UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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Portland, Oregon 97232-1274

Refer to NMFS No: WCRO-2022-00316

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June 1, 2022

Mr. Calvin Terada
Director, Superfund & Emergency Management Division
US Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 155
Seattle, Washington 98101

Ms. Linda Jackson
Forest Supervisor
Payette National Forest
500 North Mission Street, Building 2
McCall, Idaho 83638

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Stibnite Administrative Settlement and Order on Consent for Removal Actions Project; Headwaters East Fork South Fork Salmon River Subwatershed, HUC# 170602080201, Valley County, Idaho

Dear Mr. Terada and Ms. Jackson:

Thank you for your letter of February 15, 2022, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Stibnite Administrative Settlement and Order on Consent for Removal Actions Project. The U.S. Environmental Protection Agency (EPA) and Payette National Forest (PNF) submittal included a final biological assessment (BA) that analyzed the effects of the proposed action on Snake River Basin steelhead (*Oncorhynchus mykiss*), Snake River spring/summer Chinook salmon (*O. tshawytscha*), and designated critical habitat for these species. The EPA is the lead Federal action agency for this project.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)] for this action.

In this biological opinion (opinion), NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of Snake River spring/summer Chinook salmon and Snake River Basin steelhead. NMFS also concludes that the action will not destroy or adversely modify designated critical habitat for Snake River spring/summer Chinook salmon and Snake River Basin steelhead.

As required by section 7 of the ESA, NMFS provides an incidental take statement (ITS) with the opinion. The ITS describes reasonable and prudent measures (RPM) NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth terms and conditions, including reporting requirements, that the PNF must comply with in order to be exempt from the ESA take prohibition.

This document also includes the results of our analysis of the action's effects on EFH pursuant to section 305(b) of the MSA, and includes five conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These conservation recommendations are a non-identical set of the ESA Terms and Conditions. Section 305(b)(4)(B) of the MSA requires Federal agencies provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH Conservation Recommendations, the EPA or PNF must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, NMFS asks that you clearly identify the number of Conservation Recommendations accepted.

Please contact Bill Lind, Boise NMFS, at (208) 378-5697 or bill.lind@noaa.gov; or Johnna Sandow, at (208) 378-5737 or johnna.sandow@noaa.gov, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Enclosure

cc:
C. Terada – EPA
L. Jackson – PNF
C. Nalder – PNF
K. Hendricks – USFWS
M. Lopez – NPT
C. Colter – SBT

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response

EPA Stibnite Administrative Settlement and Order on Consent for Removal Actions Project

NMFS Consultation Number: WCRO-2022-00316

Action Agencies: U.S. Environmental Protection Agency
USDA Forest Service, Payette National Forest

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Snake River Basin steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No
Snake River spring/summer Chinook salmon (*O. tshawytscha)*	Threatened	Yes	No	Yes	No

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office
West Coast Region
National Marine Fisheries Service

Date: June 1, 2022

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ACRONYMS LIST

API	American Petroleum Institute
ASAOC	Administrative Settlement and Order on Consent
BA	Biological Assessment
BMP	Best Management Practices
BNF	Boise National Forest
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemicals of Concern
CSI	Canadian Superior Mining
CWA	Clean Water Act
CY	Cubic Yards
dB	Decibels
DMEA	Defense Mineral Exploration Administration
DPS	Distinct Population Segment
DQA	Data Quality Act
eDNA	Environmental Deoxyribonucleic Acid
EFH	Essential Fish Habitat
EFSFSR	East Fork South Fork Salmon River
EPA	Environmental Protection Agency
EPP	Environmental Protection Plan
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FA	Functioning Appropriately
FAR	Functioning At Risk
FHWA	Federal Highway Administration
FR	Federal Register
FUR	Functioning At Unacceptable Risk
HAPC	Habitat Area of Particular Concern
HUC	Hydrologic Unit Code
H:V	Horizontal:Vertical
ICTRT	Interior Columbia Technical Recovery Team
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IPS	Inches per Second
ISAB	Independent Scientific Advisory Board
ITS	Incidental Take Statement
LRMP	Land and Resource Management Plan
LWD	Large Woody Debris

Matrix	Southwest Idaho Ecogroup Matrix of Pathways and Watershed Condition Indicators
mm	Millimeters
MPG	Major Population Group
MSA	Magnuson–Stevens Fishery Conservation and Management Act
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFR	National Forest Road
NMFS	National Marine Fisheries Service
NPT	Nez Perce Tribe
NTU	Nephelometric Turbidity Units
OHWM	Ordinary High Water Mark
Opinion	Biological Opinion
PBF	Physical or Biological Feature
PCE	Primary Constituent Element
PDF	Project Design Features
PFMC	Pacific Fishery Management Council
PNF	Payette National Forest
PPV	Peak Particle Velocity
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride
RC	Reverse Circulation
RCA	Riparian Conservation Area
RMS	Root Mean Square
RPA	Reasonable and Prudent Alternative
RPM	Reasonable and Prudent Measure
SDS	Safety Data Sheets
SFSR	South Fork Salmon River
SPCCP	Spill Prevention, Control and Countermeasure Plan
SPL	Sound Pressure Level
SWPPP	Stormwater Pollution Prevention Plan
TCRA	Time Critical Removal Action
μPa	Micropascal
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
VSP	Viable Salmonid Population
WCI	Watershed Condition Indicator

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1. Background

National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson–Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR part 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the Snake Basin Office in Boise, Idaho.

1.2. Consultation History

NMFS and the U.S. Fish and Wildlife Service (USFWS) received a draft proposed action on September 8, 2021 with a follow-up conference call September 17, 2021. We received a draft biological assessment (BA) on October 22, 2021, providing comments on the draft BA to the action agencies on November 2, 2021. Comments on the draft BA were discussed in meetings on November 22, 2021 and January 6, 2022. A revised BA was received on February 15, 2022, and consultation was initiated at this time.

The species and designated critical habitats subject to this consultation include Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha*), Snake River Basin steelhead (*O. mykiss*), and their designated critical habitats. In addition, the U.S. Environmental Protection Agency (EPA) and Payette National Forest (PNF) requested EFH consultation for Pacific salmon (Chinook salmon). Given the completeness of the consultation request package, February 15, 2022, serves as the initiation date for both the ESA and MSA consultation.

On March 23, 2022, NMFS provided a copy of the proposed action and terms and conditions sections of the draft opinion to the EPA, PNF, Nez Perce Tribe (NPT), and Shoshone Bannock Tribes. Comments were received from EPA and the PNF on April 7, 2022 regarding monitoring and reporting on the status of post-project ground cover, asking that annual reporting occur for three years post project. Comments were received from the NPT on April 20, 2022. The NPT made the point that they are opposed to the action as developed by EPA and the PNF, and provided a letter to EPA detailing the reasons for their opposition[1]. In addition, the NPT also requested that progress toward meeting revegetation goals be reported annually, but that ground cover monitoring and reporting be continued for five years post-project due to historical difficulties getting vegetation to grow following disturbance in the past. This longer duration of monitoring and reporting have been incorporated into our final take statement. No comments were received from the Shoshone Bannock Tribes.

In preparing this opinion, NMFS relied on information from the BA (Stantec 2022) and its supporting documentation, published scientific literature, and other documents (e.g., government reports). This information provided the basis for our determinations as to whether the EPA and PNF can ensure that their proposed action is not likely to jeopardize the continued existence of ESA-listed species, and is not likely to result in the destruction or adverse modification of designated critical habitat.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02). Under the MSA, "Federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (see 50 CFR 600.910).

We considered, under the ESA, whether or not the proposed action as described below would cause any other activities and determined that it would not. Although the proposed Stibnite Gold Project overlaps the action area, it is a separate Federal action that is currently in the supplemental draft environmental impact statement stage of the National Environmental Policy Act and will require many additional permits and approvals from Federal, State, and local agencies before construction and mining operations could begin. The Stibnite Gold Project is not contingent upon the proposed action, and is a separate Federal decision that will require separate consultation pursuant to section 7 of the ESA.

The BA submitted by the EPA and PNF outlines the potential effects of Phase 1 of the Administrative Settlement and Order on Consent (ASAOC) for Removal Actions at the Stibnite Mine Site (Proposed Action) (Stantec 2022)[2]. The Settlement determined that the conditions described constituted an actual or threatened release of a hazardous substance from the facility, and that removal actions required by the Action Memoranda, and reflected in the Proposed Action, are necessary to protect the public, health, welfare, or the environment. The Proposed Action occurs on private lands owned by Perpetua Resources (Perpetua) and public lands administered by the Boise National Forest (BNF) and Payette National Forest (PNF) in Valley County, Idaho (Figure 1). The EPA will provide project oversight and is the lead Federal action agency for this consultation. They will permit these activities under authorities granted by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the

[1] August 25, 2021 Letter to Conor Neal, EPA, from the Nez Perce Tribal Executive Committee regarding the Nez Perce Tribe's Comments on the Stibnite Mine Action Memorandum and Administrative Record.
[2] This opinion only analyzes the effects associated with time critical removal actions associated with Phase 1 of the ASAOC. Any work completed under future phases of the ASAOC is not addressed in this opinion and may be subject to additional section 7 consultation.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. Because some of the proposed action is located on Federal lands administered by the U.S. Forest Service (USFS), the BNF and PNF will assist with project oversight and will be cooperating agencies.

The Proposed Action consists of the following three removal actions and three stream diversions.

- Schoolhouse Tailings Removal.
- Northwest Bradley Dumps Stream Waste Removal and Slope Stabilization.
- Bradley Man Camp Dumps Removal and On-Site Repository.
- Stream Diversions:
  - Northwest Bradley Waste Rock Dumps (Hennessy Creek).
  - U.S. Defense Mineral Exploration Administration (DMEA) Waste Rock Dump (unnamed tributary).
  - Smelter Flats/Hangar Flats (Meadow Creek).

In addition, the Proposed Action will utilize the following four access roads:

- Boise to Cascade – Highway 55 (77.4 miles).
- Cascade to Landmark – two-lane, paved Warm Lake Road (35.6 miles).
- Landmark to Yellow Pine – single-lane, unpaved Johnson Creek Road (25.3 miles).
- Yellow Pine to Stibnite – single-lane, unpaved Stibnite Road (14 miles).

The work plans/design basis reports developed by McMillen Jacobs Associates (2021), Perpetua Resources (Perpetua) (2021a, b, c, d, e), Rio ASE (2021a, b, c), and Tierra Group International, Ltd. (2021) have been prepared for the implementation of a Time Critical Removal Action (TCRA) for various areas of the Stibnite Mine property (Project Area) (Figure 2). Perpetua is implementing the TCRA in accordance with the requirements of an ASAOC for Removal Actions with the EPA and USFS (USEPA & USFS 2021). The work will be conducted under the CERCLA and the NCP. As shown on Figure 2, the CERCLA boundary encompasses the Project Area and is approximately 3,067 acres.

The purpose and need of the Proposed Action is to eliminate or reduce potential ecological and human exposure to metals by mitigating sources of contamination from contact with sediment and surface water. This will be accomplished through the removal of mill tailings and mine waste located within the channels and floodplain of the East Fork South Fork Salmon River

(EFSFSR) and select tributaries, and the diversion of surface water around mine wastes that are sources of metals.

Historical operations within the Stibnite Mining District resulted in the placement and deposition of tailings and mine waste within the floodplain of lower Meadow Creek and the EFSFSR. Surface water quality data from the lower reach of Meadow Creek and from the EFSFSR below its confluence with Meadow Creek, have consistently shown elevated arsenic and antimony concentrations that exceed Idaho's chronic aquatic life water quality criteria.

The presence of mill and mine wastes adjacent to Meadow Creek and EFSFSR in the areas of the Schoolhouse Tailings, Bradley Man Camp Dumps, and Northwest Bradley Dump contribute sediment and dissolved constituents to the adjacent surface waters. These impacts are proposed to be remediated by removal of these mill and mine wastes from proximity with the flowing water.

In addition to the above-mentioned wastes, surface water and ground water impacts are being caused by current surface water flow paths over the Northwest Bradley Dump, DMEA Waste Rock Dump, and Smelter Flats/Hangar Flats areas. In these areas, new channels will be constructed to eliminate the current interaction of surface flows with the mining wastes.

The proposed action includes three removal actions, three stream diversions, and the use of access roads have been proposed by Perpetua and are analyzed in this opinion. Figure 2 shows the location of these removal actions and stream diversions, j006D while Figure 1 displays the access roads. Appendix A of the BA presents Perpetua's Environmental Protection Plan (EPP) (incorporated by reference). Detailed descriptions of each removal action and stream diversion, including unique design features, are presented in the following sections, while additional details can be found in the work plans/design basis reports (McMillen Jacobs Associates 2021; Perpetua 2021a, Rio ASE 2021a, b, c; Tierra Group International, Ltd. 2021).

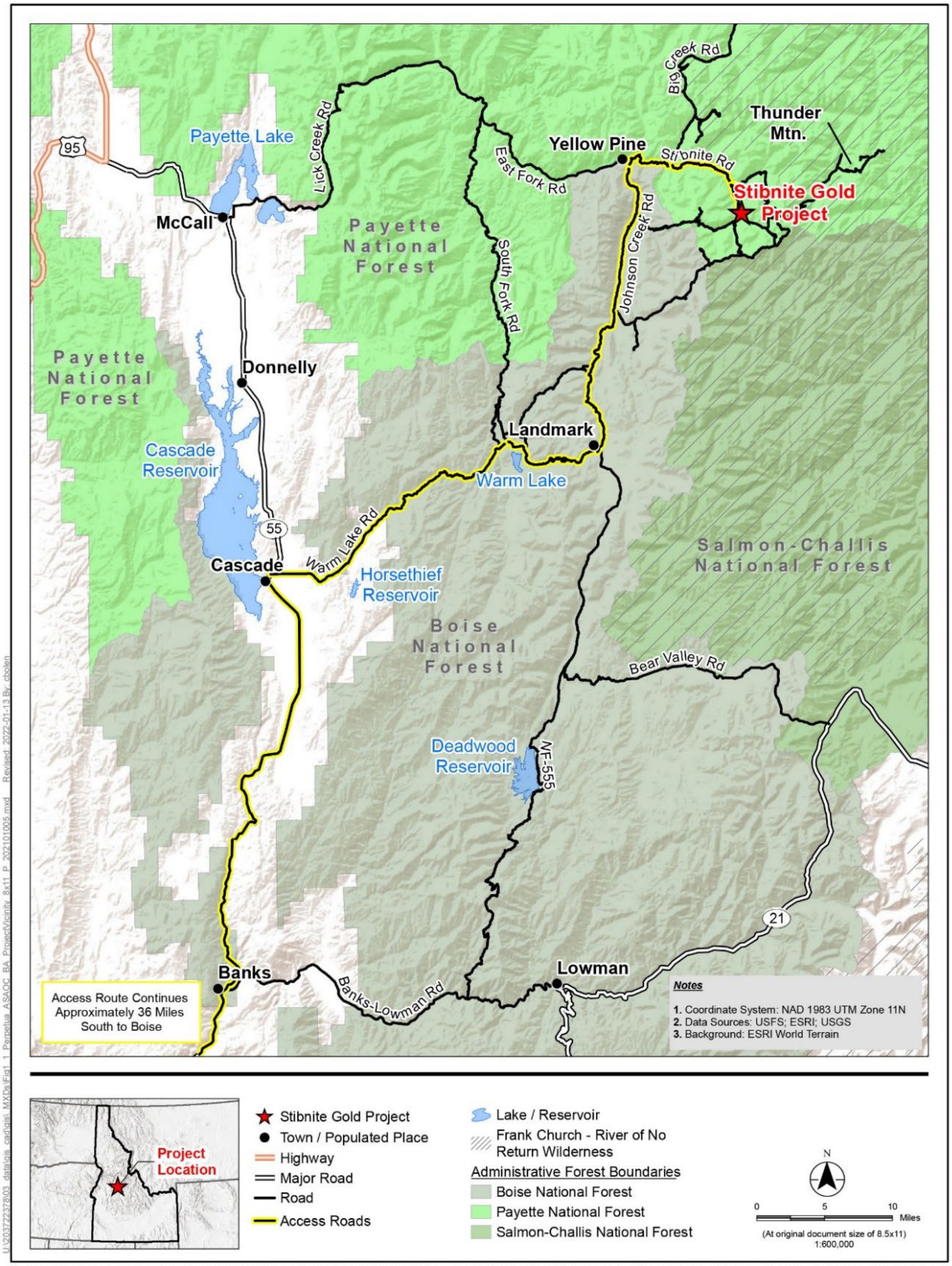

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Figure 1: Proposed Action Location and Access

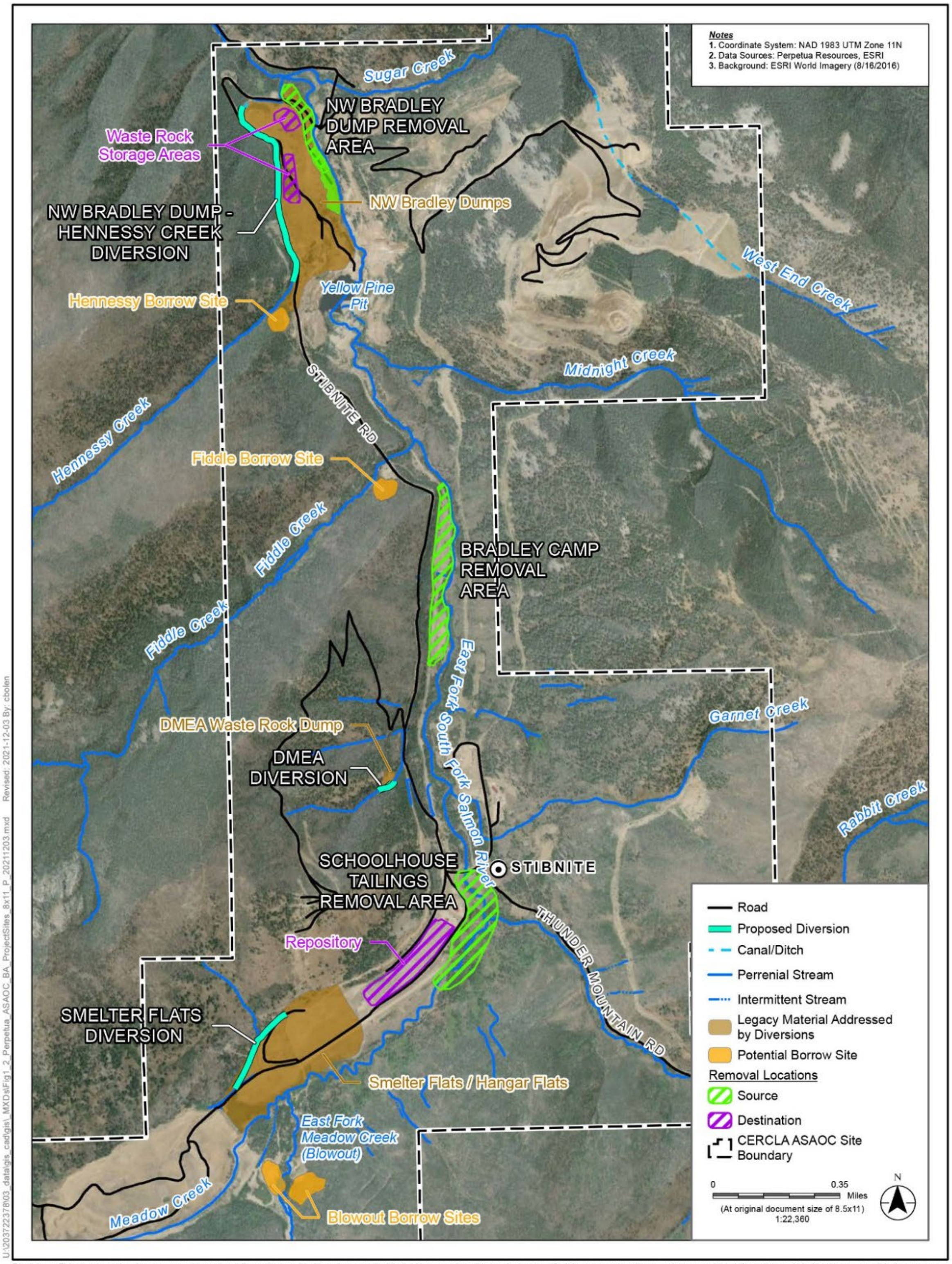

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Figure 2: Proposed Action Site-Specific Locations

1.3.1. Schoolhouse Tailings Removal[3]

Historical mill operations within the Stibnite Mining District resulted in the placement and deposition of mill tailings and mine waste within the floodplain of the EFSFSR. Interaction of tailings and mine wastes with surface flows in the EFSFSR below its confluence with Meadow Creek have resulted in arsenic and antimony concentrations that exceed Idaho's chronic aquatic life water quality criteria.

The Schoolhouse Tailings Removal (Figure 3 and BA Appendix B) will include removal of approximately 21,530 cubic yards (CY) of tailings, covering 3.5 acres from the former Schoolhouse tailings impoundment along the EFSFSR, approximately 100 feet below the confluence with Meadow Creek and extending to the box culvert. Approximately 2,930 CY of native ground and 3,030 CY of floodplain backfill material will also be excavated to create a functional floodplain.

Access to the area west of the EFSFSR is from the county road or the existing airstrip. The area west of EFSFSR is open and essentially unvegetated, except on the northern end where the former infiltration galleries are present.

The primary goal of the Schoolhouse Tailings Removal is to reduce the uncontrolled release of metals and sediment to surface water in the EFSFSR through the removal of tailings and mine waste in contact with the EFSFSR. The ASAOC limits the overall removal of 25,000 tons of material in a limited area. The area is being optimized to maximize the removal of material that contacts surface and shallow groundwater in the channel and adjacent floodplain area. All waste materials removed will be placed in the southeast portion of the repository to be constructed on the former Canadian Superior Mining (CSI) heap leach pads. The objectives for this removal action are:

- Reduce transport of Chemicals of Concern (COC) that contribute to unacceptable ecological risks from tailings and mine waste, contaminated soil, and contaminated sediment into surface water, sediment, and groundwater.

- Protect surface water and sediment quality in the EFSFSR by consolidating tailings and mine waste material, and impacted soil/sediment in an on-site repository that is a permanent disposal location for the waste materials that eliminates migration of hazardous constituents to the environment.

- Reconstruct stream channels to restore aquatic and riparian habitat.

The key objectives will help guide the removal action and meet the removal action objective of reconstructing stream channels in a manner that restores aquatic and riparian habitat.

[3] The removal action described in this section is based on the Proposed Action's 50 percent design. Perpetua will be required to provide the final design to the Agencies for this removal action and use of access roads prior to contracting the work, to be sure the work plan containing the 90 percent design is consistent with information presented in the BA and this opinion.

1.3.1.1 *Removal Actions*

As described in the Design Basis Report for the Schoolhouse Tailings Removal (Rio ASE 2021a), the Proposed Action includes the excavation of approximately 21,530 CY of tailings and mine waste within the channel and along the banks of the EFSFSR for placement in the on-site repository (Figure 3 and BA Appendix B). Tailing excavation, loading, and hauling will be accomplished using standard equipment sized for the task such as small excavators, backhoes, and articulated trucks. Excavation and hauling production rates are expected to be variable depending on the degree of tailings saturation and particle size.

The Schoolhouse Tailings Removal Action includes tailings materials in the former tailings ponds that were not removed in the previous Meadow Creek reconstruction. Excavation includes removal of tailings, mine waste, and native material within an approximately 190-foot-wide floodplain corridor along the EFSFSR beginning at the Meadow Creek confluence and extending downstream to the existing box culvert. Mine waste and native material will be removed down to the proposed floodplain elevation (approximately 2 feet above the existing channel invert elevation). As described in Section 3.3.2 of the Schoolhouse Tailings Removal Project 50% Design Basis Report (Rio ASE 2021a), if tailings extend below the proposed floodplain elevation, tailings will be over-excavated and backfilled with clean native material to match proposed grade. Sampling and analysis procedures will be conducted in accordance with the Field Sampling Plan and Addendum to the Field Sampling Plan, including visual observations, physical characteristics, and field screening with a portable X-ray fluorescence device (Perpetua 2021b, c).

This removal action includes removing tailings from the banks, channel, and floodplain. However, tailings are not thought to occur in the streambed in significant quantities due to historical bed scour revealing a coarse armored substrate following the Blowout Creek flood event. To meet the specified volume, the removal action is designed to excavate approximately 21,530 CY of tailings, along with 2,930 CY of native materials commingled with tailings, occurring along the banks of the EFSFSR, and 3,030 CY of backfill material to create a functional floodplain. The minimization measures and best management practices (BMP) for the removal action will follow the general approaches described in Appendix A of the BA, particularly the measures listed below.

- Prior to any earthwork or instream work, stormwater and erosion controls will be installed in accordance with Perpetua's Stormwater Pollution Prevention Plan (SWPPP). These controls will include BMPs such as silt fences, coir logs, and/or soil berms to prevent run-on of stormwater into the construction area and manage runoff, sediment, and erosion from the construction areas. Construction entrance and exit area(s) will be installed to prevent tracking mud and sediment onto roadways. The BMPs will be designed and installed to protect aquatic habitat and minimize sediment introduction during instream work and during work adjacent to the stream.

- Existing access routes will be preferentially used and the number and length of temporary access roads and paths through riparian areas, wetlands, and floodplains will be minimized.

- Wetlands and riparian areas outside of the work limits will be protected wherever access roads traverse through these features and will be restored to their original grade and condition. Protection measures will include stripping and stockpiling wetland vegetation for subsequent reclamation. Protective mats, wood chips, or quarry spalls underlain with geotextile fabric will be installed and removed at completion.

- The removal of riparian vegetation during construction of temporary access roads will be minimized. When temporary vegetation removal is required, vegetation will be cut at ground level (not grubbed). All temporary roads used solely by actions described in the ASAOC will be reclaimed after the action is complete. Additional details are presented in BA Appendix B, Drawing G3 and in the Reclamation and Closure Plan (Tetra Tech 2021).

As described in detail in the 50 percent design documents for the Schoolhouse Tailings Removal Action (Rio ASE 2021a), this removal action requires instream work (construction of a new channel of the EFSFSR) and work in the floodplain. This work is expected to occur during the low flow period (mid-June to November). As illustrated in Figure 3 and BA Appendix B, Perpetua will conduct the instream work based on the following sequence for the removal action (BA Appendix B, Drawings C3, C4, and C5). Protection measures (BA Appendix A and BA Appendix B, Drawings G2 through G6) will be implemented as required, specifically for fish salvage, turbidity monitoring, dewatering, rewatering, erosion control, and revegetation, based on the applicable steps listed below. Several of these measures are also highlighted in Section 1.3.1.4.

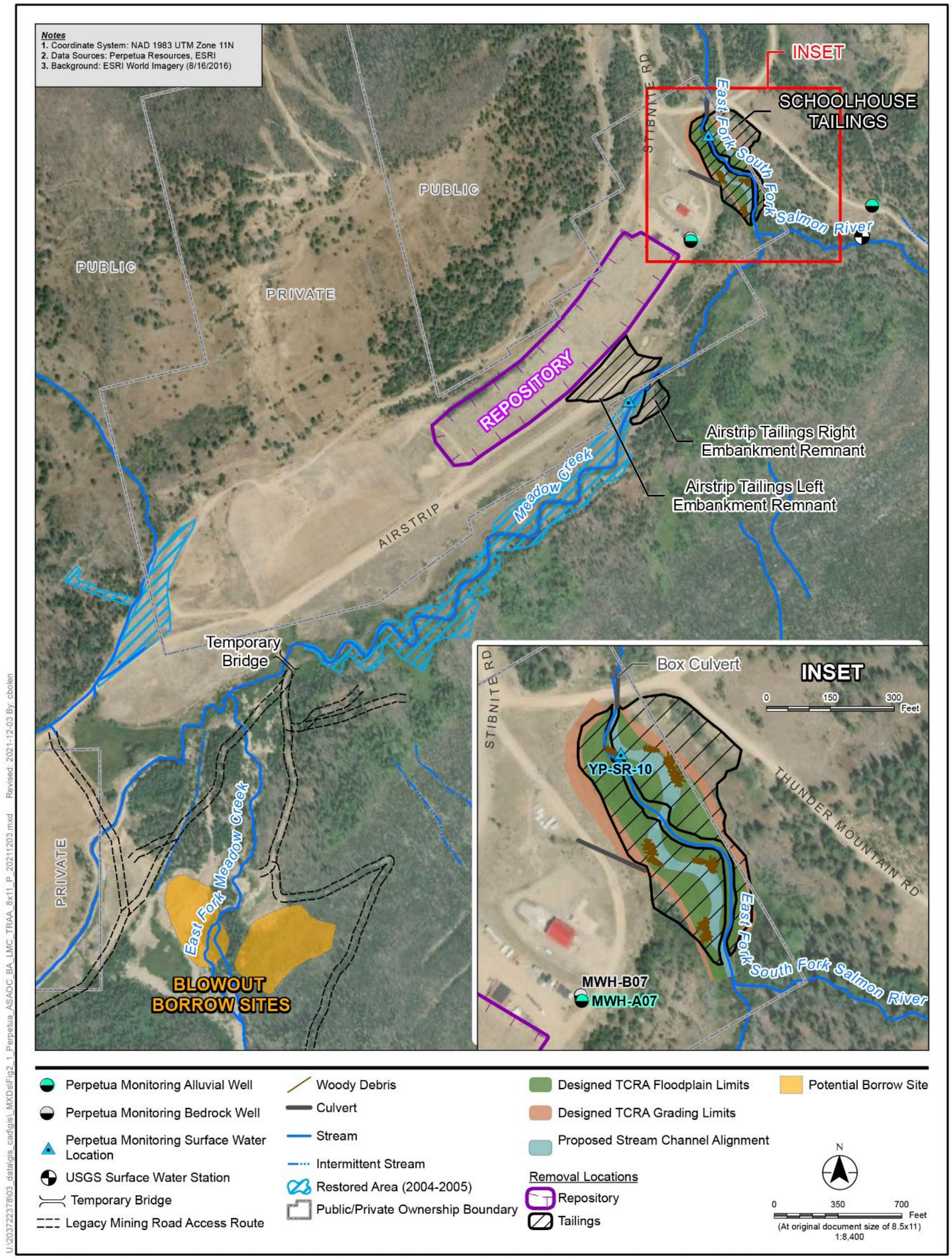

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Figure 3: Schoolhouse Tailings Removal Area

The construction sequencing is detailed in BA Appendix B, Drawings C3, C4, and C5 and summarized as follows:

- Construction staking, mobilization, installation of temporary erosion control measures in accordance with the SWPPP, and installation/preparation of access routes and staging areas.

