

Technical Memorandum

Date: Oct 11, 2024

Project: Chehalis River Basin Flood Damage Reduction Project

To: Chehalis Basin Flood Control Zone District

From: Jacob Hyles, PE

Subject: **In-Water Work Steps During Construction**

1.0 Introduction

1.1 Background

The Chehalis River Basin Flood Damage Reduction project (Project) objective is to develop recommendations for a series of measures aimed at reducing damage to the communities of the Chehalis River Basin from Pe Ell to Centralia during major flood events. Among these measures is a proposed Flood Retention Expandable (FRE) structure on the Chehalis River, south of the town of Pe Ell.

The Chehalis River Basin Flood Damage Reduction, Revised Project Description Report (RPDR) is a supplemental report documenting the relocation of and changes to the FRE facility as originally documented within the Combined Dam and Fish Passage Conceptual Design Report (HDR Engineering, Inc. [HDR] 2017) and FRE Dam Alternative Report (HDR 2018).

The RPDR describes, supports, contrasts, and illustrates the changes to the proposed upstream FRE in a single comprehensive document.

1.2 Document Purpose

As a standalone attachment to Appendix K: Constructability Report to the RPDR, this technical memorandum (TM) provides additional detail to describe flow diversion aspects of construction phasing to include:

- Major elements of in-water work associated with flow diversion,
- Planned steps to transition construction phases,
- Conditions based requirements to progress from one step to the next, and
- Discussion of next steps and items for future consideration.



1.3 Previous Related Documentation

The RPDR provides a revised project description, and details activities and studies related to new and revised project elements. In addition to Appendix K, two additional appendices provide information related to the proposed channel diversion during construction.

Appendix D2: Hydraulic Design of Fish Passage and Evacuation Conduits TM

This TM documents the hydraulic analysis of the fish passage and evacuation conduits. The TM includes the permanent approach and discharge channels. The Approach Channel connects existing reaches of Crim Creek and the Chehalis River to the FRE passage conduits. The Discharge Channel connects the passage conduit stilling basin to the Chehalis River downstream. Both channels constitute the proposed project condition but are preliminary concepts only.

Appendix D3: Chehalis Construction Bypass Hydraulic Modeling TM

This TM documents the hydraulic analysis of the proposed Chehalis River and Crim Creek construction bypass channels (Bypass Channel), which characterizes hydraulic conditions (i.e., depth, velocity) within the proposed channels in relation to cost estimating, constructability, and fish passage. The preliminary designs are based upon existing conditions within reference reaches in the vicinity of the project. The proposed Bypass Channel mimics the hydraulics of these reference reaches to support upstream and downstream movement of aquatic organisms. The Bypass Channel can contain the 25-year annual exceedance probability (AEP) discharge.

2.0 Construction Sequence Overview

2.1 FRE Construction Sequence

The general FRE construction sequence consists of five phases presented in Table 1. In order to maintain volitional fish passage in the Chehalis River throughout the overall construction period, the dam structure will be constructed in three segments. A bypass channel will be installed to maintain river flows during construction of the second segment of the facility in Phase 2. This flow will be transitioned into the permanent channel and through the FRE conduits for remaining construction during phases 3 and 4. Additional discussion is included in the RPDR.

Table 1. Construction Sequence Summary

Phase	Work	Duration (months)
0	Preliminary work independent of the river	6-12
1	Site preparation, right side foundation construction, Chehalis and Crim Creek bypass channel construction	10-12



2	Outlet works and conduit construction, left side foundation construction, grading	20-24
3	Remove bypass channel and restore vegetation, foundation closure - connect left and right foundations	10-12
4	Complete facility construction, finishing touches, finalize the facility for use	6-12

2.2 Construction Phase Transitions

The transitions between construction phases are based upon several criteria being met. For the purposes of this TM, the transitions presented here are defined by the conditions surrounding the diversion and handling of the Chehalis River and Crim Creek. Specifically, this TM details the conceptual transitions from Phase 1 to Phase 2 and from Phase 2 to Phase 3.

2.3 In-water Work Window

Based on the project design it is anticipated that permitting variances will be required to extend normal in-water work windows. The Washington State Department of Fish and Wildlife (WDFW) approved in-water work window for the Chehalis Basin upstream of the South Fork is August 1 to August 31, and the US Army Corps of Engineers (USACE) approved in-water work window for the same river reach is July 1 to August 31. To minimize impacts during construction by making use of the optimal hydrologic conditions as previously described, and to avoid impacts from continuous construction over a longer period of time, an extension of the in-water work window from July 1 to September 30 will be requested from WDFW and USACE.

2.4 In-water Work Items

Diversion structures

In-water work will include structures constructed to divert flows from one flow path to another to facilitate construction activities. These structures have not been designed, but temporary berms may need to be structurally designed, lined, or otherwise stable and suitable for sustained flows and favorable to support dewatering needs. Temporary diversion methods may be employed to reduce in-water work duration to allow for more permanent structures to be constructed.

Aquatic Species Stranding and Fish Rescue Surveys

Avoiding stranding of aquatic species is an essential activity during the in-water activities. While flow diversion activities will be planned and executed to limit stranding potential, monitoring teams will be in place to identify, recover, and re-locate stranded fish as flows recede and as conveyance channels are de-watered. As water depths reduce, corralling and seining of remaining individuals will be conducted towards the downstream channel connection. As flows become shallower, electrofishing and relocation will be conducted. Mussel salvage and relocation activities will be completed once water levels allow.

