Icicle Creek Boulder Field Passage Design

14th Round Funding Cycle
July 12th, 2013

Trout Unlimited-Washington Water Project
103 Palouse Street #14, Wenatchee, WA 98801
Jason M Hatch

Anticipated Request - SRFB:	$179,000
Anticipated Request - Tributary Committee:	$0
Anticipated Total Request for Proposal:	**$179,000**
Anticipated Other Funding/Contributions/Matches:	Design-only project
Anticipated TOTAL Project Budget:	**$179,000**

Trout Unlimited – Washington Water Project Icicle Creek Boulder Field Passage Design *Full Proposal Project Checklist / Table of Contents*		
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✓	**Other / Deliverables:** Completed *Icicle Creek Boulder Field Fish Passage Assessment*, a deliverable from the first phase of this project.	Attached separately in PRISM due to file size.

2013 Project Proposal for Planning Projects (Assessment, Design, and Study) and Combination Planning and Acquisition Projects, Excluding Barrier Inventories

Please respond to each question individually – do not summarize your answers collectively in essay format. Local citizen and technical advisory groups will use this information to evaluate your project. **Limit your response to ten pages (single-sided)** You may delete the italicized portion of the questions and inapplicable supplemental questions to shorten the proposal).

RCO *Manual 18, Salmon Recovery Grants* section and appendix references are available at www.rco.wa.gov/doc_pages/manuals_by_number.shtml.

Submit this proposal as a PRISM attachment titled "Project Proposal."

NOTE: **Sponsors of barrier inventory projects should NOT fill out this proposal.** They should instead use the Barrier Inventory Project Proposal.

1. **Problem Statement**

   Provide an overview of fish resources, current habitat conditions, site or reach conditions, gaps in knowledge, and other key salmon recovery problem(s) in the watershed that this project is intended to address.

Icicle Creek, an Upper Columbia Regional Technical Team (RTT) Priority 2 watershed, is the largest tributary of the Wenatchee River subbasin, contributing 20% of late season flows (Andonaegui 2001). Stream conditions, floodplain connectivity and riparian habitat below the wilderness boundary, have been impacted by road construction, ~~c~~campgrounds, timber harvest, private development, fish passage impediments and water withdrawals by irrigation districts, the city of Leavenworth, the Leavenworth National Fish Hatchery (Leavenworth NFH) and private parties. (Andonaegui, 2001; Berg and Lowman, 2001).

The RTT ~~has~~ identified assessment of passage at the Icicle Creek boulder field (RM 5.6) as a priority action (RTT Biological Strategy Priorities - 2013), as well as reconfiguring the diversions of the Icicle Peshastin Irrigation District and the city of Leavenworth. National Oceanic and Atmospheric Administration (NOAA) ~~NOAA Fisheries~~ cites "Evaluate fish passage at the boulder field in Icicle Creek", as a priority Research and Monitoring Action in the Upper Columbia Spring Chinook and Steelhead Recovery Plan (2007). There are more than ~~26~~ 23 main--stem miles of potential fish habitat available above the boulder field, ~~plus~~in addition to Eightmile, Jack and French Creeks.~~,~~ Ecosystem Diagnosis and Treatment (EDT) and Interior Columbia Technical Review Team (ICTRT)RT intrinsic potential models predict very large increases in capacity for steelhead with access to the upper Icicle.

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Based on this prioritization, Trout Unlimited-Washington Water Project (~~TU~~TU-WWP) secured funding and completed ~~to purse~~ a fish passage~~n~~ assessment ~~of fish passage~~ from ~~at~~ the ~~Boulder~~ boulder ~~Field~~ field to~~and~~ the irrigation diversion dam, which ~~identified~~assessed ~~would identify~~investigation of ~~the~~ the extent of anthropogenic influence from road~~/ and~~ canal construction~~. The assessment also~~and and ~~developed~~included ~~identification of~~ several passage alternatives with conceptual designs. Migratory adult steelhead and bull trout were identified as the target species for this study by regional fisheries experts with WA Department of Fish and Wildlife (WDFW) and US Fish and Wildlife Service (USFWS), at flow targets of 200-1000 cfs. See chart below:

Table 1 - Target species selection and associated environmental attributes

Target Species	Target Life History	Range of Mean Daily flows[1] (cfs) during Migration Period	Design Flows[2] (cfs)	Adult Peak Migration Period	Target Fish size (in.)	Life history Significance
bull trout	Fluvial	175-900	20 - 1000	Aug - Sept	12 to 17	Spawning migration, foraging, distribution
steelhead	anadromous 1 and 2 salt[3]	225 – 1600	100 - 1200	Apr – May	25 to 31	Spawning migration, kelt movements

[1] Data used for the analysis was mean daily flows from April 1, 1997 to September 30, 2011

[2] Based on probable range of flows that adult migrants could successfully pass through the boulder field given gradient and discharge conditions where velocity would not impede fish passage.

[3] Number of years spent in sea, influences size of fish.

Source: *Dominguez, L., P. Powers, E. S. Toth, and S. Blanton. 2013. Icicle Creek Boulder Field Fish Passage Assessment. Prepared for Trout Unlimited-Washington Water Project. Wenatchee, WA.*

While migratory bull trout have been observed above the key boulder (aka Anchor Boulder)~~, and~~ there ~~have been anecdotal steelhead observations above the boulder field, uncertainty remains as to historic~~has been no documented passage of either steelhead or bull trout above the Anchor Boulder. ~~However, T~~~~there~~There are resident populations of bull trout and rainbow trout above the boulder field.

The *Icicle Creek Boulder Field Fish Passage Assessment* (Dominquez, L, 2013) ~~Consultants~~ identified two primary areas of fish passage impediment in the 2,700 foot study reach~~: ., which is from the Snow Creek trail access bridge to above the Icicle Peshastin Irrigation District Diversion Dam, approximately 2700 feet. In order to evaluate done withthe reach the consultants used a fish energetics model based on channel geometry, flow analysis and fish swimming and leaping ability. Results determined that o~~O~~~~o~~ne large boulder~~,~~ (the "Anchor Boulder") and the material that collects behind it, ~~is as~~ is the primary impediment during the majority of flows~~. At the Anchor(Boulder there is~~ with ~~a 25~~ 21 foot vertical drop ~~withand~~and ~~30~~% gradient) and~~.~~ t~~T~~he second~~ary~~ impediment is the upstream irrigation diversion dam during~~at~~ low~~-~~flows.