- Removal of 23,000 CY of material down to native ground. The estimated native ground/mine waste removal surface is shown in BA Appendix B, Drawing C3 (Step 1). This surface utilizes data from various sources to estimate the native ground interface; however, the actual removal surface may be different based on results of the pending field investigation. The removal surface will be widened if additional material is needed to be removed to reach the required removal volume[4].

- Excavation of native material down to the desired floodplain elevation is shown in BA Appendix B, Drawing C3 (Step 2). This material will be temporarily stockpiled and later used to fill the existing channel in a subsequent step if it is deemed suitable based on physical and geochemical properties.

- New channel excavation (see Figure 3 inset) will occur after floodplain grading, including installation of pools, riffles, riffle material (if required), wood habitat structures, and any specified bank treatments (BA Appendix B, Drawing C4, Step 3).

- BA Appendix B, Drawing C4 (Step 4) shows work area isolation/cofferdam locations for performing work within the in-water work window. Cofferdams will be placed within the existing EFSRSR channel to isolate areas for excavated connections between the existing and new channel. The new channel will then be activated, and additional cofferdams will be required to complete filling of the existing EFSRSR channel and installation of wood habitat structures.

Borrow Sources. Material stockpiles and borrow sources (Hennessy, Fiddle, and Blowout seen in Figure 2) will be required for the removal action to support Proposed Action objectives and reclamation of work areas. In addition, to access the Blowout borrow sources specifically, Perpetua will construct a temporary bridge at the historic/existing bridge location on Meadow Creek (Figure 3). Regrading will be required on the approaches along with clearing and grubbing of the access road and removal of trees will be avoided where possible. Material generated during this work will be saved for reclamation. This may include any slash generated. Clearing will be limited to that required for equipment passage. The temporary bridge abutments will be placed above the ordinary high-water mark (OHWM) of Meadow Creek. To cross Blowout Creek, a bottomless half-arch culvert will be utilized to span the flowing creek, or another temporary bridge similar to the one crossing Meadow Creek will be used. Stockpiling will be used to preserve native topsoil and vegetation wherever possible, and additional construction material stockpiles will be created as borrow materials are sorted (screened) to segregate various

[4] Due to the estimated duration of construction (mid-June to November), removal of material outside of the ordinary high-water line will be performed outside of the NMFS and USFWS approved in-water work window (July 15 to August 15).

silt/sand, gravel, cobble, and boulder fractions for later use. Design features for borrow sources and stockpiles are summarized in Appendix A of the BA. In addition, Perpetua has developed a Borrow Source Development Plan (Perpetua 2021e) that outlines specific details on how Perpetua will utilize borrow sources during this removal action. Materials considered not to be mine waste and therefore clean in-situ materials may be reused on the floodplain or elsewhere as backfill and/or hauled to a borrow area or stockpiled as clean fill for future borrow closure recontouring. Material will be assessed in accordance with the Field Sampling Plan and Addendum to the Field Sampling Plan (Perpetua 2021c, d) to ensure they are suitable for use.

Repository. Waste materials removed will be placed in the southeast portion of the repository to be constructed on former heap leach pads (Figure 3); the design is discussed further in Section 2.2.3.4 On-Site Repository (Tierra Group International, Ltd. 2021). The on-site repository will be located on the former On/Off Leach Pads and will be designed to contain approximately 21,530 CY of tailings, 2,930 CY of native materials commingled with tailings, and 137,000 CY of material from the Bradley Man Camp Dumps (Rio ASE 2021b). The former heap leach pads are already lined. In addition, material will be placed dry or with a minimal water content. Erosion control BMPs such as straw wattle and berms will isolate the work area. Based on these procedures, risks of spills or leaks of contamination are expected to be minimal. In the 1970s and 1980s, heap leach ores were placed on the liner and cyanide solution was applied to the heap. The leach solution was recovered, gold removed from solution, and the leach solution was recycled back to the heap leach pad. When the gold from those ores was sufficiently recovered, the material was moved off the leach pad to a spent ore disposal facility (e.g., the spent ore disposal area at Stibnite). The former leach pads provide a secure area to store the mill tailings and mine waste excavated in the removal actions. These excavated materials will be consolidated on the leach pad, covered with a liner, which then will be covered with clean earth and revegetated.

1.3.1.2 *Reconstruction*

The excavation design criterion is removal of tailings and mine waste materials to underlying native material, or as required to allow for reconstruction. All disturbed areas will be restored and revegetated as soon as practicable following construction as described in BA Appendix B, Drawings G5 and C6, while utilizing the measures described in the EPP (BA Appendix A). Standard reconstruction and revegetation practices will be followed, including segregating and stockpiling topsoil, implementing stormwater and sediment BMPs, backfilling and placing topsoil, and revegetating. A summary of design features for reconstruction and revegetation are listed in BA Appendix A. Additional details are presented in the Reclamation and Closure Plan (Tetra Tech 2021).

Portions of the EFSFSR will be modified during the process of removing the tailings and mine waste materials. As presented in BA Appendix B, Drawings C2 through C6 and D1, the reach-specific design criteria include a conceptual meander plan and profile, and representative cross sections and design quantities were calculated. In general, the proposed channel alignment and geometry will be designed to be highly functional from baseflow through bankfull flow [see Section 3.2.1 of the Schoolhouse Tailings Removal Project 50% Design Basis Report (Rio ASE 2021a)]. Flood flows are expected to inundate newly created floodplains providing for flow attenuation, sediment storage, and aquatic and terrestrial habitats. Typical bank treatments and in-channel feature designs (BA Appendix B, Drawings C6 and D1 through D9) will be developed to provide habitat diversity and facilitate bank stabilization until riparian vegetation becomes established. A generalized revegetation and planting plan based on the Reclamation and Closure Plan (Tetra Tech 2021) will be implemented for specific riparian, wetland, and upland zones to improve long-term bank stability, woody debris recruitment, overhead cover, shade, and terrestrial/wetland habitat. Large woody debris (LWD) structures will be designed following the U.S. Bureau of Reclamation's Large Woody Materials Risked-Based Design Guidelines (U.S. Bureau of Reclamation 2014). These guidelines specify that structures are designed to be stable to a particular average recurrence interval flow based on the estimated risk profile to public safety and property.

For the repository, the consolidated tailings and mine waste will be graded to have a minimum top slope of 3 percent to minimize ponding and a maximum side slope of 33 percent. The repository will be covered with a geomembrane and a minimum of 18 inches of clean fill material stabilized with temporary and permanent erosion control measures as described in BA Appendix A, the Reclamation and Closure Plan (Tetra Tech 2021), as well as in BA Section 2.2.3.4 On-Site Repository.

1.3.1.3 *Access Roads*

Access roads will be required for implementation of the Schoolhouse Tailings Removal action. For the proposed action, it is assumed that personnel will be housed at the mine site and carpooling will occur to bring crews to the mine site to limit traffic on the access roads. Equipment will mobilize to the mine site (June 2023), stay there for the field season, and mobilize out at the end of the field season (November 2023). The following is a description of the number of trips per vehicle type associated with this removal action:

- Assuming 50 contractors (5 people per vehicle for 6 months):
    - Light Vehicle\Van\Bus: Approximately 12 round trips every two weeks for a total of 144 trips, plus 64 trips in support of 16 fuel hauls, equaling 208 trips total.
    - Heavy Truck Traffic: Approximately 15 roundtrips.
    - Fuel Truck Trips (assuming 4,500-gallon trucks): Approximately 16 trips, generally in 3-truck convoys, for a total of 48 individual trips.

1.3.1.4 *Key Mitigation and Perpetua's Design Features*

Perpetua developed an EPP (BA Appendix A) to detail overarching measures that will be implemented during removal actions in the Project Area to ensure protection of human health and the environment. Performance standards and BMPs included in the EPP apply to all phases of the ASAOC implementation. In addition to the measures described in opinion Section 1.3.1.1, Removal Actions, other key mitigation, and Perpetua's design features include:

- All temporary access roads will have erosion controls in place.

- All vehicle and equipment cleaning, maintenance, refueling, and fuel storage to be at least 300 feet away from open water.

- Wetland and stream reclamation areas will be restored with native plant species (BA Appendix B). Additional details are presented in the Reclamation and Closure Plan (Tetra Tech 2021).

- For borrow sources and all areas of temporary disturbance, standard reclamation practices will be followed, including segregating and stockpiling topsoil, implementing stormwater and sediment BMPs, backfilling and placing topsoil, and revegetating.

- To minimize material loss and sediment runoff from the temporary roads and roadbeds, water bars, silt fencing, certified weed-free wattles, and/or weed-free straw bales will be installed in strategic downslope areas and in Riparian Conservation Areas (RCA).

- Work areas will be inspected for noxious and invasive plant species prior to the onset of the removal action. Weeds will be avoided or treated, as appropriate. Equipment will be inspected prior to entering the work areas. Additional details are presented in Section 3.5 of the Reclamation and Closure Plan (Tetra Tech 2021). When herbicides are used, it will be in accordance with the PNF Weed Management Program and associated consultation (WCRO-2020-01560).

- To prevent inadvertent entrapment of common and special-status wildlife during construction, all excavated, steep-walled holes or trenches more than 2 feet deep will be covered with a tarp, plywood, or similar materials at the close of each working day to prevent animals from being trapped. Prior to the start and ending of work each day, all trenches will be inspected for wildlife that may have been trapped and cannot escape.

- To minimize impacts to fish, construction activities will be conducted in dry conditions outside the OHWM of the existing channel. Cofferdams will isolate portions of the proposed channel within the existing OHWM to keep water and fish out of the new channel until construction is completed. Once the new channel is completed (including prewashing the substrate), water will be slowly reintroduced into the new channel (one-third of the flow initially), with seine block nets keeping fish from entering the new channel. Seine block nets will be placed in the upstream end of the original channel, which will then be electrofished to remove all fish before all flow can be rerouted into the new channel. Any fish captured will be moved upstream of the seine block net. Once the original channel is cleared, two-thirds of the flow will be released into the new channel, and then ultimately all flow will be released into the new channel and the seine block net to the new channel removed. The original channel will be permanently blocked from the new channel and then filled with clean native alluvium as the new floodplain. Additional information on the turbidity monitoring, staged rewatering, and fish salvage are provided in BA Appendix A.

1.3.2. Northwest Bradley Dumps Stream Waste Removal and Slope Stabilization

As described in the work plan for the Northwest Bradley Dumps Stream Waste Removal and Slope Stabilization (Perpetua 2021b) (hereafter referred to as NW Bradley Dumps Removal), the NW Bradley Dumps are a large area of mine wastes and fill material of various and poorly documented origins immediately adjacent to the EFSFSR and are a source of metals and sediment to the EFSFSR. In accordance with the requirements of the ASAOC, Perpetua will remove approximately 68,000 CY of mine waste including saturated legacy materials from the dumps located adjacent to the EFSFSR and place the materials on stable benches on top of the existing NW Bradley Dumps, reshaping the dump.

The NW Bradley Dumps are located primarily on patented mining claims owned by Perpetua, but some portions are located on public lands managed by the PNF. The public Stibnite Road circumnavigates the dumps and existing upper and lower haul roads allow vehicular access to the upper and lower portions of the dumps. This area is illustrated in Figure 4 and BA Appendix C.

The primary goal of this removal action is to reduce the uncontrolled release of metals and sediment to surface water through the removal of mine waste located within the floodplain of the EFSFSR. The objective for this removal action is to reduce transport of COC that contribute to unacceptable ecological risks from mine waste, contaminated soil, and contaminated sediment into surface water, sediment, and groundwater.

1.3.2.1 *Removal Actions*

The NW Bradley Dumps Removal (Figure 4) consists of excavating dump material upstream of the bridge over the EFSFSR for a section adjacent to the EFSFSR approximately 960 feet long and 70 feet wide, adding approximately 1.39 acres of floodplain. This work will be conducted from upstream to downstream and will prioritize removal of saturated materials in the floodplain. No instream work will occur in the EFSFSR as a result of this removal action. Logistical and operational considerations include optimal equipment sizing, haulage routes, and excavation phasing. The dump material removal will increase EFSFSR floodplain area by excavating approximately 68,000 CY and maintaining an excavated cut slope of no greater than 2.5:1 horizontal:vertical (H:V) and preferably 3:1 where existing topography allows. The excavation begins at the approximate upstream extent of unconsolidated mine-waste along the western bank of the EFSFSR, downstream of the Yellow Pine Pit. The downstream extent of the excavation will terminate where the lower bench and access road narrows to minimize potential for destabilizing the upper lifts of the NW Bradley Dump Removal site (Figure 4 and BA Appendix C).

Prior to any earthwork or work near the EFSFSR, stormwater and erosion controls will be installed in accordance with Perpetua's SWPPP, which is located in the EPP (BA Appendix A). These controls will include BMPs such as silt fences, coir logs, and/or soil berms to prevent run-on of stormwater into the construction area and manage runoff, sediment, and erosion from the construction areas. Construction entrance and exit areas will be installed to prevent tracking mud and sediment onto roadways. The BMPs will be designed and installed to protect aquatic habitat and minimize sediment introduction during work adjacent to the EFSFSR (BA Appendix A).

Repository. The dump reshaping material destination will place the excavated material in the upper area of the existing NW Bradley Dump (Figure 4) such that it is geotechnically stable, has final side slopes no greater than 2.5:1 H:V, and grade the top of the placed material at a 2 percent or greater slope to reduce the potential for rainfall ponding (BA Appendix C). All areas that are excavated or filled with excavated material should allow for stable revegetation and maintenance access upon completion. The area selected for placement of materials removed from the dump toe is located on the southern part of the NW Bradley Dump where the face of the underlying dump is less steep than surrounding areas, thereby offering the greatest geotechnical stability. This upland location contains similar material from within the same mine dump area (e.g., the material is being moved to another area of the dump) and, therefore, will not require a cap. The intent is to move the material within the dump footprint away from the EFSFSR and potential contact with water. It provides the greatest vertical separation from groundwater available in the vicinity of the removal.

Access to the NW Bradley Dumps will require reopening an approximately 0.4-mile section of historical road. Excavation of the dumps will progress from upstream to downstream for all material. Site access will be accomplished using existing roads parallel to the work areas; reactivating former forestry or mining roads (by cutting vegetation, regrading, and potentially surfacing); or creating new access roads, as required for site access.

Excavation, loading, and haulage will be accomplished using standard equipment sized for the task – generally excavators, loaders, and haul trucks up to 40 tons for bulk excavation and dozers for dump reshaping.

Borrow Sources. Material stockpiles and borrow sources (Hennessy, Fiddle, and Blowout) (Figure 2) will be required for the removal action to support Proposed Action objectives and reclamation of work areas. Stockpiling will be used to preserve native topsoil and vegetation wherever possible, and additional construction material stockpiles will be created as borrow materials are sorted (screened) to segregate various silt/sand, gravel, cobble, and boulder fractions for later use. Design features for borrow sources and stockpiles are summarized in BA Appendix A. In addition, Perpetua has developed a Borrow Source Development Plan (Perpetua 2021e) that outlines specific details on how Perpetua will utilize borrow sources during this removal action.

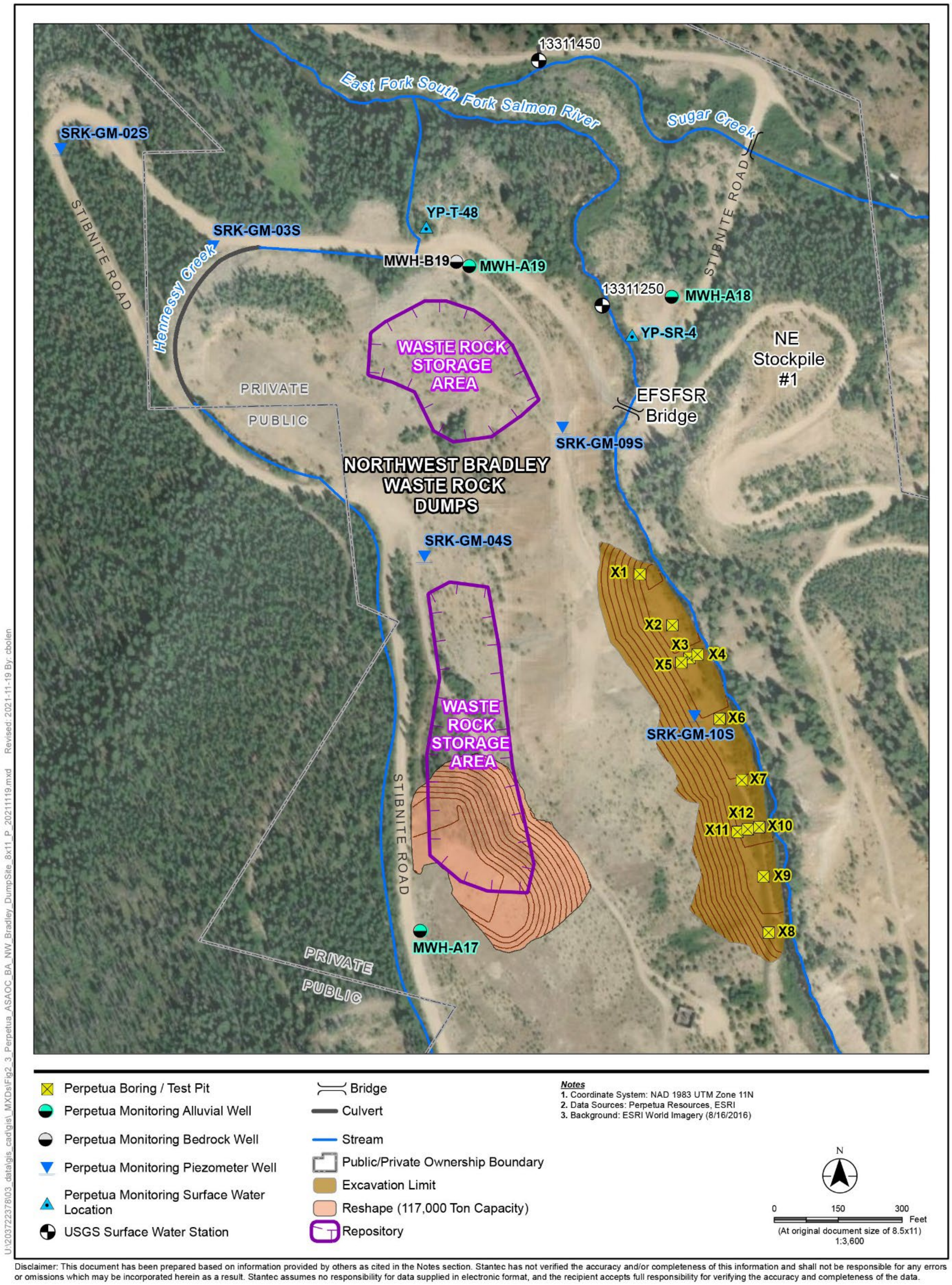

Figure 4: Northwest Bradley Waste Rock Dump Site Features

Exploration Activities. Assuming that the historic EFSFSR channel is not encountered during the excavation described above and that additional legacy material is present based on multiple lines of evidence including visual evidence of mine waste such as waste rock versus historic channel sediments, a significant decrease in pXRF[5] readings indicating a change from mine waste to native material, and/or identification of material carrying pollutants of concern above EPA Screening Levels, Perpetua will implement a subsurface investigation. Utilizing the newly created flat bench, Perpetua will conduct a subsurface investigation utilizing up to 12 channel locater tests consisting of drilled boreholes and/or small backhoe excavations (Perpetua 2021f) (Figure 4), ranging from 15 to 100 feet from the EFSFSR to locate the historic channel laterally and vertically. The test locations shown in Figure 4 are approximate and subject to change.

Backhoe excavations will be used to test locations where the depth to the historic channel is expected to be only a few feet. For boreholes, Perpetua will use an auger drill rig but may use a reverse circulation (RC) rig if excessive boulders are encountered. Based on historic topographic maps, Perpetua will drill approximately 5 feet into the native material underlying any remaining dump material, which could be 5 to 25 feet based on the historic topographic maps and their inherent uncertainties. Each drill hole will be approximately 6 to 8 inches in diameter and Perpetua will be able to drill three sites per day. This data will be used to determine how or if additional removal actions are needed. This exploration work will be conducted using the BMPs installed for removal activities described above in opinion Section 1.3.1.1 Removal Actions.

In addition to BMPs presented in opinion Section 1.3.1.1, additional BMPs related to drilling in RCAs will include:

- Drill pads will be sited to avoid removing any large trees.
- Any tree that is felled will be left in the RCA.
- Straw bales will be placed and staked around pads.
- When applicable, cross drains will be installed within the drill pad area to ensure drainage away from the RCA and stream.

If monitoring of the Proposed Action identifies unanticipated effects to fish or fish habitat, the activity will be suspended by the USFS District Ranger until corrections can be made and the Forest Service Level 1 Team will be informed, or consultation will be reinitiated.

Borehole abandonment will be in accordance with Idaho Administrative Procedures Act (IDAPA) 20, Title 03, Chapter 02 (20.03.02) - Rules Governing Exploration, Surface Mining, and Closure of Cyanidation Facilities. It will also be conducted in accordance with Borehole abandonment products will conform to American Petroleum Institute (API) guidelines for ensuring groundwater integrity. Safety Data Sheets (SDS) for all products will be posted and available on site in addition to the Spill Prevention, Control and Countermeasure Plan (SPCCP).

[5] pXRF: portable X-Ray Refraction. This is a handheld X-Ray device utilized by geologists to record the field measurement of metal concentrations in rocks/soils. It is generally accepted as a semi-quantitative measure for metal concentrations, and useful for differentiating between native soil and mine wastes.

1.3.2.2 *Reconstruction*

All disturbed areas will be restored and revegetated as soon as practicable following construction based on the EPP (BA Appendix A). Vegetation will need to be removed within the full extent of the excavation area. Where possible, mature trees and shrubs located immediately adjacent to and on the bank of the EFSFSR will be preserved. Where trees need to be removed to facilitate the excavation of the waste rock, depending on the chemical constituents of the soil that the trees are growing in, Perpetua will attempt to transplant trees down into areas that have already been excavated, targeting areas adjacent to the EFSFSR. Where brush exists along the river edge, cuttings will be collected and stored in watered buckets for use during reclamation. If trees salvaged are not able to be transplanted, they will be stockpiled for use as microhabitat during reclamation. In addition, standard reconstruction and revegetation practices will be followed, including segregating and stockpiling topsoil, implementing stormwater and sediment BMPs, backfilling and placing topsoil, and revegetating. Site access construction and reclamation will use common forestry and earthmoving equipment. A summary of design features for reconstruction and revegetation are listed in BA Appendix A. Additional revegetation details are presented in Section 3.3.5 (page 3-55) of the Reclamation and Closure Plan (Tetra Tech 2021). Additional reconstruction details are presented in Sections 3.3 (page 3-4) and 4.0 (page 4-1) of the Reclamation and Closure Plan (Tetra Tech 2021).

1.3.2.3 *Access Roads*

Access roads will be required for implementation of the NW Bradley Dumps removal action. For this proposed action, it is assumed that personnel will be housed at the mine site. Equipment will mobilize to the mine site (June 2023), stay there for the field season, and mobilize out at the end of the field season (November 2023). Due to the same schedule, the number of truck trips and types of vehicles required for this removal action are included in the description for the Schoolhouse Tailings Removal (Section 1.3.1.3).

1.3.2.4 *Key Mitigation and Perpetua's Design Features*

Perpetua developed an EPP (BA Appendix A) to detail overarching measures that will be implemented during removal actions to ensure protection of human health and the environment. Performance standards and BMPs included in the EPP apply to all phases of the ASAOC implementation.

Key environmental considerations and/or procedures for the NW Bradley Dumps Removal are the protection of the EFSFSR, safe traffic transport and equipment operations, project sequencing, and surface water management.

Portions of the NW Bradley Dumps Removal site lie directly adjacent to the west bank of the EFSFSR. Where removal actions are near the EFSFSR, roll out protections will be applied. This includes:

- Physical barriers (e.g., jersey barriers or slash bails), trenching or leaving a temporary berm as necessary to prevent material from rolling downslope into the river.

- Material will be pulled, rather than pushed, away from the riverbank whenever possible.

- Work will be conducted outside of the channel and floodplain work will be conducted during low flow periods. Equipment will not enter the water column, and vehicle and equipment cleaning, maintenance, refueling, and fuel storage will not occur within 300 feet of the EFSFSR.

The haul route will include a portion of National Forest Road (NFR) NFR-412, a public access route, between the EFSFSR bridge to the portion of the road crossing the upper portion of the NW Bradley Dumps Removal site (Figure 4). To ensure safety and prevent potential spills due to traffic congestion, caution will be exercised in the form of warning signs, radio communication between equipment operators, operator briefings, and flagging, as necessary. Any potential, unforeseen safety hazards resulting from hauling operations will be immediately remedied.

Sequencing the removal actions into a staged work schedule to enable excavation to progress from upstream to downstream for all material adjacent to the EFSFSR. In addition, the following design features will be implemented:

- The removal action will be conducted during the dry part of the year as much as practicable to further ensure that work will be conducted in dry conditions.

- Should water management be required, water will be pumped to the uncompleted work area most distant from the current removal location for land application onto upgradient areas of the dumps. A variety of erosion control features such as haybales, wattle, or berms will be used to reduce the potential erosion of water as it infiltrates. In addition, water will be dispersed using a header or similar feature to reduce velocity and distribute over a wider area.

- Temporary cofferdams or sumps will be installed as necessary to isolate the water source.

- Work will be conducted "dry" when possible. Equipment will not enter the stream channel.

- Existing vegetation on the bank consist of grasses, shrubs, and mature trees. This buffer of vegetation will remain in place, where practicable, when dump material is removed. Material removal will be conducted in a manner that will preserve the existing vegetation and streambank. Dump material will be pulled "away" from the vegetation without equipment entering the vegetated area. Care will be taken to avoid damaging roots within the drip line of mature vegetation. BMPs such as waddles will be placed between the removal area and vegetation buffer.

1.3.3. Bradley Man Camp Dumps Removal and On-Site Repository[6]

The Bradley Man Camp Dumps (also referred to as the Upper and Lower Man Camp Dumps) are a large area of mine wastes and fill of various, and poorly documented, origins immediately adjacent to the EFSFSR and are a source of metals and sediment to the EFSFSR (Rio ASE 2021b).

Figure 5 displays the Upper and Lower Bradley Man Camp Dumps. Access to the former dumps is currently by foot from foot trails off the county road west of the site, or from the north and south along a historic haul road.

The primary goal of this removal action is to reduce the uncontrolled release of metals and sediment to surface water through the removal of mine waste located within the floodplain of the EFSFSR. The specific objectives for the removal action are:

- Eliminate or reduce potential ecological and human exposure to metals by mitigating sources of contamination from contact with sediment and surface water.
- Protect surface water and sediment quality in the EFSFSR by consolidating mine waste material, tailings, and impacted soil/sediment in an on-site repository that is a permanent disposal location for the waste materials and eliminates migration of hazardous constituents to the environment.

1.3.3.1 *Removal Actions*

As described in the Design Basis Report for the Bradley Man Camp Dumps Removal Project 50% Design Basis Report (Rio ASE 2021b) (hereafter referred to as the Bradley Man Camp Dumps Removal), this removal action includes excavating approximately 137,000 CY of material from the Bradley Man Camp Dumps sites (BA Appendix D) for placement in an on-site repository located on the existing On/Off Leach Pads (also known as the CSI Heap Leach Pads) (Figure 5). No instream work in the EFSFSR will occur as a result of this removal action.