Salvage and relocation may only be conducted by personnel deemed qualified by the governing fisheries regulatory agencies. Fish salvage or relocation personnel may be government staff or private professionals, employed by the government or by the Chehalis Basin Flood Control

Zone District (District), as mutually agreed upon by the District and governing fisheries regulatory agencies. The District's construction contractor will be responsible for fish exclusion, as well as coordination with and physical support of fish salvage/relocation personnel and the governing fisheries agencies. The District will require the contractor to adhere to typical construction BMPs for the protection of fish including:

- Adherence to the agency approved in-water work window.
- Coordination with agencies to implement fish salvage plans for each stage of in-water work.
- Fish salvage would be conducted in accordance with WSDOT fish exclusion protocols (WSDOT 2016).
- Electroshocking would occur in accordance with National Marine Fisheries Service (NMFS) (2000) electrofishing guidelines.
- All electrofishing will be conducted by a person with electrofishing training on-site to direct all electrofishing activities.
- All captured and collected fish will be transported to the upstream end of the project area and released at a location sufficient for fish to recover and re-orientate to the stream environment (slow moving pool habitat).
- Monitoring of temperature and dissolved oxygen during operations and subsequent refill periods.
- Screening of intakes - pump intakes must be screened compliant with NOAA-Fisheries and WDFW requirements.
- Maintaining fish screen to prevent injury or entrapment of fish.

Screened De-watering

De-watering (i.e., removing water from a surface hole or collection) may be required during brief periods and in limited locations when diversions are made from one phase to the next. De-watering will be slow, deliberate, and screened to facilitate safe and timely removal of any fish trapped in pools. The rate of dewatering will be commensurate with permit requirements from WDFW or as defined during Endangered Species Act (ESA) consultation. Contractor will be required to implement a specific de-watering rate to avoid stranding and to allow adequate aquatic species relocation.

2.5 In-water Work Tenets

The conceptual process of flow diversions as it relates to transitioning construction phases was developed with several tenets, which guide the timing and sequencing of the proposed steps. These tenets include:

1. **Limit in-water work.** Regardless of mitigation measures in-place, in-water work has the potential to be detrimental to the function and health of the river and its ecology. Reducing the duration of in-water work reduces this risk for impacts. Performing in-water work concurrently, instead of a long sequence of steps, is one way to reduce work duration.
2. **Prevent abrupt dewatering.** To limit the risk of fish stranding, diverting river flow from one active channel to another should not result in the rapid dewatering of the once active

channel. Closure of the active change, via constructed berm or other approved methodology, should allow for deliberate reduction of flows to allow fish to safely vacate.

3. **Maintain control.** Deliberate and methodical execution of the process of diverting flows is critical to diversion success and worker safety. New channels should be first opened from the downstream end. Upstream berms should be opened at a similar rate to the closure of the channels to be abandoned.
4. **Aquatic species salvage is continuous.** Pro-active efforts to exclude and remove aquatic species is a priority. Actions of each in-water work steps must be planned and executed in support of aquatic species salvage efforts as required under permit documentation.

3.0 Construction Phase Transition and In-water Work Steps

3.1 Phase 1 to Phase 2 Transition

The flows from the Chehalis River and Crim Creek will first be diverted from the existing channels during the transition from Phase 1 to Phase 2. The combined flows will be diverted from their current channels into the Bypass Channel designed and constructed for use during Phase 2 and Phase 3 of construction. This transition includes three steps and ends when the combined flows are fully diverted and when fish salvage and de-watering operations have concluded. Each step is described below, to include the conditions at the beginning and end of each step and the major actions taken during the step. An exhibit for each step is attached.

3.1.1 Step 1

Begins: Chehalis River flows through the FRE project site in the existing channel. Crim Creek flows join the Chehalis River at the existing confluence location. The Bypass Channel is constructed and ready for use, but stream flows are precluded by the natural bank serving as a barrier to flow.

Actions Taken:

Actions during this step are limited to the work necessary to remove the existing riverbank at the downstream end of the Bypass Channel. This embankment will be removed in such a manner as to reduce the duration of in-water activity. This would include excavation as much of the existing channel bank from the dry Bypass Channel, and only breaching the embankment at the end of the operation.

Ends: This step ends when the existing riverbank at the downstream end of the Bypass Channel is fully breached and flow is allowed to backwater into the Bypass Channel.

3.1.2 Step 2

Begins: This step begins when the existing riverbank at the downstream end of the Bypass Channel is fully breached and flow is allowed to backwater into the Bypass Channel. The Chehalis River flows through the FRE project site in the existing channel. Crim Creek flows join the Chehalis River at the existing confluence location.

Actions Taken:

This step is characterized primarily by the actual diversion of flows into the Bypass Channel. The specific actions include:

- Initial breach of the channel embankments to allow flow into the Bypass Channel via the Crim Creek and Chehalis River flow paths.
- Concurrent to the initial breach of the channel embankments, construction of the flow diversion features at Crim Creek and Chehalis River will be initiated. These diversion structures have yet to be engineered, but could include earthen/rock berms, piling, super sacks or other methods.
- The Bypass Channel embankment breaches are widened, allowing for a gradual increase in flow into the Bypass Channel. Simultaneously, the diversion features continues to reduce flow into existing Chehalis Channel.
- As flow in the Existing Channel is reduced, aquatic species salvage commences.
- Diversion structures will isolate the existing river channel between the Crim Creek and Chehalis flow paths into the Bypass Channel. Aquatic species salvage will be conducted, followed by dewatering, as necessary.