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~~The *Icicle Creek Boulder Field Fish Passage Assessment* (Dominquez, L, P. Powers, S. Toth, and S. Blanton 2013)is currently in Final Draft form. Within the report, Dominquez, et al.,~~ Geologic analsysis confirmed ~~discuss with field observations, confirming that that~~ rocks in the channel ~~-~~are a result of both natural and antropogenic processes. ~~Natural sources of material include: rockfall, glacial deposits and alluvial deposits while anthropogenic sources include: blasted rock, road prism and sidecast material.~~ Dominguez (2013) suggests that while it is difficult to make a definitive conclusion as to the impact of anthropogenic ~~impacts of the anthropogenic~~ materials on fish passage in study reach, ~~at and around the Anchor Boulder,~~ it appears that the majority of the anthropogenic~~se~~ materials are at the channel margins ~~primarily~~ activated by flows of 1,5~~0~~00 cfs or more. ~~The channel adjacent to the Anchor Boulder and quality of habitat may be more impacted by small rocks andanthropgenic boulderintroduction.~~ The irrigation access road on the left bank of Icicle Creek has also encroached on channel width. ~~There have been anthropogenic impacts.~~ ~~-~~Further, Dominguez (2013) suggests that under certain conditions, such as ideal flow, favorable thalweg location, holding pools~~,~~ and presence of migratory adult bull trout and steelhead,there is a likely a passage route which is consistent with RTT Biological Strategy (Appendix E, p. 36). ~~assumption of passage for these two species…~~

~~Given what is understood of fish passage to date , the relative understanding of the influence of anthropogenic materials to fish passage, the identified impediments, the largely unimpacted quality habitat and intrinsic potential in the upper Icicle, this proposal represents a strong opportunity to explore naturalized designs to improve impeded passage. TU consulted and gathered input from representatives of WDFW, USFWS, Trout Unlimited-Icicle Valley Chapter, WildFish Conservancy, Icicle Creek Watershed Coucil, Icicle and Peshastin Irrigation District and the Upper Columbia Salmon Recovery Board. Our partner organizations and citizens of the Icicle have helped define the optimal fish passage target and narrowed the list of alternatives informed by biological, social and geographic considerations.~~

~~This proposal seeks to bring to 30% design two alternatives for the Anchor Boulder reach and one alternative for the Icicle Peshastin Irrigation diversion dam. Informed by the 30% designs, TU would work to complete one 80% design for the Anchor Boulder area and one design for the diversion dam.All designs included in this proposal provide 90 % passage for target fish populations, Steelhead and Bull Trout.~~

2. Project Purpose

When answering the questions below, please refer to Chapter 4 of the *Stream Habitat Restoration Guidelines* (wdfw.wa.gov/publications/pub.php?id=00043) for a definition of restoration goals and objectives.

State the project goal(s).

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The 2013 *Assessment* provided four passage alternatives for the Anchor Boulder area and two options for the diversion dam at low flows. ~~TU~~TU-WWP consulted and gathered input from representatives of WDFW, USFWS, Trout Unlimited-Icicle Valley Chapter, Wild Fish Conservancy, Icicle Creek Watershed Coucil, Icicle and Peshastin Irrigation Districts (IPID) and the Upper Columbia Salmon Recovery Board (UCSRB). Technical stakeholders helped define the optimal fish passage target and~~,~~ the above parties shared preference for one design alternative ~~-~~at the Anchor Boulder and one alternative at the diversion dam, informed by biological, social and geographic considerations.

Based on the *Assessment* findings as well as the largely unimpacted quality habitat and intrinsic potential in the upper Icicle, this proposal represents an important opportunity to develop designs to improve impeded passage.

The goal of this proposal is to develop prelimary designs from the~~refine~~ preferred conceptual design options identified in the *Assessment*. ~~Icicle Creek Passage *Assesment* and develop. Furthering~~Developing these designs will further the effort to ~~which ill~~ould ~~-~~ improve connectivity between upper and lower I~~i~~cicle habitat, providing access to ~~. to t, decreasing the extent of passage impediments which impair~~This could leade to ~~connectivity to~~ more than 23 miles of nearly undisturbed mainstem habitat (plus upper Icicle tributaries), ~~and~~ provide~~ing~~ climate change refuge, ~~-while~~and advancing steelhead and bull trout recovery.

A. List the project's objectives.

This proposal ~~seeks to bring~~ will complete~~is for completion of~~30% design ~~-~~on the preferred alternatives for the Anchor Boulder reach and the Icicle ~~-Peshastin~~ Irrigation diversion dam. ~~When further design is needed TU~~TU-WWP would bring the~~hese~~ two preferred alternatives to 80% design, ~~with a completion goal of~~by early ~~-~~2015. The proposed designs ~~included~~in this proposal would provide 90-% passage for target fish populations, adult Steelhead and Bull Trout. The preferred alternatives for further development are described below:

~~Develop to 80% design, fish passage alternatives for identified impediments in the Icicle Creek Boulder Field Study reach, at the Anchor Boulder and irrigation diversion bridge by 2015. Including:~~

Anchor Boulder area~~:~~

~~:~~

Channel Profile Adjustment: This design is based ~~up~~on adjusting the existing 30% gradient to approximately 9%, the average gradient in the study reach. This could be achieved by bringing material in or adjusting the existing material in-channel by identifying key boulders in this reach to adjust/split/calve/blast. ~~materials~~ ~~-~~In the latter approach, the adjusted boulder material would move downstream and the stream would naturally regrade over time. ~~-~~Gradual adjustment over years would allow for adaptive management. This design option would provide fish passage between 100 cfs to 1,500

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cfs. Further geologic analysis ~~and rock boring needed~~ is necessary to understand site conditions, as well as which approach is most site appropriate.

~~***1) Channel Profile Adjustment: identify key boulders in this reach to adjust/split/calve/blast materials to adjust the 30% gradient to 9%. Material would move downstream and stream would naturally regrade over time. Gradual adjustment would allow for adaptive management. This option would provide fish passage between 100cfs to 1500cfs.***~~

~~***2) Naturalized Pool and Weir: This design option would enhance an identified potential fish passage route, by creating a series of pools and weirs (6 total), each with a 3-4 foot drop. This would provide passage at 100 cfs-500 cfs and require removing a portion of the irrigation access road, while redeveloping another irrigation access point at western end of road. Steps would be created by removing material to blast steps into the bedrock.***~~

Irrigation Diversion Dam

Pool and Chute Fishway: This option would remove a section of the dam and construct a concrete pool and chute fishway~~-~~ that is~~,~~ 24' wide, has a ~~-~~12' pool length with a~~and~~ high design flow of 120 cfs, providing passage at the~~is~~ low head dam at low flow.

Irrigation Diversion Dam design ideas were ~~drawn~~ adapted from ~~*USBR*~~the US Bureau of Reclamation's (Reclamation) *Icicle Irrigation District Screen Replacment and Barrier Removal-Appraisal Report* (April 2007).

3. Project Context

A. Describe the location of the project in the watershed,

Icicle Creek is a tributary of the Wenatchee River near Leavenworth, WA, WRIA 45. The project area is approximately RM 5.6 to RM 5.7 in channel.