The Upper and Lower Man Camp Dumps will be mined in six continuous stages (Figure 6) requiring approximately 10 to 12 weeks to prepare the site and transfer the material (Table 1). Additional time will be required to reclaim the site once the legacy dump material is removed.

[6] The removal action described in this section is based on the Proposed Action’s 50 percent design. Perpetua will be required to provide the final design to the Agencies for this removal action and use of access roads prior to contracting the work to be sure the design basis report containing the 90 percent design is consistent with information presented in this BA.

Table 1: Bradley Man Camp Dumps Stages

Stage	Acres	Tons	Volume (cubic yards)	Production (Days)
Preparation	2.30	n/a	n/a	5
1	1.86	41,698	28,273	11
2	0.73	13,660	9,262	4
3	1.86	38,349	26,002	11
4	1.98	57,111	38,723	16
5	2.44	39,750	26,952	11
6	0.78	11,258	7,633	4
Cover and Revegetate	11.5	n/a	n/a	10
Total	**9.65**	**201,826**	**136,844**	**72**

Access to the Upper and Lower Man Camp Dumps will require temporarily reopening a 2,500-foot (0.5-mile) section of historical haul road that is approximately 45 feet wide with potential locations for further widening, such as pullouts, to allow haul equipment to pass safely (Figure 5). The total average round-trip haul distance from the Upper and Lower Man Camp Dumps to the repository is approximately 12,500 feet (2.4 miles).

Excavation will progress upstream to downstream for all material between the historical haul road and the EFSFSR. The dump material within the historical haul road will be excavated downstream to upstream as the equipment retreats from the Upper and Lower Man Camp Dumps to accommodate erosion control and site reclamation. The excavation phasing is shown in Figure 6.

The site preparation and excavation portion of the Bradley Man Camp Dumps removal action is expected to take approximately 10 to 12 weeks based on an average production rate of 390 tons per hour, 9.6 operating hours per day (based on 80 percent utilization for 12-hour shift), and 7 operating days per week. This removal action utilizes a single excavator, a fleet of approximately four 40-ton articulated dump trucks, support equipment, and includes 1 week of preparation to reopen the historic haul road and establish erosion control structures.

Borrow Sources. Material stockpiles and borrow sources (Hennessy, Fiddle, and Blowout) (Figure 2) will be required for the removal action to support Proposed Action objectives and reclamation of work areas. Stockpiling will be used to preserve native topsoil and vegetation wherever possible, and additional construction material stockpiles will be created as borrow materials are sorted (screened) to segregate various silt/sand, gravel, cobble, and boulder fractions for later use. Design features for borrow sources and stockpiles are summarized in BA Appendix A. In addition, Perpetua has developed a Borrow Source Development Plan (Perpetua 2021e) that outlines specific details on how Perpetua will utilize borrow sources during this removal action.

1.3.3.2 *On-Site Repository*

Waste materials removed will be placed in the repository to be constructed on the former On/Off heap leach pads, the design of which is discussed in the Technical Specifications (50 percent Submittal) for the Stibnite Gold Project On-Site Repository (Tierra Group International, Ltd. 2021).

General Repository Design. The repository will use the existing On/Off Leach Pads as a lined foundation. The foundation consists of (top to bottom) 11 to 19 feet thick fill material previously placed over the On/Off Leach Pads, 3 inches of asphaltic concrete with a seamless thermoplastic seal coat, 12 inches of ¾-inch crushed base rock, and a continuous polyvinyl chloride (PVC) subliner over a polypropylene non-woven, geotextile fabric. Tailings and waste rock relocated to the repository will be placed in lifts (layers) that are multiple feet thick, with the lift height determined during testing to achieve adequate compaction.

The repository will contain relocated tailings that will be placed in the southern-most pad (cell) of the facility in a pile measuring approximately 300 feet long by 150 feet wide by 23 feet tall with 2:1 H:V slopes and a crest measuring 50 feet wide. The overall repository, once completed with relocated mine waste and contaminated native material, will be approximately 1,550 feet long by 200 feet wide by 25 feet tall with 3:1 H:V slopes and a crest measuring 50 feet wide.

All tailings and waste rock placed in the repository will be encapsulated by an engineered cover designed to reduce infiltration of meteoric water. The repository cover will be graded to drain and minimize ponding to further reduce infiltration. At a minimum, cover systems including a geosynthetic membrane will be used as the repository cover system in areas containing tailings. These liner systems rely on the low permeability of the geosynthetic component to limit infiltration into the underlying mine waste. Drainage layers consisting of coarse-grained material or geocomposite overlying the geosynthetic membrane further reduces infiltration by directing water off the geosynthetic component away from the repository. The covers will rely on 18 inches of earth with revegetation (a mix of native perennials) to stabilize the cover surface and reduce erosion. Standard BMPs, such as mulching and coir rolls, will be utilized to control runoff and erosion until vegetation is fully established on the cover surface.

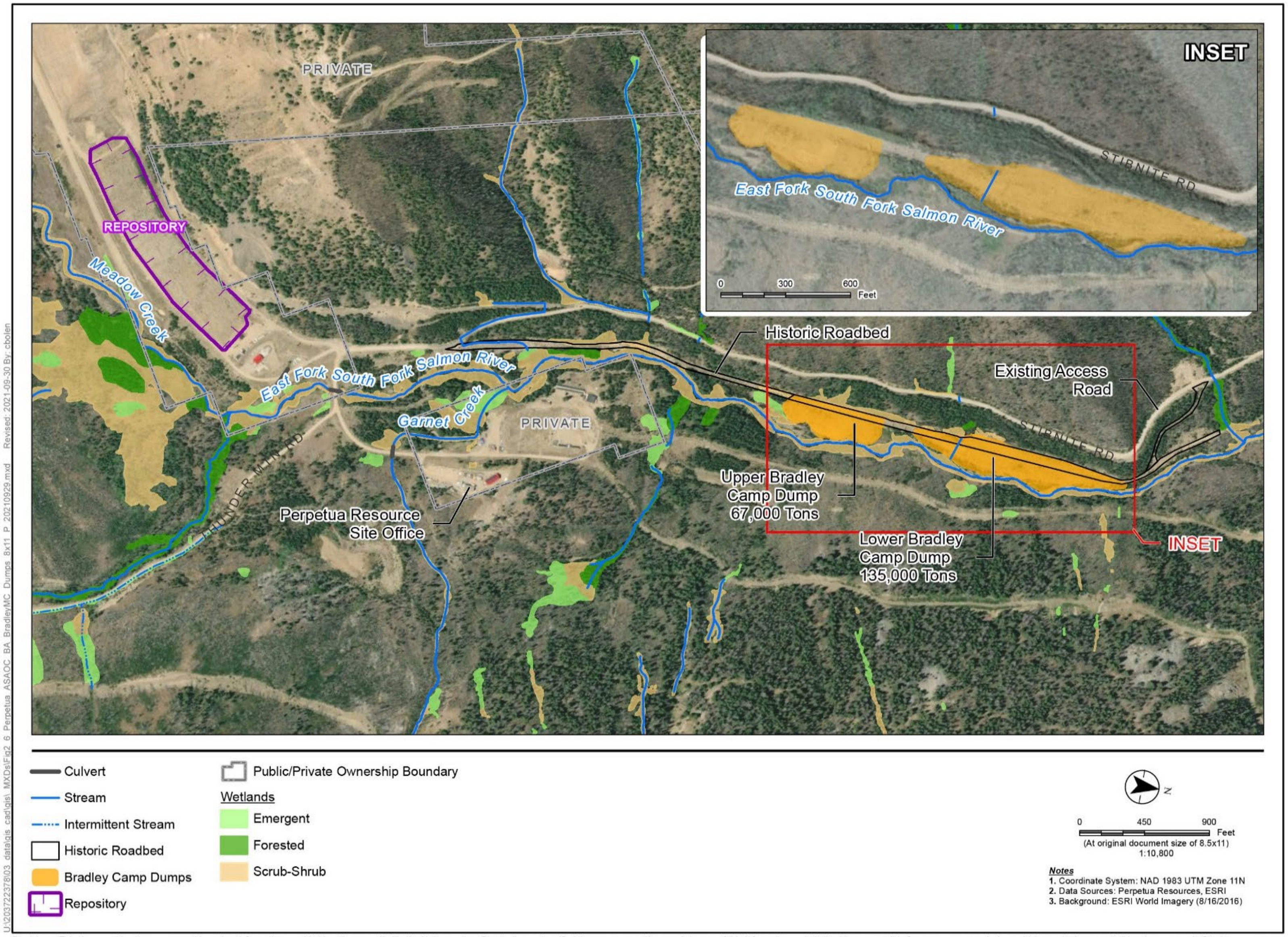

Figure 5: Bradley Man Camp Dumps Site Access

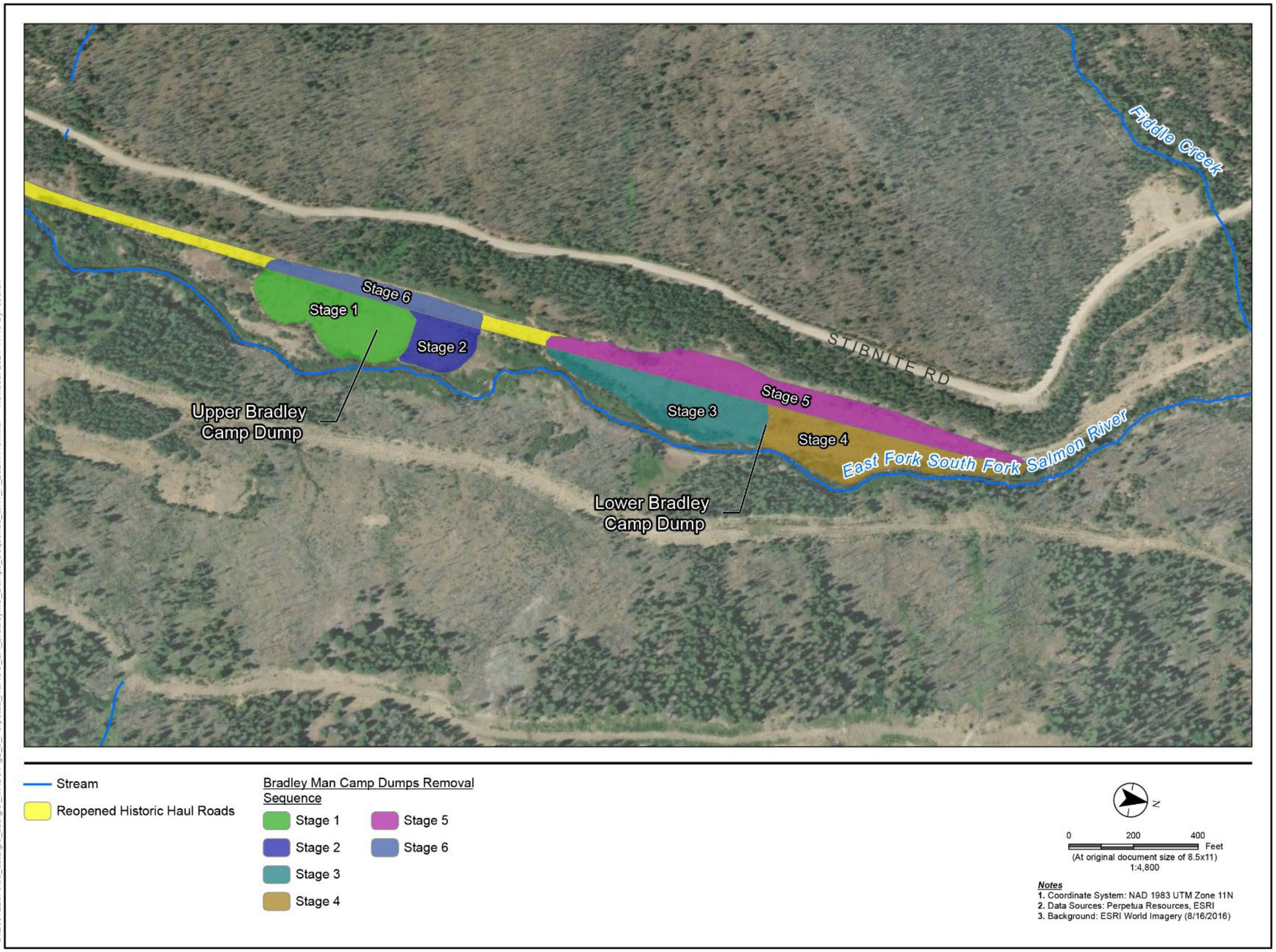

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Figure 6: Bradley Man Camp Dumps Removal Sequence

1.3.3.3 *Reconstruction*

All disturbed areas will be restored and revegetated as soon as practicable following construction based on BA Appendix D, Drawings G5 and D1 through D4, and measures presented in the EPP (BA Appendix A). Where trees need to be removed to facilitate the excavation of the waste rock, depending on the chemical constituents of the soil that the trees are growing in, Perpetua will attempt to transplant trees down into areas that have already been excavated, targeting areas adjacent to the EFSFSR. Where brush exists along the river edge, cuttings will be collected and stored in watered buckets for use during reclamation. If trees salvaged are not able to be transplanted, they will be stockpiled for use as microhabitat during reclamation. In addition, standard reconstruction and revegetation practices will be followed based on BA Appendix A, including segregating and stockpiling topsoil, implementing stormwater and sediment BMPs, backfilling and placing topsoil, and revegetating. The dump material within the historical haul road will be excavated downstream to upstream as the equipment retreats from the Upper and Lower Man Camp Dumps to accommodate erosion control and site reclamation. A summary of design features for reconstruction and revegetation are listed in BA Appendix A. Additional details are presented in the Reclamation and Closure Plan (Tetra Tech 2021).

1.3.3.4 *Access Roads*

Access roads will be required for implementation of the Bradley Man Camp Dumps Removal action. For this proposed action, it is assumed that personnel will be housed at the mine site. Equipment will mobilize to the mine site (June 2023), stay there for the field season, and mobilize out at the end of the field season (November 2023). Due to the same schedule, the number of truck trips and types of vehicles required for this removal action are included in the description for the Schoolhouse Tailings Removal (Section 1.3.1.3).

1.3.3.5 *Key Mitigation and Perpetua's Design Features*

Perpetua developed an EPP (BA Appendix A) to detail overarching measures that will be implemented during removal actions in the Project Area to ensure protection of human health and the environment. Performance standards and BMPs included in the EPP apply to all phases of the ASAOC implementation.

Removal Actions. Key environmental considerations and/or procedures for the Bradley Man Camp Dumps Removal are the protection of the EFSFSR, safe traffic transport and equipment operations, project sequencing, and surface water management. Portions of the Bradley Man Camp Dumps lie directly adjacent to the west bank of the EFSFSR. Where removal actions are near the EFSFSR, BMPs to inhibit migration of sediment into the river and roll-out protections will be utilized. This includes:

- Physical barriers or trenching as necessary to prevent material from rolling downslope into the river.

- Material will be pulled, rather than pushed, away from the riverbank whenever possible.

- Equipment will not enter the water column and material, or equipment staging will not occur within 300 feet of the EFSFSR.

The haul route will include a portion of NFR-412, a public access route, from its intersection with the historical haul road to the On/Off Leach Pads. To ensure safety and prevent potential spills due to traffic congestion, caution will be exercised in the form of warning signs, radio communication between equipment operators, operator briefings, and flagging, as necessary. Any potential, unforeseen safety hazards resulting from hauling operations will be immediately remedied.

Sequencing the removal actions into stages will enable excavation to progress upstream to downstream for all material adjacent to the EFSFSR. Excavation of the historical haul road will occur in the final stages and proceed as equipment retreats to accommodate erosion control and site reclamation. In addition, the following measures will be implemented:

- Site reclamation in the form of seeding and mulching will occur as soon as a stage has been completed.
- Erosion controls will remain in place until vegetation is reestablished.
- Wherever possible, a vegetated buffer will be retained between the EFSFSR and the excavation areas.

The EFSFSR is deeply incised in the reach adjacent to the Bradley Man Camp Dumps Removal actions are not anticipated to require water management. Additionally, the following measures will be implemented to reduce environmental effects:

- The removal action will be scheduled during the dry part of the year as much as practicable to ensure that work will be conducted in dry conditions.
- Should water management be required, water will be pumped to the uncompleted work area (stage) most distant from the current removal site for land application for infiltration into portions of the dumps yet to be removed.
- Temporary cofferdams or sumps will be installed as necessary to isolate the water source.
- Wet material will be staged separately within an unfinished portion or stage of the removal area for drying before being hauled to the repository, or subject to other strategies.

Repository. Key environmental considerations and/or procedures for the repository are the foundation lining, surface water management, and material placement and management. Specific design features are:

- The repository will utilize the existing On/Off lined foundation. The On/Off pads were designed to consist of fill material, sealed asphaltic concrete, crushed base rock, and a continuous PVC subliner over a geotextile fabric. Validation of the construction of the existing liner system is a goal of the field investigation. This repository foundation is unlikely to allow significant leaching to the underlying natural soil, due to presence of a drain layer above the PVC subliner, which itself overlays low permeability tailings. The repository foundation integrity will be analyzed to ensure that differential settlement will not impact liner integrity.

- The active disturbance areas of the repository will be bermed or utilize silt fence to prevent offsite migration of sediment and include sediment traps as needed at the outlet of stormwater channels. Offsite stormwater will be redirected around the Repository via existing perimeter channels or new channels excavated into native ground and stabilized against erosion.

- Material will be placed in the repository in lifts, with the lift height determined during testing to achieve adequate compaction. After material placement, spreading, and leveling to the appropriate lift thickness, tailings and waste rock will be uniformly compacted. A grading plan has been developed to accommodate approximately 160,000 CY of waste rock and tailings. The repository will be encapsulated by an engineered cover designed to reduce infiltration of meteoric water.

- Dust will be controlled at the repository as necessary with water sprinkling. The tailings cell of the repository (southwest corner) also will be covered as soon as practicable with waste rock once maximum height is achieved. Slopes will not exceed 3:1 (H:V). Erosion and sediment controls will be incorporated into the final cover design as appropriate.

After construction, repository integrity will be inspected and maintained to ensure damage such as erosion, settlement, vandalism, burrowing animals, or other issues are identified and corrected and to manage leachate if the design entails this aspect.

1.3.4. Stream Diversions[7]

Environmental contaminant source areas (NW Bradley Dumps, DMEA Waste Rock Dump, and Smelter Flats/Hangar Flats) have been present in the Project Area for decades and are relics of mine waste disposal practices of former operators. The source areas are generally composed of broken rock and other wastes of varying grain sizes that contain metals available to leaching when in contact with water and/or that can be transported in sediment. Metals of particular concern are arsenic, antimony, and mercury, which also are present naturally in undisturbed areas but are potentially less susceptible to mobilization through contact with surface runoff or streamflow relative to disturbed mine waste materials that have enhanced surface area and potential for mobilization.

[7] The stream diversions described in this section are based on the Proposed Action's 50 percent design. Perpetua will be required to provide the final design to the Agencies for the stream diversions and use of access roads prior to contracting the work to be sure the design basis report containing the 90 percent design is consistent with information presented in this BA.

1.3.4.1 *Site Locations*

Stream diversions are proposed to be installed at the NW Bradley Dumps, DMEA Waste Rock Dump area, and the Smelter Flats/Hangar Flats area. The locations of these diversions are shown on Figures 2, 7, 8, and 9, and in BA Appendix E.

1.3.4.2 *Goals and Objectives*

The objective of the stream diversions is to reduce inputs of various metal contaminants to the EFSFSR and certain tributaries. The primary mechanism currently responsible for moving contaminants from these source areas is neutral metal leaching of arsenic and antimony in subsurface water in contact with mine waste, and transport of these metals in dissolved form via groundwater. As some of the source areas are partially covered by soil and/or vegetation and feature flat areas that capture runoff, a secondary, less frequent, and less spatially extensive mechanism is erosion of mine waste by rainfall and snowmelt (either in active gullies or as more widespread sheet erosion during runoff events) and transport of eroded materials in suspended or dissolved forms to the receiving stream.

The primary goal of the stream diversions is to reduce the release of metals into the waterways by diverting surface water around three historical mining features at the Stibnite Mine: NW Bradley Waste Rock Dumps, the DMEA Waste Rock Dump area, and Smelter Flats/Hangar Flats. No instream work in the EFSFSR or Meadow Creek will occur as a result of the stream diversions.

1.3.4.3 *Northwest Bradley Dumps Diversion*

As described in the work plan for the Stream Diversions (McMillen Jacobs Associates 2021), the NW Bradley Dumps are located primarily on private lands owned by Perpetua (Figure 7). Portions of the dumps and the diversion route are located on public lands under the administrative authority of the PNF. Portions of the road that passes through this site are covered by an easement to Valley County. Access to this site is via the existing county road. Portions of the lower (northern) dumps are steep, potentially unstable, and impinge upon the active EFSFSR channel and floodplain and access to these areas may require additional earthwork, such as concurrent material removal and access areas for construction, to facilitate safe use of excavators.

Hennessy Creek, which does not support fish, flows perennially in its upper reaches and during high-flow periods but the lower reach loses water and dries out in the vicinity of the NW Bradley dump during low flow portions of the year. It is a tributary to the EFSFSR, entering from the southwest, which was previously intercepted and routed around this source area through a constructed diversion ditch west of the NW Bradley Dumps and along Stibnite Road. This creek, ultimately reporting to the EFSFSR near its confluence with Sugar Creek (Figure 7), only contains water during high flow events such as spring runoff. This ditch loses water and typically goes dry on the upstream side of the NW Bradley waste rock dumps. The water is believed to flow through the NW Bradley waste rock dumps and thereby transports metals to the EFSFSR. The work will be conducted dry, any water present in the channel during construction will be piped around the work area. Prior to releasing water back into the reconstructed channel, the new channel will be pre-washed and turbid wash water will be detained and pumped to sediment capture areas so as to not be discharged into the EFSFSR until all turbidity criteria are met. The stream diversion will improve all or part of the present Hennessy Creek diversion. The improved sections of the Hennessy Creek channel will be designed to transport the 100-year flow event without erosion and include a low-permeability geosynthetic liner. The channel will be constructed in a trapezoidal shape with a bottom width of approximately 1-foot, side slopes of approximately 2:1 (H:V), and a depth that will vary depending on the channel slope and discharge (water depth will range from approximately 0.9 feet to 1.6 feet).

Existing culverts will be evaluated for capacity and structural stability for haul traffic (40-ton articulated dump truck), and a new culvert(s) will replace the existing culverts at the road crossing, where the diversion passes under the Stibnite Road. The diversion will continue to the northwest roughly along the current alignment between the road and dump in a new lined channel, and transition to the existing channel alongside (northwest) of the dump where the channel is no longer upgradient of mine waste. The channel will flow along the toe of the NW Bradley Dump in the existing, unimproved diversion, and cross Stibnite Road to the north through an existing culvert (Figure 7; BA Appendix E).

Borrow Sources. Material stockpiles and borrow sources (Hennessy, Fiddle, and Blowout) (Figure 2) will be required for the stream diversion to support Proposed Action objectives and reclamation of work areas. Stockpiling will be used to preserve native topsoil and vegetation wherever possible, and additional construction material stockpiles will be created as borrow materials are sorted (screened) to segregate various silt/sand, gravel, cobble, and boulder fractions for later use. Design features for borrow sources and stockpiles are summarized in BA Appendix A. In addition, Perpetua has developed a Borrow Source Development Plan (Perpetua 2021e) that outlines specific details on how Perpetua will utilize borrow sources during this removal action.

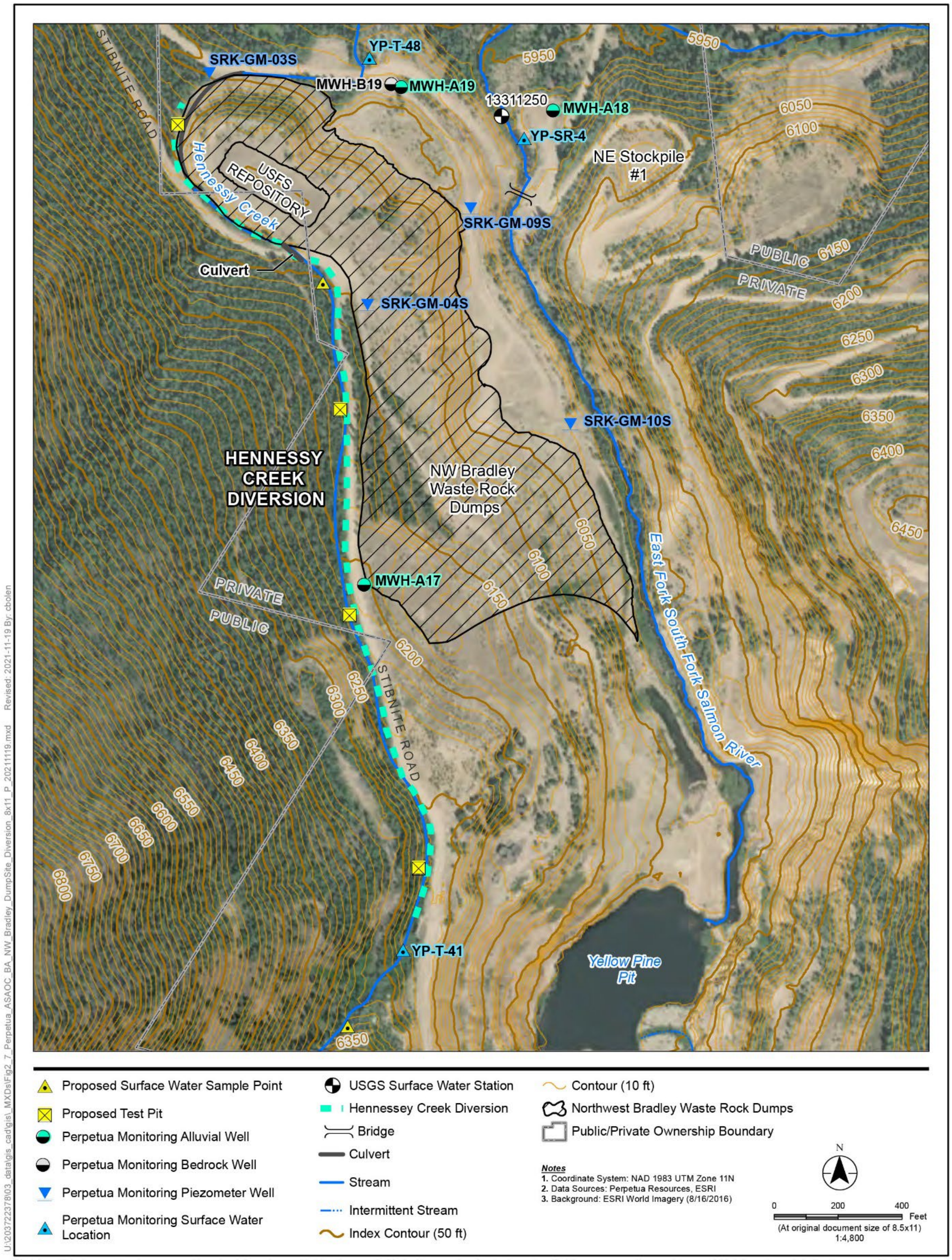

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Figure 7: Northwest Bradley Waste Rock Dump Site Diversion.