Ends: This step ends when Chehalis River and Crim Creek flows are completely diverted into the constructed bypass. The existing Chehalis River channel is closed at Crim Creek. The existing channel located between the Crim Creek and Chehalis portions of the Bypass is closed to stream flow and aquatic species salvage is complete. The downstream end of the Existing Channel, adjacent to the Bypass Channel outfall, is open.

3.1.3 Step 3

Begins: This step begins when Chehalis River and Crim Creek flows are completely diverted into the constructed Bypass Channel. The upstream end of the existing Chehalis River channel is closed at Crim Creek, but remains open at the downstream end, adjacent to the Bypass Channel.

Actions Taken:

This step consists of the downstream closure of the existing Chehalis River channel. The specific actions include:

- With complete diversion of streamflow into the Bypass Channel, the downstream end of the existing Chehalis River channel can be closed. This closure will be gradual and in-concert with aquatic species salvage efforts in the channel.
- As the existing Chehalis River channel will be subject to backwater conditions only, the final closure will isolate a final pool of water within the channel. This pool will be gradually dewatered via screened pumps, at a rate necessary to support aquatic species salvage as required in the approved in-water work plan.

Ends: This step ends when the existing river channel between Crim Creek and the downstream end of the Bypass Channel is closed to streamflow. De-watering is complete. Aquatic species salvage efforts are complete.

3.2 Phase 2 to Phase 3 Transition

The transition from Phase 2 to Phase 3 is the second and last proposed diversion of Chehalis River and Crim Creek flows construction. The combined flows will be diverted from the Bypass Channel into the Approach Channel. Flows from the Approach Channel will pass through the FRE via the passage conduits and stilling basin and into the Discharge Channel. The Discharge Channel will pass the combined flows back into the downstream, existing reach of the Chehalis. This transition includes three steps and ends when the combined flows are fully diverted and when fish salvage and unwatering operations have concluded.

3.2.1 Step 1

Begins: Chehalis River and Crim Creek flows pass through the FRE project site via the Bypass Channel. The FRE conduits and stilling basin are constructed and ready to receive flow. The permanent Approach Channel upstream and the Discharge Channel downstream of the FRE conduits are constructed and ready to receive flow, but flow is precluded by constructed berms at the upstream and downstream ends.

Actions Taken:

Actions during this step are limited to the work necessary to remove the constructed embankment at the downstream end of the permanent Discharge Channel.

Ends: This step ends when the berm at the downstream end of the Discharge Channel is fully breached and flow is allowed to backwater into the Discharge Channel.

3.2.2 Step 2

Begins: This step begins when the berm at the downstream end of the Discharge Channel is breached and flow is allowed to backwater into the Discharge Channel.

Actions Taken:

This step is characterized primarily by the actual diversion of flows into the permanent Approach Channel. The specific actions include:

- Initial breach of the diversion structures to allow flow into the Approach Channel via the Crim Creek and Chehalis River flow paths. This includes breaching the diversion structures isolating the portion of the existing Chehalis River channel between the Crim Creek and Chehalis River entrances to the Bypass Channel.
- Concurrent to degrading the diversion structures of the Bypass Channel, new diversion structures at the Crim Creek and Chehalis River entrances to the Bypass Channel will be initiated in order to gradually reduce flow into the Bypass Channel.
- As flow in the Bypass Channel is reduced, aquatic species salvage commences.

Ends: This step ends when Chehalis River and Crim Creek flows are completely diverted into the Approach Channel. The upstream end of the Bypass Channel is closed but remains open at the downstream end.

3.2.3 Step 3

Begins: This step begins when Chehalis River and Crim Creek flows are completely diverted into the Engineered Channel, passage conduits, and stilling basin. The Bypass Channel is closed at the upstream end but remains open at the downstream end.

Actions Taken:

This step consists of the downstream closure of the Bypass Channel. The specific actions include:

- With complete diversion of streamflow into the Approach Channel, the downstream end of the Bypass Channel can be closed. This closure will be gradual and in-concert with aquatic species salvage efforts in the channel.
- As the Bypass Channel will be subject to backwater conditions only, the final closure will isolate a final pool of water within the channel. This pool will be gradually dewatered via screened pumps, at a rate necessary to support aquatic species salvage.

Ends: This step ends when the Bypass Channel is closed to streamflow at both ends. Dewatering is complete. Aquatic species salvage efforts are complete.

4.0 Next Steps

Construction activities, timing, and sequencing are still under development. Means and methods of diversion activities have yet to be determined, but should support the tenets provided here-in. The in-water work sequencing presented herein is a feasible option; however, the selected contractor may develop alternative plans which will be subject to review by the District and regulatory agencies to ensure consistency with existing environmental authorizations.

5.0 References

HDR Engineering, Inc. (HDR)

2018b Fish Passage: CHTR Preliminary Design Report. February 2018.

2024a Revised Project Description Report. April 2024.

2024b Revised Project Description Report, Appendix D2: Hydraulic Design of Fish Passage and Evacuation Conduits TM. April 2024.