B. List the fish resources present at the site and targeted by this project.

Species	Life History Present (egg, juvenile, adult)	Current Population Trend (decline, stable, rising)	ESA Coverage (Y/N)	Life History Target (egg, juvenile, adult)
Steelhead	Adult	Stable	Yes	Adult
Bull Trout	Adult	Stable	Yes	Adult

C. Discuss how this project fits within your regional recovery plan and local lead entity's strategy to restore or protect salmonid habitat in the watershed

This project builds on the priority action identified by the ~~Upper Columbia Regional Technical Team (~~RTT~~),~~ which identified assessment of passage at the Icicle Creek boulder field (RM 5.6) as a priority action (RTT Biological Strategy Priorities - 2013~~), as well as~~

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reconfiguring the diversions of the Icicle Peshastin Irrigation District and the city of Leavenworth (RM 5.7). Final Draft of). *Icicle Creek Boulder Field Fish Passage Assessment* (Dominquez, L, P. Powers, S. Toth, and S. Blanton-2013), identified that the irrigation diversion is a low flow passage impediment as is the area around the Anchor Boulder. This project seeks to develop alternatives for improving habitat connectivity to the Upper Icicle Creek for adult migratory bull trout and steelhead. Among the ecological concerns highlighted in the Biological Strategy (2013), the top two relate to Habitat Quantity and the natural (*uncertain*) and anthropogenic barriers. EDT and ICTRT intrinsic potential models predict access to the upper Icicle would yield very large increases in capacity for steelhead with access to the upper Icicle steelhead.

D. Explain why it is important to do this project now instead of at a later date.

With completion of a long-standing RTT Priority with the *Icicle Creek Boulder Field Fish Passage Assessment (2013),* TUTU-WWP and project partners have contributed to addressing a long standing data gap and have developed fish passage alternatives. which require further development/design. To further understand whether it is desirable to address fish passage impediments in the target area, a valuable decision-making tool ist to know in detail how passage improvement might be achieved. To that end, This proposal will further the important policy discussion as to the desirability of passage improvement and habitat connectivity to the Upper Icicle. TUTU-WWP has engaged key stakeholder input through multiple group and individual meetings during the course of the *Assessment*. This input furthered the discussion of providing fish passage at the Boulder Field with participants identifying preferred alternatives to pursue with further design. It is important to continue this work now while engagement in this project is high, building on the momentum of *Assessment (2013) and* To addressing in more detail the second ranking priority in the Wenatchee Watershed, passage at the Icicle Creek boulder field and to build on the momentum of the *Assessment (2013)*, it is important to continue this work through funding this SRFB roundnow while engagement in this project is high.

If any part or phase of this project has previously been reviewed or funded by the SRFB, please fill in the table below.

Project # or Name	Status	Status of prior phase deliverables and relationship to current proposal?
N/A	☐ Completed ☐ In Process ☐ Not Funded*	

* If previous project was not funded, describe how the current proposal differs from the original.

4. Project Description

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NOTE that projects that include acquisition have supplemental questions at the end of this proposal. Please answer the questions below and all pertinent supplemental questions.

~~A.~~E. Provide a detailed description of the proposed project and how it will address the problem described above.

This project builds on ~~the priority action identified by the Upper Columbia Regional Technical Team (RTT) which identified~~ the recently completed assessment-*Icicle Creek Boulder Field Fish Passage Assessment* (Dominquez, L, P. Powers, S. Toth, and S. Blanton-2013)- of passage at the Icicle Creek boulder field (RM 5.6), a priority action ~~as a priority action~~ (RTT Biological Strategy Priorities-2013), ~~, as well as reconfiguring the diversions of the Icicle Peshastin Irrigation District and the city of Leavenworth. Final Draft of the *Icicle Creek Boulder Field Fish Passage Assessment* (Dominquez, L, P. Powers, S. Toth, and S. Blanton-2013), has been completed.This project, building upon that understanding,~~ Given what is understood of fish passage to date, the relative understanding of anthropogenic influence to fish passage, the identified impediments, the largely unimpacted quality habitat and intrinsic potential in the Upper Icicle, this proposal continues progress by developing 80% designs to ultimately improve habitat connectivity to the Upper Icicle and achieve 90% passage for adult migratory bull trout and Steelhead.

~~would~~ This projects continues progress and furthers understanding by ~~develop 80% designs~~ ultimately~~to improve habitat connectivity to the Upper Icicle and achieve 90% passage for adult migratory bull trout and~~ Steelhead~~.~~

~~Given what is understood of fish passage to date, the relative understanding of the influence of anthropogenic materials to fish passage, the identified impediments, the largely unimpacted quality habitat and intrinsic potential in the Upper Icicle, this proposal represents a strong opportunity to explore naturalized designs to improve impeded passage.. This proposal seeks to bring to 30% design~~ The deliverable ~~would be design of~~two alternatives for the Anchor Boulder reach and ~~one alternative for the Icicle Peshastin Irrigation diversion dam, which is listed as a priority by the RTT Biological Strategy (2013).~~ This project includes: ~~would complete~~ a professional site survey, geologic analysis of site conditions, rock coring to further evaluate geology of potentially adjusted boulders ~~and since a portion of the irrigation access road may be used in a fish passage alternative, a road under which the municipal water supply line from the diversion dam is currently location, an evaluation of this pipeline is necessary~~, 30% design of two alternatives at the Boulder Field and 80% design of the selected alternative at the Boulder Fi~~l~~eld and the Diversion Dam.~~:~~ The preferred alternatives for preliminary design are as follows:~~One design for the Anchor Boulder area and one design for the diversion dam would develop 80% design.~~

Anchor Boulder area:

Channel Profile Adjustment: This design is based upon adjusting the existing 30% gradient to approximately 9%, the average gradient in the study reach. This could be

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achieved by bringing material in or adjusting the existing material in-channel by identifying key boulders in this reach to adjust/split/calve/blast- materials ~~to adjust the 30% gradient to 9%.~~ In the latter approach, ~~Material~~ the adjusted boulder material would move downstream and the stream would naturally regrade over time. Gradual adjustment over years would allow for adaptive management. This design option would provide fish passage between 100 cfs to 1,500 cfs. Further geologic analysis and rock boring needed is necessary to understand site conditions as well as which approach is most site appropriate.

~~***1) Naturalized Pool and Weir: This design option would enhance an identified potential fish passage route, by creating a series of pools and weirs (6 total), each with a 3-4 foot drop. This would provide passage at 100 cfs-500 cfs and require removing a portion of the irrigation access road, while redeveloping another irrigation access point at western end of road. Steps would be created by removing material to blast steps into the bedrock. Further geologic analysis and rock boring needed.***~~

Irrigation Diversion Dam:

Pool and Chute Fishway: This option would remove a section of the dam and construct a concrete pool and chute fishway~~,~~, 24' wide. 12' pool length and high design flow of 120 cfs, providing passage at this low head dam at low flow.

Irrigation Diversion Dam design ideas were drawn from ~~USBR's~~ Reclamation's *Icicle Irrigation District Screen Replacment and Barrier Removal-Appraisal Report* (April 2007).

This proposal will address identified impediments, provide preliminary designs, in order to prepare for a final design to ~~determine the desirability of~~ improve~~ing~~ connectivity to the Upper Icicle habitat for listed Bull Trout and Steelhead.