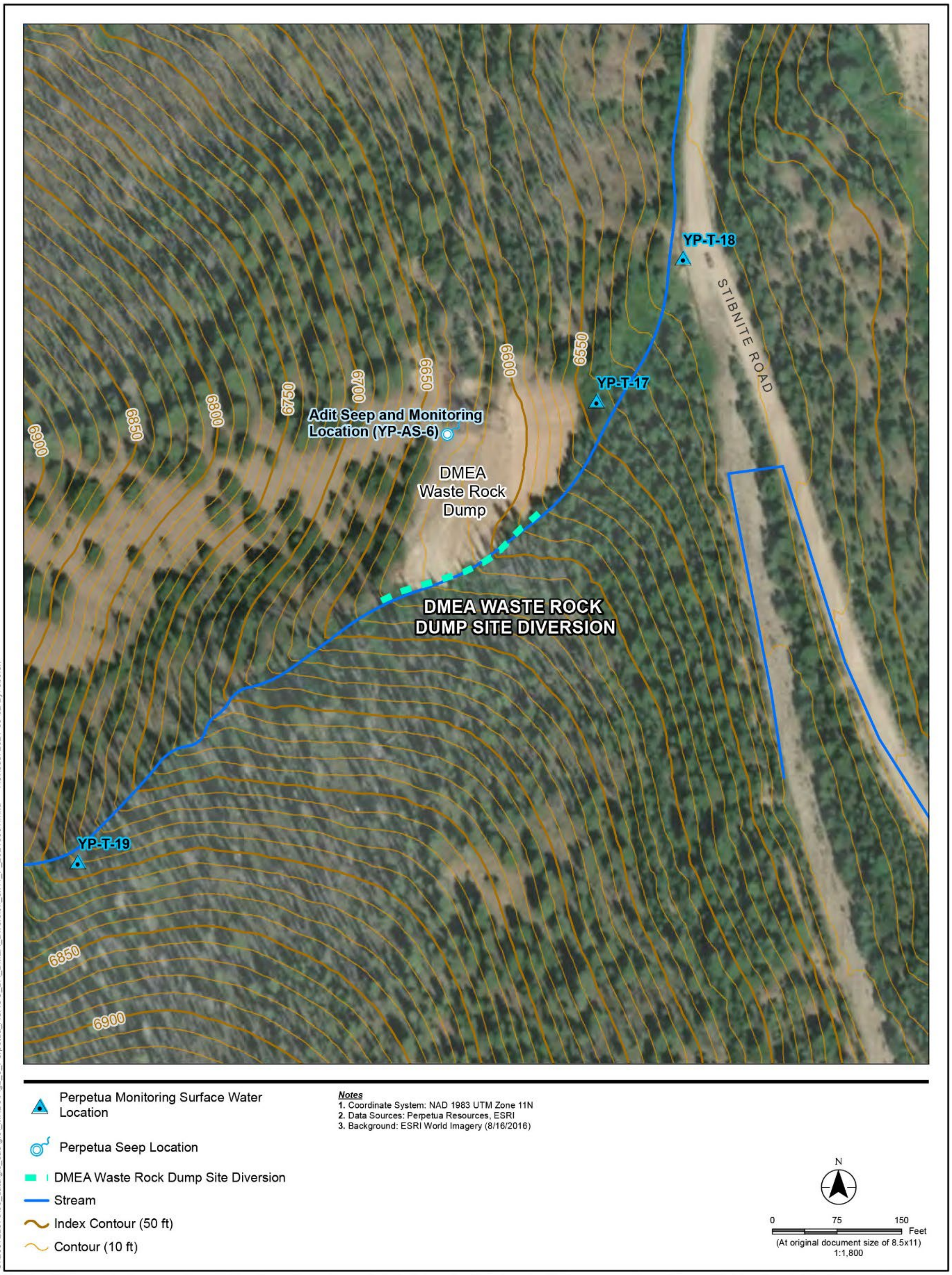

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Figure 8: Defense Mineral Exploration Administration Waste Rock Dump Site Diversion.

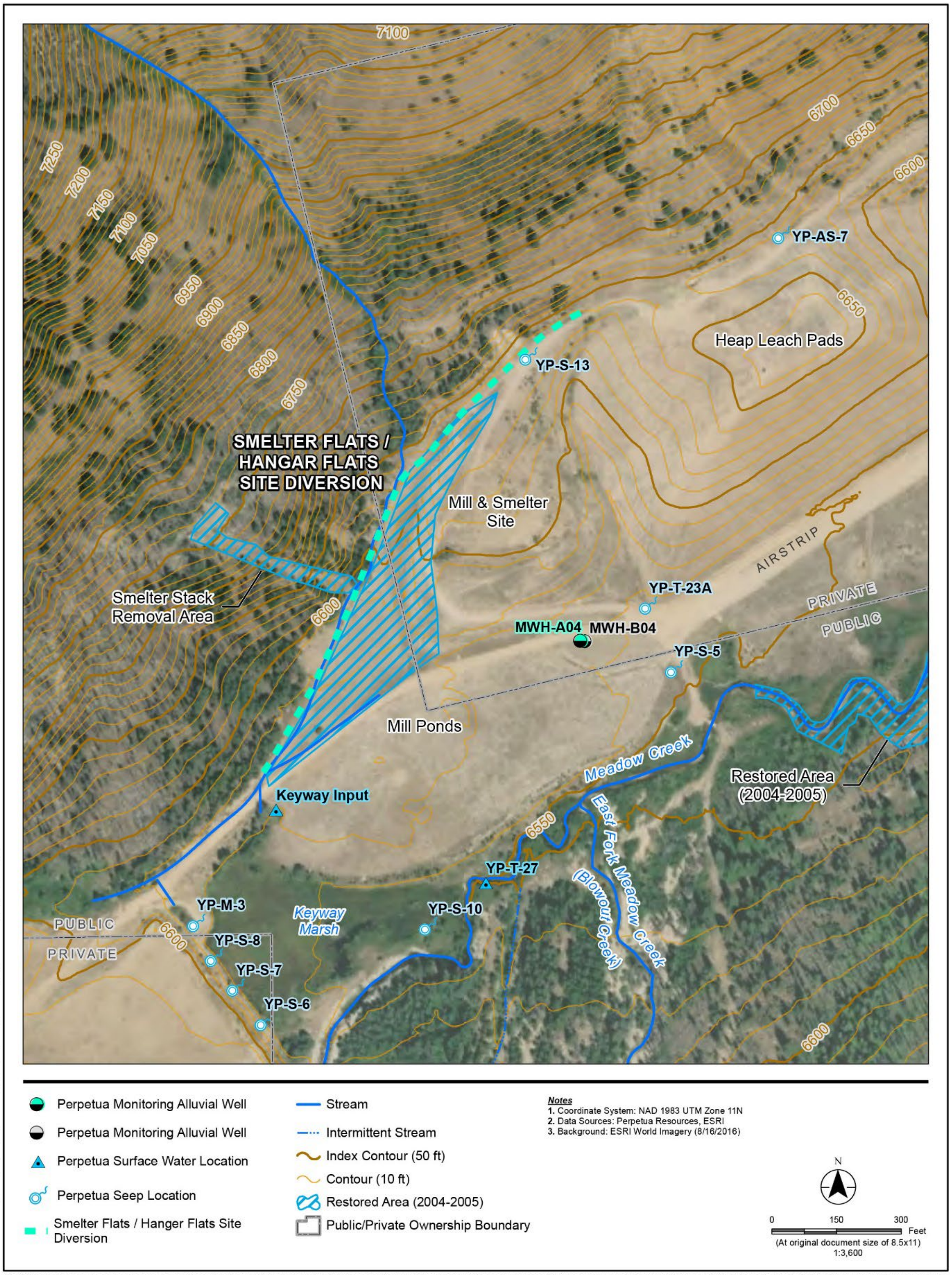

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Figure 9: Smelter Flats/Hangar Flats Site Diversion.

1.3.4.4 *DMEA Waste Rock Dump Area Diversion*

As described in the work plan for the Stream Diversions (McMillen Jacobs Associates 2021) and DMEA Dump Removal 50 Percent Design Basis Report (Rio ASE 2021c), the DMEA waste rock dump and adit site are located entirely on public lands under the administration of the PNF. The DMEA waste rock dump and adit were the result of underground tungsten and antimony exploration, and development work associated with the DMEA program in the Stibnite area, which was conducted under the 1950 Defense Production Act to explore for critical and strategic minerals. The DMEA adit issues metals-impacted water into the unnamed drainage, via seeping into the DMEA waste dump, potentially leaching additional metals along its pathway before ultimately entering shallow groundwater or seeping out the toe of the dump and combining with surface water.

Access to the dump and adit are via a gated, unimproved spur road off the county road approximately 900 feet north of the dump and adit area. The road is listed as an unauthorized road by the PNF but has been in existence and in use since the 1940s by both private landowners and the Forest Service. The road is currently permitted for limited use by Perpetua. Existing access is sufficient for small- to moderate-size tracked equipment and for small dump trucks (less than 10 cubic yards capacity) with only minor brushing and clearing of deadfall. Access for larger equipment will require tree cutting and possibly earthwork.

The area around the DMEA waste rock dump was heavily burned in a 2007 wildfire and vegetation on the burned slopes is still poorly developed, resulting in a high erosion potential if soils are disturbed during operations. A small unnamed perennial creek crossing is present along the spur of this road to the adit and waste rock dump and will require armoring prior to any use. The unnamed tributary is not a fish-bearing waterway. Several larger trees and a number of smaller lodgepole pines will need to be cut to allow access for any equipment or vehicles along the spur. In addition, the slope below the road at this creek crossing is unstable and will require reinforcement with ballast and riprap to allow for equipment and truck traffic to pass without causing a slope failure. Another access alternative for the use of this road and spur will be to access the DMEA waste rock dump from below at the junction of a former reclaimed haul road and the Stibnite Road where the unnamed stream passing through the DMEA waste rock dump intersects the lower road reach.

This action will entail partial removal of the DMEA dump to allow for reconstruction of the stream in the upgradient unnamed tributary to flow in its approximate original, pre-mining alignment (Figure 8 and BA Appendix E). This will involve partial removal of the DMEA waste rock dump (total estimated at 11,000 CY) with transport of the dump materials to the NW Bradley Dumps, the same destination specified for waste removed in Section 1.3.1.2 of this opinion. Water management will consist of diverting water around the work area using a pipe. A temporary cofferdam will be used to divert water into the pipe. The exit flow from the pipe will be located in a vegetated area, this will help to reduce turbidity prior to flowing back into the channel/culvert, which passes below the Stibnite Road.

Borrow Sources. Material stockpiles and borrow sources (Hennessy, Fiddle, and Blowout) (Figure 2) will be required for the stream diversion to support Proposed Action objectives and reclamation of work areas. Stockpiling will be used to preserve native topsoil and vegetation wherever possible, and additional construction material stockpiles will be created as borrow materials are sorted (screened) to segregate various silt/sand, gravel, cobble, and boulder fractions for later use. Design features for borrow sources and stockpiles are summarized in BA Appendix A. In addition, Perpetua has developed a Borrow Source Development Plan (Perpetua 2021e) that outlines specific details on how Perpetua will utilize borrow sources during this removal action.

1.3.4.5 *Smelter Flats/Hangar Flats Diversion*

As described in the work plan for the Stream Diversion (McMillen Jacobs Associates 2021), the deposit at Smelter Flats/Hangar Flats is composed of thousands of cubic yards of buried smelter and mineral processing waste located along Meadow Creek, a fish-bearing tributary to the EFSFSR that enters from the southwest near the southern end of the Project Area. Water that enters the Meadow Creek drainage in an unnamed drainage from the northwest through a leaky ditch will be captured in this diversion and routed around the upper portion of this source area and into Meadow Creek via the keyway marsh, reestablishing the function of a previously filled ditch and reducing the impact on the quality of water in the stream.

This action will develop a channel along the north side of the spent ore disposal area access road, extending to the existing road culvert just north of Keyway Marsh (Figure 9 and BA Appendix E). This will be designed to divert the 100-year event from the small drainage basins and hillside north of the Smelter Flats area. The channel will be lined with a low permeability geosynthetic and protected with riprap against erosion. The existing culvert will be evaluated to confirm 100-year flow capacity and structural soundness for traffic loads from a 40-ton articulated dump truck and replaced, if warranted. The work on this diversion will be conducted dry. A portion of the current ditch contains minor flow emanating from a drainage that feeds into the ditch. The water will be diverted into a pipe using a cofferdam. The water will be piped to below the work area and discharged into the Keyway Marsh, which is the terminus location of both the old and new ditch.

The area around the former Smelter and Hecla heap leach pad is accessible via the existing county road (Figure 9). There are no barriers to access for heavy equipment unless activity involves work on the steep slopes above the valley floor.

Borrow Sources. Material stockpiles and borrow sources (Hennessy, Fiddle, and Blowout) (Figure 2) will be required for the stream diversion to support Proposed Action objectives and reclamation of work areas. Stockpiling will be used to preserve native topsoil and vegetation wherever possible, and additional construction material stockpiles will be created as borrow materials are sorted (screened) to segregate various silt/sand, gravel, cobble, and boulder fractions for later use. Design features for borrow sources and stockpiles are summarized in BA Appendix A. In addition, Perpetua has developed a Borrow Source Development Plan (Perpetua 2021e) that outlines specific details on how Perpetua will utilize borrow sources during this removal action.

Reconstruction. All disturbed areas will be restored and revegetated as soon as practicable following construction based on BA Appendix E and measures presented in the EPP (BA Appendix A). Standard reconstruction and revegetation practices will be followed, including segregating and stockpiling topsoil, implementing stormwater and sediment BMPs, backfilling and placing topsoil, and revegetating. A summary of design features for reconstruction and revegetation are listed in BA Appendix A. Additional details are presented in the Reclamation and Closure Plan (Tetra Tech 2021).

Northwest Bradley Dumps Diversion. Improved segments of channel will be lined with a low permeability geosynthetic (specific type to be determined in subsequent design phases) and, if necessary, with a protective layer of geotextile fabric. Seams in the liner will be made per manufacturer's recommendations. A minimum of 6 inches of sand/gravel will be placed on top of the geomembrane liner prior to the placement of riprap. In sections where the channel slope is less than 0.10 foot/foot, Federal Highway Administration (FHWA) Class 1 (5 inches $< D_{50} <$ 8 inches) riprap may be used. Where the channel slope exceeds 0.10 foot/foot, FHWA Class 2 (8 inches $< D_{50} <$11 inches) will be used. Riprap will be placed to a depth of 2 x D_{50}, should have an "angular" geometry (or D_{50} adjusted accordingly), and have a specific gravity of approximately 2.65.

DMEA Dump Waste Rock Dump Area Diversion. Following removal of the dump, the original land surface at the DMEA dump site will be scarified, amended as required, and seeded with native vegetation, potentially with mulch and/or tackifier according to slope steepness. The original channel associated with the unnamed drainage through the area will be reconstructed to mimic (dimensions, sinuosity) the undisturbed portion of the channel above the current mine dump while being stable for the 100-year discharge.

Smelter Flats/Hangar Flats Diversion. The channel will be lined with a low permeability geosynthetic with a protective layer of geotextile fabric as required per subgrade conditions. Seams in the liner will be made per manufacturer's recommendations. A minimum of 6 inches of sand/gravel will be placed on top of a geomembrane liner prior to the placement of riprap. Due to the low flow and flatter slope, riprap at Smelter Flats diversion could have a D_{50} of approximately 3 inches. Riprap will be placed to a depth of 2 x D_{50}, should have an "angular" geometry, or increased in size accordingly, and have a specific gravity of approximately 2.65.

1.3.4.6 *Access Roads*

Access roads will be required for implementation of the stream diversions. For this proposed action, it is assumed that personnel will be housed at the mine site. Equipment will mobilize to the mine site (July 2022), stay there for the field season, and mobilize out at the end of the field season (October 2022). The following is a description of the number of trips per vehicle type associated with the stream diversions:

- Light Vehicle: Approximately 5 roundtrips every two weeks over three months for a total of 30 trips, plus 28 trips in support of 7 fuel hauls, equaling 58 trips total.
- Heavy Truck Traffic: Approximately 6 roundtrips.
- Fuel Truck Trips (assuming 4,500-gallon trucks): Approximately 7 trips, in 3-truck convoys, equaling 21 individual trips.

1.3.4.7 *Key Mitigation and Perpetua's Design Features*

Perpetua developed an EPP (BA Appendix A) to detail overarching measures that will be implemented during stream diversions in the Project Area to ensure protection of human health and the environment. Performance standards and BMPs included in the EPP apply to all phases of the ASAOC implementation.

1.4. Schedule

The three permanent ASAOC stream diversions are proposed to occur in 2022 (July through October), initiating once snow conditions and vehicular weight restrictions allow mobilization of equipment to the site.

Key criteria to meeting this schedule are the following:

- Agency approval of final designs for the Proposed Action will be completed prior to commencement of construction.
- A completed formal consultation process to obtain a Biological Opinion from USFWS and NMFS prior to contractor procurement.
- Construction contractors are available summer of 2022 and bids to complete the work will be determined to be reasonable and generally in-line with engineers' estimates.
- No unusual wastes (non-mine) will be encountered during construction that will require special treatment as hazardous.
- Suitable borrow materials can be obtained on-site.

The removal actions are proposed to occur in 2023 (June through November), initiating once snow conditions and vehicular weight restrictions allow mobilization of equipment to the site. As stated in the 50 percent design document for the Schoolhouse Tailings Removal Action, the schedule for that removal action may occur in 2024. However, for the purposes of this proposed action, it is assumed that all three removal actions will occur in 2023.

Key to meeting this schedule is the following:

- Field investigations to fill data gaps will not require permits prior to proceeding, including road reopening to access the dumps and borrow source investigation areas.
- Agency approval of final designs for the removal action will be completed by prior to commencement of construction.
- The lead agencies will complete the ESA formal Section 7 consultation to obtain a Biological Opinion from the fisheries agencies prior to contractor procurement.

- Construction contractors are available summer of 2023 and bids to complete the work will be determined to be reasonable and generally in-line with engineers' estimates.

- No unusual wastes (non-mine) are encountered during construction that will require special treatment as hazardous.

2. Endangered Species Act: Biological Opinion And Incidental Take Statement

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

This opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This opinion also relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designations of critical habitat for Snake River spring/summer Chinook and Snake River Basin steelhead use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The ESA Section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision does not change the scope of our analysis, and in this Opinion, we use the terms “effects” and “consequences” interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative (RPA) to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species’ likelihood of both survival and recovery. The species status section also helps to inform the description of the species’ “reproduction, numbers, or distribution” for the jeopardy analysis. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species. The Federal Register notices and notice dates for the species and critical habitat listings considered in this opinion are included in Table 2.

Table 2: Listing status, status of critical habitat designations and protective regulations, and relevant Federal Register decision notices for Endangered Species Act listed species considered in this opinion.

Species	Original Listing Status[1]	Original Critical Habitat[2]	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)			
Snake River spring/summer	T 4/22/92; 57 FR 14653	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Steelhead (*O. mykiss*)			
Snake River Basin	T 8/18/97; 62 FR 43937	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160

Note: Listing status 'T' means listed as threatened under the ESA; 'E' means listed as endangered.
[1]The listing status for Snake River spring/summer Chinook salmon was corrected on 6/3/92 (57 FR 23458) and reaffirmed on 6/28/05 (70 FR 37160). The listing status for Snake River Basin steelhead was reaffirmed on 1/5/06 (71 FR 834). The listing status for both species was reaffirmed again on April 14, 2014 (79 FR 20802).
[2]Critical habitat for Snake River spring/summer Chinook salmon was revised on 10/25/99 (64 FR 57399).

The status of each species and designated critical habitats are described further in Sections 2.2.1 and 2.2.2, respectively. One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. The impact of climate change on species and their designated critical habitat is discussed in Section 2.2.3.

2.2.1. Status of the Species

This section describes the present condition of the Snake River spring/summer Chinook salmon evolutionarily significant unit (ESU) and the Snake River Basin steelhead distinct population segment (DPS). NMFS expresses the status of a salmonid ESU or DPS in terms of likelihood of persistence over 100 years (or risk of extinction over 100 years). NMFS uses McElhany et al.'s (2000) description of a viable salmonid population (VSP) that defines "viable" as less than a 5 percent risk of extinction within 100 years (low risk of extinction) and "highly viable" as less than a 1 percent risk of extinction within 100 years (very low risk of extinction). A third category, "maintained," represents a less than 25 percent risk within 100 years (moderate risk of extinction). To be considered viable, an ESU or DPS should have multiple viable populations so that a single catastrophic event is less likely to cause the ESU/DPS to become extinct, and so that the ESU/DPS may function as a metapopulation that can sustain population-level extinction and recolonization processes (ICTRT 2007). The risk level of the ESU/DPS is built up from the aggregate risk levels of the individual populations and major population groups (MPGs) that make up the ESU/DPS.

Attributes associated with a VSP are: (1) abundance (number of adult spawners in natural production areas); (2) productivity (adult progeny per parent); (3) spatial structure; and (4) diversity. A VSP needs sufficient levels of these four population attributes in order to safeguard the genetic diversity of the listed ESU or DPS, enhance its capacity to adapt to various environmental conditions, and allow it to become self-sustaining in the natural environment (ICTRT 2007). These viability attributes are influenced by survival, behavior, and experiences throughout the entire salmonid life cycle, characteristics that are influenced in turn by habitat and other environmental and anthropogenic conditions. The present risk faced by the ESU/DPS informs NMFS' determination of whether additional risk will appreciably reduce the likelihood that the ESU/DPS will survive or recover in the wild.

The following sections summarize the status and available information on the species and designated critical habitats considered in this opinion based on the detailed information provided by the *ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon & Snake River Basin Steelhead* (NMFS 2017); *Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest* (NWFSC 2015); and *2016 5-year review: Summary and evaluation of Snake River sockeye salmon, Snake River spring-summer Chinook, Snake River fall-run Chinook, Snake River Basin steelhead* (NMFS 2016). These three documents are incorporated by reference here. Additional information (e.g., abundance estimates) has become available since the latest status review (NMFS 2016) and its technical support document (NWFSC 2015). NOAA has also recently issued an updated viability assessment for Pacific salmon as part of the new status review effort (Ford 2022). This latest information represents the best scientific and commercial data available and is also summarized in the following sections.

2.2.1.1 Snake River Spring/Summer Chinook Salmon

The Snake River spring/summer Chinook salmon ESU was originally listed as threatened on April 22, 1992 (57 FR 14653), with a revised listing on June 28, 2005 (70 FR 37160). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Large portions of historical habitat were blocked in 1901 by the construction of Swan Falls Dam, on the Snake River, and later by construction of the three-dam Hells Canyon Complex from 1955 to 1967. Dam construction also blocked and/or hindered fish access to historical habitat in the Clearwater River basin as a result of the construction of Lewiston Dam (removed in 1973, but believed to have caused the extirpation of native Chinook salmon in that subbasin). The loss of this historical habitat substantially reduced the spatial structure of this species. The production of this ESU was further affected by the development of the eight Federal dams and reservoirs in the mainstem lower Columbia/Snake River migration corridor between the late 1930s and early 1970s (NMFS 2017).

Several factors led to NMFS' conclusion that Snake River spring/summer Chinook salmon were threatened: (1) abundance of naturally produced Snake River spring and summer Chinook runs had dropped to a small fraction of historical levels; (2) short-term projections were for a continued downward trend in abundance; (3) hydroelectric development on the Snake and Columbia Rivers continued to disrupt Chinook runs through altered flow regimes and impacts on estuarine habitats; and (4) habitat degradation existed throughout the region, along with risks associated with the use of outside hatchery stocks in particular areas (Good et al. 2005). On May 26, 2016, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Life History. Snake River spring/summer Chinook salmon are characterized by their return times. Runs classified as spring Chinook salmon are counted at Bonneville Dam beginning in early March and ending the first week of June; summer runs are those Chinook salmon adults that pass Bonneville Dam from June through August. Returning adults will hold in deep mainstem and tributary pools until late summer, when they move up into tributary areas and spawn. In general, spring-run type Chinook salmon tend to spawn in higher-elevation reaches of major Snake River tributaries in mid- through late August, and summer-run Chinook salmon tend to spawn lower in Snake River tributaries in late August and September (although the spawning areas of the two runs may overlap).

Spring/summer Chinook spawn follow a "stream-type" life history characterized by rearing for a full year in the spawning habitat and migrating in early to mid-spring as age-1 smolts (Healey 1991). Eggs are deposited in late summer and early fall, incubate over the following winter, and hatch in late winter and early spring of the following year. Juveniles rear through the summer, and most overwinter and migrate to sea in the spring of their second year of life. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or overwintering areas. Snake River spring/summer Chinook salmon return from the ocean to spawn primarily as 4- and 5-year-old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year-old "jacks," heavily predominated by males (Good et al. 2005).

Spatial Structure and Diversity. The Snake River ESU includes all naturally spawning populations of spring/summer Chinook in the mainstem Snake River (below Hells Canyon Dam) and in the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (57 FR 23458), as well as the progeny of 13 artificial propagation programs (85 FR 81822). The hatchery programs include the McCall Hatchery [South Fork Salmon River (SFSR)], SFSR Eggbox, Johnson Creek, Pahsimeroi River, Yankee Fork Salmon River, Panther Creek, Sawtooth Hatchery, Tucannon River, Lostine River, Catherine Creek, Lookingglass Creek, Upper Grande Ronde River, and Imnaha River programs. The historical Snake River ESU likely also included populations in the Clearwater River drainage and extended above the Hells Canyon Dam complex.

Within the Snake River ESU, the Interior Columbia Technical Recovery Team (ICTRT) identified 28 extant and 4 extirpated or functionally extirpated populations of spring/summer-run Chinook salmon, listed in Table 3 (ICTRT 2003; McClure et al. 2005). The ICTRT aggregated these populations into five MPGs: Lower Snake River, Grande Ronde/Imnaha Rivers, South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 3 shows the current risk ratings that the ICTRT assigned to the four parameters of a VSP.

Spatial structure risk is low to moderate for most populations in this ESU (NWFSC 2015) and is generally not preventing the recovery of the species. In the most recent viability assessment, the ICTRT ratings for spatial structure remain unchanged (Ford 2022). Spring/summer Chinook salmon spawners are distributed throughout the ESU albeit at very low numbers. Diversity risk, on the other hand, is somewhat higher, driving the moderate and high combined spatial structure/diversity risks shown in Table 3 for some populations. Several populations have a high proportion of hatchery-origin spawners—particularly in the Grande Ronde, Lower Snake, and South Fork Salmon MPGs—and diversity risk will need to be lowered in multiple populations in order for the ESU to recover (ICTRT 2007; ICTRT 2010; NWFSC 2015).

Abundance and Productivity. Historically, the Snake River drainage is thought to have produced more than 1.5 million adult spring/summer Chinook salmon in some years (Matthews & Waples 1991), yet in 1994 and 1995, fewer than 2,000 naturally produced adults returned to the Snake River (ODFW & WDFW 2019). From the mid-1990s and the early 2000s, the ESU increased dramatically and peaked in 2001 at 45,273 naturally produced adult returns. Since 2001, the numbers have fluctuated between 32,324 (2003) and 4,183 (2019), and the trend for the most recent 5 years (2016–2020) has been generally downward (ODFW & WDFW 2021).

Furthermore, productivity for the most recent returns indicate that all populations in the ESU are below replacement for the 2012 through 2014 brood years (Felts et al. 2020). Since the last status review, observations of coastal ocean conditions suggested that the 2015-2017 outmigrant year classes experienced below average ocean survival during a marine heatwave and its lingering effects. This led researchers to predict a corresponding drop in adult returns through 2019 (Werner et al. 2017). As reported in the most recent viability assessment (Ford 2022), the most recent five-year geometric mean abundance estimates for 26 of the 27 evaluated populations are lower than the corresponding estimates for the previous five-year period by varying degrees (recent five-year abundance levels for these 27 populations declined by an average of 55 percent). All 28 extant populations are at now considered to be at high risk of extinction due to low abundance/productivity (Ford 2022). Therefore, all currently extant populations of Snake River spring/summer Chinook salmon will likely have to increase in abundance and productivity in order for the ESU to recover (Table 3). Information specific to populations within the action area is described in the environmental baseline section.

Table 3: Summary of viable salmonid population parameter risks, overall current status, and recovery plan goal for each population in the Snake River spring/summer Chinook salmon ESU.

MPG	Population	VSP Risk Parameter[1]		Viability Risk Rating[1]	
		Abundance/ Productivity	**Spatial Structure/ Diversity**	**2016 Status Review**	**Proposed Recovery Goal[2]**
South Fork Salmon River (Idaho)	Little Salmon River	*Insf. data*	Low	High	Moderate
	South Fork Salmon River[3]	High	Moderate	High	Low
	Secesh River[3]	High	Low	High	Very Low
	East Fork South Fork Salmon River[3]	High	Low	High	Moderate
Middle Fork Salmon River (Idaho)	Chamberlain Creek	High	Low	Moderate	Low
	Lower Middle Fork Salmon River	High	Moderate	High	Moderate
	Big Creek	High	Moderate	High	Very Low
	Camas Creek	High	Moderate	High	Moderate
	Loon Creek	High	Moderate	High	Low
	Upper Middle Fork Salmon River	High	Moderate	High	Moderate
	Sulphur Creek	High	Moderate	High	Moderate
	Bear Valley Creek	High	Low	High	Low
	Marsh Creek	High	Low	High	Low
Upper Salmon River (Idaho)	North Fork Salmon River	High	Low	High	Moderate
	Lemhi River	High	High	High	Low
	Salmon River Lower	High	Low	High	Moderate
	Pahsimeroi River	High	High	High	Low
	East Fork Salmon River	High	High	High	Low
	Yankee Fork Salmon River	High	High	High	Moderate
	Valley Creek	High	Moderate	High	Low
	Salmon River Upper	High	Low	High	Very Low
	Panther Creek			***Extirpated***	***Reintroduction***
Lower Snake (Washington)	Tucannon River	High	Moderate	High	Very Low
	Asotin Creek			***Extirpated***	***Consider Reintroduction***

MPG	Population	VSP Risk Parameter[1]		Viability Risk Rating[1]	
		Abundance/ Productivity	Spatial Structure/ Diversity	2016 Status Review	Proposed Recovery Goal[2]
Grande Ronde and Imnaha Rivers (Oregon/ Washington)[4]	Wenaha River	High	Moderate	High	Very Low or Low
	Lostine/Wallowa River	High	Moderate	High	Very Low or Low
	Minam River	High	Moderate	High	Very Low or Low
	Catherine Creek	High	Moderate	High	Very Low or Low
	Upper Grande Ronde River.	High	High	High	Moderate
	Imnaha River	High	Moderate	High	Very Low or Low
	Lookingglass Creek			***Extirpated***	***Consider Reintroduction***
	Big Sheep Creek			***Extirpated***	***Consider Reintroduction***

[1]Risk ratings are defined based on the risk of extinction within 100 years: High = greater than or equal to 25 percent; Moderate = less than 25 percent; Low = less than 5 percent; and Very Low = less than 1 percent.
[2]There are several scenarios that could meet the requirements for ESU recovery (as reflected in the proposed goals for populations in Oregon and Washington). What is reflected here for populations in Idaho are the proposed status goals selected by NMFS and the State of Idaho.
[3] Populations shaded in gray are those that occupy the action area.
[4]At least one of the populations must achieve a very low viability risk rating.