2024c Revised Project Description Report, Appendix D3: Chehalis Construction Bypass Hydraulic Modeling. April 2024.

2024c Revised Project Description Report, Appendix K: Constructability Report. April 2024.

National Marine Fisheries Service (NMFS)

2000. Guidelines for electrofishing waters containing salmonids listed under the Endangered Species Act. Available: www.nwr.noaa.gov/ESA-SalmonRegulations-Permits/4d-Rules/upload/electro2000.pdf (October 2005).

WSDOT (Washington Department of Transportation).

2016 *Fish Exclusion Protocols and Standards*. September 2016.

6.0 Acronyms/Abbreviations

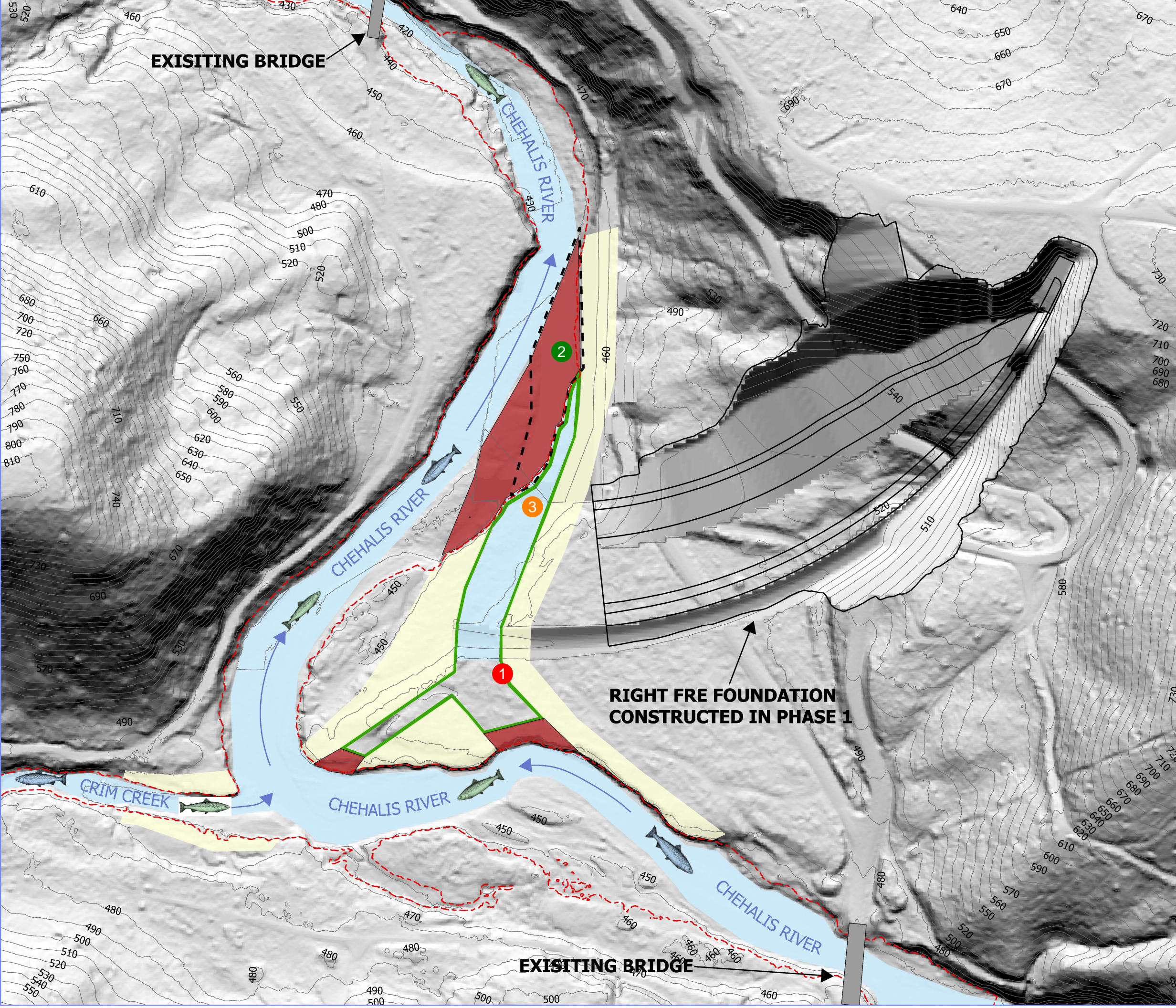
AEP	Annual Exceedance Probability
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FFPF	Flood Fish Passage Facility
FRE	Flood Retention Expandable
HDR	HDR Engineering, Inc.
NMFS	National Marine Fisheries Service
RPDR	Revised Project Description Report
USACE	US Army Corps of Engineers
WDFW	Washington State Department of Fish and Wildlife



