Wallowa Falls Hydroelectric Project

FERC Project No. P-308

Revised Study Plans - Aquatics

December 2011

Prepared by:
PacifiCorp Energy
Hydro Resources
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Portland, OR 97232

PACIFICORP ENERGY
A DIVISION OF PACIFICORP

For Public Review

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1.0 INTRODUCTION

PacifiCorp Energy (PacifiCorp) filed a Notice of Intent (NOI) and associated Pre-Application Document (PAD) to commence the Federal Energy Regulatory Commission's (FERC) Integrated Relicensing Process (ILP) of the Wallowa Falls Hydroelectric Project, FERC Project No. P-308 (Project) on February 22, 2011. As part of the FERC ILP, prospective license applicants are required to submit relevant resource study plans (18 cfr 5.11).

During compilation of the PAD, PacifiCorp found limited information concerning aquatic fish species in waters influenced by the Project and encompassed within the Project boundary. Historical data concerning aquatic species presence or absence; distribution, both spatial and temporal; and abundance was sparse. To date, the only empirical fishery data available from within Project influenced streams stems from three fish salvages of the Project tailrace channel due to de-watering during maintenance events and one truncated snorkel survey of the Project bypass.

In consideration of available information, PacifiCorp identifies two aquatic resource studies to gain information on local aquatic resources and potential impacts of the Wallowa Falls Hydroelectric Project on these resources.

Proposed studies include:

- Relative Abundance, Composition, and Spatial and Temporal Distribution of Fish Species Residing in Waters Influenced by the Project.

- Evaluation of Bull Trout use of the Project Tailrace Channel and Bypassed East Fork Wallowa River

This Study Plan is intended to fulfill 18 cfr 5.9(b) of the FERC Integrated License Process and contains the following information:

1. A description of the goals and objectives of each study proposal and the information to be obtained;
2. If applicable, an explanation of relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
3. If the requester is not a resource agency, explanation of any relevant public interest considerations in regard to the proposed study;
4. Description of existing information concerning the subject of the study proposal, and the need for additional information;
5. Explanation of any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results will inform the development of license requirements;
6. Explanation of how any proposed study methodology is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;

7. Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.

2.0 PROJECT AREA

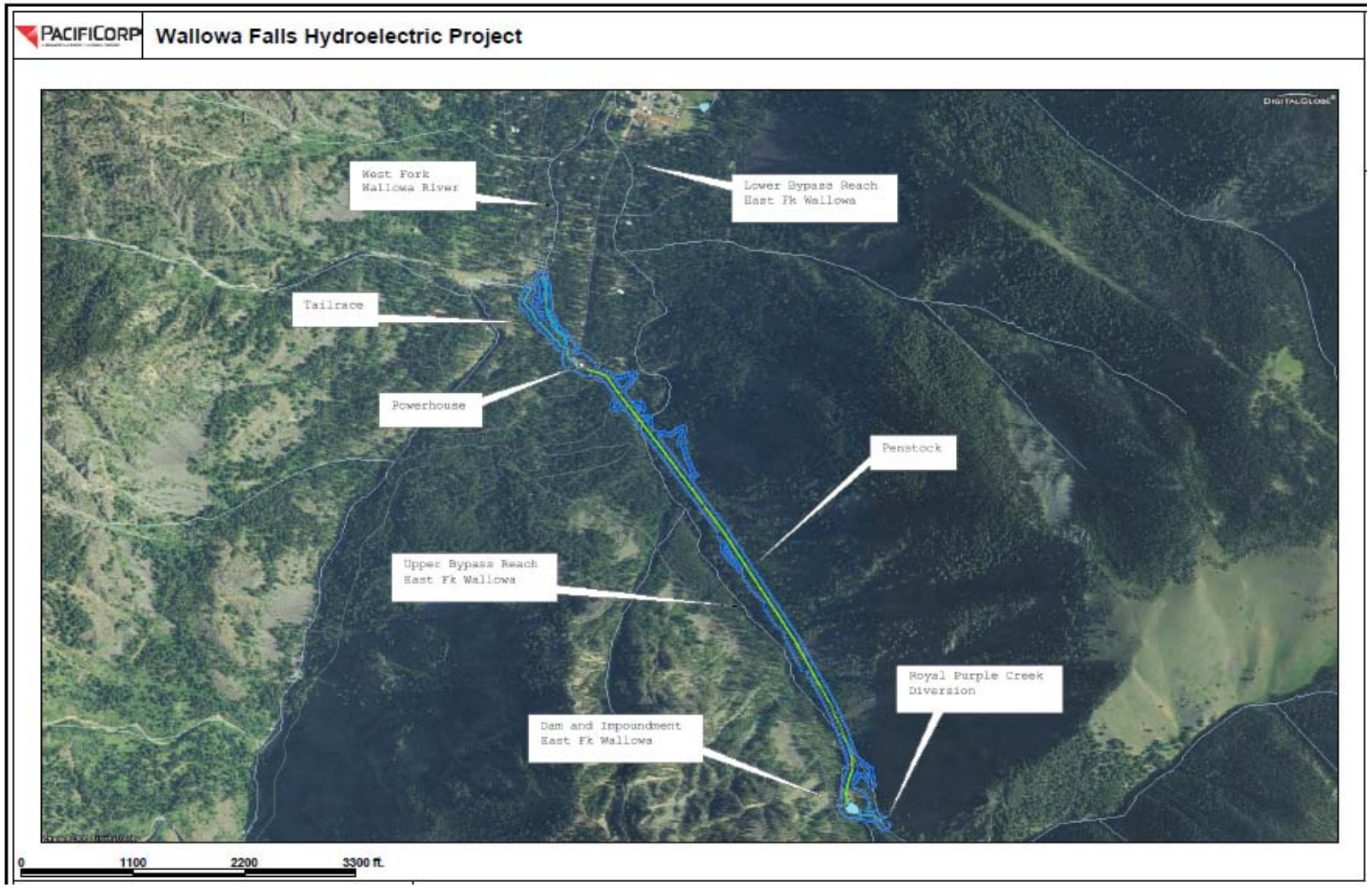
The Wallowa Falls Hydroelectric Project is located on the East Fork Wallowa River approximately 11 miles outside of the City of Joseph in Northeastern Oregon. The Project (Figure 2.0.1) reservoir/forebay lies over 1,600 meters above mean seal level and is approximately 0.2 surface acres in size. Because the Project operates as run of river, there is no measurable storage. Water diverted from the forebay travels through the flow line and penstock to the generating turbine in the Project powerhouse. Water exits the turbine and flows into an approximately 300 meters long tailrace channel that discharges into the West Fork Wallowa River. This channel has an average wetted-width of 3.1 meters and an average depth of 0.3 meter.