Recovery Plan. The ESA recovery plan for Snake River spring/summer Chinook salmon (NMFS 2017) includes delisting criteria for the ESU, along with identification of factors currently limiting the recovery of the ESU, and management actions necessary for recovery. The biological delisting criteria are based on recommendations by the ICTRT. They are hierarchical in nature, with ESU-level criteria based on the status of natural-origin Chinook salmon assessed at the population level. The plan identifies ESU- and MPG-level biological criteria, and within each MPG, it provides guidance on a target risk status for each population, consistent with the MPG-level criteria. Population-level assessments are based on evaluation of population abundance, productivity, spatial structure, diversity (McElhany et al. 2000), and an overall extinction risk characterization. Achieving recovery (i.e., delisting) of the ESU will require substantial improvement in its abundance, productivity, spatial structure, and diversity. Table 3 also includes the recovery plan goals for Snake River spring/summer Chinook salmon populations.

Status of Snake River Spring/Summer Chinook Salmon Summary. All 28 extant Chinook salmon populations are at high risk of extinction due to low abundance/productivity (24 populations) or have insufficient data to make a determination (one population). (Ford 2022) Nine of the populations are at low risk, 14 are at moderate risk, and five are at high risk of extinction due to spatial structure/diversity. In order to achieve recovery, substantial improvements in abundance and productivity are required across all populations and a number of populations will need to see improvements in their spatial structure and diversity risk ratings.

2.2.1.2 Snake River Basin Steelhead

The Snake River Basin steelhead was listed as a threatened ESU on August 18, 1997 (62 FR 43937), with a revised listing as a DPS on January 5, 2006 (71 FR 834). This DPS occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Reasons for the decline of this species include substantial modification of the seaward migration corridor by hydroelectric power development on the mainstem Snake and Columbia Rivers, loss of habitat above the Hells Canyon Dam complex on the mainstem Snake River, and widespread habitat degradation and reduced streamflows throughout the Snake River basin (Good et al. 2005). Another major concern for the species is the threat to genetic integrity from past and present hatchery practices, and the high proportion of hatchery fish in the aggregate run of Snake River Basin steelhead over Lower Granite Dam (Ford 2011; Good et al. 2005). On May 26, 2016, in the agency's most recent 5-year status review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Life History. Adult Snake River Basin steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the Snake River basin, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations and later dispersal occurs at higher elevations. Juveniles emerge from the gravels in 4 to 8 weeks, and move into shallow, low-velocity areas in side channels and along channel margins to escape high velocities and predators (Everest & Chapman 1972). Juvenile steelhead then progressively move toward deeper water as they grow in size (Bjornn & Rieser 1991). Juveniles typically reside in fresh water for 1 to 3 years, although this species displays a wide diversity of life histories. Smolts migrate downstream during spring runoff, which occurs from March to mid-June depending on elevation, and typically spend 1 to 2 years in the ocean.

Spatial Structure and Diversity. This species includes all naturally-spawning steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, as well as the progeny of six artificial propagation programs (85 FR 81822). The artificial propagation programs include the Dworshak National Fish Hatchery, Salmon River B-run, South Fork Clearwater B-run, East Fork Salmon River Natural, Tucannon River, and the Little Sheep Creek/Imnaha River programs. The Snake River Basin steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The ICTRT identified 24 extant populations within this DPS, organized into five MPGs (ICTRT 2003). The ICTRT also identified a number of potential historical populations associated with watersheds above the Hells Canyon Dam complex on the mainstem Snake River, a barrier to anadromous migration. The five MPGs with extant populations are the Clearwater River, Salmon River, Grande Ronde River, Imnaha River, and Lower Snake River. In the Clearwater River, the historical North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS, such that spatial structure risk is generally low. For each population in the DPS, Table 4 shows the current risk ratings for the parameters of a VSP.

The Snake River Basin steelhead DPS exhibits a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified Snake River Basin steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominantly spend 1 year in the ocean; B-run steelhead are larger with most individuals returning after 2 years in the ocean. New information shows that most Snake River populations support a mixture of the two run types, with the highest percentage of B-run fish in the upper Clearwater River and the SFSR; moderate percentages of B-run fish in the Middle Fork Salmon River; and very low percentages of B-run fish in the Upper Salmon, Grande Ronde, and Lower Snake Rivers (NWFSC 2015). Maintaining life history diversity is important for the recovery of the species.

Diversity risk for populations in the DPS is either moderate or low. Large numbers of hatchery steelhead are released in the Snake River, and the relative proportion of hatchery adults in natural spawning areas near major hatchery release sites remains uncertain. Moderate diversity risks for some populations are thus driven by the high proportion of hatchery fish on natural spawning grounds and the uncertainty regarding these estimates (NWFSC 2015). Reductions in hatchery-related diversity risks would increase the likelihood of these populations reaching viable status.

Table 4: Summary of viable salmonid population parameter risks, overall current status, and proposed recovery goals for each population in the Snake River Basin steelhead distinct population segment.

MPG	Population	VSP Risk Parameter[1]		Viability Risk Rating[1]	
		Abundance/ Productivity	Spatial Structure/ Diversity	2016 Status Review	Proposed Recovery Goal[2]
Lower Snake River[3]	Tucannon River	High	Moderate	High?	Very Low or Low
	Asotin Creek	Low	Moderate	Moderate?	Very Low or Low
Grande Ronde River[2]	Lower Grande Ronde	High	Moderate	Moderate?	Low or Moderate
	Joseph Creek	Low	Low	Very Low	Very Low, Low, or Moderate
	Wallowa River	High	Low	Moderate?	Low or Moderate
	Upper Grande Ronde	Very Low	Moderate	Low	Very Low or Low
Imnaha River	Imnaha River	Very Low	Moderate	Moderate?	Very Low
Clearwater River (Idaho)	Lower Mainstem Clearwater River[4]	Very Low	Low	Moderate?	Low
	South Fork Clearwater River	Very Low	Moderate	High?	Moderate
	Lolo Creek	Moderate	Moderate	High?	Moderate
	Selway River	Moderate	Low	Moderate?	Low
	Lochsa River	Moderate	Low	Moderate?	Very Low
	North Fork Clearwater River			*Extirpated*	*N/A*
Salmon River (Idaho)	Little Salmon River	Very Low	Moderate	Moderate?	Moderate
	South Fork Salmon River[5]	Moderate	Low	Moderate	Low
	Secesh River[5]	Moderate	Low	Moderate?	Moderate
	Chamberlain Creek	Moderate	Low	Moderate?	Low
	Lower Middle Fork Salmon R.	Moderate	Low	Moderate?	Very Low
	Upper Middle Fork Salmon R.	Moderate	Low	Moderate?	Low
	Panther Creek	Moderate	Moderate	High?	Low
	North Fork Salmon River	Moderate	Moderate	Moderate?	Moderate
	Lemhi River	Moderate	Moderate	Moderate?	Low
	Pahsimeroi River	Moderate	Moderate	Moderate?	Moderate
	East Fork Salmon River	Moderate	Moderate	Moderate?	Moderate
	Upper Mainstem Salmon R.	Moderate	Moderate	Moderate?	Moderate
Hells Canyon	Hells Canyon Tributaries			*Extirpated*	*N/A*

[1]Risk ratings with "?" are based on limited or provisional data series. Risk ratings are defined based on the risk of extinction within 100 years: High = greater than or equal to 25 percent; Moderate = less than 25 percent; Low = less than 5 percent; and Very Low = less than 1 percent.
[2]There are several scenarios that could meet the requirements for ESU recovery (as reflected in the proposed goals for populations in Oregon and Washington). What is reflected here for populations in Idaho are the proposed status goals selected by NMFS and the State of Idaho.
[3]At least one of the populations must achieve a very low viability risk rating.
[4]Current abundance/productivity estimates for the Lower Clearwater Mainstem population exceed minimum thresholds for viability, but the population is assigned moderate risk for abundance/productivity due to the high uncertainty associated with the estimate.
[5]Populations shaded in gray are those that occupy the action area.

Abundance and Productivity. Historical estimates of steelhead production for the entire Snake River basin are not available, but the basin is believed to have supported more than half the total steelhead production from the Columbia River basin (Mallet 1974, as cited in Good et al. 2005). The Clearwater River drainage alone may have historically produced 40,000 to 60,000 adults (Ecovista et al. 2003), and historical harvest data suggests that steelhead production in the Salmon River was likely higher than in the Clearwater (Hauck 1953). In contrast, at the time of listing in 1997, the 5-year geomean abundance for natural-origin steelhead passing Lower Granite Dam, which includes all but one population in the DPS, was 11,462 adults (Ford 2011). Abundance began to increase in the early 2000s, with the single year count and the 5-year geomean both peaking in 2015 at 45,789 and 34,179, respectively (ODFW & WDFW 2021). Since 2015, the numbers have declined steadily with only 9,634 natural-origin adult returns counted for the 2020 run year (ODFW & WDFW 2021). According the most recent viability assessment (Ford 2022), the five-year geometric mean abundance estimates for the populations in this DPS all show significant declines in the recent past, with each population decreasing by roughly 50 percent in the past five-year period.

According to Ford (2022), populations in this DPS exhibited similar temporal patterns in brood year returns per spawner, oscillating with a rough period of ten years. Return rates for brood years 1995−99 generally exceeded replacement (1:1); were well below replacement for many populations for brood years 2001−03; cycling above replacement during 2005–10; and have now been strongly below replacement since 2010. Year-to-year patterns in aggregate Snake River basin stocks of wild summer steelhead also show a steep recent decline.

The status of many of the individual populations remains uncertain, and four out of the five MPGs are not meeting viability objectives (NWFSC 2015). In order for the species to recover, more populations will need to reach viable status through increases in abundance and productivity. Information specific to populations within the action area is described in the environmental baseline section.

Recovery Plan. The ESA recovery plan for Snake River Basin steelhead (NMFS 2017) includes delisting criteria for the DPS, along with identification of factors currently limiting the recovery of the DPS, and management actions necessary for recovery. Biological delisting criteria are based on recommendations by the ICTRT. They are hierarchical in nature, with DPS-level criteria based on the status of natural-origin Snake River Basin steelhead assessed at the population level. The plan identifies DPS- and MPG-level biological criteria, and within each MPG, it provides guidance on a target risk status for each population, consistent with the MPG-level criteria. Table 4 summarizes the recovery plan goals. In order to achieve recovery, the DPS will require sufficient improvement in its abundance, productivity, spatial structure, and diversity.

Summary of the Status of Snake River Basin Steelhead. Of the 24 extant Snake River Basin steelhead populations, two are at low or very low risk of extinction, 18 are at moderate risk, and four are at high risk of extinction. However, all of the moderate and high risk determinations were made with very limited abundance/productivity data (NMFS 2017). The number of wild steelhead migrating over Lower Granite Dam has steadily declined since 2015. In order to achieve recovery, the DPS will require sufficient improvement in its abundance, productivity, spatial structure, and diversity.

2.2.2. Status of Critical Habitat

In evaluating the condition of designated critical habitat, NMFS examines the condition and trends of PBFs essential to the conservation of the species. These are features that occur in specific areas and that are essential to support the life-history needs of the species (84 FR 45020). Table 5 identifies the PBFs for Snake River spring/summer Chinook salmon and Snake River Basin steelhead. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding, spawning, incubation, rearing, and the growth and development of juvenile fish. Modification of PBFs may affect freshwater spawning, rearing, or migration in the action area.

Table 5: The physical or biological features of designated critical habitat and the species life stages that each physical or biological feature supports.

Area	Features	Species Life Stage
Snake River Basin steelhead[1]		
Freshwater spawning	Water quality, water quantity, and substrate	Spawning, incubation, and larval development
Freshwater rearing	Water quantity and floodplain connectivity to form and maintain physical habitat conditions	Juvenile growth and mobility
	Water quality and forage[2]	Juvenile development
	Natural cover[3]	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover[3]	Juvenile and adult mobility and survival
Snake River spring/summer Chinook salmon		
Spawning and juvenile rearing	Spawning gravel, water quality and quantity, cover/shelter, food, riparian vegetation, space, and water temperature	Juvenile and adult
Migration	Substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food[4], riparian vegetation, space, safe passage	Juvenile and adult

[1]Additional features pertaining to estuarine and nearshore areas have also been described for Snake River steelhead. These areas will not be affected by the proposed action; therefore, their features are not described in this opinion.
[2]Forage includes aquatic invertebrate and fish species that support growth and maturation.
[3]Natural cover includes shade, large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
[4]Food applies to juvenile migration only.

Table 6 describes the geographical extent within the Snake River of critical habitat for Snake River spring/summer Chinook salmon and Snake River Basin steelhead. Critical habitat includes the stream channel and water column with the lateral extent defined by the ordinary high-water line, or the bankfull elevation where the ordinary high-water line is not defined. In addition, critical habitat for Snake River spring/summer Chinook salmon includes the adjacent riparian zone, which is defined as the area within 300 feet of the line of high water of a stream channel or from the shoreline of standing body of water (58 FR 68543). The riparian zone is critical because it provides shade, streambank stability, organic matter input, and regulation of sediment, nutrients, and chemicals.

Spawning and rearing habitat quality in tributary streams in the Snake River basin varies from excellent in wilderness and roadless areas to poor in areas subject to intensive human land uses (NMFS 2017). Critical habitat throughout much of the Interior Columbia (which includes the Snake River and the Middle Columbia River) has been degraded by intensive agriculture, alteration of stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer streamflows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in non-wilderness areas. Human land use practices throughout the basin have caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations.

Table 6: Geographical extent of designated critical habitat within the Snake River for Endangered Species Act listed salmon and steelhead.

Evolutionarily Significant Unit / Distinct Population Segment	Designation	Geographical Extent of Critical Habitat
Snake River spring/summer Chinook salmon	58 FR 68543; December 28, 1993 64 FR 57399; October 25, 1999	All Snake River reaches upstream to Hells Canyon Dam; all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Salmon River basin; and all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Hells Canyon, Imnaha, Lower Grande Ronde, Upper Grande Ronde, Lower Snake–Asotin, Lower Snake–Tucannon, and Wallowa subbasins.
Snake River Basin steelhead	70 FR 52630; September 2, 2005	Specific stream reaches are designated within the Lower Snake, Salmon, and Clearwater River basins. Table 21 in the Federal Register details habitat areas within the distinct population segment's geographical range that are excluded from critical habitat designation.

In many stream reaches designated as critical habitat in the Snake River basin, streamflows are substantially reduced by water diversions (NMFS 2017). Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996). Reduced tributary streamflow has been identified as a major limiting factor for Snake River spring/summer Chinook and Snake River Basin steelhead in particular (NMFS 2017).

Many stream reaches designated as critical habitat for these species are listed on the Clean Water Act (CWA) 303(d) list for impaired water quality, such as elevated water temperature (IDEQ 2020). Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures, such as some stream reaches in the Upper Grande Ronde. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Water quality in rearing areas in the Snake River has also been impaired by high levels of sedimentation and by heavy metal contamination from mine waste (IDEQ 2001; IDEQ & EPA 2003).

The construction and operation of water storage and hydropower projects in the Columbia River basin, including the eight run-of-river dams on the mainstem lower Snake and lower Columbia Rivers, have altered biological and physical attributes of the mainstem migration corridor. Hydrosystem development modified natural flow regimes, resulting in warmer late summer and fall water temperatures. Changes in fish communities led to increased rates of piscivorous predation on juvenile salmon and steelhead. Reservoirs and project tailraces have created opportunities for avian predators to successfully forage for smolts, and the dams themselves have created migration delays for both adult and juvenile salmonids. Physical features of dams, such as turbines and juvenile bypass systems have also killed some out-migrating fish. However, some of these conditions have improved. The Bureau of Reclamation and U.S. Army Corps of Engineers have implemented measures in previous Columbia River System hydropower consultations to improve conditions in the juvenile and adult migration corridor including 24-hour volitional spill, surface passage routes, upgrades to juvenile bypass systems, and predator management measures. These measures are ongoing and their benefits with respect to improved functioning of the migration corridor PBFs will continue into the future.

Measures taken through the individual and combined efforts of Federal, State, tribal, local, and private entities, in the decades since critical habitat was designated have improved the functioning of spawning and rearing area PBFs. These include protecting and improving instream flow, improving habitat complexity, improving riparian area condition, reducing fish entrainment, and removing barriers to spawning and rearing habitat. However, more improvements will be needed before many areas function at a level that supports the recovery of Snake River spring/summer Chinook salmon and Snake River Basin steelhead.

The regional tributary habitat strategy set forth in the final recovery plans (NMFS 2017) is to protect, conserve, and restore natural ecological processes at the watershed scale that support population viability. Ongoing actions to support recovery of these two species include, but are not limited to, conserving existing high quality habitat and restoring degraded (and maintaining properly functioning) upland processes to minimize unnatural rates of erosion and runoff. Recovery strategies and actions for spawning and rearing habitat for populations within the action area include: (1) reduce road-related impacts (e.g., sediment delivery) on streams; (2) inventory stream crossings and replace any that are barriers to passage; (3) reduce floodplain and channel encroachment; and (4) restore floodplain function.

2.2.3 Climate Change Implications for ESA-listed Species and their Critical Habitat

One factor affecting the rangewide status of Snake River salmon and steelhead, and aquatic habitat at large is climate change. The U.S. Global Change Research Program (USGCRP) reports average warming in the Pacific Northwest of about 1.3ºF from 1895 to 2011, and projects an increase in average annual temperature of 3.3ºF to 9.7ºF by 2070 to 2099 (compared to the period 1970 to 1999), depending largely on total global emissions of heat-trapping gases (predictions based on a variety of emission scenarios including B1, RCP4.5, A1B, A2, A1FI, and RCP8.5 scenarios). The increases are projected to be largest in summer (Melillo et al. 2014; USGCRP 2018). The 5 warmest years in the 1880 to 2019 record have all occurred since 2015, while 9 of the 10 warmest years have occurred since 2005 (Lindsey & Dahlman 2020).

Several studies have revealed that climate change has the potential to affect ecosystems in nearly all tributaries throughout the Snake River (Battin et al. 2007; ISAB 2007). While the intensity of effects will vary by region (ISAB 2007), climate change is generally expected to alter aquatic habitat (water yield, peak flows, and stream temperature). As climate change alters the structure and distribution of rainfall, snowpack, and glaciations, each factor will in turn alter riverine hydrographs. Given the increasing certainty that climate change is occurring and is accelerating (Battin et al. 2007), NMFS anticipates salmonid habitats will be affected. Climate and hydrology models project significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest over the next 50 years (Mote & Salathé 2009). These changes will shrink the extent of the snowmelt-dominated habitat available to salmon and may restrict our ability to conserve diverse salmon life histories.

In the Pacific Northwest, most models project warmer air temperatures, increases in winter precipitation, and decreases in summer precipitation. Average temperatures in the Pacific Northwest are predicted to increase by 0.1 to 0.6°C (0.2°F to 1.0°F) per decade (Mote & Salathé 2009). Warmer air temperatures will lead to more precipitation falling as rain rather than snow. As the snow pack diminishes, seasonal hydrology will shift to more frequent and severe early large storms, changing stream flow timing, which may limit salmon survival (Mantua et al. 2009). The largest driver of climate-induced decline in salmon populations is projected to be the impact of increased winter peak flows, which scour the streambed and destroy salmon eggs (Battin et al. 2007).

Higher water temperatures and lower spawning flows, together with increased magnitude of winter peak flows are all likely to increase salmon mortality. The Independent Scientific Advisory Board (ISAB) (2007) found that higher ambient air temperatures will likely cause water temperatures to rise. Salmon and steelhead require cold water for spawning and incubation. As climate change progresses and stream temperatures warm, thermal refugia will be essential to persistence of many salmonid populations. Thermal refugia are important for providing salmon and steelhead with patches of suitable habitat while allowing them to undertake migrations through or to make foraging forays into areas with greater than optimal temperatures. To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in the confluence of colder tributaries or other areas of cold water refugia (Mantua et al. 2009).

Climate change is expected to make recovery targets for salmon and steelhead populations more difficult to achieve. Climate change is expected to alter critical habitat by generally increasing temperature and peak flows and decreasing base flows. Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration. Habitat action can address the adverse impacts of climate change on salmon. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters, protecting and restoring riparian vegetation to ameliorate stream temperature increases, and purchasing or applying easements to lands that provide important cold water or refuge habitat (Battin et al. 2007; ISAB 2007).

Summary of Climate Change*.* Climate change is expected to impact Pacific Northwest anadromous fishes during all stages of their complex life cycle and is expected to make recovery targets for Chinook salmon and steelhead populations more difficult to achieve. Climate change is expected to alter critical habitat by generally increasing temperature and peak flows and decreasing base flows. Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration. Habitat actions can address the adverse impacts of climate change on Chinook salmon and steelhead. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters, protecting and restoring riparian vegetation to ameliorate stream temperature increases, and purchasing or applying easements to lands that provide important cold water habitat and cold water refugia (Battin et al. 2007; ISAB 2007).

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The Proposed Action occurs on private lands and public lands administered by the BNF and PNF in Valley County, Idaho (Figure 10), encompassing the Upper EFSFSR 5th level hydrologic unit code (HUC) (including the EFSFSR from the Sugar Creek confluence upstream to its headwaters and its tributaries), the EFSFSR downstream to the town of Yellow Pine, Johnson Creek along Johnson Creek Road, and any waterways that cross State Route 55 down to the town of Cascade. Specifically, the action area includes the following:

- Access/haul Routes
    - Boise to Cascade – Highway 55
    - Cascade to Landmark – two-lane, paved Warm Lake Road
    - Landmark to Yellow Pine – single-lane, unpaved Johnson Creek Road
    - Yellow Pine to Stibnite – single-lane, unpaved Stibnite Road.
    - Headwaters East Fork South Fork Salmon River 5th Field HUC: EFSFSR; Meadow Creek; Blowout Creek; and Fiddle Creek.

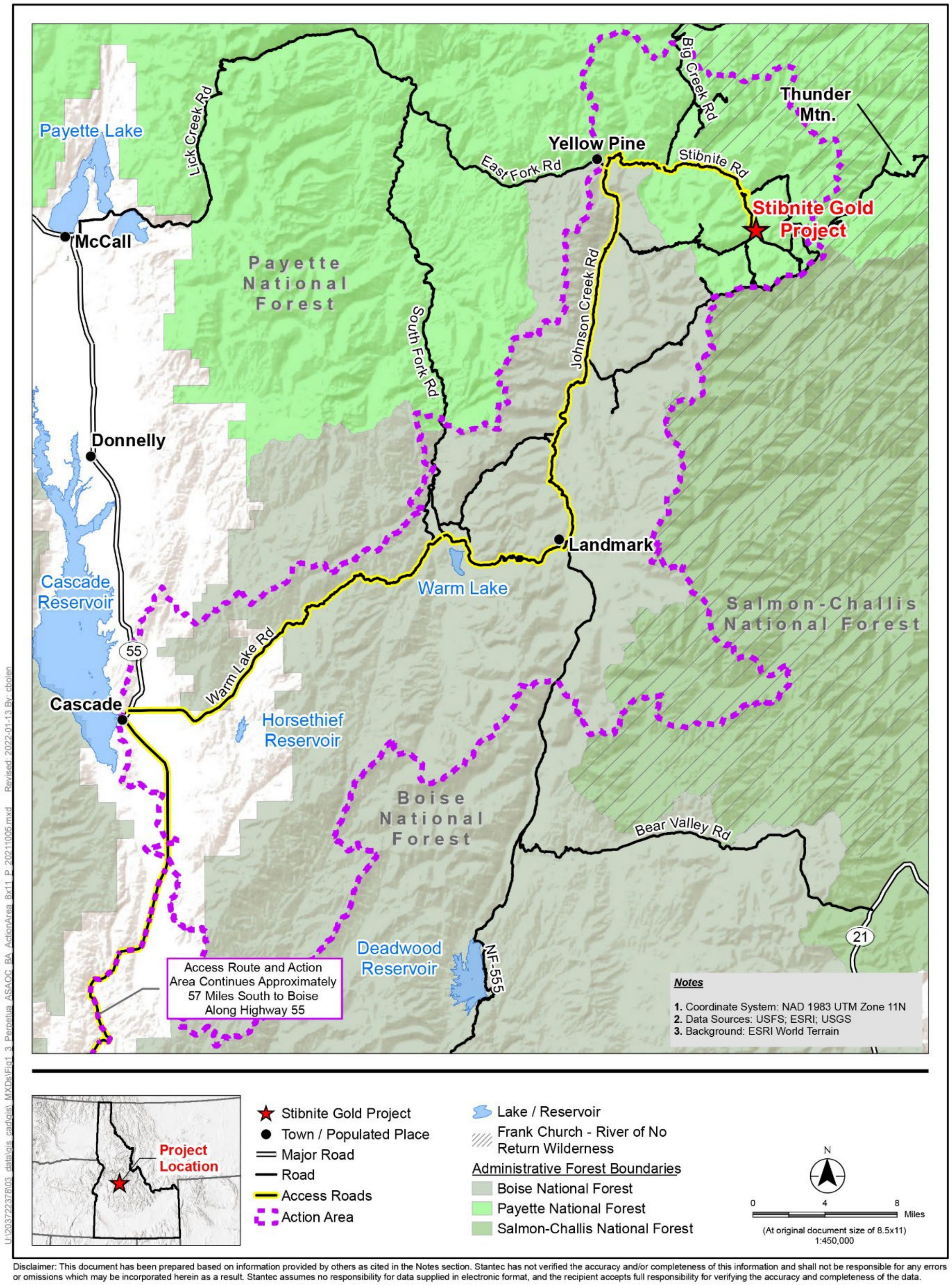

Figure 10: Action Area.

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

The action area is used by all freshwater life history stages of threatened Snake River spring/summer Chinook salmon and Snake River Basin steelhead. Streams within the action area are designated critical habitat for both of these species. The condition of the listed species and designated critical habitats in the action area are described further below. Because climate change has already had impacts across the Snake River basin, discussions of the status of the species, status of critical habitat, and environmental baseline within the action area incorporates effects of climate change.

2.4.1. <u>Condition of Species in the Action Area</u>

All life stages of Snake River spring/summer Chinook salmon and Snake River Basin steelhead have potential to be exposed to the effects of the proposed action. The following sections provide a summary of the current status and importance of populations within the action area to the recovery of these species.

2.4.1.1 Snake River Spring/summer Chinook Salmon

Two populations of Snake River spring/summer Chinook salmon, the SFSR and EFSFSR populations, occur within the action area. The SFSR population is a large-size population, has hatchery influence (hatchery supplementation began in the mid-1970s), and is proposed to achieve a viable status in order to support recovery of the ESU. The EFSFSR population is a large-size population, has hatchery influence (hatchery supplementation began in the 1998), and is proposed to achieve a maintained status in order to support recovery of the species. Both populations are currently at a high risk of extinction within the next 100 years based on information available for the 2016 status review and the recently completed viability assessment for Pacific salmon as part of the new status review effort (Ford 2022). Excess sediment, floodplain connectivity, poor water quality, and high water temperatures are limiting factors that both of these populations share. Other limiting factors include passage barriers (EFSFSR population), channel alteration (SFSR population), and degraded riparian habitat (EFSFSR population).

Chinook salmon in the upper EFSFSR (upstream from the Yellow Pine pit) were extirpated by diversion of the EFSFSR into a bypass tunnel from mining operations in the late 1930s. After cessation of mining and abandonment of the bypass tunnel, a high gradient and impassable riffle/cascade on the EFSFSR flowing directly into the Yellow Pine pit continued to prevent fish passage into the upper watershed. Both the riffle/cascade and the Yellow Pine pit were created as a result of mining operations. Chinook salmon use the SFSR and the mainstem of the EFSFSR downstream from the Yellow Pine pit as a migratory corridor and for spawning and rearing. Adult Chinook salmon and salmon redds have been observed in Sugar Creek and in the EFSFSR as far upstream as the inlet of the Yellow Pine pit (i.e., downstream from the impassable cascade).

Chinook salmon have been periodically introduced into Meadow Creek and the upper EFSFSR, upstream from the Yellow Pine pit, by the Idaho Department of Fish and Game (IDFG) in cooperation with the NPT when there is sufficient overstock from the local hatchery (Table 7). Since supplementation began, some adult Chinook salmon have returned to spawn in the EFSFSR, but are not able to migrate beyond the cascade that exists upstream of the Yellow Pine pit. The Chinook salmon transported upstream from the Yellow Pine pit, although introduced, were part of the ESA-listed population. The juveniles migrate downstream naturally and mix with the juveniles spawned downstream from the Yellow Pine pit. However, IDFG has not introduced Chinook salmon upstream of the Yellow Pine pit since 2017, and Chinook are therefore not currently present upstream of the pit.