Attachment A. Phase 1-2 Transition, Step 1

CONSTRUCTION IN-WATER WORK STEPS

YEAR 1
IN-WATER WORK WINDOW 1
TRANSITION FROM PHASE 1 TO PHASE 2
STEP 1

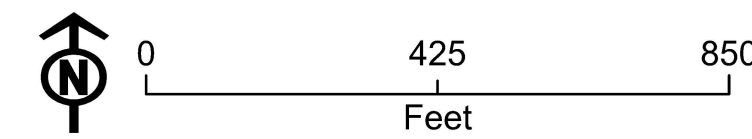


Legend

- FRE FACILITY
- EXISTING
- OHWM - 2YR WSEL
- 10 FT CONTOUR
- CHANNEL BREACH
- DIRECTION OF FLOW
- EXISTING RIVER BANK
- BYPASS CHANNEL EMBANKMENT
- BYPASS CHANNEL APPROX.
- SUMMERTIME WETTED AREA
- UPSTREAM FISH PASSAGE ROUTE
- DOWNSTREAM FISH PASSAGE ROUTE

- 1** BYPASS CHANNEL AND BYPASS CHANNEL EMBANKMENT ABOVE OHWM CONSTRUCTED IN THE DRY, BEHIND THE EXISTING RIVER BANK, PRIOR TO STEP 1.
- 2** EXISTING RIVER BANK BREACHED DURING STEP 1, CONNECTING BYPASS CHANNEL TO EXISTING CHEHALIS RIVER. BYPASS CHANNEL BACKWATERED BY CHEHALIS RIVER. AQUATIC SPECIES EXCLUDED AND REMOVED FROM WORK AREA PRIOR TO CONSTRUCTION BELOW OHWM.
- 3** AQUATIC SPECIES EXCLUSION REMOVED FROM WORK AREA FOLLOWING CONSTRUCTION BELOW OHWM. AQUATIC SPECIES HAVE ACCESS TO BACKWATERED BYPASS CHANNEL.

NOTES
 1. REQUESTED IN-WATER WORK WINDOW: JULY 1 - SEPTEMBER 30.
 2. VOLITIONAL UPSTREAM AND DOWNSTREAM AQUATIC SPECIES PASSAGE CONTINUES THROUGHOUT CONTRUCTION.







Attachment B. Phase 1-2 Transition, Step 2

CONSTRUCTION IN-WATER WORK STEPS

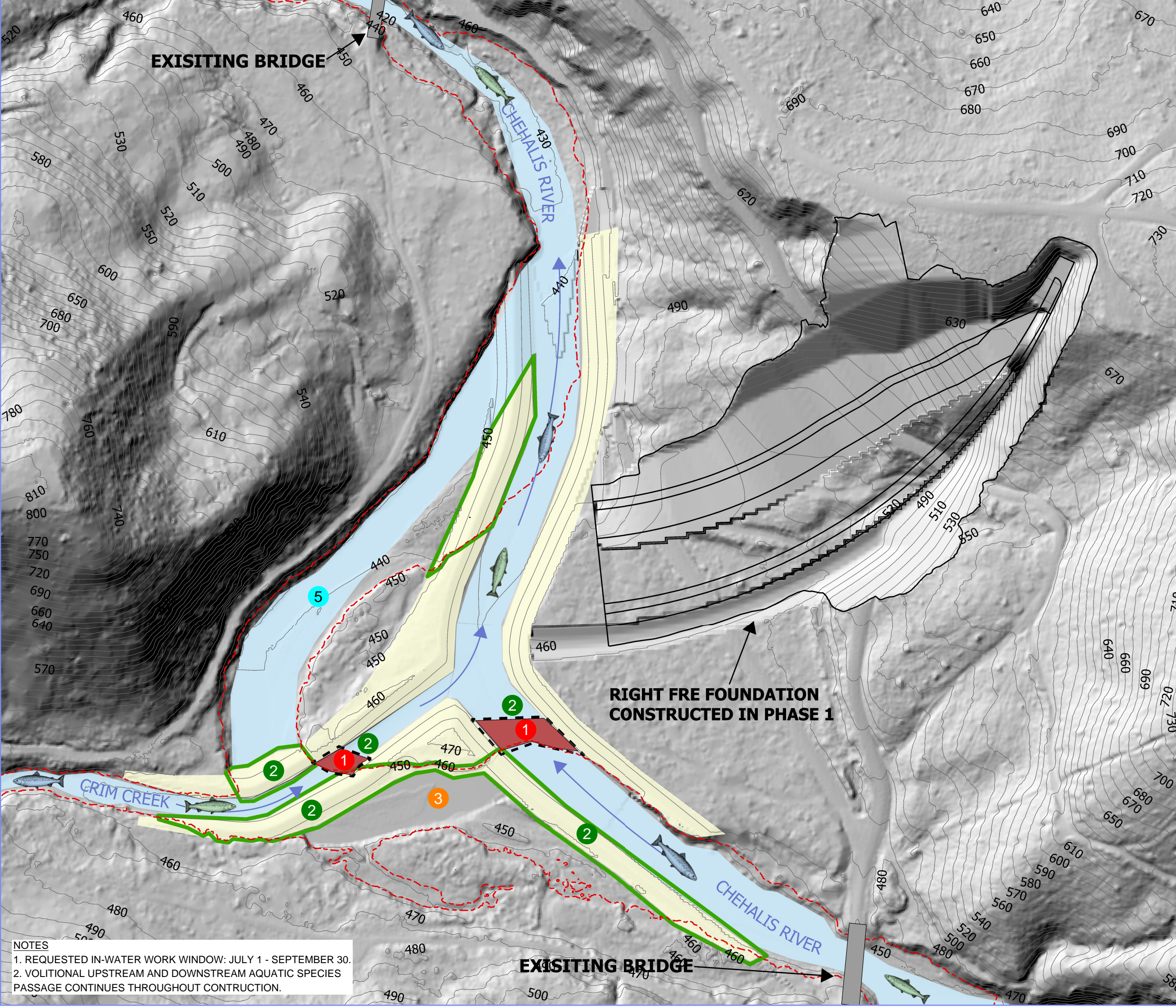
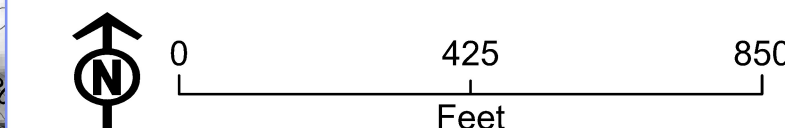
YEAR 1
IN-WATER WORK WINDOW 1
TRANSITION FROM PHASE 1 TO PHASE 2
STEP 2