The Project also consists of a 0.6-meter-high, 2.8-meter-long concrete diversion dam, having a 0.3-meter-wide spillway, at elevation 1,824 meters on Royal Purple Creek which is a tributary to the East Fork Wallowa River; a 75-meter-long, 20-centimeter diameter pvc pipeline discharges flows from Royal Purple Creek into the Wallowa Falls Project forebay, 62.5 meters upstream of the larger East Fork Wallowa River diversion dam. No fish are known to inhabit Royal Purple Creek.

The bypassed portion of the East Fork Wallowa River within and near the Project boundary is approximately 2,800 meters long from the Project diversion dam to its confluence with the West Fork Wallowa River. Gradient in this reach is high, with the upper 1,600 meters averaging approximately 19 percent and the lower 1,200 meters averaging 8.5 percent. Habitat type within most of the upper reach is dominated mainly by steep bedrock, vertical waterfalls, and cascades over boulders; though the upper reaches are steep, the lower 800 meters to the confluence with the West Fork is a shallower gradient with habitat consisting of numerous riffles and pools.

Wallowa Lake and portions of the East and West Forks of the Wallowa River are listed under the Bull Trout Critical Habitat Designation Final Ruling (Federal Register, Vol. 75, No. 200 – October 2010 pgs. 63,898 – 64,070). The waterways upstream of the irrigation dam at the terminus of Wallowa Lake are listed as Essential Fish Habitat for spring Chinook and Coho under the Magnuson-Stevens Fishery Conservation and Management Act (NOAA 2008).

Figure 2.0.1. Wallowa Falls Hydroelectric Project



3.0 PROPOSED AQUATIC STUDIES IDENTIFIED IN PRE-APPLICATION DOCUMENT

3.1 Relative Abundance, Composition, and Spatial and Temporal Distribution of Fish Species Residing in Waters Influenced by the Project

3.1.1 Study Description and Objectives

Based on limited data concerning fish presence in waters within the Project boundary or waters directly influenced by Project operations, surveys are proposed to quantify current fish species composition as well as relative abundance of identified species in catch per unit of effort. Surveys will be designed to also assess if relative abundance of identified species changes spatially throughout the study streams and temporally throughout the study time-frame.

The objectives of the proposed study will be to gain a better understanding of what aquatic fish species currently inhabit waters of the Project during differing times of the year, the spatial distribution of captured species, and their relative abundance.

Specific information regarding data obtained during the proposed study will be as follows: all captured fish will be identified to genus and species, relative abundance of all captured species will be quantified in catch per unit of effort, geographic spatial distribution of all captured species will be qualified by stream of capture as well as location within the stream. Catch per unit of effort will also be employed to quantify seasonal distribution of captured aquatic fish species over the course of the seasonal surveys.

3.1.2 Resource Management Goals.

Management goals of the fishery resources in this Study Plan can be found in the USDA-Forest Service's Wallowa-Whitman National Forest Land and Resource Management Plan produced in 1990; The Oregon Department of Fish and Wildlife's Statewide Trout Management Plan produced in 1987; and the United States Fish and Wildlife Service's draft Bull Trout Recovery Plan which is currently in the finalization process.

Goals of these listed Management Plans are to conserve and protect the aquatic resources and in the case of the USDA-Forest Service's Wallowa-Whitman National Forest Land and Resource Management Plan and the Oregon Department of Fish and Wildlife's statewide trout management plan, to allow beneficial use of the resource. In the case of the United States Fish and Wildlife Service's draft Bull Trout Recovery Plan, the goal is to recover the federally listed bull trout to population numbers that allow for de-listing of the species.

3.1.3 Existing Information

Fish species known to occur by direct observation in waterways within the Project Area include wild and hatchery stock rainbow trout (*Oncorhynchus mykiss*), native and introduced kokanee (*Oncorhynchus nerka*), non-native introduced brook trout (*Salvelinus fontinalis*), and Endangered Species Act (ESA) listed bull trout (*Salvelinus confluentus*).

Limited information exists concerning current fish presence within the Project Area. Fish abundance, distribution, and species composition information currently comes mainly from three data sources:

(1) The Oregon Department of Fish and Wildlife (ODFW) annual fish propagation reports;
(2) Fish salvages of the approximately 300 meter long tailrace discharge channel immediately downstream of the Project powerhouse. Salvages were performed prior to or during de-watering events in 2009 and 2010; and,
(3) Snorkel surveys performed in 2010 within the Project tailrace and bypass reach in the East Fork Wallowa River.

According to the 2008 ODFW Propagation Annual Report, Aneroid Lake, a small highland lake five miles upstream which flows directly into the Project forebay, was most recently stocked with 4,000 rainbow trout fry in 2008 (ODFW 2008). Aneroid Lake currently is on a three-year stocking cycle with the small lake scheduled for an additional 4,000 rainbow trout fry in 2011 (Pers. Comm. Bill Knox, ODFW, September 2010). Hatchery stock rainbow trout are also annually stocked in Wallowa Lake (ODFW 2008).

Historically, Wallowa Lake supported a native stock of kokanee. The native population experienced a precipitous collapse in the early 1960's which lead to artificial supplementation of kokanee from out of basin. The lake was last stocked with kokanee in 1982. The current population is self-sustaining though genetically not comprised of the native stock (Cramer and Witty 1998). In the past, kokanee have been known to spawn in the lower gradient reaches of both the Project tailrace channel and the bypass section of the East Fork Wallowa River. This was verified during a recent survey on September 15, 2010 when PacifiCorp observed numerous adults actively constructing redds and spawning in the lower 40 meters of the Project tailrace channel and lower 200 meters of the bypass section.