~~B.~~F. Clearly list and describe all products that will be produced (i.e., project deliverables).~~:~~

1) Professional Site Survey

2) Geologic Investigation of Anchor Boulder Area

3) Municipal Water Supply Line Evaluation

~~1)~~4) Preliminary 30% Design on ~~3~~ one alternative at Anchor Boulder and one alternative at Irrigation Diversion Dam~~alternatives~~

~~2)~~5) Preliminary 80% Design on one alternative at Anchor Boulder and one alternative at Irrigation Diversion Dam~~2 alternatives:~~

~~a. Anchor Boulder~~

~~b. Diversion dam~~

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~~C. If the project will occur in phases or is part of a larger recovery strategy, describe the goal of the overall strategy, explain individual sequencing steps and which steps are included in this application.~~

~~D. If your proposal includes an assessment or inventory (NOTE: project may extend across a wide area and cover multiple properties):~~

~~i. Describe any previous or ongoing assessment or inventory work in your project's geographic area and how this project will build upon rather than duplicate completed work.~~

~~ii. Describe how the assessment or inventory addresses the stages and elements in Guidance on Watershed Assessment for Salmon (Joint Natural Resources Cabinet, May 2001,~~ ~~www.digitalarchives.wa.gov/governorlocke/gsro/watershed/watershed.pdf~~~~).~~

~~E.~~G. **If your proposal includes developing a design:**

i. **Will the project design be developed by a licensed professional engineer?**.

Yes.

~~ii. For final design projects, if you do not intend to apply for permits as part of this project's scope of work, please explain why and when permit applications will be submitted.~~

~~iii.~~ii. **Has Washington Department of Natural Resources confirmed that your project is or is not on state-owned aquatic lands?**

TU-WWP has confirmed with Shane Early , Aquatic Land Manager, Aquatic Resources Division / Rivers District of Washington State Department of Natural Resources (DNR), that the proposed project ~~is on SOAL. Mr. Early and Alan Lebovitz (DNR, Restoration Specialist) are aware of the project and will be in coordination.~~is not SOAL *(Personal Communication: email 5/6 and phone call 5/7)*

~~iv.~~iii. **For design projects intending to provide no match, verify you meet ALL of the following eligibility criteria.** [Answer: n/a, Yes, or No]

1. **The project addresses a particular problem at a specific location.**

   Yes.

2. **Funding request is $200,000 or less.**

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Yes.

3. **The project will be completed within 18 months of the SRFB funding meeting.**

   Yes.

4. **The project will develop a preliminary design or final project design.**

   Preliminary Design (30% and 80%).

~~F.~~H. **If your proposal includes a fish passage or screening design:**

i. **Has the project received a Priority Index (PI) or Screening Priority Index (SPI) number? If so, provide the PI or SPI number and describe how it was generated:**

No.

ii. **For fish passage design projects:**

1. **If a culvert or arch is proposed, will it employ a stream simulation, no slope, hydraulic, or other design?**

2. **Describe the amount and quality of habitat made accessible if the barrier is corrected.**

~~An~~ More than ~~additional~~ 23 ~~.4~~ miles of mainstem habitat (along with access to Eightmile, Jack and French Creeks) in USFS and wilderness lands~~habitat~~ would be accessible to the target species beyond existing Anchor Boulder and diversion dam. EDT and ICTRT intrinsic potential model predict very large increases in capacity for steelhead with access to the upper Icicle.

3. **Identify if there are additional fish passage barriers downstream or upstream of this project.**

USFWS Leavenworth National Fish Hatchery structure 2 (headgate) is opened to provide upstream passage, and USFWS water supply diversion dam has ~~fish~~ operable fish ladder. ~~While~~ There ~~there~~ are additional natural falls above the Icicle Irrigation District diversion dam; boulder falls at Bridge Creek (RM 9), Icicle Gorge falls (RM 16), Rock Island Campground falls (RM 18) and complex falls at French Creek (RM 21.5) (Nelson et al. 2011). ~~,~~Yet ~~–~~only the falls at Leland Creek (RM 29) are deemed impassable to fish (Bryant and Parkhurst 1950).

~~G.~~I. **Describe other approaches and design alternatives that were considered to achieve the project's objectives and why the proposed alternative was selected.**

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Among the other considerations for potential passage designs include:

Anchor Boulder area

1) *Vertical Slot Fishway:* this alternative would require major concrete construction in channel which is socially unacceptable at this location. Med-high maintenance required.

2) *Fishway above the Anchor Boulder*: this may have fish attraction issues and alternative may prove socially unacceptable for visibly constructed fish ladder near USFS and wilderness area

3) *Fishway above Anchor Boulder* and utilizing irrigation flume: alternative may prove socially unacceptable for visibly constructed fish ladder near USFS and wilderness area and irrigation flume is used for irrigation.

4) *No Action:* passage impediments would remain and additional information to determine viability and desirability of improving upstream connectivity would not be obtained.

5) *Roughened Channel:* This option would have have 14 foot artificial channel constructed of more than 250 feet in length which would provide access at 100 cfs -1000 cfs. This option would require in channel concrete structures.

Irrigation Diversion Dam

1) *Constructed Riffle:* more expensive solution, potential risk to infrastructure and a naturalized solution to a concrete dam is unnecessary. Pool and Chute option was preferred by Icicle Peshastin Irrigation DistrictIPID.

Irrigation Diversion Dam design ideas were drawn from USBR's Reclamation's *Icicle Irrigation District Screen Replacment and Barrier Removal-Appraisal Report* (April 2007).

H.J. Describe your experience managing this type of project.

Trout UnlimitedTU-WWP has experience managing complex irrigation and habitat projects, demonstrated in completed projects as well as those that are ongoing. Examples include the Pioneer Canal pumpback system from the Columbia River and Ninemile Creek's POD change and habitat improvements. In addition, TUTU-WWP has immense experience in obtaining required permits.

I. Jason Hatch, Project Manager, will be the lead for this project implementation. He has experience managing multi-stakeholder and funder projects and has developed *the Icicle Creek Boulder Field Passage Assessment* Boulder Field Passage Assessment and *Icicle Boulder Field Design Pproject* in close coordination with the Icicle Peshastin Irrigation DistrictIPID and key agencies.

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~~J.~~K. Explain how the project's cost estimates were determined.

Cost estimates were provided by Pat Powers of Waterfall Engineering, a Fish Passage Consultant who has served as WDFW Chief Habitat Engineer, designed fish passage solutions and was a consultant on the *Icicle Creek Boulder Field Passage Assessment.*

~~K.~~L. List Project Partners and their role and contribution to the project..

USFWS-Mid Columbia Fisheries Resource Office	Fisheries information
WDFW	Fisheries information
Icicle-Peshastin Irrigation District	Project partner, landowner
Priest Rapids Coordinating Committee (PRCC)	Initial funder
NOAA	Fish passage consultation
US Bureau of Reclamation	Technical assistance

~~L.~~M. List all landowner names.

Icicle-~~-~~Peshastin Irrigation District

~~Washington Department of Natural Resources~~

~~M.~~N. Contingency Planning: State any constraints, uncertainties, possible problems, delays, or additional expenses that may hinder completion of the project. Explain how you will address these issues as they arise and their likely impact on the project.