Table 7: Chinook Salmon Releases in Meadow Creek by IDFG.

Year of Release	Total Adults Released	Female/Male/Jacks
2011	459	N/A
2012	294	140/122/32
2013	130	65/65
2014	0	-
2015	100	N/A
2016	536	285/251
2017	81	N/A
2018 - 2021	0	-

Source: Felty 2015, Folsom 2013, Gebhards 2018, McPhearson 2013, Mitchell 2016, Nalder 2021. Key: N/A = Not Available.

Fisheries surveys have been conducted in the analysis area since 2012. Snorkel surveys were conducted between 2012 and 2014 (BA Table 3-3; BA Figure 3.2). In 2015, two sites in the analysis area were surveyed via snorkeling and electrofishing (MWH-011 on the EFSFSR along the Bradley Man Camp Dumps site and MWH-014 on Meadow Creek just upstream from the confluence), but no ESA-listed fish species were observed or collected. Environmental deoxyribonucleic acid (eDNA) for Chinook salmon were detected in the EFSFSR in 2016 and 2017 downstream from the Meadow Creek confluence; both years had Chinook adult releases in Meadow Creek.

The NPT and IDFG have conducted annual Chinook salmon redd surveys in the EFSFSR and its tributaries below the Yellow Pine pit. Over a 20-year period, 38 redds have been observed between the Yellow Pine pit and the road crossing upstream from Sugar Creek, with only four redds observed along the NW Bradley Dumps site.

2.4.1.2. Snake River Basin Steelhead

The proposed action would affect individuals in the SFSR steelhead population. This population is one of the few that has never been supplemented with hatchery fish and have high proportions of B-run individuals. The SFSR population is currently at a moderate risk of extinction within the next 100 years based on information available for the 2016 status review and the recently completed viability assessment for Pacific salmon as part of the new status review effort (Ford 2022). The SFSR population is targeted to achieve a viable status (low risk of extinction). The 5-year geometric mean for the SFSR and Secesh River populations (combined) has steadily decreased since 2010, decreasing by 57 percent over the two most recent five year periods (Ford 2022). Limiting factors include excess sediment, migration barriers, and degraded riparian conditions. The recovery strategy emphasizes reducing and stabilizing disturbed areas and improving and rehabilitating roads as actions for reducing sediment delivery to spawning and rearing stream reaches.

The SFSR population spawns, rears, and migrates through the action area. Steelhead spawning overlaps many of the mainstem areas used by Chinook salmon, and steelhead redds have been observed in smaller tributaries such as Camp and Fitsum Creeks (Thurow 1987). In the EFSFSR, Snake River Basin steelhead occur up to Yellow Pine pit, where an impassable falls/cascade (22 percent gradient) caused by past mining activities blocks upstream migration. Due to their spawn timing, spawning surveys are not typically performed; therefore, where spawning occurs in the watershed is not well documented. Steelhead redds and adults were identified in 2004 downstream from the town of Yellow Pine. Most of the observed spawning sites were in small pockets of suitable substrate, often in marginal positions rather than in well-developed spawning riffles (Nelson 2004). Some steelhead also spawn in the EFSFSR upstream from the town of Yellow Pine. Within the analysis area, anadromous steelhead spawning is restricted to below the Yellow Pine pit, coincident with the upstream endpoint for designated critical habitat in the EFSFSR. There is no recreational fishery for steelhead in the SFSR nor is the population supplemented with hatchery-produced fish.

No *O. mykiss* have been observed in the EFSFSR upstream from the Yellow Pine pit during the aquatic baseline surveys conducted since 2012, but some have been observed in the Yellow Pine pit and downstream from Sugar Creek (BA Table 3-4) (Brown & Caldwell 2019; MWH 2017). In 2016, eDNA samples were collected in the inflow to the Yellow Pine pit, which detected Chinook salmon, bull trout, and *O. mykiss* DNA.

2.4.2. Condition of Designated Critical Habitat

Streams within the action area are designated critical habitat for both Snake River spring/summer Chinook salmon and Snake River Basin steelhead. The SFSR and its tributaries offer a large amount of suitable spawning and rearing habitat. The majority of land in the lower SFSR and EFSFSR watersheds is Federally managed. Historically, the area was impacted by logging, mining, grazing, and road building. Grazing no longer occurs in the action area, and mining in the action area is not as prevalent as it once was. Logging rarely occurs, and has most recently been performed as post-fire salvage or when reducing hazard fuels. In more recent times, wildfire has become the largest disturbance mechanism in the SFSR subbasin. Recreation and use of the existing road system is the primary human activity in the action area, although some private inholdings and associated homesteads exist. The existing network of roads and trails continue to impact aquatic habitat conditions.

Within the project area, steelhead designated critical habitat (occupied) extends upstream to the Yellow Pine pit. For Chinook salmon, critical habitat is also currently occupied up to the base of the cascade upstream from Yellow Pine pit, but considered unoccupied designated critical habitat in the EFSFSR and Meadow Creek upstream from the pit.

Habitat conditions within the action area have been significantly impacted by mining activities. Open pit mining activities began upstream of the EFSFSR and Sugar Creek confluence in 1938 and continued for 14 years. Upstream fish passage was eliminated when the EFSFSR was initially diverted around the mining area. In order to expand and deepen the Yellow Pine Pit, the EFSFSR was diverted through the Bradley Tunnel to Sugar Creek in 1943 (Hogen 2002; Midas Gold, Inc. 2016). When mining ceased in 1952, the Bradley Tunnel was abandoned and the EFSFSR was allowed to flow into the abandoned pit, which was 450 feet deep. Over time, sediment transported downstream from the watershed settled in the Yellow Pine Pit lake (hereinafter referred to as "lake"). Now, the lake is approximately 5 acres in size and averages about 30 feet deep. It is predominantly surrounded by steep, unnatural shorelines created by historical mining operations. Very little vegetation exists on the hillside and shoreline. A long, steep riffle/cascade, with a gradient of about 30 percent, exists at the inlet of the lake. This cascade is considered an impassible barrier to Chinook salmon, and is likely an impassible barrier to steelhead under most flows. Overtime, an alluvial fan has formed at the base of this cascade and Chinook salmon have been documented spawning at the inlet to the lake.

All of the PBFs listed in Table 5 are represented to varying degrees in Appendix B of the PNF land and resource management plan (LRMP) (USFS 2003). This appendix contains the Southwest Idaho Ecogroup Matrix of Pathways and Watershed Condition Indicators (Matrix). A watershed condition indicator (WCI) is a particular aquatic, riparian, or hydrologic measure that is relevant to the conservation of ESA-listed salmonids. In some instances, a WCI is synonymous to a PBF, temperature being a prime example. In other instances, many WCIs comprise a PBF. For example, the LWD, pool frequency and quality, large pools/pool quality, and off-channel habitat WCIs provide insight into the natural cover and cover/shelter features of spawning, rearing, and migration areas.

The BA uses the Matrix as a tool for assessing environmental baseline conditions and evaluating the potential effects of an action on WCIs, which as described above are representative of the PBFs essential for the conservation of ESA-listed species. The WCIs are described in terms of their functionality, that is, functioning appropriately (FA), functioning at risk (FAR), or functioning at unacceptable risk (FUR). A watershed comprised of WCIs that are FA is considered to be meeting the biological requirements of listed anadromous species (whereas WCIs that are FAR or FUR suggest that the relevant PBF is not in a condition that is suitable for conservation).

The EPA and PNF evaluated the baseline conditions for the EFSFSR in the BA (Stantec 2022). However, the BA did not describe baseline conditions for the SFSR; therefore, NMFS looked to a recent BA completed by the PNF for SFSR Restoration Access Management Plan (USFS 2021) project to help characterize habitat conditions for that portion of the action area. We agree with their conclusions regarding the environmental baseline, which are described in the 2022 BA (Stantec 2022; page 3-10 and Appendix F) and the 2021 BA (USFS 2021; p. 34, Table 7), both incorporated by reference here. The analysis performed by the EPA and the PNF represents some of the best available science in regard to the environmental baseline within the action area. Table 8 summarizes the general conclusions made by the action agencies for each of the WCIs in the action area. The WCIs most likely to be affected by the proposed action include water quality (temperature, turbidity, and chemical contaminants/nutrients), and RCAs; each is discussed in more detail below.

Table 8: Environmental baseline of the pathway and watershed condition indicators within the action area at the watershed scale for the SFSR and EFSFSR.

Pathway and Watershed Condition Indicator	Baseline Condition	
	SFSR	**EFSFSR**
Water Quality		
Temperature	FAR	FA - FUR
Sediment/Turbidity	FA - FAR	FA
Chemical Contaminants and/or Nutrients	FAR	FUR
Habitat Access		
Physical Barriers	FA	FAR
Habitat Elements		
Interstitial Sediment Deposition	FAR	FA
Large Woody Debris	FA	FA
Pool Frequency	FA	FAR - FUR
Pool Quality	FA	FA
Off-Channel Habitat	FA - FAR	FAR
Refugia	FAR	FAR
Channel Condition and Dynamics		
Width/Max Depth Ratio	FA	FA
Streambank Condition	FA - FAR	FAR
Floodplain Connectivity	FAR	FAR
Flow/Hydrology		
Change in Peak/Base Flows	FA	FAR
Drainage Network Increase	FAR	FAR
Watershed Conditions		
Road Density and Location	FA - FUR	FAR
Disturbance History	FA - FUR	FUR
Riparian Conservation Areas	FA - FAR	FUR
Disturbance Regime	FA - FAR	FUR
Integration of Species and Habitat Conditions	FAR	FAR

Baseline conditions are described as functioning appropriately (FA), functioning at risk (FAR), or functioning at unacceptable risk (FUR).

2.4.2.1 *Water Temperature*

EFSFSR - For the aquatic baseline studies, water temperatures in lower Meadow Creek (MWH-004) have been monitored since 2014, and in the EFSFSR above Sugar Creek (MWH-007) since 2013 (MWH 2017; Stantec 2020). A U.S. Geological Survey stream gage in the EFSFSR immediately upstream from Meadow Creek has been recording water temperatures since 2011. Based on the monitoring results, water temperatures along the project sites typically exceed the criteria and are considered FUR for spawning and incubating bull trout; however, the temperatures are typically within the FA range for Chinook salmon spawning and rearing at both locations, and within the FA range for spawning and rearing/migration for steelhead downstream from the Yellow Pine Pit along the NW Bradley Dump site (Stantec 2018, 2019, 2020).

SFSR - Data are FAR but are considered to reflect a natural temperature regime in most of the SFSR drainage because there is little evidence of management effects in these watersheds that would contribute to elevated temperatures. Extensive wildfire, especially in 2007, has likely had some effect on stream temperature. Given the stream elevation, topography, aspect, and riparian vegetation characteristics, and extent of wildfire, the data likely reflects the natural range of variability, except along the mainstem SFSR Road, where shading is compromised (USFS 2021).

2.4.2.2 *Sediment*

Interstitial sediments are classified as less than 6.3 mm in particle size (Bjornn et al. 1977). Salmonid survival and production are reduced as fine sediment increases, producing multiple negative impacts on salmonids at several stages. Increases in fine sediment entombs incubating eggs in redds, reduces egg survival by reducing oxygen flow, alters the food web, reduces pool volumes for adult and juvenile salmonids, and reduces the availability of rearing space for juveniles, rendering them more susceptible to predation (Bjornn et al. 1977; Suttle et al. 2004). High levels of fine sediment can cause an overall loss of productivity and diversity within a stream. Bjornn et al. (1977) found that when the percentage of fine sediment exceeds 20 to 30 percent in spawning riffles, survival and emergence of salmonid embryos begins to decline. Using modeling based on an extensive literature review Jensen et al. (2009) found that egg to fry survival for salmon and steelhead shows a negative curvilinear relationship to the percent of sediment in stream that is less than 0.85 millimeters (mm) in diameter and falls more dramatically above a threshold of approximately 10 percent.

The current condition of the interstitial sediment deposition indicator is determined using free matrix and cobble embeddedness monitoring, which measure the degree to which salmonid spawning substrate (i.e., substrate particles ranging from approximately 45 to 300 mm) are surrounded or covered by fine sediment. The rearing capacity of salmonid habitat is decreased as embeddedness levels increase. For example, Suttle et al. (2004) found that growth and survival of juvenile steelhead declined with a measure of increasing substrate embeddedness. The substrate monitoring sites are spread out across the action area and are measured annually, so the data are best interpreted as a measure of annual, watershed scale conditions and trends, rather than site-specific effects from point sources of sediment. Generally high embeddedness relative to reference conditions could indicate degraded conditions in a watershed, while low embeddedness indicate favorable conditions in a watershed.

Nelson & Burns (2005), Nelson et al. (2006), and Zurstadt et al. (2016), describe a method to rate the interstitial sediment deposition indicator. The rating system is used in this analysis to describe the current condition of the interstitial sediment deposition indicator in the analysis area. Background levels of sediment deposition are generally lower in areas dominated by non-granitic lithology (Nelson et al. 2006), however the watershed geology within most of the action area is granitic.

EFSFSR - The current existence, use, and maintenance of the Stibnite Road, Quartz Creek Road, and historical mining disturbance in the Stibnite area continue to be a source of existing and potential anthropogenic sediment to the EFSFSR. Because they occur in the same geology and have experienced similar weather and management activity, analysis area tributaries that lack data are expected to have embeddedness levels comparable with those measured in other tributaries.

The floods of 2008 and landslides in 2018 and 2019 deposited sediment into the EFSFSR and the sediment accumulations behind log jams and debris fans that were created are evident. However, it also may be that the influx of diverse particle sizes and LWD were more beneficial than deleterious because the system was deficient in LWD, and spawning sites were limited downstream of the town of Yellow Pine.

Within the analysis area, cobble embeddedness and interstitial sediment deposition (measured through free matrix surveys) immediately upstream from the Meadow Creek confluence (MWH-013), in lower Meadow Creek (MWH-014), and in the EFSFSR immediately downstream from the Sugar Creek confluence (MWH-009) are FA (Stantec 2018, 2019, 2020).

SFSR - Core sampling sites are located in the larger channels where salmon and steelhead spawn such as the upper South Fork Salmon River, Secesh River, and Lower Johnson Creek. Sediment delivered from a network of open, closed, and unauthorized roads affects baseline sediment conditions in the SFSR. The Elk Creek, Grouse Creek-South Fork Salmon River, Pony Creek, and Zena Creek–Secesh River subwatersheds produced the highest modeled sediment delivery per mile of road. The mainstem SFSR is 303(d) listed for sediment/siltation. Total maximum daily load targets are based on interstitial sediment deposition and intragravel quality threshold for functioning appropriately. However, overall, long-term sediment monitoring indicates that both intragravel quality and interstitial sediment deposition have been on an improving trend (i.e., reduced sediment) (Zurstadt 2017). The trends are in part the result of rehabilitation actions and implementation of more protective Forest Plan standards. Interstitial sediment deposition ranges from FA to FAR, with the majority of free matrix sites rated FA (USFS 2021).

2.4.2.3 *Turbidity*

After sediment is delivered to a stream channel, larger particles are deposited onto the streambed relatively quickly, while finer particles such as silt and clay remain in suspension for long periods of time, causing prolonged turbidity. According to Idaho Department of Environmental Quality (IDEQ), turbidity in Idaho should not be greater than 50 nephelometric unit (NTU) instantaneous or 25 NTU for more than 10 consecutive days above baseline background (Rowe et al. 2003).

Turbidity monitoring in the Stibnite area showed lower Meadow Creek, just upstream from the confluence with the EFSFSR, having monthly average NTUs ranging from 1.2 to 24, with the highest measurements occurring in April, May, and December; 6 months were below 3 NTUs. The EFSFSR just upstream from the box culvert near the confluence with Meadow Creek showed monthly average NTUs ranging between 1.3 and 8.9; nine months were below 3 NTUs. The EFSFSR near the bridge just downstream from the NW Bradley Dumps Removal area showed monthly average NTUs ranging from 1.7 to 15 and seven months were at or near 3

NTUs (HDR 2017). There is no WCI identified for turbidity alone, but is connected to the metric for sediment, specifically surface fines. Based on the aquatics baseline monitoring, surface fines are considered FA (See BA Appendix F). No turbidity monitoring was reported for the SFSR portion of the action area, although the surface fines are also considered to be FA (Table 8)

2.4.2.4 *Chemical Contamination/Nutrients*

EFSFSR **–** Historical operations within the Stibnite Mining District resulted in the placement and deposition of tailings and mine waste within the floodplain of lower Meadow Creek and the EFSFSR. Surface water quality data from the lower reach of Meadow Creek and from the EFSFSR below its confluence with Meadow Creek have consistently shown elevated arsenic and antimony concentrations that exceed Idaho's chronic aquatic life water quality standards. The presence of mill and mine wastes adjacent to Meadow Creek and EFSFSR in the areas of the Schoolhouse Tailings, Bradley Man Camp Dumps, and Northwest Bradley Dump contribute sediment and dissolved constituents to the adjacent surface waters. The Chemical Contamination/Nutrient WCI is rated FUR for the EFSFSR (Table 8).

SFSR **–** Although water quality is likely influenced by degraded water quality conditions upstream in the EFSFSR, streams in the SFSR portion of the action area are not known to be contaminated, and the Chemical Contamination/Nutrient WCI is rated FAR for the SFSR (Table 8).

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action (see 50 CFR 402.02). A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered the factors set forth in 50 CFR 402.17(a) and (b).

As described above, the proposed action is designed to eliminate or reduce human and ecological exposure to metals by mitigating sources of contamination from contact with sediment and surface water. This will be accomplished through the removal of mill tailings and mine waste located within the channels and floodplain of the EFSFSR and select tributaries, and the diversion of surface water around mine wastes that are sources of metals.

Only the work at the Northwest Bradley Dump site borders stream segments occupied by ESA-listed fish species. Chinook salmon and steelhead are not currently able to access the EFSFSR upstream of the falls/cascade on the upstream side of the Yellow Pine pit lake. Although work at the Bradley Camp and Schoolhouse Tailings Removal projects will occur in and alongside unoccupied Chinook salmon designated critical habitat, it will be upstream from occupied designated critical habitat for Snake River Basin steelhead that ends at the Yellow Pine pit lake. All three diversion projects will occur in non-fish-bearing tributaries upstream of designated critical habitat.

No in-water work or fish salvage will occur at the Northwest Bradley Dump site; therefore, effects to salmon and steelhead will primarily be habitat-related (i.e., water quality). However, because of their close proximity to working machinery at the Northwest Bradley Dump site, disturbance due to noise and vibrations generated by equipment and drilling could also occur at this location. Effects are mostly expected to be temporary in nature, with the proposed action resulting in localized improvements to water quality, habitat quality, forage, and improved stream floodplain connectivity in action area streams. These effects will be discussed in greater detail below.

2.5.1. Effects to Designated Critical Habitat

Within the action area, the following major streams are designated as critical habitat for Snake River spring/summer Chinook salmon and Snake River Basin steelhead: Johnson Creek; the SFSR; the EFSFSR, and Meadow Creek. In the EFSFSR, designated critical habitat for steelhead terminates just downstream of the Yellow Pine Pit lake. For Chinook salmon, critical habitat includes the EFSFSR, from its mouth upstream to and beyond the Yellow Pine Pit lake, including Meadow Creek and any other tributaries upstream that were historically accessible. Designated critical habitat for Chinook salmon includes the adjacent riparian zone, which is defined as those areas within 300 feet of the OHWM. Table 5 summarizes the suite of essential PBFs of designated critical habitat.

The proposed action has the potential to affect the following PBFs: (1) spawning gravel/substrate; (2) water quality (i.e., turbidity, temperature, and chemical contamination); (3) floodplain connectivity; (4) food/forage; (5) cover/shelter; and (6) riparian vegetation. Any modification of these PBFs may affect freshwater spawning, rearing, or migration in the action area. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding and spawning, and the growth and development of juvenile fish. All remaining PBFs will not be affected by the proposed action. As previously described, the proposed action incorporates a variety of BMPs and design features that will minimize the potential for and magnitude of adverse effects to these PBFs.

2.5.1.1 *Spawning Gravel/Substrate*

Salmonid spawning habitats are created by and depend on channel characteristics and complexities that cause hydraulic sorting and gravel accumulation into suitable spawning beds. If well established, these beds are relatively resistant to scour during periods of egg incubation. Increased sediment deposition may lead to increased embeddedness of downstream substrates. Fine, redeposited sediments have the potential to adversely affect primary and secondary productivity (Spence et al. 1996), and reduce incubation success (Bell 1991) and cover for juvenile salmonids (Bjornn & Reiser 1991). Some sedimentation of substrates, potentially used for spawning and rearing of Chinook and steelhead, will likely occur downstream in the mainstem EFSFSR.

Proposed road use and ground disturbing activities have the potential to cause sediment delivery to action area streams. Roads are often chronic sources of sediment delivery to nearby streams through surface erosion (from cutslopes, fillslopes, ditchlines, and running surfaces) and mass wasting. Sediment yield to streams from roads is influenced by a number of factors including, but not limited to, distance between the road and stream; road surface composition; road gradient; road condition (e.g., drainage characteristics, level of maintenance, saturation, etc.); and quantity, type (e.g., total vehicle load, axles and wheel configuration, etc.), and behavior (e.g., acceleration/deceleration, speed, etc.) of trafficking vehicles. The proposed action would result in some temporary reopening of closed roads and increased traffic, both of which can contribute to sediment delivery.

Traffic increases have been shown to result in increased sediment yield to nearby streams. When comparing traffic to no-traffic use of forest roads, Foltz (1996) found sediment yields from road segments being used by logging trucks to be between two and 25 times greater than sediment yields from the same roads when no logging truck use occurred (only occasional light pickup traffic occurred). The magnitude of the increase in sediment yield was dependent upon the quality of gravel on the surface of the road, with it becoming more important as use increased. Reid & Dunne (1984) compared sediment yield from road segments receiving various levels of use defined as: heavy (more than 4 logging truck trips per day); moderate (between one and four logging truck trips per day); light (no logging trucks, but some light vehicles), and abandoned. They found that when compared to a paved road, the average sediment yield on a gravel road with light vehicle traffic increased two fold, moderate log truck traffic increased 20 fold, and heavy log truck traffic (traffic loads ranged between 16 and 32 trucks per day) increased 250 fold. Sediment yield on a gravel road with moderate log truck traffic was 11 times greater than that with light traffic. Sheridan et al. (2006) found that total sediment yield from graveled roads in their study increased by two and four times when comparing high traffic use (nine or more logging truck passes) to low traffic use (fewer than nine logging truck passes) during "dry" and "wet" road conditions, respectively.

Although studies have shown sediment yield to increase with increasing traffic use of roads, these studies have primarily evaluated the effects of logging truck traffic. Therefore, these results are not directly comparable to the potential increases in traffic proposed, which are primarily comprised of lighter vehicles (208 trips total), with limited heavy vehicle (15 round trips) and fuel truck (48 trips) use. Furthermore, as previously stated, there are many factors that influence sediment yield from roads. Based on existing research, NMFS expects project-related traffic to cause an increase in sediment yield to action area streams; however, we expect the increase in sediment to be minor for a number of reasons, which are described below:

- Project-related traffic is minimal and primarily comprised of lighter vehicles. Personnel will be housed at the mine site. Equipment will mobilize to the mine site, stay there for the field season, and mobilize out at the end of the field season.

- Once on site, the heavy trucks will remain at Perpetua's office location, while the lightweight vehicles will transport crews on a daily basis. Traffic levels from the proposed action will be a less than 1 percent increase over the ongoing traffic activity because the work crews will be housed near the Stibnite Perpetua Resource office, so daily traffic will not be required.

- Once the excavation equipment is on site, there will be minimal equipment transportation. Fuel will be transported between the Stibnite Perpetua Resource office to the excavation sites (no more than two miles). Therefore, there will be minimal sediment transportation from vehicle movement.

- The EFSFSR road was surfaced with a 6-inch lift of gravel aggregate in 2012. Placement of gravel aggregate has been found to reduce sediment yield from roads because it helps prevent rutting (even in wet spring conditions) and is generally more resistant to crushing and abrasion from tires than the native surfaces of roads in this area.

- Because of routine road maintenance, the transportation routes are in relatively stable condition.

Given the discussion above, sediment generation and mobilization resulting from increased traffic use will be low and should not result in large increases in sediment contribution and deposition in area streams. Similarly, temporarily reopening the short segment of road at the Bradley Man Camp Removal area will not result in a measurable increase in turbidity or sediment deposition because of the flat nature of the road, the short distance of road to be reopened (0.4 miles), the anticipated effectiveness of proposed erosion control BMPs, and the staged revegetation of the area as work progresses.

Individually, various project components are not expected to result in more than minimal introductions of sediment to the stream network. However, when considering the amount of traffic, combined with the large amount of ground disturbance (e.g., road opening/rehabilitation, drilling, fill removal, channel realignment, etc.) taking place within RCAs over a relatively short timeframe, NMFS cumulatively expects enough fine sediment to enter action area streams to at least locally affect instream habitat conditions in the near term. Re-watering the new channel for the EFSFSR at the Schoolhouse Tailings Removal project area will provide the largest volumes of sediment, but that should be minimized by working in the dry and the proposed staged rewatering of this work area. Occupied habitat in the EFSFSR is most likely to be affected by ground-disturbing activities for removal and drilling activities at the Northwest Bradley Dump site. Given the proposed BMPs and setbacks from stream for most activities, these turbidity pulses and plumes are expected to be infrequent, of low magnitude, and short duration (i.e., minutes to a few hours). Sediment deposition is expected to occur in localized pockets where lower stream velocities allow suspended sediment to settle out. Although the substrate PBF will be affected in the short term, high flushing stream flows in the spring are expected to clean most if not all project-generated sediment out of substrate within a year or two of project completion. Other than for the Northwest Bradley Dump site, the majority of sediment produced will likely settle out in the Yellow Pine pit lake. Therefore, project-related sediment is not expected to affect the long-term conservation value of substrate PBFs.

2.5.1.2 *Water Quality*

Chemical Contamination. The following components of the proposed action have the potential to cause chemical contamination of designated critical habitat: drilling, equipment operation in RCAs, suspension of contaminated soils, or refueling of equipment and transportation of fuel. As described in the proposed action section, various BMPs and project design features (PDF) will be implemented to minimize the risk of contamination of designated critical habitat.

Both the Northwest Bradley Dumps Removal and the Bradley Man Camp Dumps Removal areas will have material extraction and vehicle activity within the RCA, with excavation and geotechnical drilling activity occurring as close as 15 feet from the EFSFSR. When drilling, there is potential for drilling fluids to daylight and enter surface waters, particularly for drill pads in close proximity to the EFSFSR. The risk of drilling fluids being discharged to streams is very low; however, it cannot be discounted. Although NMFS presumes that the primary drilling fluid will be water and that no additives will be used to increase viscosity or reduce fluid loss, the BA does not specifically state whether any additives will be used and if they would be non-toxic.

In addition to potential chemical contamination, if delivery to surface water occurred, it would also result in turbidity pulses and subsequent deposition of fine materials (e.g., sediments and bentonite clay material) within stream channels. Implementation of proposed BMPs (e.g., liners placed under the rig with waddles to contain fluids or spillage, containing drill cuttings within the drill pad area, a sump or containment tank to contain drill cuttings, etc.) should minimize both the risk and amount of drilling fluids being discharged to nearby streams – effectively minimizing the risk of adverse effects to the water quality PBF even if they were released into streams.

Because large quantities of fuel will be transported (about 16 4,500 gallon trucks, or 72,000 gallons), stored, and used as part of this project, there is potential for an accidental spill of toxic chemicals into the riparian zone or directly into action area streams. However, fuel-related BMPs/mitigation measures keep fuels at least 300 feet from live water and include measures to reduce the likelihood of uncontained spills. All refueling of equipment will take place within containment devices designed to hold a minimum of 120 percent of the volume of fuel, including any drill rig being refueled or operated. Equipment will be well maintained to prevent fuel or lubricant leaks. A SPCCP will be implemented, and spill prevention and cleanup kits will be placed at the fuel storage site and any other areas where fuel and/or petroleum products are present. Various standard operating procedures and mitigation measures will be implemented when fuel is being transported to and within the project area, including no transportation during the weekend, and transporting only during and under favorable weather conditions.

Fuel spills have occurred in the SFSR drainage in the past. Between 1987 and 1993, there were seven accidents involving trucks that were hauling fuel or chemicals to Stibnite area mines. Four of these accidents involved fuel haul. Diesel fuel entered a perennial stream in one of these accidents. This accident occurred on September 6, 1989, and an estimated 400 gallons of the 1,700 gallons of spilled fuel reached Johnson Creek. After this event, transportation procedures for commercial haulers on National Forest System roads were strengthened in numerous ways (e.g., driver safety inspection of transport vehicles, prohibition of hauling petroleum products in trailers, reduced speed limits, use of pilot vehicles, etc.). In addition, tanker manhole covers were required to be upgraded in 1993. Rather than withstanding pressures of 9 pounds per square inch (psi), the manhole covers were required to withstand pressures of 36 psi. The higher psi requirement coupled with some of the new transportation requirements for commercial haulers were thought to reduce the risk of spills from occurring and entering streams. Since 1990, no spill has occurred; other than one incident in 1991 when a truck carrying hazardous material slid into a ditch while trying to navigate the Johnson Creek road during difficult driving conditions. Although no spill occurred, there was potential to adversely affect ESA-listed fish because material could have readily reached Johnson Creek.