Legend

- FRE FACILITY
- EXISTING
- - - OHWM - 2YR WSEL
- 10 FT CONTOUR
- - - CHANNEL BREACH
- ← DIRECTION OF FLOW
- EXISTING RIVER BANK
- ▭ CONSTRUCTED EMBANKMENT
- BYPASS CHANNEL EMBANKMENT
- APPROX.
- SUMMERTIME WETTED AREA

-  UPSTREAM FISH PASSAGE ROUTE
-  DOWNSTREAM FISH PASSAGE ROUTE

- 1** PERFORM INITIAL BREACH OF EXISTING RIVER BANKS TO ALLOW CHEHALIS RIVER AND CRIM CREEK INTO THE BYPASS CHANNEL.
- 2** GRADUALLY WIDEN BREACHES OF EXISTING RIVER EMBANKMENTS WHILE SIMULTANEOUSLY CONSTRUCTING BYPASS CHANNEL EMBANKMENTS. AS FLOW GRADUALLY DIVERTS INTO THE BYPASS CHANNEL THE WSEL IN THE EXISTING CHEHALIS RIVER WILL SLOWLY LOWER. PERFORM AQUATIC SPECIES RELOCATION CONTINUOUSLY THROUGHOUT IN-WATER WORK. WORK CONTINUES UNTIL EXISTING CHANNEL AREAS WITHIN THE FINAL BYPASS FOOTPRINT ARE FULLY BREACHED, BYPASS EMBANKMENTS ARE COMPLETE, AND FLOW IS FULLY DIVERTED FROM THE EXISTING CHEHALIS RIVER AND CRIM CREEK TO THE BYPASS CHANNEL.
- 3** RELOCATE AQUATIC SPECIES FROM THE EXISTING RIVER CHANNEL AS WSEL DROPS. PUMP OUT REMAINING WATER AND RELOCATE FISH SIMULTANEOUSLY UNTIL CHANNEL IS DRY.
- 4** CONSTRUCT PART OF DOWNSTREAM, LEFT BANK BYPASS CHANNEL EMBANKMENT. EXCLUDE AND RELOCATE AQUATIC SPECIES PRIOR TO STARTING IN-WATER WORK.
- 5** AQUATIC SPECIES HAVE ACCESS TO BACKWATERED EXISTING CHEHALIS RIVER CHANNEL.



NOTES
1. REQUESTED IN-WATER WORK WINDOW: JULY 1 - SEPTEMBER 30.
2. VOLITIONAL UPSTREAM AND DOWNSTREAM AQUATIC SPECIES PASSAGE CONTINUES THROUGHOUT CONSTRUCTION.