Potential for delays or constraints include climatic/hydraulic conditions that would impact when field surveys ~~that~~ may be conducted. Other constraints are the further exploration of geological conditions of the stream channel as well as that of the irrigation access road. Evaluation of the current location of the city of Leavenworth water supply line under the irrigation access road will be conducted in the Site Survey. These constraints will be evaluated~~formed~~ in the 30% design and ultimately help determine how~~which~~ alternatives are developed to move to 80% design. ~~Trout Unlimited~~TU-WWP and consultants will work in close coordination with appropriate agencies, the RTT, permitting agencies and landowners, to insure that timelines are met.

~~N.~~O. List and describe the major tasks and schedule you will use to complete the project. (Planning projects should typically be completed within two years of funding approval).

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Task 1:	Landowner, Agency, Stakeholder Outreach and Coordination (September 2013-May 2015)
Task 2:	Site Survey (Aug 2014-Oct 2014)
Task 3:	Geologic Analysis (April 2014-Nov 2014)
Task 4:	Municipal Water Supply Line Evaluation (April 2014-Nov 2014)
Task 5:	30% Design (Dec 2014)
Task 6:	80% Design (May 2015)
Task 7:	Reporting (May 2015)

Appendix A: References

Andonaegui , C. 2001. Salmon, Steelhead, and Bull Trout Habitat Limiting Factors For the Wenatchee Subbasin (Water Resource Inventory Area 45) and Portions of WRIA 40 within Chelan County (Squilchuck, Stemilt and Colockum drainages). WA State Conservation Commission. Olympia, WA. 347 pp.

Bryant F. G and Z. E. Parkhurst. 1950. Survey of the Columbia River and its tributaries-part IV: Area III Washington streams from the Klickitat and Snake Rivers to Grand Coulee Dam, with notes on the Columbia and its tributaries above Grand Coulee Dam. Special Scientific Report-Fisheries No. 37. Washington D.C.

Dominguez, L., P. Powers, S. Toth, and S. Blanton. 2013. Icicle Creek Boulder Field Fish Passage Assessment. Prepared for Trout Unlimited-Washington Water Project. Wenatchee, WA.

Draft Wenatchee Subbasin Plan. 2004. Prepared for the Northwest Power and Conservation Council, May 28, 2004. 423 pp.

Nelson, M. C., A. Johnsen, and R. D. Nelle. 2011. Seasonal movements of adult fluvial bull trout and redd surveys in Icicle Creek, 2010 Annual Report. U.S. Fish and Wildlife Service, Leavenworth, WA. 60 pp.

Appendix B: Budget

Item	Estimated Cost
Professional Site Survey	$199,000
Geologic Analysis	$29,000
Rock Drilling-Core Samples	$28,000
Municipal Water Supply Pipe Evaluation	$9,000

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30% Design (23 ~~3~~ options)	$20,500
Construction Sequencing, Design Plans, Cost Projection	$15,500
Consultant Agency, Landowner Coordination	$12,000
80% Design (2 options)	$41,000
Project Administration	$5,000
COST ESTIMATE TOTAL	**$179,000**
SRFB REQUEST	**$179,000**

TOTAL BUDGET	**$179,000**
SRFB REQUEST	**$179,000**

~~**Appendix D: Maps**~~

~~**Appendix E: Conceptual Design**~~

~~**Appendix F: Landowner Acknowledgment Form**~~

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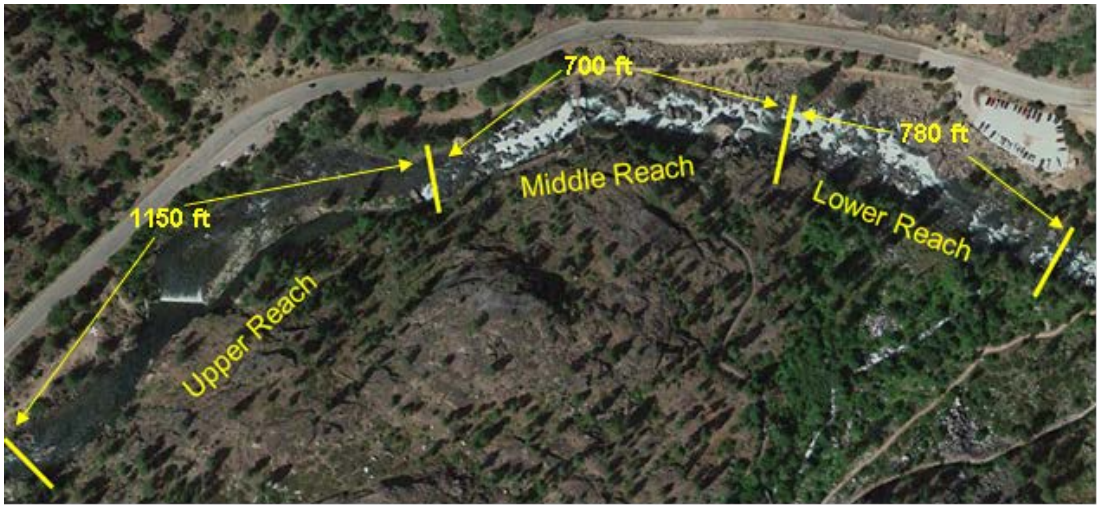
Appendix C: Photos

