital, located at 530 Bogachiel Way, 20 miles northwest of the project area. The Jefferson County Department of Emergency Management provides services to county residents in case of an emergency.

The project area is within the boundaries of the Quillayute Valley School District, which buses students from Lindner Creek Lane in the project area to schools in Forks. Schools and programs include the Forks Elementary School (preschool through grade 3), Forks Intermediate School (grades 4 through 6), Forks Junior/Senior High School (grades 7 through 12), Forks Alternative School, and Home School Plus.

4.11.1.5 Revenues and Expenditures

Jefferson County's 2016 Final Budget, adopted in December of 2015, includes $47.3 million in revenues and $52.7 million in expenses. Top revenue and expenditure categories include County roads, the sheriff's department, and public health. Jefferson County and the state tax goods and services at 9.0 percent, with 6.5 percent going to the State of Washington and the remaining 2.5 percent staying in the County. Hotel/motel tax is an additional 2 percent of sales. The tax code area for the project area is 0220; residents in this tax code area paid taxes to the following districts or programs in 2014: flood zone, hospital, library, port, public utility, road, and school.

4.11.2 Environmental Consequences

This section describes direct, indirect and cumulative impacts to socioeconomic resources from the project alternatives.

4.11.2.1 No Action Alternative

With the No Action Alternative, emergency repairs would continue to occur on the UHRR and result in unexpected delays and other temporary construction-related disruptions to residents and employees in the project area. Emergency repairs would continue to require the purchase of materials, the temporary employment of workers, and the use of equipment.

4.11.2.2 Build Alternative

Direct Impacts

Construction

Construction would occur between June 1 and October 31, and possibly over two weeks in January or February. One lane of the UHRR would be closed at a time to allow for construction activities, staging, and equipment storage at each of the six sites. Flaggers, pilot cars, and temporary stoplights would control traffic during lane closures. If bridge and culvert construction also occurs during the winter, the road may close for up to two weeks during January or February. **Table 4-16** shows the estimated duration of construction at each of the six sites. Some construction activities would be concurrent.

Table 4-16. Estimated Construction Durations

Location	Estimated Length of Construction (days)
Site C1	45
Site C2	100
MP 4.38 Culvert	45
Site C3 -Tower Creek Bridge	90
Site C4	45
Site C5 - Canyon Creek Bridge	90

During bank stabilization activities at Sites C1, C2, and C4, residents and businesses would retain access to their properties, but all traffic on UHRR would experience typical delays of 30 minutes, and occasional delays up to 4 hours. The UHRR may close for two weeks during the winter to allow for bridge and culvert construction at MP 4.38 and Sites C3 and C5. The closure would disrupt access for residents and businesses and result in travel delays. WFLHD and the construction crew would need to coordinate with the full-time park ranger and the private resident residing between the project area and the park to ensure that access to their homes is maintained at all times.

Typical construction disruptions, such as increases in noise levels and dust, could temporarily change the character of the quiet, rural community for as long as construction activities occur. Due to the location of the sites in relation to the cluster of residences in the project area, the temporary noise and dust would not represent a substantial change in the character of the community. Adverse economic impacts during construction could include lost patronage at local businesses due to access difficulties, both in summer months due to lane closures and in winter months due to a possible road closure.

Visitors to the Hoh District of ONP would also experience delays. To the extent Hoh District visitors decide to delay or forego their visit, economic benefits to the local area related to ONP

visitors would decrease. The decrease in economic benefit would not be substantial within the context of total visitor spending by Hoh District ONP visitors because the road would not be closed during high-use summer months, and most delays would be approximately 30 minutes.

Temporary economic benefits related to project construction would include additional jobs, earned income, and spending for materials and equipment. To the extent workers are hired locally and materials are sourced locally, these temporary economic benefits would occur locally.

Seton Construction, the quarry just east of Canyon Creek culvert (Site C5) provides riprap for local construction projects, including some projects along the Hoh River banks. During lane or road closures, Seton Construction would need to coordinate with construction crews to minimize disruptions.

Access for fire and emergency services would need to be maintained at all times during construction. WFLHD and construction crews would work with service providers to put in place procedures so that during the possible winter road closure, if an emergency arises, emergency vehicles can pass. Construction crews would coordinate with residents to the extent practical. WFLHD and Jefferson County would coordinate with ONP so that notice of traffic delays on UHRR can be posted on ONP's website. The school district, WFLHD, and Jefferson County would work together to ensure that students living in the project area can be picked up and dropped off for school during any road closures in the winter.