Non-native introduced brook trout are found within the Project Area. Brook trout were stocked in Aneroid Lake starting in the early 1900's with the last hatchery plant occurring in the 1950's (Pers. Comm. Bill Knox, ODFW, September 2010). These fish have naturally persisted and dispersed throughout the Project Area as evidenced by observations in the bypassed East Fork Wallowa River during a September 15, 2010 snorkel survey, as well as individuals captured in the Project tailrace during fish salvages from de-watering events (Figure 3.1.1).

In 1997, ODFW released 600 bull trout ranging in size from 70 – 380 millimeters into Wallowa Lake. These fish were salvaged from a decommissioned hydroelectric plant's power canal located on Big Sheep Creek in the Imnaha River drainage. Bull trout were first observed by PacifiCorp within the Project Area on July 12, 2010, during a salvage of the Project tailrace due to a planned de-watering event. Two bull trout were captured (Figure 3.1.1) downstream of the powerhouse, prior to the channel being de-watered, and were subsequently released into the West Fork Wallowa River, per the conditions of PacifiCorp's Oregon State Fish Collection Permit (permit no.15214). During a September 15, 2010 snorkel survey, one bull trout was observed just downstream of the turbine discharge. Later during that same survey, two bull trout were observed in the bypassed section of the East Fork Wallowa River approximately 250 meters upstream from the confluence with the West Fork Wallowa River. These fish were observed paired-up near a partially completed redd.

Figure 3.1.1 illustrates the number of fish captured, by species, during salvages of the Project tailrace channel in 2009 and 2010. The channel was dewatered and salvaged for fish three times during this two-year span, once on July 20, 2009; and twice in 2010, on July 12, 2010, and August 2, 2010. The majority of fish captured were rainbow trout (91 percent) followed by brook and bull trout at 4.5 percent each respectively.

Figure 3.1.2 illustrates the size distribution of fish captured in the Project tailrace discharge channel during fish salvages in 2009 and 2010. Of the total fish captured, 77 percent were between 101 and 200 millimeters. Of the 39 rainbow trout caught to date, all but three were <200 mm. Brook trout encountered during fish salvages (2) were between 200 and 300 millimeters and captured bull trout (2) were >300 millimeters.

Figure 3.1.1. Number of fish captured by species in the Project tailrace discharge channel in 2009 and 2010 during fish salvages. Salvages were performed during planned Project de-watering events.

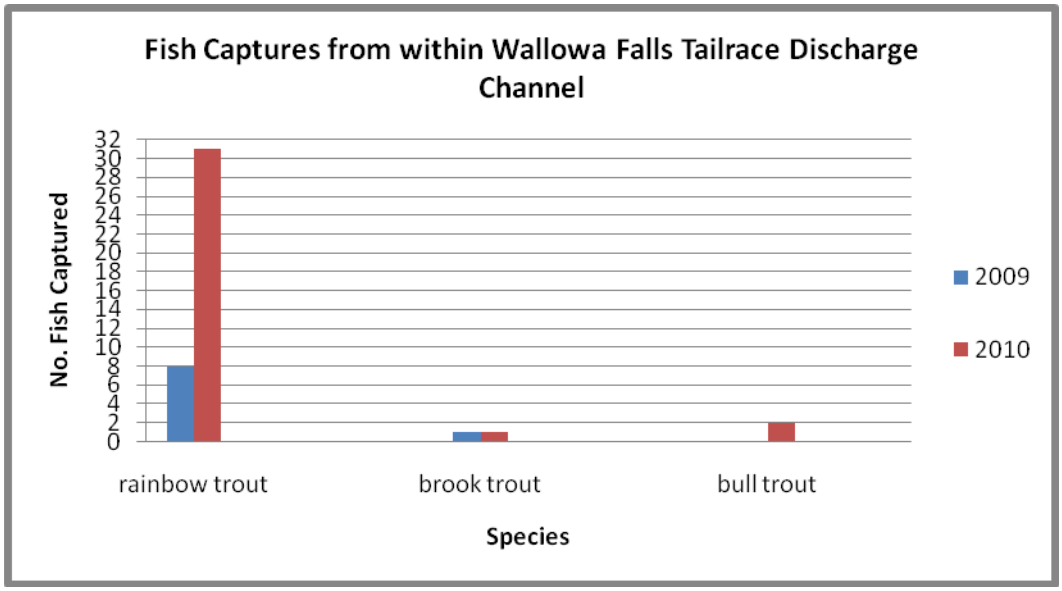
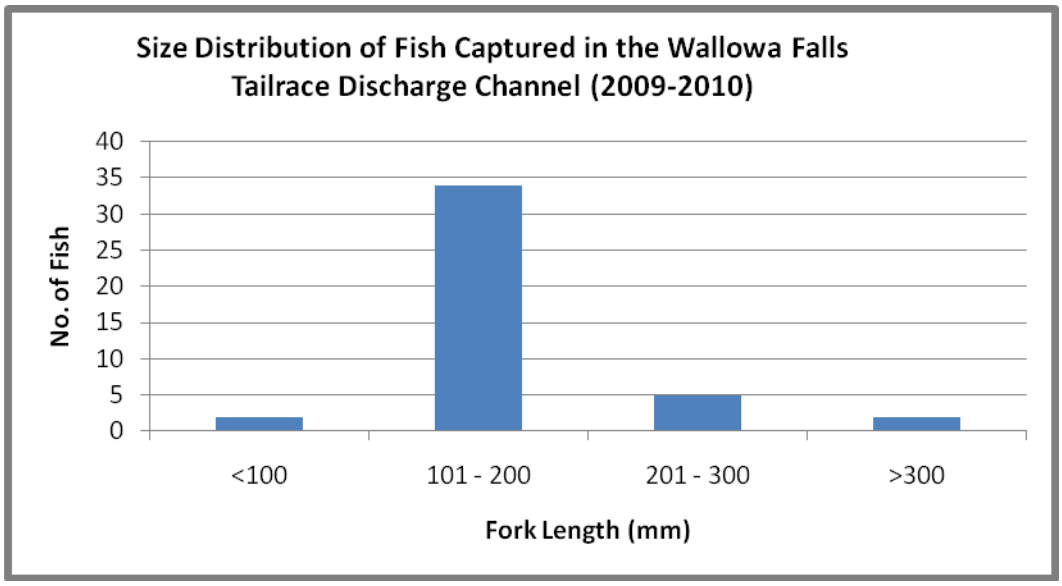


Figure 3.1.2. Size distribution of fish captured in the Project tailrace discharge channel from fish salvages during de-watering events in 2009 and 2010.