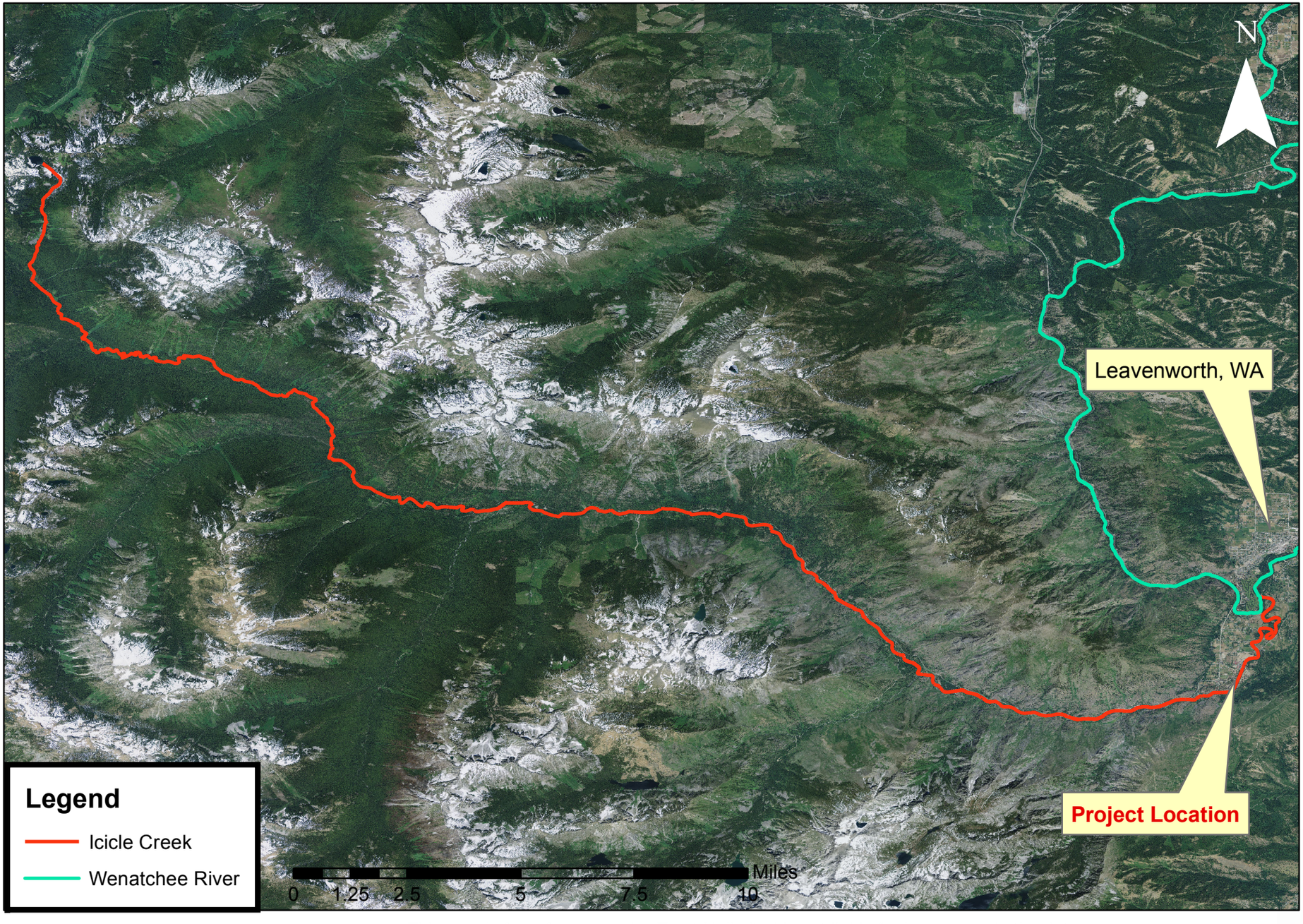
Icicle Creek Boulder Field Passage Design
PRISM 13-1342

Anchor Boulder Area

Study Area: Anchor Boulder in Middle Reach, Diversion Dam in Upper Reach



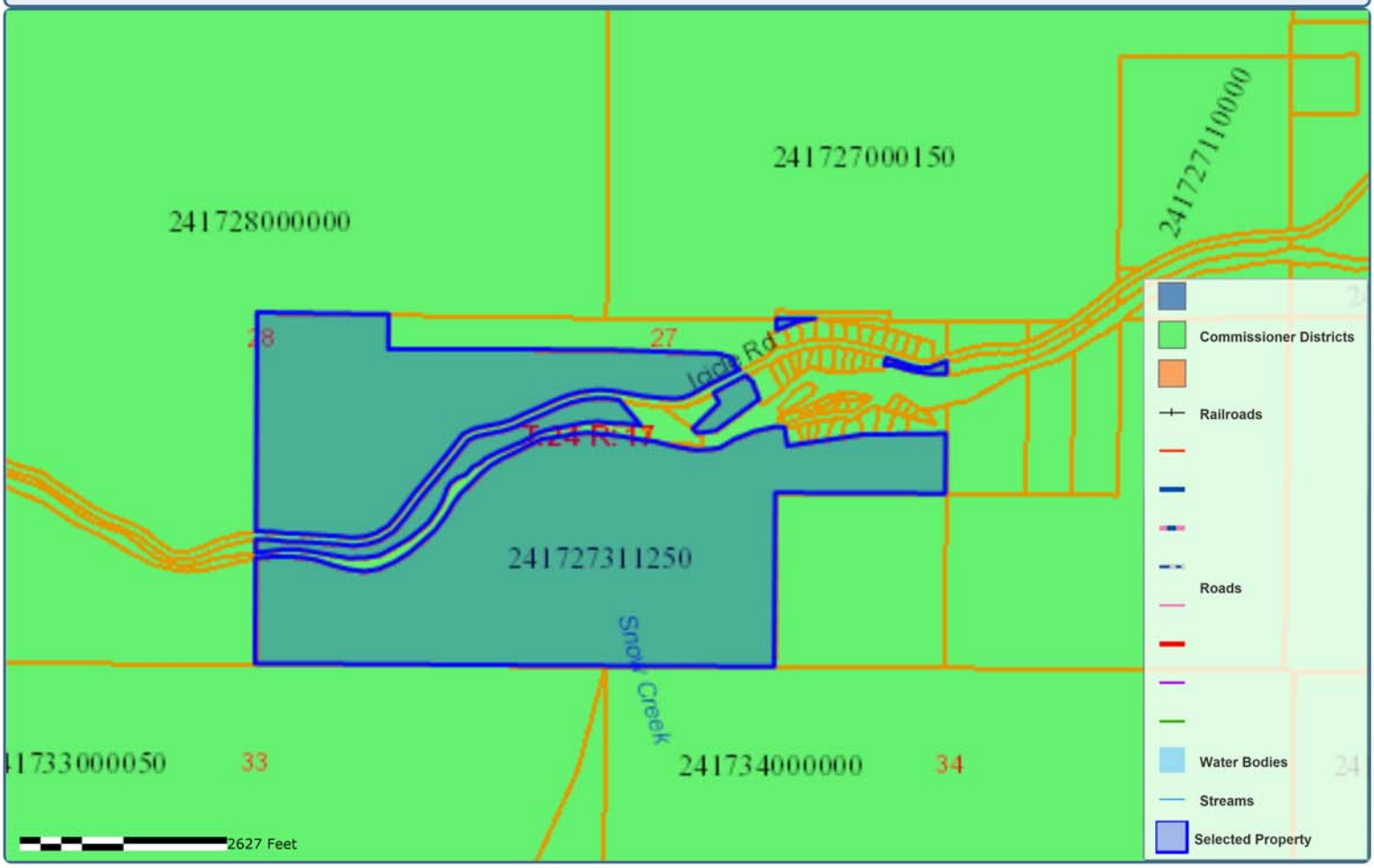
Icicle Creek Boulder Field Passage Design
Vicinity Map



This map is for reference only. Trout Unlimited is not liable for inaccuracy in the data.