Attachment C. Phase 1-2 Transition, Step 3

CONSTRUCTION IN-WATER WORK STEPS

YEAR 1
IN-WATER WORK WINDOW 1
TRANSITION FROM PHASE 1 TO PHASE 2
STEP 3

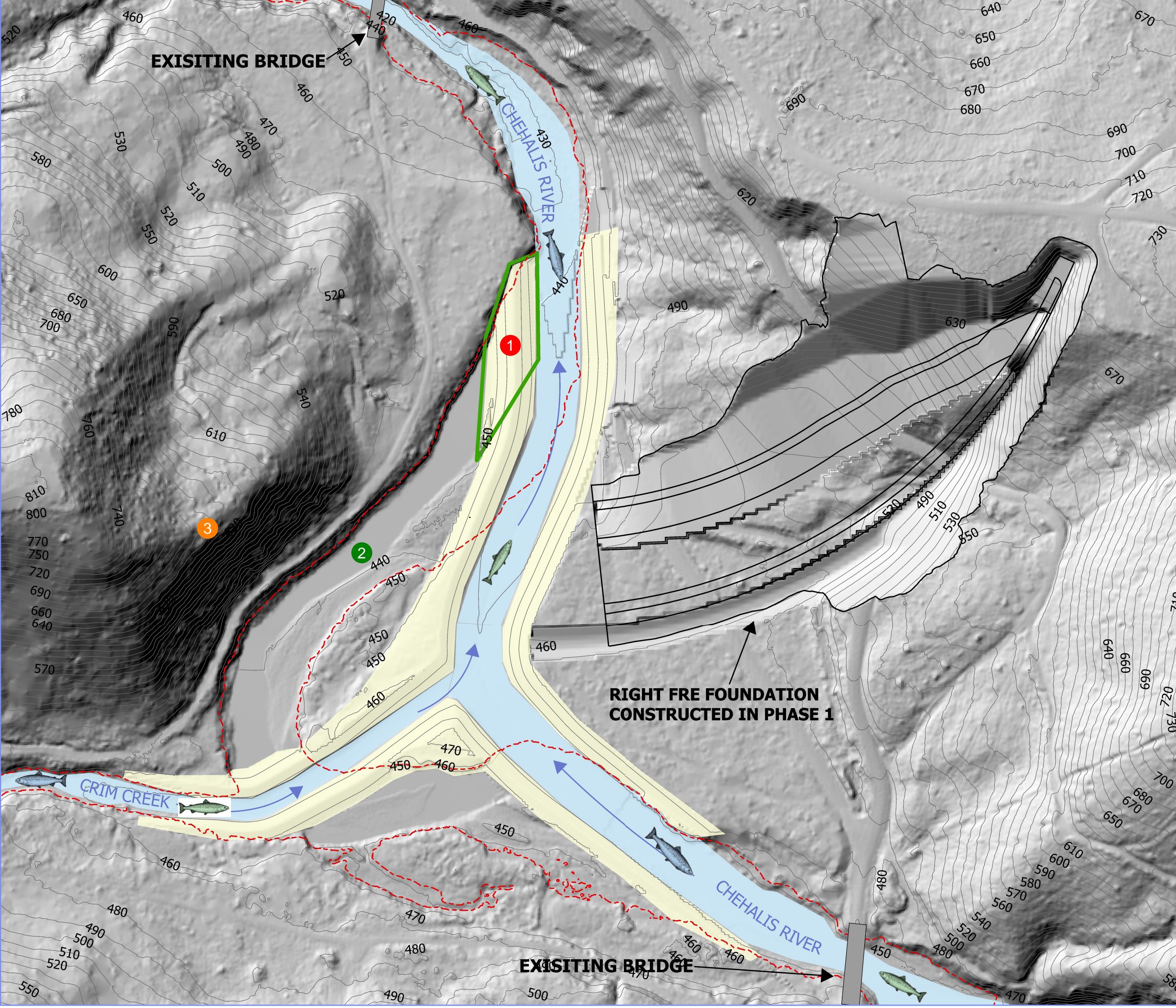
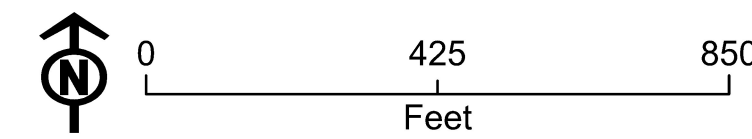
Legend

- FRE FACILITY EXISTING
- OHWM - 2YR WSEL
- 10 FT CONTOUR
- ← DIRECTION OF FLOW
- CONSTRUCTED EMBANKMENT
- BYPASS CHANNEL EMBANKMENT
- APPROX. SUMMERTIME WETTED AREA

-  UPSTREAM FISH PASSAGE ROUTE
-  DOWNSTREAM FISH PASSAGE ROUTE

- 1** EXCLUDE AQUATIC SPECIES FROM THE WORK AREA. GRADUALLY CONSTRUCT FINAL BYPASS CHANNEL EMBANKMENT SIMULTANEOUSLY WITH AQUATIC SPECIES RELOCATION.
- 2** RELOCATE AQUATIC SPECIES FROM THE EXISTING RIVER CHANNEL AS WSEL DROPS WHILE FINAL BYPASS CHANNEL EMBANKMENT IS CONSTRUCTED. PUMP OUT REMAINING WATER AND RELOCATE AQUATIC SPECIES SIMULTANEOUSLY UNTIL OLD CHEHALIS RIVER CHANNEL IS DRY AND AQUATIC SPECIES ARE SAFELY RELOCATED.
- 3** PHASE 2 WORK COMMENCES FOLLOWING CONCLUSION OF IN-WATER WORK WINDOW 1.

NOTES
1. REQUESTED IN-WATER WORK WINDOW: JULY 1 - SEPTEMBER 30.
2. VOLITIONAL UPSTREAM AND DOWNSTREAM AQUATIC SPECIES PASSAGE CONTINUES THROUGHOUT CONTRUCTION.