3.1.4 Nexus to Project

To the extent of the powerhouse's hydraulic capacity, the Project directly dictates the quantity of water flowing into the East Fork Wallowa River natural channel as well as the Project tailrace channel. The current FERC license requires 0.5 cubic feet per second to be routed back to the East Fork Wallowa River natural channel at the upper diversion. The Project has 16 cubic feet per second non-consumptive water right for Project operation (hydraulic capacity). Flows diverted to the powerhouse are not available to the 2,800 meter long bypass reach on the East Fork. There are no ramping requirements in the bypass reach, the only current license requirement is to maintain the minimum flow of 0.5 cubic feet per second at all times.

During periods of high water, all river flow at the diversion greater than 16.5 cubic feet per second spills over the crest of the dam and into the East Fork Wallowa River natural channel. High water typically occurs during the spring and summer snow melt-off.

In most instances, when the generator unit in the powerhouse goes off-line during an un-planned event (unit trip), the penstock head-gate remains open and penstock pressure is maintained. A needle valve will close to a forty percent open position and a deflector plate will drop to redirect the flow away from the turbine and into the draft tube. This allows approximately 6 cubic feet per second of water to continue to flow into the Project tailrace channel. There are two conditions that will initiate a generator lockout and a head-gate closure; loss of voltage to the gate control cable or a 'low penstock pressure' indication. On occasions when the head-gate closes, the tailrace channel remains watered for approximately 2.5 hours. During these emergency events, local crews walk the channel looking for stranded fish for collection and transport to the West Fork Wallowa River.

3.1.5 Study Area

The areas to be surveyed include the Project forebay, the tailrace channel, the bypass section of the East Fork Wallowa River, and the West Fork Wallowa River from the tailrace channel confluence to the confluence of the East Fork Wallowa River.

The Project (Figure 2.0.1) forebay lies over 1,600 meters above mean seal level and is approximately 0.2 surface acres in size. The depth is approximately 3 to 6 feet deep, the substrate is composed mainly of sand and gravel and the forebay has no large woody debris or structural habitat features.

The powerhouse tailrace channel is approximately 300 meters long. This channel has an average wetted-width of 3.1 meters and an average depth of 0.3 meter. The upper 250 meters of the tailrace is dominated by high water velocities over large cobble. In the lower 50 meters above the confluence with the West Fork Wallowa River, gradient decreases and the substrate consists mainly of sand and gravel.

The bypassed portion of the East Fork Wallowa River within and near the Project boundary is approximately 2,800 meters long from the Project diversion dam to its confluence with the West Fork Wallowa River. Gradient in this reach is high, with the upper 1,600 meters averaging approximately 19 percent and the lower 1,200 meters averaging 8.5 percent. Habitat type within most of the upper reach is dominated mainly by steep bedrock, vertical waterfalls, and cascades over boulders; though the upper reaches are steep, the lower 800 meters to the confluence with the West Fork is a shallower gradient with habitat consisting of numerous riffles and pools.

The West Fork Wallowa River section between the confluence with the Project tailrace channel and the confluence with the East Fork Wallowa River is approximately 1,200 meters in length with an average wetted-width in this section of 17 m. The West Fork Wallowa River is a high-energy, high velocity river and the substrate in this section is dominated by large boulders and cobble.

3.1.6 Methods

Seasonal electrofishing surveys will be performed of the entire natural channel of the East Fork Wallowa River, along the margins of the West Fork Wallowa River between the confluence of the Project tailrace and the confluence with the East Fork Wallowa River, and the entire Project tailrace channel. Triple-pass depletion electrofishing will be employed in order to obtain an accurate count of fish residing in survey streams during the time of the survey (where feasible). Triple-pass depletion will only be employed in the Project tailrace channel and the lower gradient portion of the East Fork Wallowa River (approximately 800 meters). High gradient areas will be single-pass electrofished and only where deemed safe and accessible. The margins of the West Fork Wallowa River survey section will only be single-pass electrofished in an upstream manner.

Lower gradient portions of the East Fork Wallowa River natural channel and the entire tailrace channel will be broken into 100 meter sections. Using block-nets, each section will be depletion electrofished using a three-pass method with a Smith-Root® model LR-24 backpack

electrofisher. During each electrofishing pass, all captured fish will be quantified to species, measured to their caudal fork and then released back to the stream below the downstream block-net so as to avoid recapture during the next electrofishing pass. Surveys will start at the downstream end and progress upstream. If surveys are anticipated to take more than one day, a block net will be left in place to keep downstream fish from moving into un-surveyed areas (Nielsen/Johnson 1983).

In addition to the recording of identified standard biological data for captured species during electro-fishing surveys, the Wallowa-Whitman National Forest and Oregon Department of Fish and Wildlife requested that condition factors also be recorded from fish captured in the East Fork Wallowa River bypass reach. To that end, it was agreed among the stakeholders that condition factor would be recorded for a sub-sample of captured fish by species from the bypass reach. Condition factor will be recorded for the first 25 specimens collected per species in the bypass reach only. After the first 25 specimens per species are collected, condition factor will then be recorded from a 10 percent sub-sample per species. Condition factor will be calculated by comparing recorded length and weight as described below.

Condition factor (K-factor) is a simple weight-length relation that is generally thought to be one of several indices of healthy fish (Nielson and Johnson 1983). T.W. Fulton (1902) established the weight-length relation equation that will be used to estimate K-factors in this study.