Using data from Valley County, there have been additional accidents associated with commercial haul within the action area. In 2010, a truck hauling bentonite on the Johnson Creek Road was involved in an accident. The causal agent in this case was cited as unstable terrain and overloading of the truck. In 2008, a logging truck was center, or left of center, on the SFSR Road and was involved in a collision. In 2010, a truck was traveling too fast for its weight load and was pushed over an embankment on the SFSR road.

Large quantities of fuel were hauled to the Stibnite Mining area in 2012 and 2013. A total of 64 fuel haul convoys (using trucks with the capacity to carry either 500 gallons or up to 4,000 gallons of fuel) occurred during this 2-year time period and no incidents occurred. The PNF used incident data from the Valley County Sheriff and road count data from PNF traffic counters to evaluate the potential for accidents. The incident data included both personal vehicles and commercial traffic. On the Johnson Creek Road, the calculated accident rate was one incident per 4,455 vehicle counts for the time period between 2000 and 2001. This incident rate was higher than any other point during the period of 2000 to 2010. Using data from a longer time period (i.e., historical road counts from 1984 through 2001 and accident data for 2000 through 2010), the calculated accident rate is one incident per 10,495 counts. The Stibnite Road has a calculated accident rate of 1 per 40,606 vehicle counts.

Considering this information, there is clearly a risk of accident and spill; however, the majority of the BMPs and fuel haul requirements implemented as part of this proposed action will reduce the likelihood that a spill associated with fuel haul is likely to occur. If a spill were to occur in, or outside of the RCA, there are contingencies in place to prevent or minimize the quantity of fuel reaching live water. Based on the historic and recent accident information and because the action agencies will implement various BMPs aimed at reducing the risk of fuel spills, NMFS has determined the risk of chemical contamination of area streams from spills is very unlikely to occur.

Ground disturbing activities in the action area have the potential to liberate contaminants from the soil and tailings. Arsenic and antimony could be released from project area tailings during fill removal activities. However, water quality within Meadow Creek, the EFSFSR, and their tributaries are already exposed to these contaminants due to streamside tailings, channel instability, and groundwater infiltration, and the primary purpose of the project is to relocate these stream channels away from these contaminated tailings. Completing instream work in the dry, pulling material back from the vegetated buffer at tailing removal sites when working along streambanks, and standard placement of erosion control measures, should help ensure that few if any contaminants are released to action area streams as a result of project implementation. Use of clean fill materials from non-contaminated borrow source locations should ensure contaminated soils are not used in reclamation efforts. The proposed action should address some of the chronic delivery of metals to action area waters from past mining activities, resulting in a localized beneficial effect to water quality.

Temperature. The NW Bradley and Bradley Man Camp Dumps Removal actions may result in the removal of riparian vegetation, including trees. However, where possible, trees on the riverbank will be preserved. While reducing stream cover has the potential to affect water temperature by reducing stream shade, the effects to stream shade are expected to be minor due to the short length of stream affected (1,545 feet for Bradley Man Camp Dumps and 990 feet for NW Bradley Dumps Removal), and the fact that these two sections of stream currently do not experience high levels of stream shade, and most of the trees at the river's edge will remain in place.

In the long term, effects of this Proposed Action are expected to be beneficial to water temperature. Improved conditions through the removal of contaminated materials and excavation to historic floodplain levels and the planting of riparian vegetation post removal are expected to result in increased riparian vegetation growth and coverage. This will lead to substantially increased stream shade, providing localized benefits to the water temperature PBF.

Turbidity. As mentioned above for the spawning gravel/substrate PBF, sediment delivery is expected to occur to action area streams from road use and ground disturbing activities. Given the proposed BMPs and setbacks from stream for most activities, resulting turbidity pulses and plumes are expected to be infrequent, of low magnitude, localized, and of short duration (i.e., minutes to a few hours). Turbidity generated from most activities will be upstream from the Yellow Pine pit lake, and should not extend downstream into designated critical habitat occupied by ESA-listed salmon and steelhead. Should turbidity occur from activities at the Northwest Bradley Dump excavation, proposed monitoring is expected to ensure that turbidity does not exceed State turbidity requirement[8], and it is therefore not expected to extend far downstream - generally expected to settle out within 600 to 1,000 feet from project activities. Literature reviewed in Rowe et al. (2003) indicated that NTU levels below 50 generally elicit only behavioral responses from salmonids. Therefore, project-related sediment is not expected to affect the long-term conservation value of water quality PBF.

2.5.1.3 *Floodplain Connectivity*

Floodplain connectivity is FAR in the action area, currently restricted by mine tailings and the road network in the action area. As a result of channel rehabilitation/relocation within RCAs, and the floodplain restoration aspects of the project it is expected that both floodplains and wetlands will be better linked to the main channel post project. This will better encourage over-bank flows, wetland/floodplain functions, and riparian vegetation succession in the long term.

2.5.1.4 *Riparian Vegetation*

Clearing of vegetation has the potential to affect both instream habitat and water quality by decreasing LWD recruitment and/or nutrient delivery to the stream, or by increasing water temperatures, turbidity, and instream sediment levels (Spence et al. 1996).

[8] Turbidity shall not exceed background turbidity by more than fifty (50) NTU instantaneously or more than twenty-five (25) NTU for more than ten (10) consecutive days.

At the Schoolhouse Tailings Removal location, most of the streambanks along this stretch of the EFSFSR support narrow band of shrub-type riparian vegetation, dominated by willows. Much of this vegetation will be removed as the new stream channel is being excavated; however, under the EPP, and as listed in Appendix A of the BA, all disturbed areas will be restored and revegetated as soon as practicable following construction.

Both the Northwest Bradley Dumps Removal and the Bradley Man Camp Dumps Removal areas will have material extraction and vehicle activity as close as 15 feet from the EFSFSR. However, there are few trees along this section of the EFSFSR, with riparian vegetation consisting of willows and other brush-type vegetation, as well as some coniferous trees (most of which approximately 15 feet tall or shorter), and do not provide much stream shade. Trees and shrubs that are right at the river's edge will not be removed, and all disturbed areas will be restored and revegetated as soon as practicable following construction.

Revegetation will take place in all disturbed sites with a goal of 70 percent ground cover within three years of planting. Where trees need to be removed to facilitate the excavation of the waste rock, depending on the chemical constituents of the soil where the trees are growing, there will be an attempt to transplant trees down into an area that has already been excavated targeting areas adjacent to the EFSFSR. If trees salvaged are not able to be transplanted, they will be stockpiled for use as microhabitat during reclamation. Where brush exists along the stream edge cuttings will be collected and stored in watered buckets for use during reclamation.

Because the removal areas already have few trees, and because trees will be left in place where possible, there will not be a large number of trees removed. There will be a temporary removal of less than 1 acre of RCA vegetation due to requirement to remove waste materials. However, the focus of the removal is the mine dump material, which is elevated above the historical floodplain and does not contain riparian vegetation with the exception of some isolated pockets. This removal action will increase the area available for riparian vegetation by removing material down to the elevation of the historical floodplain. Additionally, vegetation on the banks of the EFSFSR will remain in place, and reclaimed areas will be replanted. The removal of contaminated material, the regrading down to the historical floodplain, and the revegetation will support the establishment of a healthy RCA, including larger trees that will provide increased overhead canopy and stream shade, reverting the RCA back to a more natural state. The immediate loss of vegetation will result in a short-term effect to the riparian vegetation PBF, but a localized beneficial effect post-project.

2.5.1.5 *Cover and Shelter*

Cover and shelter may be slightly and temporarily affected due to tailings removal in floodplains and corresponding temporary increases in turbidity and sediment deposition. In low flows, juveniles depend on cover provided by undercut banks and overhanging vegetation to provide locations for resting, feeding, and protection from predation. During periods of high streamflow, juveniles often seek refuge in low velocity microhabitats, including undercut banks and off-channel habitat. Cover and shelter are currently compromised in action area streams from historical mining activities and an overall lack of existing overhanging vegetation.

Mine tailings artificially confine significant portions of Meadow Creek and the EFSFSR in the project area. The proposed removal of these tailings from the floodplain and restoring of the floodplain to its natural elevation are expected to restore floodplain function in these areas long term. The action intends to maintain a vegetated buffer between removal actions and action area streams, minimizing damage to existing undercut banks and overhanging vegetation. Although the project will affect other riparian vegetation in the RCA in the short term, the replanting of these areas with native vegetation following removal actions should result in the long term improvement of riparian vegetation in the action area, resulting in a corresponding long term improvement in available cover and shelter in project area streams.

2.5.1.6 *Food/Forage*

Project activities will take place in and alongside designated critical habitat for Snake River spring/summer Chinook salmon and Snake River Basin steelhead. Ground-disturbing activities, including operation of heavy machinery, stream channel construction, stream channel reclamation, mine tailings removal and storage, borrow site excavation, and temporary reopening of closed roads are expected to result in exposure of large areas of bare soil. Therefore, the action, as proposed, has the potential to increase surface erosion and temporarily result in increased sediment delivery to or chemical contamination of Meadow Creek and the EFSFSR.

Meadow Creek and the EFSFSR upstream of the Yellow Pine pit are not currently occupied by ESA-listed salmon and steelhead; however, they do provide a source of forage to downstream, occupied habitats in the mainstem EFSFSR. The magnitude, duration, and frequency of turbidity pulses and subsequent deposition are expected to occur in localized pockets where lower stream velocities allow suspended sediment to settle out, and not expected to be sufficient enough to alter the benthic community in unoccupied or occupied habitats. In the unlikely event that drilling fluids are transported downstream to occupied habitats, the bentonite material and sediment are not expected to be in sufficient concentrations, nor are they expected to persist for a sufficient amount of time. Reestablishment of floodplain and riparian vegetation function should improve forage availability in the long term.

2.5.2. <u>Effects to ESA-listed Fish Species</u>

All life stages of Chinook salmon and steelhead have been documented in the action area, although their current occurrence is limited to stream reaches downstream of the Yellow Pine Pit Lake. Within the EFSFSR watershed, juvenile steelhead and Chinook salmon are known to occur upstream to the lake. Similarly, Chinook salmon and steelhead spawning occurs in the EFSFSR as far upstream as the inlet of the lake. Most project activities will occur upstream of the lake, and only the work proposed alongside the Northwest Bradley Tailings Dump Removal will border streams occupied by ESA-listed salmon and steelhead.

The proposed action could directly affect ESA-listed fish species as a result of disturbance from machinery or sound pressure level changes and ground vibrations associated with geotechnical drilling. In addition, Chinook salmon and steelhead could be indirectly affected through impacts to critical habitat. As described in the previous section, habitat-related effects could include effects to water quality (i.e., turbidity, temperature, and chemical contamination), spawning gravel/substrate, food/forage, floodplain connectivity, and riparian vegetation. Each of these potential pathways of effect are discussed in more detail below.

2.5.2.1 *Disturbance/Noise from Equipment Operation.*

Implementation of the proposed action will include operation of equipment as close as 15 feet to occupied habitat in the EFSFSR at the NW Bradley Dump Removal site. Noise and vibration from heavy equipment operating adjacent to live water will disturb fish in the immediate vicinity causing short-term displacement. Heavy equipment operation near the EFSFSR will create noise, vibration, and potentially water surface disturbance. Popper et al. (2003) and Wysocki et al. (2007) discussed potential impacts to fish from long-term exposure to anthropogenic sounds, predominantly air blasts and aquaculture equipment, respectively. Popper et al. (2003) identified possible effects to fish including temporary, and potentially permanent hearing loss (via sensory hair cell damage), reduced ability to communicate with conspecifics due to hearing loss, and masking of potentially biologically important sounds. Studies evaluated noise levels ranging from 115 to 190 decibels (dB) [referenced at 1 micropascal (µPa)]. In the studies identified by Popper et al. (2003) that caused ear damage in fishes, all evaluated fish were caged and thus incapable of moving away from the disturbance. Wysocki et al. (2007) did not identify any adverse impacts to rainbow trout from prolonged exposure to three sound treatments common in aquaculture environments (115, 130, and 150 dB) (re: 1 µPa). Popper & Hastings (2009) discussed how differences in how fish use sound (i.e., generalist versus specialists), fish size, development, and possibly genetics, can lead to different effects from the same sounds. As a result, they caution that studies on the effects of sound, particularly if they are from different sources, are not readily extrapolated between species, fish sizes, or geographic location.

Machinery operation adjacent to the stream will be intermittent with actual activity near the stream occurring only in daylight hours on any given day. The Federal Highway Administration (2008) indicates that for the types of equipment that will be operating onsite backhoe, excavator, dozer, and dump truck noise production will range between 80 and 88 dB. These noises are in-air and cannot be directly compared against the 150 dB root mean squared disturbance threshold for underwater noise. This considered, noise from equipment may cause fish to temporarily move away from the disturbance. However, because the decibel scale is logarithmic, there is nearly a 100-fold difference between noise levels expected from the action and noise levels known to have generated adverse effects to surrogate species, as discussed above. Therefore, although noise related disturbances of this magnitude may cause fish to temporarily relocate or avoid work areas during work days, they are unlikely to result in injury or death.

Although they are not likely to be killed as a result of disturbance, rearing juvenile salmon or steelhead could be periodically displaced from habitat in the EFSFSR when work is occurring at the Northwest Bradley Dump site. If fish respond in this manner, they are expected to generally migrate only short distances to an area where they feel more secure and only for a few hours in any given day. Although not likely, it is possible that some disturbed juvenile salmon or steelhead may be subject to predation as they attempt to find more suitable cover.

Work in this location also has the potential to disturb spawning salmon or steelhead. However, as outlined in the BA, although spawning does occur in this section of the EFSFSR, it is rarely used by Chinook salmon or steelhead for spawning. Only four Chinook salmon redds have been observed along the Northwest Bradley Dumps site in 20 years of sampling by the NPT and IDFG, as habitat conditions are not considered suitable due to substrate size and water depth. Therefore, although possible, disturbance of spawning salmon or steelhead is not expected to occur.

2.5.2.2 *Sound Pressure and Ground Vibrations from Drilling*

Drilling activities near the EFSFSR have the potential to affect fish by creating underwater noise and vibration. Resulting effects on fish are related to the level and duration of the sound exposure (Popper & Hastings 2009). Drilling will occur at approximately 12 locations ranging from 15 to 100 feet from the EFSFSR for work at the Northwest Bradley Dump Removal site. Use of an auger drill rig is preferred; however, a RC drill rig may be required if excessive boulders are present that will inhibit the use of an auger rig. Drilling depths are anticipated to be approximately 35 feet and could occur after August 15. At three drill sites per day, it will take approximately four days to complete drilling in this location.

Literature documenting the effects of drilling next to stream channels is lacking. Given the lack of data and the myriad of variables that influence transmission of sound and vibrations through the ground and water, it is not possible to accurately predict the effects from sonic drilling on fish. Consequently, we rely upon a qualitative analysis comparing proposed geotechnical drilling activities to pile driving, an activity for which extensive research has been conducted.

In order to avoid injury, sound levels of a single pile strike should be less than 206 peak dB and extended time should be less than 187 dB (183 dB for fish less than 2 grams) sound exposure level (re: 1 μPa for sound traveling through water, measured at a distance of 10 meters) (Fisheries Hydroacoustic Working Group 2008). Fish behavior changes may occur at lower noise levels than levels that injure. The root mean square (RMS) of sound pressure levels (SPLs) is a commonly used metric in behavioral studies. NMFS assumes SPLs in excess of 150 dB_{RMS} (re: 1μPa) are likely to elicit temporary behavioral changes, such as a startle response, or other behaviors indicative of stress and recommends this value as a threshold for possible behavioral effects.

In addition to sound effects, excessive ground vibrations have the potential to affect fish, particularly during the sensitive egg life stage (Kolden & Aimone-Martin 2013; Timothy 2013). Smirnov (1954, as cited in Alaska Department of Fish and Game 1991) found significant egg mortality caused by ground vibrations with a peak particle velocity (PPV) of 2 inches per second (ips). Jensen & Collins (2003) found that a PPV of 5.8 ips resulted in 10 percent mortality of Chinook salmon embryos. Faulkner et al. (2008) found that PPVs up to 9.7 ips resulted in significantly higher mortality in *O. mykiss* eggs but there was no increase in mortality when exposed to PPVs of 5.2 or less. The Alaska Department of Fish and Game have PPV restrictions of 2.0 ips to protect salmonids (Timothy 2013). The reported PPV value for an in-situ soil sampling rig at a distance of 100 feet is 0.011 ips (ATS Consulting 2013).

In 2017, Perpetua conducted sound source monitoring during a sonic drilling geotechnical study in the Meadow Creek area (Jasco Applied Sciences 2017). The instream monitoring locations were approximately 65 meters away from the drill location. Results of this study, which applied similar drilling methods to those proposed for the proposed action, showed a maximum peak pressure of 157 dB (re: 1 μPa). The median ambient peak pressure was 103.5 dB (re: 1 μPa), which increased to 105 dB (re: 1 μPa) during both drilling and hammering. The maximum PPV was recorded at 0.0077 ips. These values were below those that will result in injury to fish less than 2 grams. Because the drilling activities for this proposed action will be much closer to the stream (approximately 15 feet), we anticipate that sound and vibration effects will be greater than what was previously observed. However, there is insufficient information to determine what the resultant instream sound pressure levels and ground vibration levels will be as we were unable to find studies completed in closer proximity to streams. Given the documented ground vibrations were over 250 times lower than PPV injury threshold values described above and considering the decibel scale is logarithmic, we do not anticipate effects associated with drilling to rise to the level of injury or mortality. However, it is reasonable to assume that sound pressure levels may exceed 150 dB_{RMS} and cause temporary behavioral modifications. Drilling activities are expected to be short in duration, will occur during daylight hours, and are anticipated to take no more than 4 days. During this time, rearing juvenile salmon or steelhead could be periodically displaced from habitat in the EFSFSR. If fish respond in this manner, they are expected to generally migrate only short distances to an area where they feel more secure and only for a few hours in any given day. Although not likely, it is possible that some disturbed juvenile salmon or steelhead may be subject to predation as they attempt to find more suitable cover.

2.5.2.3 *Habitat-related Effects*

As described in detail in the critical habitat effects section of this opinion, habitat-related effects to fish from impacts to water quality (i.e., temperature, turbidity, chemical contamination), substrate, cover, disturbance to riparian vegetation, etc., are expected to have localized, temporary to short-term negative effects on rearing and spawning salmon and steelhead in the EFSFSR mainstem. Of these effects, exposure to turbidity and potential chemical contamination are most likely to affect salmon and steelhead in the EFSFSR downstream from the Yellow Pine pit. Although these effects are expected to be localized and temporary, they could result in short-term negative effects on rearing and spawning salmon and steelhead in the EFSFSR mainstem. Exposure of juvenile salmonids to multiple low intensity and temporary turbidity plumes is most likely to cause only minor behavioral modifications as these fish seek more suitable habitat conditions. However, these fish could also be subject to predation as they attempt to relocate to more suitable habitats. Immediately following project completion and into the long term, fish should benefit as habitat conditions realize a localized improvement through restoration of floodplain and riparian function, and addressing the current source of chronic metals contamination to action area streams.

2.6. Cumulative Effects

"Cumulative effects" are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR 402.02 and 402.17(a)]. Future Federal actions that are unrelated to the proposed action, including possible Federal permitting of new mineral exploration/development in the action area, are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline vs. cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described earlier in the discussion of climate change implications for ESA-listed species and their critical habitat (Section 2.2.3).

The action area is primarily managed by the BNF and PNF. A few small parcels of private property and state-administered lands are scattered throughout the action area. Uses on these lands are not expected to change in the foreseeable future. Activities in the action area include road/trail maintenance performed by non-Federal entities (e.g., Valley County, Idaho State Parks and Recreation) and recreation (e.g., camping, fishing, hiking, etc.) These activities will continue to influence water quality and habitat conditions for anadromous fish in the action area. Riparian and stream corridors have been negatively impacted by roads and trails and these impacts will continue in the future. The impacts of these activities on the current condition of ESA-listed species and designated critical habitats within the action area was described in the Status of the Species, Status of Critical Habitat, and Environmental Baseline sections of this opinion. Current levels of these activities are likely to continue into the future and are unlikely to be substantially more severe than they currently are.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

2.7.1. Designated Critical Habitat

Critical habitat throughout the Snake River spring/summer Chinook salmon and Snake River Basin steelhead designations, ranges from excellent in roadless areas, to degraded in areas of human activity. Historical mining pollution, sediment delivery from historical logging practices, and degraded riparian conditions from past grazing were major factors in the decline of anadromous fish populations in the action area. Habitat-related limiting factors for recovery of one or more populations within the action area include excess sediment, degraded riparian conditions, passage barriers, and high water temperatures (NMFS 2017). Climate change is likely to exacerbate several of the ongoing habitat issues, in particular, increased summer temperatures.

The impacts of Federal and non-Federal land use activities on critical habitat are reflected in the environmental baseline section of this document. Current levels of these uses are likely to continue into the future and are unlikely to be substantially more severe than they currently are. It is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the status of the species.

Streams within the action area are vitally important to the recovery of anadromous fish species. There are a number of heavily used Chinook salmon and steelhead spawning areas in the action area (i.e., SFSR, Johnson Creek, etc.) Tributary habitat will likely become even more important for thermal refugia in the face of climate change. Mining, recreation, and use of the existing road system are the primary human activities in the action area, although some private inholdings and associated homesteads exist. Roads from legacy logging remain on the landscape and are a threat to the aquatic ecosystem. In more recent times, wildfire has become the largest disturbance mechanism in the action area. Sediment conditions have generally been on an improving trend, likely due to restoration actions and changes to land management approaches in the action area. Water temperatures are currently warmer than optimal and will likely continue to warm into the future. Riparian conditions are degraded in historically mined areas and areas where roads are located in the RCAs. Although there are some localized areas of heavy impacts as described above, habitat conditions in mainstem rivers and tributary streams within the action area are good overall.

Designated critical habitat within the action area will be most negatively impacted in the temporary timeframe (less than three years), primarily due to increased sediment delivery to the action area. We anticipate that spawning and rearing habitat will be negatively impacted in small, localized areas of the EFSFSR immediately following instream and ground-disturbing activities as a result of turbidity pulses and subsequent sediment deposition. Stream temperature may also be impacted at the site scale; however, because the impact areas will be small, discrete, and in previously disturbed portions of the action area, we do not expect implementation of the proposed action to measurably alter stream temperatures at the broader reach scale in any timeframe. Ultimately, implementation of the proposed action is expected to positively impact designated critical habitat by eliminating chronic sources of metals contamination and sediment delivery, and through improving floodplain and RCA conditions. These actions directly address the excess sediment, poor water quality, floodplain connectivity, and high water temperature limiting factors identified in the recovery plans. Furthermore, by restoring the landscape to more natural condition, the proposed action will increase the resilience of the action area to a changing climate.

When considering the status of the critical habitat, environmental baseline, effects of the action, and cumulative effects, NMFS concludes that EPA's and the PNF's implementation of this proposed action will not appreciably diminish the value of designated critical habitat as a whole for the conservation of both species.

2.7.2. Species

As described in Section 2.2, individuals belonging to two different populations within the Snake River spring/summer Chinook salmon ESU (SFSR and EFSFSR) and one population (SFSR) within the Snake River Basin steelhead DPS use the action area to fully complete the migration, spawning, and rearing parts of their life cycle. The Snake River spring/summer Chinook salmon ESU is currently at a high risk of extinction. Similarly, the Snake River Basin steelhead DPS is not currently meeting its VSP criteria and is at a moderate risk of extinction. Since the last status review, there has been a substantial downturn in adult abundance for both species. This downturn is thought to be driven primarily by marine environmental conditions and a decline in ocean productivity. Very large improvements in abundance will be needed to bridge the gap between the current status and proposed status for recovery for many of the ESU/DPS component populations.

The regional tributary habitat strategy set forth in the final recovery plans (NMFS 2017) is to protect, conserve, and restore natural ecological processes at the watershed scale that support population viability. Ongoing actions to support recovery of these two species include, but are not limited to, conserving existing high quality habitat and restoring degraded (and maintaining properly functioning) upland processes to minimize unnatural rates of erosion and runoff. Natal habitat recovery strategies and actions for populations within the action area include: (1) reduce road-related impacts (e.g., sediment delivery) on streams; (2) inventory stream crossings and replace any that are barriers to passage; (3) reduce floodplain and channel encroachment; and (4) restore floodplain function.

The environmental baseline incorporates effects of restoration actions implemented to date. It also reflects impacts that have occurred as a result of mining, recreation, and implementation of various programmatic activities. In addition, impacts from existing state and private actions are reflected in the environmental baseline. Cumulative effects from State and private actions in the action area are expected to continue into the future and are unlikely to be substantially more severe than they currently are. The environmental baseline also incorporates the impacts of climate change on both the species and the habitat they depend on. Several of the ongoing habitat issues that impact VSP parameters, in particular, increased summer temperatures and decreased summer flows, will continue to be affected by climate change.

Both populations of Chinook salmon occupying the action area are at a high risk of extinction. The SFSR population of steelhead is at a moderate risk of extinction. NMFS' preferred recovery scenario for the Snake River spring/summer Chinook salmon ESU targets the SFSR population to achieve a viable or highly viable status, and the EFSFSR population to be viable or maintained status. The preferred recovery scenario for the Snake River Basin steelhead DPS targets the SFSR population to be viable or highly viable. In order to achieve these goals, it is vitally important to preserve habitat conditions that are FA and improve habitat conditions that are FAR or FUR.

The proposed action includes actions to specifically address chronic metals contamination associated with historical mining in the headwaters of this important subbasin. The EPA, PNF, and their contractors will implement the proposed action as proposed, with full adherence to the BMPs and PDF. Given this, we expect that adverse effects to ESA-listed species will be minimized to the extent practicable. As described in the Effects of the Action (Section 2.5), noise and vibration of heavy equipment and drilling operations in RCAs have the potential to disturb individual Snake River spring/summer Chinook salmon and Snake River Basin steelhead. Although fish will temporarily be disturbed by noise and vibration from construction and drilling activities, no fish are expected to be harmed or killed as a result of these activities. Fish will also be exposed to habitat-related effects associated with potential impacts to water quality (i.e., temperature, turbidity, chemical contamination), substrate, cover, and disturbance to riparian vegetation. However, these effects are expected to be localized, temporary to short-term negative effects on rearing and spawning salmon and steelhead in the EFSFSR mainstem. These effects are not expected to reach levels that will injure or harm ESA-listed fish species. However, exposure to multiple low intensity and temporary turbidity plumes will potentially trigger minor behavioral modifications to exposed fish, most likely observed in a reach of the EFSFSR no more than 1,000 feet downstream of work at the Northwest Bradley Dump site. Exposed salmon and steelhead are expected to simply temporarily relocate to nearby non-turbid water during the exposure. Immediately following project completion and into the long term, fish should benefit as habitat conditions realize a localized improvement through restoration of floodplain and riparian function, and addressing the current source of chronic metals contamination to action area streams.

Because no fish are expected to be injured or killed as a result of project implementation, it is not expected to have a measurable effect on the productivity of the impacted populations. Sediment introduced into and subsequently deposited in the EFSFSR and its tributaries as a result of project implementation is not expected to reduce the current productivity of the EFSFSR or SFSR Chinook salmon and SFSR steelhead populations. This is primarily because: (1) turbidity pulses are expected to be short-lived (lasting only a matter of minutes to hours); (2) turbidity plumes are not expected to exceed Idaho State standards; and (3) completing work in the dry along with proven erosion control practices should effectively limit turbidity's downstream extent. Our assessment assumes the EPA, PNF, Perpetua, and any contractors will properly implement appropriate PDF and BMPs during project implementation. Because these impacts will not reduce the productivity of the affected populations, it is reasonable to conclude the action will not negatively influence VSP criteria at the population scale. Thus, the viability of the MPGs and the ESU/DPS are also not expected to be reduced. When considering the status of the species, and adding in the environmental baseline, and cumulative effects, implementation of the proposed action will not appreciably reduce the likelihood of survival and recovery of Snake River spring/summer Chinook salmon or Snake River Basin steelhead.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of Snake River spring/summer Chinook salmon and Snake River Basin steelhead or destroy or adversely modify their designated critical habitats.

2.9. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Harass" is further defined by interim guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1. Amount or Extent of Take

The proposed action is reasonably certain to result in incidental take of ESA-listed species. NMFS is reasonably certain the incidental take described here will occur because adult and juvenile Chinook salmon and steelhead will occur in the action area during project implementation, and those fish will be exposed to effects of the proposed action. In some instances, NMFS is able to quantify the amount of take; however, where available information precludes our ability to quantify take, we use surrogates to describe the incidental take pursuant to 50 CFR 402.14 (I).