TROUT UNLIMITED

Chelan County Assessor & Treasurer - Map of Property ID 29981 for Year 2012



Property Details

Account

Property ID: 29981
Geo ID: 241727311250
Type: Real
Legal Description: TOWNSHIP 24N RANGE 17EWM SECTION 27, LOT B BLA 2004-069, NESW, ACRES 241.0400

Location

Situs Address: ICICLE RD LEAVENWORTH, WA 98826
Neighborhood: Cycle 3 Icicle/ Tumwater div 1 RES
Mapsco:
Jurisdictions: 010170,110001,155001,160001,644001,652001,652005,654161,654170,654175,671101,677

Owner

Owner Name: ICICLE IRRIGATION DIST
Mailing Address: PO BOX 371, CASHMERE, WA 98815-0371

Property

Appraised Value: $361560

Icicle Creek Boulder Field Passage Design
PRISM 13-1342
Conceptual Designs

Irrigation Diversion Dam: Design Pool and Chute Fishway

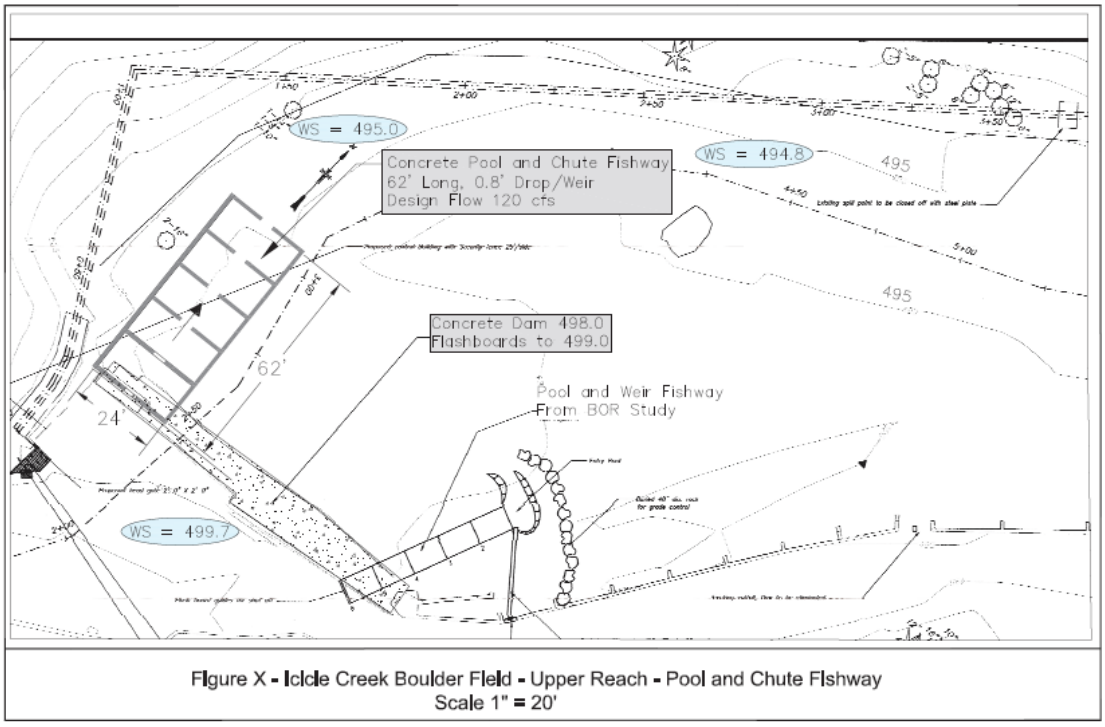


Figure X - Icicle Creek Boulder Field - Upper Reach - Pool and Chute Fishway
Scale 1" = 20'

Anchor Boulder: Channel Profile Adjustment

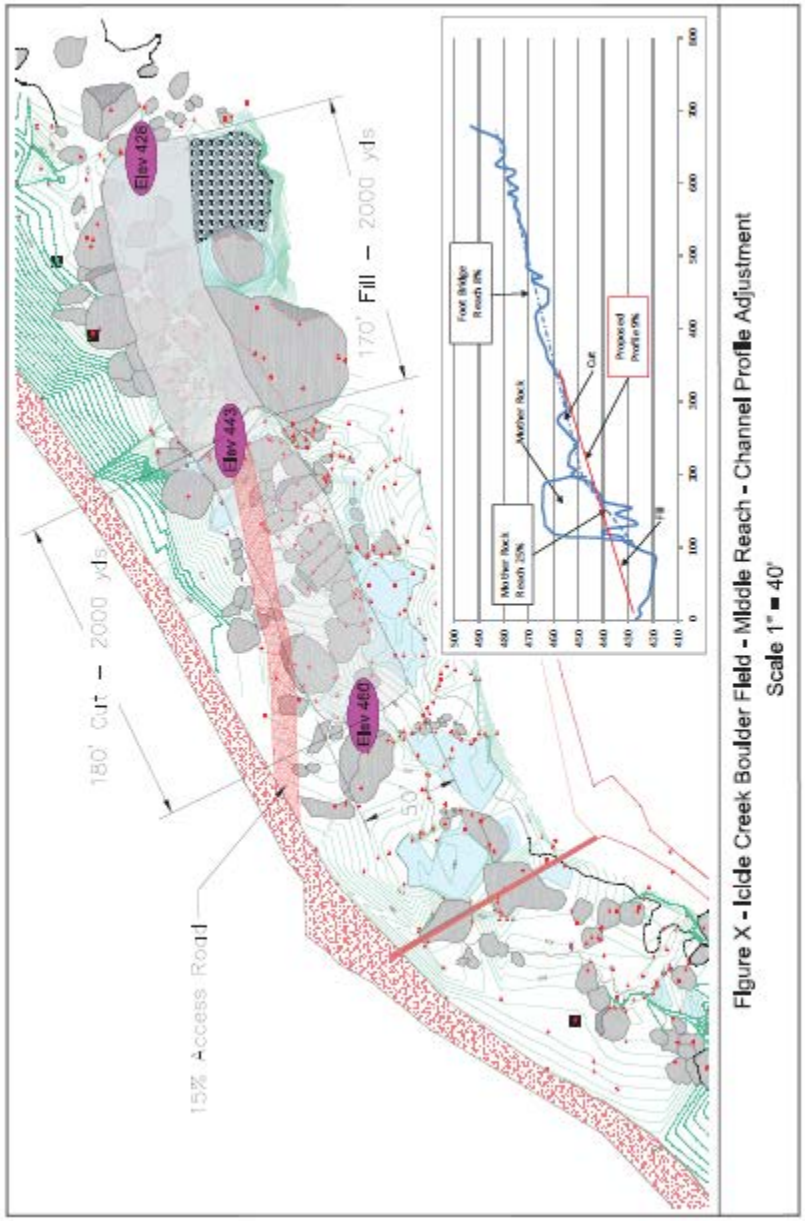
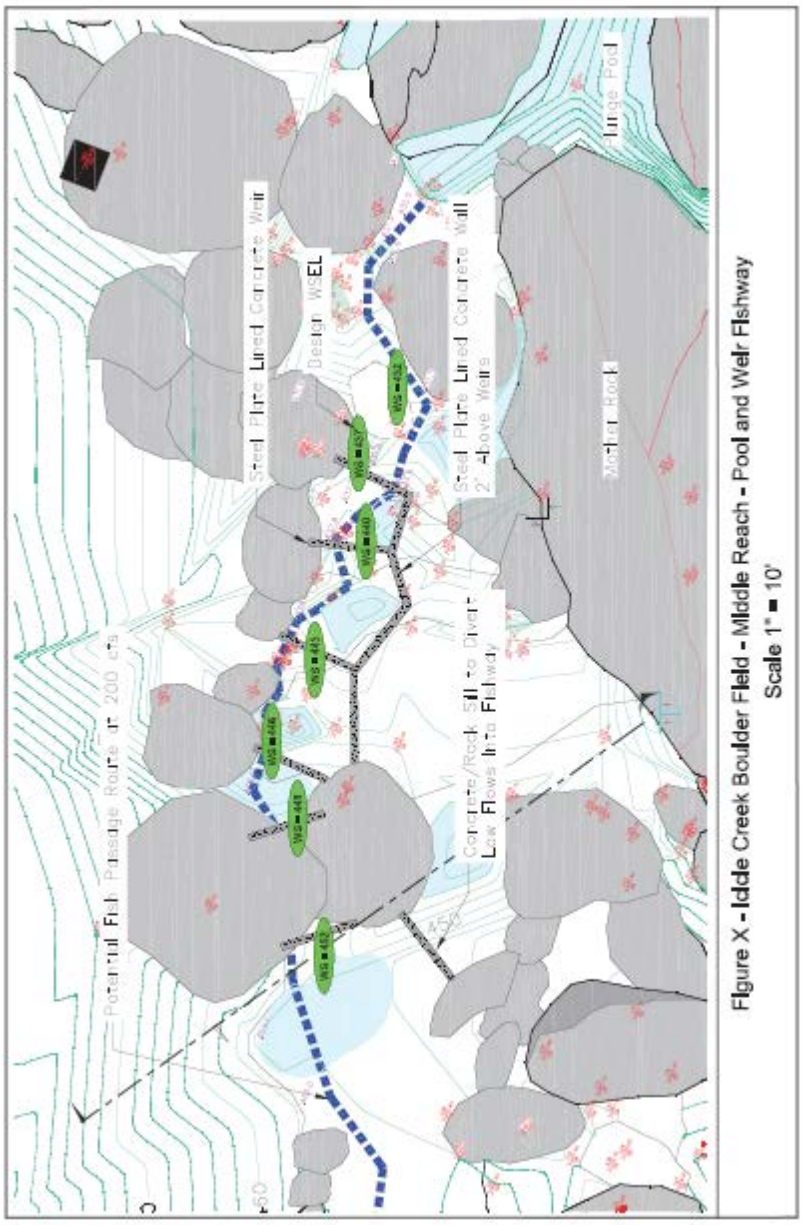