The Fulton-type equation to be used is as follows;

K= (W/L^3)*X

Where;

K = metric condition factor

W = weight in grams

L = length in millimeters

X = Arbitrary scaling constant (for the purposes of this study 10^5 will be used)

K-factor sub-sample fish will be weighed individually while in water. Small fish (<1,000 grams) will be weighed to the nearest gram using a portable scale. To weigh small fish, a container holding water will be placed on the scale and allowed to tare to 0, the captured fish will then be placed in the container and the weight recorded. Large fish (>1,000 grams) will be weighed to the nearest gram by means of a hand-held scale. To weigh large fish, an 18 liter bucket will be partially filled with water, attached to the hand-held scale, and allowed to tare to 0; the captured fish will then be placed in the bucket and the weight recorded.

If bull trout are encountered during any electrofishing survey, a 1 square centimeter fin-clip tissue sample (as recommended by the USFWS Abernathy Conservation Genetics Lab standard protocol) will be taken from each fish for future genetic analysis. If the captured bull trout is >120 millimeters in fork length (FL), a uniquely coded 13 millimeter half-duplex (HDX) Passive Integrated Transponder (PIT) tag will be inserted into the dorsal sinus for identification in case

of future recapture. The PIT tag will be inserted using a tagging syringe just anterior to the dorsal sinus and the tag will then be gently pushed toward the caudal peduncle into the sinus. This procedure has been occurring for all maiden captured bull trout on the Lewis River in Southwest Washington since 2002 with no known tag mortalities and little to no tag loss (PacifiCorp Energy 2010).

All electrofishing activities will follow protocols as set forth in the National Marine Fisheries Service Backpack Electrofishing Guidelines (NMFS 2000). Generally, the electrofisher will be set to un-pulsed direct current (DC) at the lowest possible setting to still allow capture of fish. Care will be taken during electrofishing surveys to stay away from actively spawning fish and newly constructed redds.

Along with the electrofishing surveys in the East Fork Wallowa River West Fork Wallowa River and downstream of the Project powerhouse, seining surveys of the Project reservoir/forebay will also occur during the same seasonal time-frame.

Once in June, July, and October the Project impoundment will be sampled with a 2 meters deep, 30 meters long stick seine with 6 millimeters mesh. Given the small size of the impoundment (0.2 surface acres) it is anticipated that the entire area will be sampled. Fish will be collected and held in a live car until sampling is completed. All captured fish will be quantified to species and measured to the caudal fork prior to release.

3.1.7 Progress Reporting

A study progress meeting will be held in October of 2012. A study progress report (draft Technical Report) will be made available for 30-day stakeholder review and comment in November, 2012. Stakeholder comments will be addressed in the initial study report. The initial study report will be made available for review in mid January, 2013; followed by an initial study report meeting in late January, 2013. Depending on the success of proposed surveys and the quality of data collected, surveys may be extended to encompass a second year. If a second year of data collection is warranted, a second year progress report (updated draft Technical Report) will be made available for 30-day stakeholder review and comment in November, 2013. Stakeholder comments will be addressed in the final Technical Report.

3.1.8 Final Product

A final Technical Report will be made available for stakeholder review in June, 2013 assuming one season of data collection is sufficient. If a second year of data collection is warranted, the final Technical Report will be made available in January, 2014. The final Technical Report will include detailed specific information obtained during surveys concerning aquatic species composition, relative abundance, and spatial and temporal distribution in Project influenced waters.

3.1.9 Schedule

Table 3.1-1 is the proposed schedule for conducting surveys to document fish species composition, relative abundance, and spatial and temporal distribution in Project influenced waters.

Table 3.1-1. Proposed schedule for conducting surveys to document fish species composition, relative abundance, and spatial and temporal distribution in Project influenced waters.

Study Component	Completion Date
Electrofish East Fork Wallowa River from confluence with West Fork Wallowa River to Project diversion, Project tailrace Channel, and section of West Fork Wallowa River between the confluence of the Project tailrace channel and the confluence with the East Fork Wallowa River	January 2012 (if feasible)
Electrofish East Fork Wallowa River from confluence with West Fork Wallowa River to Project diversion, Project tailrace Channel, and section of West Fork Wallowa River between the confluence of the Project tailrace channel and the confluence with the East Fork Wallowa River	May 2012
Electrofish East Fork Wallowa River from confluence with West Fork Wallowa River to Project diversion, Project tailrace Channel, and section of West Fork Wallowa River between the confluence of the Project tailrace channel and the confluence with the East Fork Wallowa River	July 2012
Electrofish East Fork Wallowa River from confluence with West Fork Wallowa River to Project diversion, Project tailrace Channel, and section of West Fork Wallowa River between the confluence of the Project tailrace channel and the confluence with the East Fork Wallowa River	October 2012
Seine Project forebay	May 2012 (if feasible)
Seine Project forebay	July 2012
Seine Project forebay	October 2012
Study Progress Meeting	October 2012
Study Progress Report	November 2012
Initial Study Report filed with FERC	January 2013

Study Component	Completion Date
Initial Study Report Meeting	January 2013
Meeting Summary filed with FERC	February 2013
Final Technical Report*	June 2013
Updated Study Plan for second year**	March 2013
Second year of data collection**	April-October 2013
Second year Study Progress Report**	November 2013
Final Technical Report (Updated Study Report) filed with FERC**	January 2014
Final Technical Report (Updated Study Report) Meeting**	January 2014
Meeting Summary filed with FERC**	February 2014

** Assumes one season of data collection.*
*** If determined necessary by PacifiCorp and stakeholders during initial study report meeting.*

3.1.10 Level of Effort and Cost

Table 3.1-2 below is an estimate of the cost associated with implementing and completing one year of proposed electrofishing and seining surveys, and reporting. Labor to perform surveys is standardized at $95 per hour/$760 per day as well as a $200 per diem. Equipment costs/rentals are estimates.

Table 3.1-2 Estimate of the cost associated with implementing and completing one year of proposed electrofishing and seining surveys, and reporting.