Construction would result in (1) temporary benefits to the region in the form of jobs, income, and spending; and (2) temporary adverse impacts to the social and economic conditions in the project area due to intermittent traffic delays.

Long-Term Operation

The proposed project would increase the long-term safety and reliability of the UHRR, thus ensuring more consistent and reliable access for project area residents; business owners, employees, and patrons; and ONP visitors. Increased reliability of the UHRR would improve the quality of life for the project area residents due to fewer travel delays, fewer emergency repairs along the road, and better access for emergency services. In addition, road reliability would encourage tourism and the related economic stimulus. Spending related to tourism and recreation (including fishing) could increase slightly, due to more reliable access to the Hoh River from the UHRR. Seton Construction and vehicles accessing the quarry, east of the project area, would benefit from the improved reliability associated with the proposed project. No long-term direct adverse impacts to socioeconomics are expected.

Indirect Impacts

Increased long-term reliability of the road could lead to indirect economic benefits such as supplier and worker spending in the local and regional area, and related tax revenues. In addition, local businesses relying on tourism may benefit due to increased visitation to ONP and area recreational attractions related to road reliability. No long-term, indirect, adverse impacts to socioeconomics are expected.

Cumulative Impacts

The proposed project, together with the projects listed in **Table 4-1**, could result in long-term permanent increased economic activity for area businesses, leading to potential increases in tax

revenue and a more sustainable economy. The projects would cumulatively increase the long-term quality of life for project area residents.

Mitigation Measures

The following mitigation measures are recommended to offset potential impacts:

- Access for fire and emergency services would be maintained during construction;
- Specific procedures would be in place so that if an emergency arises during the winter road closure, emergency vehicles could pass;
- Construction crews would coordinate with residents to the extent practical to ease access during construction activities;
- WFLHD and Jefferson County would coordinate with ONP so that notice of traffic delays on UHRR can be posted on ONP's website;
- Flaggers, pilot cars, and temporary stoplights would control traffic during lane closures; and
- WFLHD and Jefferson County would coordinate with the school district to ensure students can be picked up and dropped off during the winter road closure.

5.0 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible commitments are those that cannot be regained, such as the extinction of a species, the expenditure of federal funds, or the removal and use of fossil fuels. Irretrievable commitments are those that are lost for a period of time, such as the loss of production, harvest, or use of renewable resources. Fossil fuels, labor, and construction materials such as riprap, dolosse, logs, and steel would be irreversibly expended by construction of the proposed project. Labor and fossil fuels would be consumed during operation of construction equipment for material movement and construction activities. In addition, labor and natural resources would be used in the fabrication and preparation of construction materials. Construction would also require an expenditure of federal funds that could not be used for any other projects. Vegetation, including large conifers, would be temporarily lost for a period of time as a result of the project, representing an irretrievable commitment of resources, and a use of renewable resources.

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6.0 PERMITS AND APPROVALS

Required permits and approvals would be obtained prior to construction. The following permits and approvals are expected to be required for implementation of the Build Alternative:

- National Environmental Policy Act;
- State Environmental Policy Act;
- U.S. Army Corps of Engineers Section 404 of the Clean Water Act;
- Endangered Species Act Section 7;
- Washington State Department of Ecology Section 401 of the Clean Water Act;
- Section 402 Stormwater Construction Permit;
- Washington Department of Natural Resources Aquatic Lease;
- Section 106 of the National Historic Preservation Act;
- Uniform Relocation Assistance and Real Property Acquisitions Act;
- Coastal Zone Management Certification;
- Jefferson County Shoreline Substantial Development and Conditional Use Permit; and
- Jefferson County Stormwater Management/Grading/Clearing Permit.

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7.0 COORDINATION AND CONSULTATION

7.1 Agency Coordination

WFLHD is the lead agency for federal reviews and approvals on this project and has therefore coordinated with the following agencies as part of project design, planning, and scoping: DAHP, ONP (NPS), WDNR, the Hoh Tribe, the Corps, WDFW, the Hoh River Trust, Ecology, and the USFWS.

Coordination with DAHP included the following: WFLHD submitted the April 1, 2015, cultural resources report to DAHP, and the updated report completed in September 2015. On October 29, 2015, DAHP concurred with the study, which stated the following:

- No evidence of archaeological material was found during the pedestrian survey;
- No historic-period buildings or structures are present in the area of potential effect; and
- Sites C1, C2, and C5 contain steep slopes and swampy areas outside the road corridor and archaeological deposits are unlikely to be present. However, ground surface conditions found at two locations in the central portion of study areas C3 and C4 may contain subsurface archaeological deposits. Shovel testing was recommended and conducted and did not recover any archaeological material or identify any historic-period buildings or structures.