Disturbance associated with equipment operation (i.e., from noise) and drilling (i.e., from noise and vibration) is likely to harass rearing juvenile salmonids (i.e., annoying juveniles sufficiently to disrupt normal behavioral patterns). As described in the species effects analysis, NMFS is unable to quantify the take associated with disturbance due to equipment operation in close proximity to the EFSFSR. It is not possible to tell whether fish are present and have been disturbed, and it is not possible to determine how many, if any, juvenile fish are subject to predation as a result of these activities. Because we are not able to define an amount of take, we have defined a surrogate instead. Equipment operation will produce noise (earth moving equipment and RC drill) and vibration (primarily RC drill) at sufficient intensities to cause behavioral modifications. The degree that juvenile salmon and steelhead will be harassed is directly correlated with both the amount of work done and the proximity of that work to streams. Equipment is expected to operate at the Northwest Bradley Dump Site for up to 18 weeks, operating during daylight hours only. Drilling activities are expected to be shorter in duration, also occurring during daylight hours, and are anticipated to take no more than 4 days. As such, NMFS will consider take exceeded if: (1) equipment operation at the takes longer than 18 weeks to complete removal actions at the Northwest Bradley Dump site; (2) drilling at the Northwest Bradley Dump Site takes longer than 4 days to complete: or (3) any drilling locations take place closer than 15 feet of the EFSFSR. Although these surrogates could be considered coextensive with the proposed action, they function as effective reinitiation triggers because they can be readily monitored, and thus will serve as a regular check on the proposed action.

Similarly, take caused by the increased sediment delivery into action area streams cannot be accurately quantified as number of fish for a variety of reasons. The distribution and abundance of fish within the action area is dependent upon a number of environmental factors that vary over time and space, potentially including exposure of both juvenile and adult salmon and steelhead to resulting turbidity plumes. It is not possible to monitor the number of fish that may be displaced by turbidity plumes. In these circumstances, NMFS can use the causal link established between the activity and the likely changes in habitat conditions affecting the listed species to describe the extent of take as a numerical level of habitat disturbance.

The best available indicators for the extent of take is the magnitude and extent of turbidity plumes in the receiving waters during project implementation. The magnitude and extent of the turbidity plume is proportional to the amount of harm that the proposed action is likely to cause through short-term degradation of water quality and instream habitat. Sediment levels are expected to rapidly peak and then steadily decrease in intensity within 1,000 feet downstream of construction areas that are immediately adjacent to or within the stream channel. Although we recognize the limitations of using turbidity as a surrogate for suspended sediment, it is a reasonable and cost effective measure that can be readily implemented in the field. Most of the time turbidity measurements take 30 seconds, can be done on site, and therefore allow for rapid adjustments in project activities if turbidity approaches unacceptable levels. For these reasons, we have chosen turbidity as a surrogate for incidental take from sediment-related effects.

NMFS will consider the extent of take exceeded if turbidity readings, taken approximately 1,000 feet downstream of work at the Northwest Bradley Dump Removal site, reveal turbidity concentrations greater than 50 NTU above background for more than 90 minutes, or 100 NTUs instantaneously. Literature reviewed in Rowe et al. (2003) indicated that NTU levels below 50 generally elicit only behavioral responses from salmonids thereby making this a suitable surrogate for sublethal incidental take monitoring. This take indicator functions as effective reinitiation trigger because it can be readily monitored, and thus will serve as a regular check on the proposed action.

2.9.2. Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). The EPA and the PNF have the continuing duty to regulate the activities covered in this ITS where discretionary Federal involvement or control over the action has been retained or is authorized by law.

NMFS believes that full application of conservation measures included as part of the proposed action, together with use of the RPMs and terms and conditions described below, are necessary and appropriate to minimize the likelihood of incidental take of ESA-listed species due to completion of the proposed action.

The EPA and PNF shall:

- Minimize the potential for incidental take from water quality impacts to streams.
- Ensure completion of a monitoring and reporting program to confirm that the terms and conditions in this ITS were effective in avoiding and minimizing incidental take and ensure incidental take is not exceeded.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The EPA, PNF, or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. To implement RPM 1, the EPA and PNF shall:

    a. Apply standard construction practices, including minimizing the amount of surface disturbance and clearly delineating all work zones before starting construction, to minimize the potential to deliver sediment to action area streams.

    b. Monitor turbidity as proposed in Appendix A of the BA. Stop construction activities if turbidity levels 1,000 feet downstream of their source begin to approach 50 NTUs above background or are visible for more than 90 minutes or begin to approach 100 NTUs above background at any time. After stopping the activities, contact NMFS to determine when work can proceed and if additional BMPs need to be employed to further minimize the intensity of remaining plumes to ensure extent of take is not exceeded.

    c. Initiate a visual turbidity monitoring program when drilling occurs in RCAs below the lake. Visual monitoring must occur at least two times during drilling activities at each location. If visible turbidity is present downstream of drilling activities, operations will cease until the source of turbidity can be identified and mitigated.

2. To implement RPM 2, the EPA and PNF shall:

    a. Submit a project status/completion report to NMFS within 6 weeks of project completion for activities completed under the proposed action. In the event work spans more than 1-year, reports shall be provided each year work occurs. At a minimum reports shall identify:

i. Project Name and Agency Contact.

ii. Starting and ending dates for completed work.

iii. Labeled before and after site photos.

iv. A summary of pollution and erosion control inspection results, including description of any erosion control failure, contaminant release, and efforts to correct such incidences.

v. Results of turbidity monitoring to demonstrate the authorized extent of take was not exceeded.

vi. Total amount of time (in weeks and days) equipment operates on-site at the Northwest Bradley Dump Site. Identification of the drilling locations, their distance from the EFSFSR, and time needed to complete drilling at each location.

vii. Specific to revegetation efforts, annually submit post-construction revegetation reports documenting progress toward achieving the targeted goal of 70% ground cover within three years of planting. Considering difficulties establishing vegetation in the project area in past rehabilitation efforts, ground cover monitoring and annual updates shall continue for 5 years post-project.

b. The report shall provide the above identified information and confirm the project's proposed BMPs and that this opinion's terms and conditions were successfully implemented.

c. Reports must be submitted electronically to NMFSWCR.SRBO@noaa.gov. The

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, "conservation recommendations" are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

- To mitigate the effects of climate change on ESA-listed salmonids, the EPA and PNF should follow recommendations by the Independent Scientific Advisory Board (2007) to plan now for future climate conditions by implementing protective tributary and mainstem habitat measures. In particular, implement measures to remove barriers and to protect or restore riparian buffers, wetlands, and floodplains.

- When drilling within RCAs, if anything other than water is used to increase viscosity or to reduce fluid loss, ensure that any additive used is non-toxic.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Stibnite ASAOC action.

Under 50 CFR 402.16(a): "Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) if the amount or extent of taking specified in the incidental take statement is exceeded; (2) if new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) if a new species is listed or critical habitat designated that may be affected by the identified action."

3. MAGNUSON–STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)].

This analysis is based, in part, on the EFH assessment provided by the EPA and PNF and descriptions of EFH for Pacific Coast salmon (PFMC 2014) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

The proposed action for this consultation is described in the Introduction (Section 1.3) to this document. The action area is described in Section 2.3 and includes areas designated as unoccupied EFH for spawning, rearing, and migration life-history stages of Chinook salmon.

The PFMC has identified five habitat areas of particular concern (HAPC), which warrant additional focus for conservation efforts due to their high ecological importance. Three of the five HAPC are applicable to freshwater and include: (1) complex channels and floodplain habitats; (2) thermal refugia; and (3) spawning habitat. These reaches of the EFSFSR and Meadow Creek include both occupied and unoccupied spawning habitat, thermal refugia, and the complex channels and floodplain habitats HAPC.

3.2. Adverse Effects on Essential Fish Habitat

The proposed action and action area are described in the BA and prior opinion. The action area includes habitat designated as occupied and unoccupied EFH for various life stages of Chinook salmon. The effects of the proposed action on fish habitat is described in the habitat effects section of the opinion. To summarize the conclusions in the opinion, the following adverse and beneficial effects to EFH will occur:

- Multiple turbidity plumes will produce brief and temporary adverse water quality-related impacts. Individual pulses are not expected to persist more than 90 minutes, will remain less than 100 NTUs over background, and not extend more than 1,000 feet downstream. Individual plumes should be temporary, and affect narrow, short segments of EFH.

- There will be long term beneficial effects to EFH, including: (1) improved habitat conditions the upper EFSFSR; (2) improved water quality (reduced levels of chronic metals contamination and sediment delivery; (3) improved floodplain connectivity; and, (4) improved riparian functions and processes.

3.3. Essential Fish Habitat Conservation Recommendations

NMFS determined that the following Conservation Recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

- Standard construction practices should be applied, including minimizing the amount of surface disturbance and clearly delineating all work zones before starting construction, to minimize the potential to deliver sediment to action area streams.

- Construction activities should be stopped if turbidity levels 1,000 feet downstream of their source begin to approach 50 NTUs above background or are visible for more than 90 minutes. At that time, additional BMPs should be employed to further minimize the intensity of remaining plumes.

- When drilling within RCAs, if anything other than water is used to increase viscosity or to reduce fluid loss, any additive used should be non-toxic.

- A visual turbidity monitoring program should be used when drilling occurs in RCAs. If visible turbidity is present downstream of drilling activities, operations should cease until the source of turbidity can be identified and mitigated.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in section 3.2, above, for Pacific Coast salmon.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the EPA and PNF must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of the measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects [50 CFR 600.920(k)(1)].

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5. Supplemental Consultation

The EPA and PNF must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations [50 CFR 600.920(l)].

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the EPA and PNF. Other interested users could include Perpetua and contractors implementing the cleanup actions. Individual copies of this opinion were provided to the EPA and PNF. The document will be available within 2 weeks in the NOAA Library Institutional Repository at https://repository.library.noaa.gov/welcome. The format and naming adhere to conventional standards for style.

4.2. Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3. Objectivity

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR part 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

5. References

Alaska Department of Fish and Game. 1991. Blasting Standards for the Protection of Fish. Alaska Department of Fish and Game, Division of Habitat, Douglas, AK.

ATS Consulting. 2013. Final Construction Noise and Vibration Report SR 520, West Connection Bridge Report. Prepared for Washington State Department of Transportation. 38 pp.

Battin, J., M. W. Wiley, M. H. Ruckelshaus, R. N. Palmer, E. Korb, K. K. Bartz, and H. Imaki. 2007. Projected impacts of climate change on salmon habitat restoration. Proceedings of the National Academy of Sciences of the United States of America 104(16):6720–6725.

Bell, M. C. 1991. Fisheries handbook of Engineering requirements and biological criteria. Fish Passage Development and Evaluation Program. U.S. Army Corps of Engineers. North Pacific Division.

Bjornn, T. C., and D. W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83–138 in W. R. Meehan, editor. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society, Special Publication 19. Bethesda, Maryland.

Bjornn, T. C., M. A. Brusven, M. P. Molnau, J. H. Milligan, R. A. Klamt, E. Chacho, and C. Schaye. 1977. Transport of Granitic Sediment in Streams and its Effects on Insects and Fish. Bulletin No. 17. College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow, Idaho, USA.

Brown and Caldwell. 2019. 2018 Yellow Pine Pit Lake Fish Sampling Summary Report. Prepared for Midas Gold Idaho, Inc. 583 pp.

Ecovista, Nez Perce Tribe Wildlife Division, and Washington State University Center for Environmental Education. 2003. Draft Clearwater Subbasin Assessment, Prepared for Nez Perce Tribe Watersheds Division and Idaho Soil Conservation Commission. 463 p.

Everest, F. H., and D. W. Chapman. 1972. Habitat selection and spatial interaction by juvenile Chinook salmon and steelhead trout in two Idaho streams. Journal of the Fisheries Research Board of Canada 29(1):91–100.

Faulkner, S. G., M. Welz, W. M. Tonn, D. R. Schmitt. 2008. Effects of Simulated Blasting on Mortality of Rainbow Trout Eggs. Transactions of the American Fisheries Society. 127:1-12.

Felts, E. A., B. Barnett, M. Davison, K. M. Lawry, C. McClure, J. R. Poole, R. Hand, M. Peterson, and E. Brown. 2020. Idaho adult Chinook Salmon monitoring. Annual report 2019. Idaho Department of Fish and Game Report 20–06.

Felty, Kenneth. 2015. Idaho Department of Fish and Game, Fish Culturist, McCall Fish Hatchery. Email communication with Stephanie Thesis regarding the 2012 release of Chinook Salmon in Meadow Creek. April 30, 2015.

FHWA (Federal Highway Administration). 2008. Effective Noise Control During Nighttime Construction – FHWA Work Zone – Mozill. December 22, 2008. http://ops.fhwa.dot.gov/wz/workshops/accessible/Schexnayder_paper.htm

Fisheries Hydroacoustic Working Group 2008. Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities.

Folsom, Anthony. 2013. Idaho Department of Fish and Game, Fish Culturist, McCall Fish Hatchery. Email communication with Stephanie Theis regarding the 2013 release of Chinook Salmon in Meadow Creek. October 25, 2013.

Foltz, R. B. 1996. Traffic and no-traffic on an aggregate surfaced road: sediment production differences. Presented at the FAO Seminar on Environmentally Sound Forest Roads, June 1996. Sinaia, Romania. 13 pp.

Ford, M. J., Editior. 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-113, 281 p.

Ford, M. J., Editor. 2022. Biological Viability Assessment Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Pacific Northwest. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-171.

Gebhards, J. 2018. Nez Perce Tribe, Department of Fisheries Management. Email Communication with Kyle Fend (Midas Gold Idaho Inc.) regarding the 2018 release of Chinook salmon in Meadow Creek. November 6, 2018.

Good, T. P., R. S. Waples, and P. Adams. Editors. 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-66, 598 p.

Hauck, F. R. 1953. The Size and Timing of Runs of Anadromous Species of Fish in the Idaho Tributaries of the Columbia River. Prepared for the U.S. Army Corps of Engineers by the Idaho Fish and Game Department, April 1953. 16 pp.

HDR. 2017. Surface Water Baseline Study, Stibnite Gold Project. Prepared for Midas Gold Idaho, Inc. December 2016, revised May 2017.

Healey, M. C. 1991. Life history of chinook salmon (*Oncorhynchus tshawytscha*). Pages 80 in C. Groot, and L. Margolis, editors. Pacific salmon life histories. University of British Columbia Press, Vancouver, Canada.

Hogen, D. M. 2002. Spatial and temporal distribution of bull trout, *Salvelinus confluentus,* in the Upper East Fork South Fork Salmon River watershed, Idaho. Master's Thesis, University of Idaho.

ICTRT (Interior Columbia Technical Recovery Team). 2003. Working draft. Independent populations of Chinook, steelhead, and sockeye for listed evolutionarily significant units within the Interior Columbia River domain. NOAA Fisheries. July.

ICTRT. 2007. Viability Criteria for Application to Interior Columbia Basin Salmonid ESUs, Review Draft March 2007. Interior Columbia Basin Technical Recovery Team: Portland, Oregon. 261 pp.

ICTRT. 2010. Status Summary – Snake River Spring/Summer Chinook Salmon ESU. Interior Columbia Technical Recovery Team: Portland, Oregon.

IDEQ (Idaho Department of Environmental Quality). 2001. Middle Salmon River–Panther Creek Subbasin Assessment and TMDL. IDEQ: Boise, Idaho. 114 p.

IDEQ. 2020. Idaho's 2018/2020 Integrated Report, Final. IDEQ. Boise, Idaho. 142 p.

IDEQ and U.S. Environmental Protection Agency (EPA). 2003. South Fork Clearwater River Subbasin Assessment and Total Maximum Daily Loads. IDEQ: Boise, Idaho. 680 p.

ISAB (Independent Scientific Advisory Board). 2007. Climate change impacts on Columbia River Basin fish and wildlife. ISAB Climate Change Report, ISAB 2007-2, Northwest Power and Conservation Council, Portland, Oregon.

Jasco Applied Sciences. 2017. Sound Source Characterization of Sonic Drilling in Meadow Creek, Stibnite, Idaho. Prepared for Midas Gold Inc., Idaho. March 15-16, 2017. Version 1.1. 24 pp.

Jensen, D. W., E. A. Steel, A. H. Fullerton, and G. R. Pess. 2009. Impact of Fine Sediment on Egg-to-Fry Survival of Pacific Salmon: A Meta-Analysis of Published Studies. Reviews in Fisheries Science. 17(3):348-359.

Jensen, N. R., and K. C. Collins. 2003. Time Required for Yolk Coagulation in Pink Salmon and Steelhead Eggs Exposed to Mechanical Shock. North American Journal of Aquaculture 65:339–343.

Kolden, K. D., and C. Aimone-Martin. 2013. Blasting Effects on Salmonids. Final report, June 2013 (IHP-13-051). Prepared for the Alaska Department of Fish and Game, Division of Habitat, Douglas, AK. 35 pp.

Lindsey, R., and L. Dahlman. 2020. Climate change: Global temperature.

Mantua, N., I. Tohver, and A. Hamlet. 2009. Impacts of climate change on key aspects of freshwater salmon habitat in Washington State. Climate Impacts Group, University of Washington, Seattle.

Matthews, G. M., R. S. Waples. 1991. Status Review for Snake River Spring and Summer Chinook Salmon. U.S. Dept. of Commerce, NOAA Tech. Memo., NMFS-F/NWC-200. https://www.nwfsc.noaa.gov/publications/scipubs/techmemos/tm201/.

McClure, M., T. Cooney, and ICTRT. 2005. Updated population delineation in the interior Columbia Basin. May 11, 2005 Memorandum to NMFS NW Regional Office, Co-managers, and other interested parties. NMFS: Seattle. 14 p.

McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-42, Seattle, 156 p.

McMillen Jacobs Associates. 2021. Stream Diversion TCRA Design Analysis Report. Prepared for Perpetua Resources. 30-50% Draft, Revision #0. 52 pp.

Melillo, J. M., T. C. Richmond, and G. W. Yohe, Editors. 2014. Climate change impacts in the United States: The third national climate assessment. U.S. Global Change Research Program, Washington, D.C.

McPherson, Gene. 2013. Idaho Department of Fish and Game, Fish Culturist, McCall Fish Hatchery. Email communication with Stephanie Theis regarding the 2011 release of Chinook Salmon in Meadow Creek. January 8, 2013.

Midas Gold Idaho, Inc. 2016. Stibnite Gold Project, Valley County, Idaho. Plan of Restoration and Operations. Submitted to the Payette National Forest.

Mitchell, J. 2016. Idaho Department of Fish and Game, Fish Hatchery Manager, McCall Fish Hatchery. Email Communication with John Gebhards (Nez Perce), forwarded to Kyle Fend (Midas Gold) regarding the 2016 Chinook salmon release of Chinook Salmon in Meadow Creek. September 12, 2016.

Mote, P. W., and E. P. Salathé. 2009. Future climate in the Pacific Northwest. Climate Impacts Group, University of Washington, Seattle.

MWH. 2017. Aquatic Resources 2016 Baseline Study, Stibnite Gold Project. Prepared for Midas Gold Idaho. 1072 pp.

Nalder, C. 2021. Payette National Forest, Forest Fisheries Biologist. Email Communication with Stephanie Theis (Stantec) regarding the 2019-2021 Chinook salmon releases in Meadow Creek. August 30, 2021.

Nelson, R. L. 2004. East Fork South Fork Salmon River Steelhead Observations. Unpublished file memorandum EF.04.0027. McCall, ID: USDA Forest Service, Payette National Forest. 4 pp.

Nelson, R. L., and D. C. Burns. 2005. Developing Appropriate Sediment-related Watershed Condition Indicators for National Environmental Policy Act Analyses and Biological Assessments in the South Fork Salmon River Basin. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 112 pp.

Nelson, R.L., D.C. Burns and C. Zurstadt. 2006. Deposition of Fine Sediment in the Salmon River Watershed, Payette and Boise National Forests, Idaho: Statistical Summary of Interstitial and Surface Sediment Monitoring 1983-2005. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 232 pp.

NMFS (National Marine Fisheries Service). 2016. 2016 5-year review: Summary and evaluation of Snake River sockeye, Snake River spring-summer Chinook, Snake River fall-run Chinook, Snake River basin steelhead. NOAA Fisheries, West Coast Region. 138 p.

NMFS. 2017. ESA Recovery Plan for Snake River Spring/Summer Chinook & Steelhead. NMFS.

NWFSC (Northwest Fisheries Science Center). 2015. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. 356 p.

ODFW (Oregon Department of Fish and Wildlife) and WDFW (Washington Department of Fish and Wildlife). 2019. 2019 Joint Staff Report: Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and other Species. Joint Columbia River Management Staff. 97 pp.

ODFW and WDFW. 2021. 2021 Joint Staff Report: Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and other Species. Joint Columbia River Management Staff. 107 pp.

Perpetua. 2021a. Northwest Bradley Dumps Removal. TCRA Work Plan Pursuant to Administrative Settlement and Order on Consent for Removal Actions (CERCLA Docket No. 10-2021-0034). Stibnite Mine Site, Valley County, Idaho. July 2021.

Perpetua. 2021b. Field Sampling Plan for Time-Critical Removal Actions. Stibnite Mine Site, Valley County, Idaho. September 2021. 55 pp.

Perpetua. 2021c. Addendum to Field Sampling Plan for Time-Critical Removal Actions. Stibnite Mine Site, Valley County, Idaho. November 2021. 7pp.

Perpetua. 2021d. Northwest Bradley Dumps Removal. TCRA Work Plan Pursuant to Administrative Settlement and Order on Consent for Removal Actions (CERCLA Docket No. 10-2021-0034). Stibnite Mine Site, Valley County, Idaho. July 2021.

Perpetua. 2021e. Borrow Source Development Plan. Submitted Pursuant to Administrative Settlement and Order on Consent for Removal Actions (CERCLA Docket No. 10-2021-0034). Stibnite Mine Site, Valley County, Idaho. April 2021. 13 pp.

Perpetua. 2021f. Presentation on the NW Bradley Dump TCRA Area in meeting with Perpetua and the Forest Service and USEPA. September 14.

PFMC (Pacific Fishery Management Council). 2014. Appendix A to the Pacific Coast Salmon Fishery Management Plan, as modified by Amendment 18. Identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon.

Popper, A. N., J. Fewtrell, M. E. Smith, and R. D. McCauley. 2003. Anthropogenic Sound: Effects on the Behavior and Physiology of Fishes. Marine Technology Society Journal Vol. 37, no. 4, pp. 35-40. 2003-2004.

Popper, A. N. and M. C. Hastings. 2009. The effects of human-generated sound on fish. Integrative Zoology. 4: 43-52.

Reid, L. M. and T. Dunne. 1984. Sediment productions from forest road surfaces. Water Resources Research. 20(11):1753-1761.

Rio ASE. 2021a. Schoolhouse Tailings Removal Project 50% Design Basis Report. Submitted Pursuant to Administrative Settlement and Order on Consent for Removal Actions (CERCLA Docket No. 10-2021-0034). Prepared for Perpetua Resources Idaho, Inc. 27 pp.

Rio ASE. 2021b. Bradley Man Camp Dumps Project 50% Design Basis Report. Submitted Pursuant to Administrative Settlement and Order on Consent for Removal Actions (CERCLA Docket No. 10-2021-0034). Prepared for Perpetua Resources Idaho, Inc. 27 pp.

Rio ASE. 2021c. DMEA Dump Removal Project 50% Design Basis Report. Submitted Pursuant to Administrative Settlement and Order on Consent for Removal Actions (CERCLA Docket No. 10-2021-0034). Prepared for Perpetua Resources Idaho, Inc. 27 pp.

Rowe, M., D. Essig, and B. Jessup. 2003. Guide to Selection of Sediment Targets for Use in Idaho TMDLs. https://19january2017snapshot.epa.gov/sites/production/files/2015-10/documents/sediment-appendix5.pdf

Sheridan, G. J., P. K. Noske, R. K. Whipp, and N. Wijesinghe. 2006. The effect of truck traffic and road water content on sediment delivery from unpaved forest roads. Hydrologic Process. 20:1683-1699.

Spence, B., G. Lomnicky, R. Hughes, and R. P. Novitski. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp.: Corvallis, Oregon.

Stantec. 2018. 2017 Aquatics Baseline Study for the Stibnite Gold Project. Prepared for Midas Gold Idaho, Inc. April 17, 2018. 78 pp.

Stantec. 2019. 2018 Aquatics Baseline Study for the Stibnite Gold Project. Prepared for Midas Gold Idaho, Inc. 147 pp.

Stantec. 2020. 2019 Aquatics Baseline Study for the Stibnite Gold Project. Prepared for Midas Gold Idaho, Inc. April 20, 2020. 44 pp.

Stantec. 2022. Final Biological Assessment for Federally Listed Snake River Spring/Summer Chinook Salmon, Snake River Steelhead, Columbia River Bull Trout, Northern Idaho Ground Squirrel, Canada Lynx, and Federally Proposed Whitebark Pine Administrative Settlement and Order on Consent for Removal Actions (CERCLA Docket No. 10-2021-0034). January 24, 2022.

Suttle, K.B., M.E. Power, J.M. Levine, and C. McNeely. 2004. How Fine Sediment in Riverbeds Impairs Growth and Survival of Juvenile Salmonids. Ecological Applications. 14:969-974.

Tetra Tech. 2021. Reclamation and Closure Plan. Stibnite Gold Project, Valley County, Idaho. Prepared for Perpetua Resources Idaho, Inc. Boise, Idaho. October 2021. 278 pp.

Thurow, R. 1987. Completion report: Evaluation of the South Fork Salmon River steelhead trout fishery restoration program. Performed for the US Department of Interior, Fish and Wildlife Service, Lower Snake River Fish and Wildlife Compensation Plan Contract No. 14-16-0001-86505. Period covering: March 1, 1984 to February 28, 1986. Idaho Department of Fish and Game, Boise, Idaho. 154 pp.

Tierra Group International, Ltd. 2021. Stibnite Gold Project On-Site Repository. Technical Specifications (50% Submittal). Prepared for Perpetua Resources. 80 pp.

Timothy, J. 2013. Alaska Blasting Standard for the Proper Protection of Fish. Alaska Department of Fish and Game, Division of Habitat. Technical Report NO. 12-03. 11 pp.

U.S. Bureau of Reclamation. 2014. Pacific Northwest Region Resource and Technical Services Large Woody Material Risk Based Design Guidelines. September 2014. Internet website: https://www.usbr.gov/pn/fcrps/documents/lwm.pdf.

USEPA (U.S. Environmental Protection Agency) and U.S. Forest Service (Forest Service). 2021. Administrative Settlement Agreement and Order on Consent for Removal Actions, Stibnite Mine Site, and the attached Statement of Work. CERCLA Docket No. 10-2021-0034. Dated January 15, 2021.

USFS (U.S. Forest Service). 2003. Payette National Forest Land and Resource Management Plan. Intermountain Region, Payette National Forest. McCall, Idaho.

USFS. 2021. Biological assessment for the potential affects from the South Fork Salmon River restoration and access management plan to Snake River spring/summer Chinook salmon, Snake River steelhead, and Columbia River bull trout in the South Fork Salmon River section 7 watershed to Canada lynx and northern Idaho ground squirrel in the South Fork Salmon River section 7 watershed on the Krassel Ranger District, Mccall Ranger District, Payette National Forest and Boise National Forest. February 2021.

USGCRP (U.S. Global Change Research Program). 2018. Impacts, risks, and adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D. R., C. W. Avery, D. R. Easterling, K. E. Kunkel, K. L. M. Lewis, T. K. Maycock, et al. (eds.)] Washington, D.C., USA. DOI: 10.7930/NCA4.2018.

Werner, K., R. Zabel, D. Huff, and B. Burke. 2017. Ocean Conditions and Salmon Returns for 2017-2018. Memorandum to M. Tehan, NMFS West Coast Region. Northwest Fisheries Science Center, Seattle, Washington. Williams, M. 2020. Geomean data sheet with five year averages for Interior salmon and steelhead populations (UCR and MCR steelhead, Chinook, SR steelhead, sockeye, fall chinook). Communication to L. Krasnow (NMFS) from M. Williams (NOAA Affiliate, NWFSC), 2/14/2020.

Wysocki, L. E., J. W. Davidson III, M. E. Smith, S. S. Frankel, W. T. Ellison, P. M. Mazik, A. N. Popper, J. Bebak. 2007. Effects of aquaculture production noise on hearing, growth, and disease resistance of rainbow trout Oncorhynchus mykiss. Aquaculture 272: 687-697.

Zurstadt, C. 2017. Deposition of fine sediment in the South Fork Salmon River Watershed, Payette and Boise National Forest, Idaho: Statistical summary of intragravel monitoring 1977-2016, and interstitial and surface sediment monitoring 1986-2016. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 29p.

Zurstadt, C., D. Mays, and G. Harris. 2016. Deposition of Fine Sediment in the South Fork Salmon River Watershed, Payette and Boise National Forest, Idaho: Statistical Summary of Intragravel Monitoring 1977-2015, and interstitial and surface sediment monitoring 1986-2015. Unpublished report. McCall, ID: U.S. Department of Agriculture, Forest Service, Payette National Forest. 30 pp.