Activity	Labor Cost	Per-Diem	Equipment Cost	Total Cost
Efish in spring. Equipment rental-Electrofisher, dipnets	$6,080	$1,600	$400	$8,080
Efish in summer. Equipment rental-Electrofisher, dipnets	$6,080	$1,600	$400	$8,080
Efish in fall. Equipment rental-Electrofisher, dipnets	$6,080	$1,600	$400	$8,080
Efish in winter. Equipment rental-Electrofisher, dipnets	$6,080	$1,600	$400	$8,080
Seine Project Forebay in spring. Equipment rental-Seine	$1,520	$400	$100	$2,020

Activity	Labor Cost	Per-Diem	Equipment Cost	Total Cost
Seine Project Forebay in summer. Equipment rental- Seine	$1,520	$400	$100	$2,020
Seine Project Forebay in fall. Equipment rental- Seine	$1,520	$400	$100	$2,020
Reporting	$3,800			$3,800
Total	$32,680	$7,600	$1,900	**$42,180**

The estimated total to perform surveys for fishery relative abundance, composition, and spatial and temporal distribution in waters influenced by the Project is $42,180.

3.2 Evaluation of Bull Trout use of the Project Tailrace Channel and Bypassed East Fork Wallowa River

3.2.1 Study Description and Objectives

The following study is proposed to gain a better understanding of the current Wallowa River bull trout population upstream of Wallowa Lake, specifically with concern to the Project tailrace and bypassed East fork Wallowa River. It is anticipated this study will shed light on the current distribution of previously captured bull trout in waters around the Project; specifically, spatial and temporal distribution within the East Fork Wallowa River natural channel and Project tailrace. Much of this proposed Study Plan is dependent upon the ability to capture and mark a portion of the bull trout population residing in and around Wallowa Lake upstream of the lake outlet.

3.2.2 Resource Management Goals

Management goals concerning bull trout in the coterminous United States can be found in the USFWS 2004 draft Recovery Plan. The overarching goal of the draft Recovery Plan is to recover Endangered Species Act listed bull trout populations to healthy, sustainable levels so that the species can be de-listed. The Final Recovery Plan is currently being developed.

3.2.3 Existing Information

In 1997, ODFW released 600 bull trout ranging in size from 70 – 380 millimeters into Wallowa Lake. These fish were salvaged from a decommissioned hydroelectric plant's power canal located on Big Sheep Creek in the Imnaha River drainage. Bull trout were first observed by PacifiCorp within the Project Area on July 12, 2010, during a salvage of the Project tailrace due to a planned de-watering event. Two bull trout were captured (Figure 3.1.1) downstream of the powerhouse, prior to the channel being de-watered, and were subsequently released into the West Fork Wallowa River, per the conditions of PacifiCorp's Oregon State Fish Collection Permit (permit no.15214). During a September 15, 2010 snorkel survey, one bull trout was observed just downstream of the turbine discharge. Later during that same survey, two bull trout

were observed in the bypassed section of the East Fork Wallowa River approximately 250 meters upstream from the confluence with the West Fork Wallowa River. These fish were observed paired-up near a partially completed redd.

3.2.4 Nexus to Project

To the extent of the powerhouse's hydraulic capacity, the Project directly dictates the quantity of water flowing into the East Fork Wallowa River natural channel as well as the Project tailrace channel. The current FERC license requires 0.5 cubic feet per second to be routed back to the East Fork Wallowa River natural channel at the upper diversion. The Project has a 16 cubic feet per second non-consumptive water right for Project operation (hydraulic capacity). Flows diverted to the powerhouse are not available to the 2,800 meter long bypass reach on the East Fork. There are no ramping requirements in the bypass reach, the only current license requirement is to maintain the minimum flow of 0.5 cubic feet per second at all times.

During periods of high water, all river flow at the diversion greater than 16.5 cubic feet per second spills over the crest of the dam and into the East Fork Wallowa River natural channel. High water typically occurs during the spring and summer snow melt-off.

In most instances, when the generator unit in the powerhouse goes off-line during an un-planned event (unit trip), the penstock head-gate remains open and penstock pressure is maintained. A needle valve will close to a forty percent open position and a deflector plate will drop to redirect the flow away from the turbine and into the draft tube. This allows approximately 6 cubic feet per second of water to continue to flow into the Project tailrace channel. There are two conditions that will initiate a generator lockout and a head-gate closure; loss of voltage to the gate control cable or a 'low penstock pressure' indication. On occasions when the head-gate closes, the tailrace channel remains watered for approximately 2.5 hours. During these emergency events, local crews walk the channel looking for stranded fish for collection and transport to the West Fork Wallowa River.

3.2.5 Study Area

The areas to be surveyed include the Project tailrace channel, the bypass section of the East Fork Wallowa River, the West Fork Wallowa River from the tailrace channel confluence to the confluence of the East Fork Wallowa River, and the head of Wallowa Lake at the confluence with the West Fork Wallowa River.

The powerhouse tailrace channel is approximately 300 meters long. This channel has an average wetted-width of 3.1 meters and an average depth of 0.3 meter. The upper 250 meters of the tailrace is dominated by high water velocities over large cobble. In the lower 50 meters above the confluence with the West Fork Wallowa River, gradient decreases and the substrate consists mainly of sand and gravel.

The bypassed portion of the East Fork Wallowa River within and near the Project boundary is approximately 2,800 meters long from the Project diversion dam to its confluence with the West Fork Wallowa River. Gradient in this reach is high, with the upper 1,600 meters averaging approximately 19 percent and the lower 1,200 meters averaging 8.5 percent. Habitat type within

most of the upper reach is dominated mainly by steep bedrock, vertical waterfalls, and cascades over boulders; though the upper reaches are steep, the lower 800 meters to the confluence with the West Fork is a shallower gradient with habitat consisting of numerous riffles and pools.

The West Fork Wallowa River section between the confluence with the Project tailrace channel and the confluence with the East Fork Wallowa River is approximately 1,200 meters in length with an average wetted-width in this section of 17 meters. The West Fork Wallowa River is a high-energy, high velocity river and the substrate in this section is dominated by large boulders and cobble.

The head of Wallowa Lake at the confluence with the West Fork Wallowa River is a typical wide fluvial floodplain with numerous side-channels feeding into the lake. The substrate is nearly completely composed of sand and depending on lake elevations, the depth drops off quickly.