DAHP concurred with the finding that archaeological deposits are unlikely to be located within the project area and with the "No Historic Properties Affected" finding in October 2015 (DAHP 2015). DAHP has also concurred on the cultural resources report for the culvert replacement at MP 4.38 (DAHP 2014). Cultural resource reports are included as **Appendix H**.

WFLHD and Jefferson County held a meeting on March 10, 2015, at the project site to introduce agency personnel to the project, describe activities leading up to the meeting, and to receive guidance or direction from the agencies regarding methods to address the issues along the UHRR. Agencies present in addition to WFLHD and Jefferson County included ONP, WDNR, the Hoh Tribe, the Corps, WDFW, the Hoh River Trust, and Ecology. The USFWS was invited but was unable to attend. **Appendix B** includes notes for this meeting.

WFLHD and Jefferson County held a pre-application meeting with the Corps on July 8, 2015, the purpose of which was to review the project scope and purpose and need; identify points of coordination between WFLHD and the Corps; and to confirm the list of information needs for the Corps Section 404 permit application. **Appendix C** includes notes from this meeting.

On April 25, 2017, a pre-application meeting with Jefferson County occurred at Jefferson County City Hall in Port Townsend related to local permits such as those to meet requirement of the Shoreline Master Program.

7.2 Tribal Coordination

In June 2015, WFLHD contacted representatives of the Hoh Tribe (Cultural Resources; Business Committee; and Timber, and Fisheries & Wildlife) and provided results of the April 2015 cultural resources study of the project area, completed as part of Section 106 compliance.

The study was updated in September 2015 and in October 2015; DAHP concurred on the updated report. A representative of the Hoh Tribe attended the October 2015 scoping meeting in Forks, Washington, and provided verbal comments on the project.

7.3 Public Involvement

WFLHD and Jefferson County held a public meeting on October 27, 2015, which was attended by approximately 10 people. WFLHD held the scoping meeting at the Olympic Natural Resource Center (ONRC) in Forks, Washington. The ONRC is located 15 miles from the western milepost limits of the project in Forks, which is the closest town to the project site. WFLHD advertised the scoping meeting in several ways:

- WFLHD mailed letters to involved agencies and interested parties on October 13, 2015, announcing the project and the scoping meeting. The mailing list included (1) property owners and residents within 0.5 mile of the project, (2) public agencies with potential interest in the project, and (3) other interested groups for whom Jefferson County had contact information. Residents received postcards, and agencies and groups received letters. Both the letter and the postcard introduced the project; provided an invitation to the scoping meetings; invited comments and questions on the project; gave an email, phone number, and address for submitting comments; and gave an end date for receiving comments (November 20, 2015);
- The scoping letter was mailed to local newspapers, including the *Port Townsend & Jefferson County Leader*, the *Peninsula Daily News*, and the *Forks Forum*; and
- The scoping letter was emailed to the Forks library and posting was requested and confirmed.

WFLHD organized the meeting as an open house format. The open house ran from 7:00 p.m. to 8:00 p.m., with a short introduction given by WFLHD. Nine people attended the meeting, including project area residents and representatives of the Hoh River Residents Association, the Olympic Forest Coalition, the Hoh Tribe, the Hoh River Trust, and the North Pacific Coast Lead Entity.

Three display boards and two roll plots describing various elements of the proposed project were available at the meeting for attendees to review and provide comment. In general, the meeting attendees were supportive of the project and interested in the methods to be employed to meet the project purpose. The scoping report for this project is included as **Appendix A**.

This EA will be distributed to agencies and the public after its publication. See Section 1.6 for next steps in the environmental process.

7.4 List of Preparers

This EA was prepared by Federal Highway Administration, Western Federal Lands Highway Division, in partnership with Jefferson County.

- Kirk Loftsgaarden, PE, WFLHD Project Manager;
- Steve Morrow, WFLHD Environmental Protection Specialist;

- Sven Leon, PE, WFLHD Lead Hydraulics Engineer; and
- Monte Reinders, Jefferson County Public Works Director

The NEPA EA and associated technical reports were prepared by David Evans and Associates, Inc. and its subconsultants.

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Final EA Appendix I
Design Plan Set (70%)

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Final EA Appendix J
Wetland Addendum

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