Figure X - Icicle Creek Boulder Field - Middle Reach - Channel Profile Adjustment
Scale 1" = 40'

Anchor Boulder-Pool and Weir*



This conceptual drawing includes concrete. In 30% design the same concept as shown above, would incorporate pool and weir design utilized to enhance existing identified passage route by modifying bedrock channel to create series of step pools.

Anchor Boulder-Roughened Channel

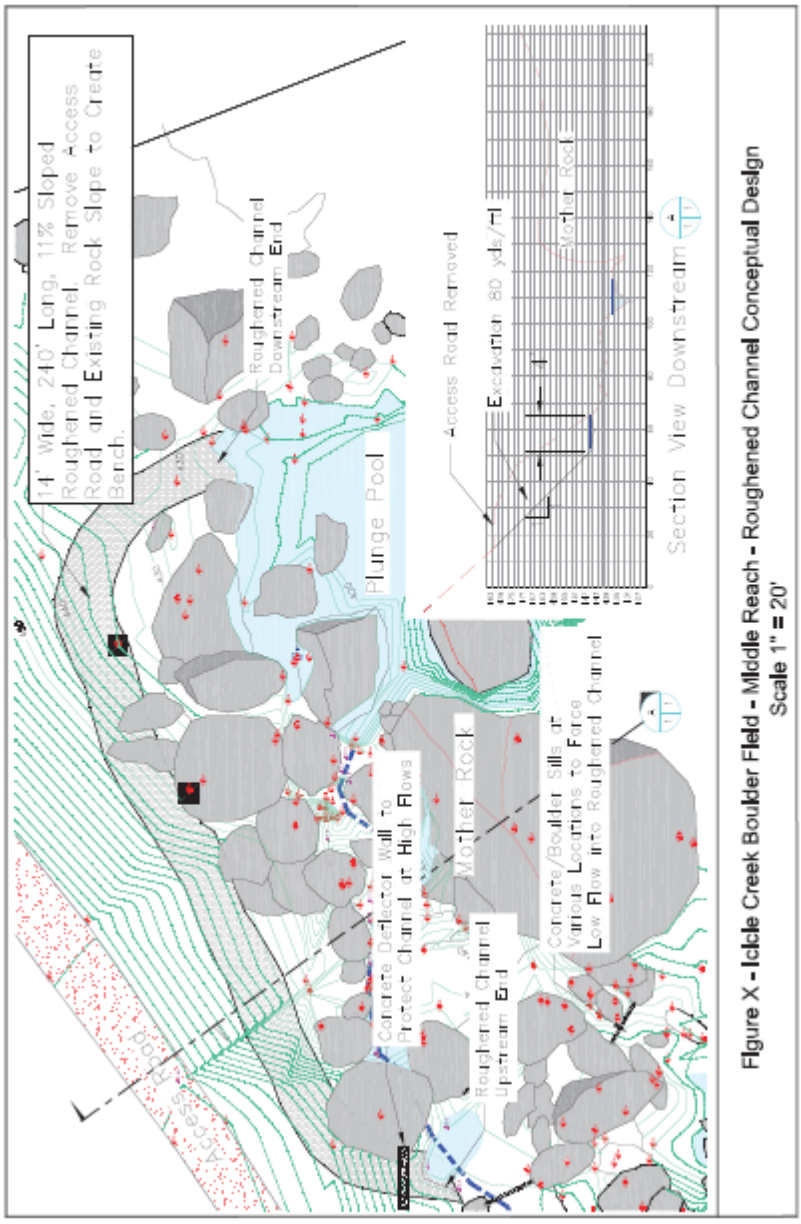


Figure X - Icicle Creek Boulder Field - Middle Reach - Roughened Channel Conceptual Design
Scale 1" = 20'

Appendix K: Landowner Acknowledgement Form

Landowner Information

Name of Landowner: Icicle Peshastin Irrigation District

Landowner Contact Information:

☐ Mr. ☐ Ms. Title: District Manager

First Name: Tony Last Name: Jantzer

Contact Mailing Address: 5594 Wescott Dr Cashmere, WA 98815

Contact E-Mail Address: tony.iid.pid@nwi.net

Property Address or Location: **Icicle Creek RM 5.6-5.7**

1. DNR (Landowner or Organization) is the legal owner of property described in this grant application.
2. I am aware that the project is being proposed on my property.
3. If the grant is successfully awarded, I will be contacted and asked to engage in negotiations.
4. My signature does not represent authorization of project implementation.

_____ _____

Landowner Signature Date

Project Sponsor Information

Project Name: Icicle Creek Boulder Field Passage Design

Project Applicant Contact Information: Trout Unlimited

☒ Mr. ☐ Ms. Title: Project Manager

First Name: Jason Last Name: Hatch

Mailing Address:103 Palouse Street #14, Wenatchee, WA 98801

E-Mail Address: jhatch@tu.org