3.2.6 Methods

In summary, bull trout captured during seasonal electrofishing surveys proposed in Section 3.1 of this Aquatic Study Plan as well as during proposed targeted bull trout collection efforts at the head of Wallowa Lake will be marked with HDX PIT tags and then released. Tagged fish within the Project boundary will be monitored using HDX PIT tag antenna arrays constructed within the East Fork Wallowa River bypass channel and Project tailrace.

To capture bull trout outside of proposed electrofishing surveys identified in Section 3.1 of this Plan, tangle nets consisting of dyed green 6# monofilament, with depths of approximately 2 meters, varying lengths of 25 – 40 meters, and varying mesh sizes of 2.5 – 7.5 centimeters stretch will be deployed with boats in and around the head of Wallowa Lake near the confluence of the West Fork Wallowa River in June and July. Nets will be set and allowed to passively fish unattended for up to 15 minutes. Any bull trout entangled in the net will be retrieved and placed in a live well. Opportunistic angling will also be incorporated into the capture survey events.

All captured bull trout will be measured to their caudal fork and a 1 square centimeter fin-clip tissue sample (as recommended by the USFWS Abernathy Conservation Genetics Lab standard protocol) will be taken from the upper lobe of the caudal fin from each individual for future genetic analysis. Captured bull trout >120 millimeters in fork length, will be tagged with a uniquely coded 13 millimeters HDX PIT tag in the dorsal sinus for identification in case of interrogation at any PIT antenna array. The PIT tag will be inserted, using a tagging syringe, just anterior to the dorsal sinus with the tag being gently pushed toward the caudal peduncle into the sinus.

Due to the greater read-range, flexible antenna construction scenarios, lower power consumption, and more affordable cost, HDX systems will be utilized for migration timing and distribution. To interrogate previously tagged bull trout that volitionally move past PIT antenna arrays, stream-width HDX PIT tag antennae will be placed in as yet to be identified areas of the Project tailrace channel and the bypass reach in the East Fork Wallowa River based on a field site assessment. Due to the size, high water velocity, and large bank full width size, the West Fork Wallowa River will not have a PIT tag antenna. Once general locations for antenna placement

are finalized, antennae will be specifically placed in shallow areas of each identified location. Per the manufacturer, 13 millimeters HDX PIT tags have a nominal read-range of 26 inches making shallow stream areas more conducive to higher detection efficiencies. The higher water velocities of shallow riffles also facilitate better fish movement through/past the antenna area.

In order to determine directionality of fish movement, each PIT array will consist of two antennae multiplexed (synchronized) and spaced approximately two meters apart. Each antenna will be comprised of a rubber-coated 1/0-gauge welding cable looped along the stream bottom (flat-plate design) starting from one stream bank, spanning the entire wetted-width of the stream along the stream bottom to the opposite bank, and then along the stream bottom back to the original starting point creating a large flattened oval shape. Each 1/0-gauge copper welding cable will be stepped down to 10-gauge copper speaker wire which will then be connected to an Oregon RFID® RI-Acc-008B antenna tuner unit. Copper twinax will then connect each tuner unit to an Oregon RFID® RI-RFM-008 reader board and data logger. Where feasible, antennae will be hooked up to electricity on-site which will then be passed through a 110-volt AC to 12-volt DC converter for continuous power. Where no grid electricity is available, antennas will be powered by 12-volt deep-cycle marine batteries which will require changing every 10 days. Once antennas are placed in the study streams and powered up, they will remain in operation during the entire study time-frame (spring – early winter, 2012) depending on conditions.

3.2.7 Progress Reporting

A study progress meeting will be held in October of 2012. A study progress report (draft Technical Report) will be made available for 30 day stakeholder review and comment in November, 2012. Stakeholder comments will be addressed in the initial study report. The initial study report will be made available for review in mid January, 2013; followed by an initial study report meeting in late January, 2013. Depending on the success of proposed surveys and the quality of data collected, surveys may be extended to encompass a second year. If a second year of data collection is warranted, a second year progress report (updated draft Technical Report) will be made available for 30 day stakeholder review and comment in November, 2013. Stakeholder comments will be addressed in the final Technical Report.

3.2.8 Final Product

A final Technical Report will be made available for stakeholder review in June, 2013 assuming one season of data collection is sufficient. If a second year of data collection is warranted, the final Technical Report will be made available in January, 2014. The Final Technical Report will include specific capture and migration information obtained during study activities.

3.2.9 Schedule

Table 3.2-1 below details the schedule to study bull trout migration and timing patterns within the Project tailrace and bypassed East Fork Wallowa River.

Table 3.2-1 Schedule to study bull trout migration and timing patterns within the Project tailrace and bypassed East Fork Wallowa River.

Study Component	Completion Date
Identify PIT antenna array locations	March-May 2012
Collect and tag bull trout	May-August 2012
Construct and install instream PIT tag antenna arrays	June-July 2012
Monitor PIT tag antenna arrays	May-December 2012
Study Progress Meeting	October 2012
Study Progress Report	November 2012
Initial Study Report filed with FERC	January 2013
Initial Study Report Meeting	January 2013
Meeting Summary filed with FERC	February 2013
Final Technical Report*	June 2013
Updated Study Plan for second year**	March 2013
Second year of data collection**	April-October 2013
Second year Study Progress Report**	November 2013
Final Technical Report (Updated Study Report) filed with FERC**	January 2014
Final Technical Report (Updated Study Report) Meeting**	January 2014
Meeting Summary filed with FERC**	February 2014

** Assumes one season of data collection.*

*** If determined necessary by PacifiCorp and stakeholders during initial study report meeting.*

3.2.10 Level of Effort and Cost

Table 3.2-2 below is an estimate of the cost associated with implementing and completing one year of collecting and tagging bull trout and operating half-duplex PIT tag antennas in and around waters of the Project. Labor to perform bull trout collection and tagging efforts as well as PIT tag antenna construction and download is standardized at $95 per hour/$760 per day as well as an additional $200 per diem. Equipment costs are estimates.

Table 3.2-2 Estimate of the cost associated with implementing and completing one year of collecting and tagging bull trout and operating half-duplex PIT tag antennas in and around waters of the Project.

Activity	Labor Cost	Per Diem	Equipment Cost	Total Cost
Collect and tag bull trout at the head of Wallowa Lake	$12,160	$3,200		$15,360
Construct three HDX antennas in Project tailrace and bypass reach	$3,040	$800		$3,840
Purchase three multiplexers and 50 HDX PIT tags			$15,150	$15,150
Purchase Joboxes, batteries, 1/0 cable			$3,250	$3,250
Download PIT tag readers and change batteries	$18,240 (assuming 4hrs per day at $95 per hour)			$18,240
Reporting	$3,800			$3,800
Total	$37,240	$4,000	$18,400	**$59,640**

The estimated total to collect and tag bull trout and construct and operate three half-duplex PIT tag antennas in waters influenced by the Project is $59,640.

3.3 Relative Abundance and Composition of Macroinvertebrate Species Residing in Waters in and around the Project

3.3.1 Study Description and Objectives

The following study is proposed to gain an understanding of the current aquatic macroinvertebrate species occupying the East Fork Wallowa River above the Project forebay and in the Project bypass reach. This study will provide information on the composition of aquatic macroinvertebrates in the study stream sections as well as relative abundance of identified species in catch per unit of effort (CPUE).

3.3.2 Resource Management Goals

Not applicable

3.3.3 Existing Information

Currently, no known data exists concerning aquatic macroinvertebrates residing within the Wallowa Falls Hydroelectric Project area.

3.3.4 Nexus to Project

The Project directly dictates the quantity of water flowing into the East Fork Wallowa River natural channel as well as the project tailrace channel. The current FERC license requires 0.5 cubic feet per second (cfs) to be routed back to the East Fork Wallowa River natural channel at the upper diversion. The project has a 16 cfs non-consumptive water right for project operation. Flows diverted to the powerhouse are not available to the 2,800 meter long bypass reach on the East Fork. There are no ramping requirements in the bypass reach, the only current license requirement is to maintain the minimum flow of 0.5 cfs at all times.

During periods of high water, all river flow at the diversion over 16.5 cfs spills over the crest of the dam and into the East Fork Wallowa River natural channel. High water typically occurs during the spring and summer snow melt-off.

3.3.5 Study Area

The areas to be surveyed include the East Fork Wallowa River above the Project forebay and the bypass section of the East Fork Wallowa River.

The bypassed portion of the East Fork Wallowa River within and near the Project boundary is approximately 2,800 m long from the Project diversion dam to its confluence with the West Fork Wallowa River. Gradient in this reach is high, with the upper 1,600 m averaging approximately 19 percent and the lower 1,200 m averaging 8.5 percent. Habitat type within most of the upper reach is dominated mainly by steep bedrock, vertical waterfalls, and cascades over boulders; though the upper reaches are steep, the lower 800 m to the confluence with the West Fork is a shallower gradient with habitat consisting of numerous riffles and pools.

3.3.6 Methods

A Surber Sampler® will be used to obtain a standard sample of aquatic macroinvertebrates residing at specified representative riffle locations within the study area. Standard protocols when using a Surber Sampler® will be employed in order to obtain a consistent sample of macroinvertebrates from each sample site (Surber 1936). A representative riffle habitat type will be sampled once in September 2012 at the following three locations of the East Fork Wallowa River; 1) in the East Fork Wallowa River above the Project forebay, 2) in the high gradient portion of the bypass reach, 3) in the low gradient portion of the bypass reach near its confluence with the West Fork Wallowa River.

To remove water, large pieces of gravel and detrital material from the macroinvertebrate sample, the contents of the Surber Sampler® collection cup will be filtered with a 500 micron mesh

sieve. The sample will then be placed in a bottle and preserved with formalin for later lab analysis.

Each sample will be sent to the Aquatic Biology Associates lab in Corvallis, OR for analysis. Analysis of each sample will consist of identifying all macroinvertebrate species present in each sample to Order as well as enumerating all macroinvertebrates within each sample. In the event of a very large sample size, a subsample will be counted and extrapolated for an estimate of the total.

3.3.7 Progress Reporting

A study progress meeting will be held in October of 2012. A study progress report (draft Technical Report) will be made available for 30 day stakeholder review and comment in November, 2012. Stakeholder comments will be addressed in the initial study report. The initial study report will be made available for review in mid January, 2013; followed by an initial study report meeting in late January, 2013. Depending on the success of proposed surveys and the quality of data collected, surveys may be extended to encompass a second year. If a second year of data collection is warranted, a second year progress report (updated draft Technical Report) will be made available for 30 day stakeholder review and comment in November, 2013. Stakeholder comments will be addressed in the final Technical Report.

3.3.8 Final Product

A Final Report detailing specific species composition and relative abundance information obtained during study activities will be distributed for comment after study completion.

3.3.9 Schedule

Activity	Periodicity
Macroinvertebrate sample gathered from each established sample site	September 2012

3.3.10 Level of Effort and Cost

Table 3.3-1 below is an estimate of the cost associated with implementing and completing a one-time rapid bio-assessment for macroinvertebrates from the identified sampling sites in September 2012. Labor to collect aquatic macroinvertebrate samples is standardized at $95 per hour/$760 per day as well as an additional $200 per diem. Equipment and lab analysis costs are approximate.

Table 3.3-1. Estimate of the cost associated with implementing and completing a one-time rapid bio-assessment for macroinvertebrates from the identified sampling sites in September 2012.

Task	# of Days	# of Surveyors	Labor Cost	Equipment Cost	Total Cost
Collect aquatic macroinvertebrate samples	1	2	$1,920		$1,920
Purchase Surber Sampler				$400	$400
Lab analysis of aquatic macroinvertebrate samples by Aquatic Biology Associates @ $225 per sample			$675		$675

The estimated total to collect and analyze aquatic macroinvertebrate samples from waters in and around the Project is $2,995.

5.0 REFERENCES

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APPENDIX A

STUDY PLAN CRITERIA

18 CFR Section 5.9(b)

Any information or study request must contain the following:

1. Describe the goals and objectives of each study proposal and the information to be obtained;

2. If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;

3. If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

4. Describe existing information concerning the subject of the study proposal, and the need for additional information;

5. Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;

6. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

7. Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.