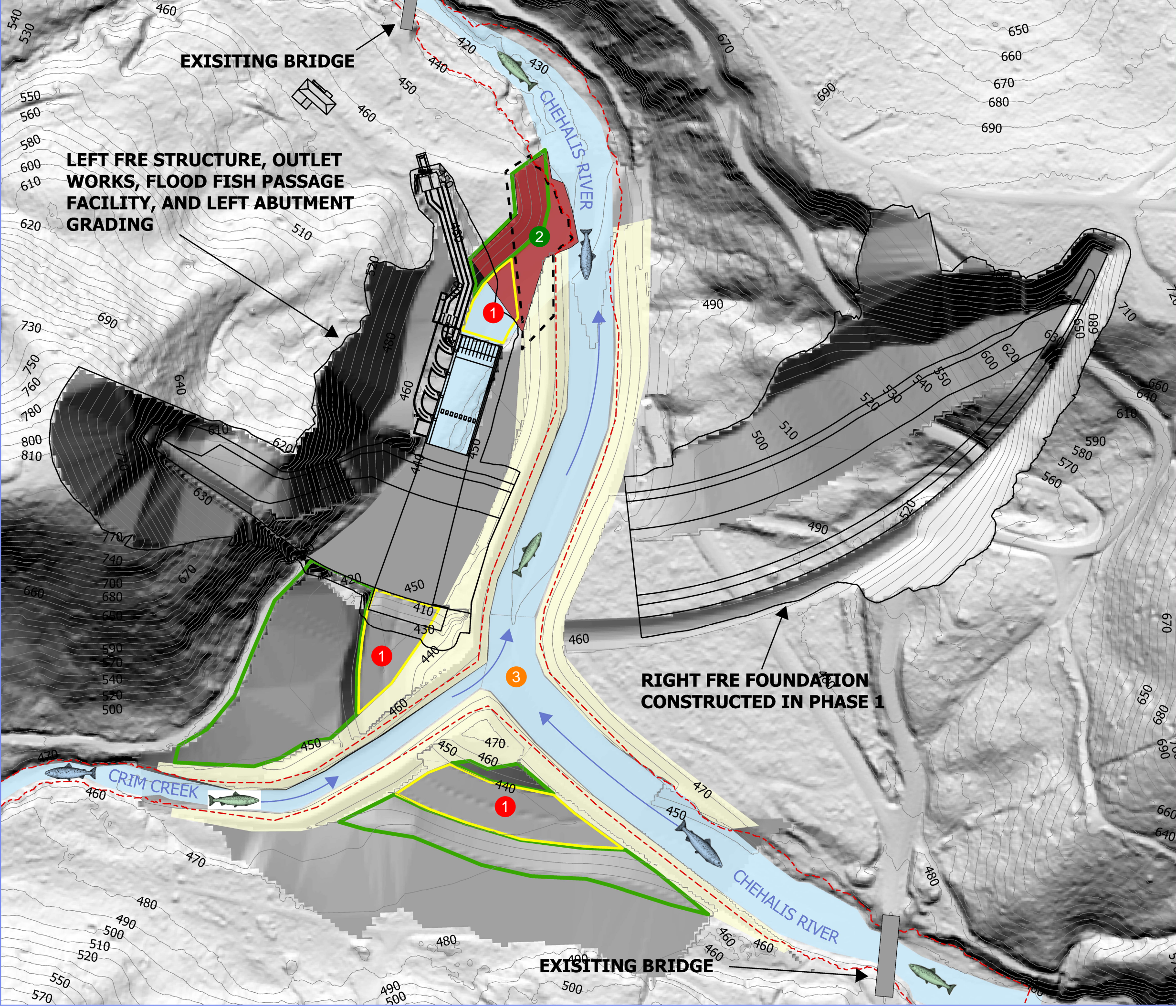




Attachment D. Phase 2-3 Transition, Step 1

CONSTRUCTION IN-WATER WORK STEPS

YEAR 3
IN-WATER WORK WINDOW 2
TRANSITION FROM PHASE 2 TO PHASE 3
STEP 1

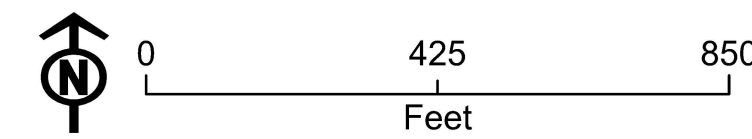


Legend

- FRE FACILITY
- OHWM - 2YR WSEL
- 10 FT CONTOUR
- - - CHANNEL BREACH
- ▭ CONSTRUCTED EMBANKMENT
- ← DIRECTION OF FLOW
- 🐟 UPSTREAM FISH PASSAGE ROUTE
- 🐟 DOWNSTREAM FISH PASSAGE ROUTE
- ▭ BYPASS CHANNEL EMBANKMENT
- ▭ APPROX. SUMMERTIME WETTED AREA
- ▭ EXISTING RIVER BANK
- ▭ PERMANENT CHANNEL

- 1** PERMANENT RIVER CHANNEL CONSTRUCTED IN THE DRY IN PHASE 2, PRIOR TO IN-WATER WORK WINDOW 2.
- 2** CHANNEL EMBANKMENT CONSTRUCTED AND EXISTING RIVER BANK BREACHED DURING STEP 1. CHEHALIS RIVER CONNECTED TO PERMANENT CHANNEL AND FISH PASSAGE CONDUIT STILLING BASIN BY BREACH. FISH PASSAGE CONDUIT STILLING BASIN AND PERMANENT CHANNEL DOWNSTREAM BACKWATERED BY CHEHALIS RIVER. AQUATIC SPECIES EXCLUDED AND REMOVED FROM WORK AREA PRIOR TO CONSTRUCTION BELOW OHWM. AQUATIC SPECIES EXCLUDED FROM FISH PASSAGE CONDUIT STILLING BASIN THROUGHOUT STEP 1.
- 3** UPSTREAM AND DOWNSTREAM VOLITIONAL AQUATIC SPECIES PASSAGE CONTINUES VIA BYPASS CHANNEL.

NOTES
1. REQUESTED IN-WATER WORK WINDOW: JULY 1 - SEPTEMBER 30.
2. VOLITIONAL UPSTREAM AND DOWNSTREAM AQUATIC SPECIES PASSAGE CONTINUES THROUGHOUT CONSTRUCTION.





Attachment E. Phase 2-3 Transition, Step 2

CONSTRUCTION IN-WATER WORK STEPS

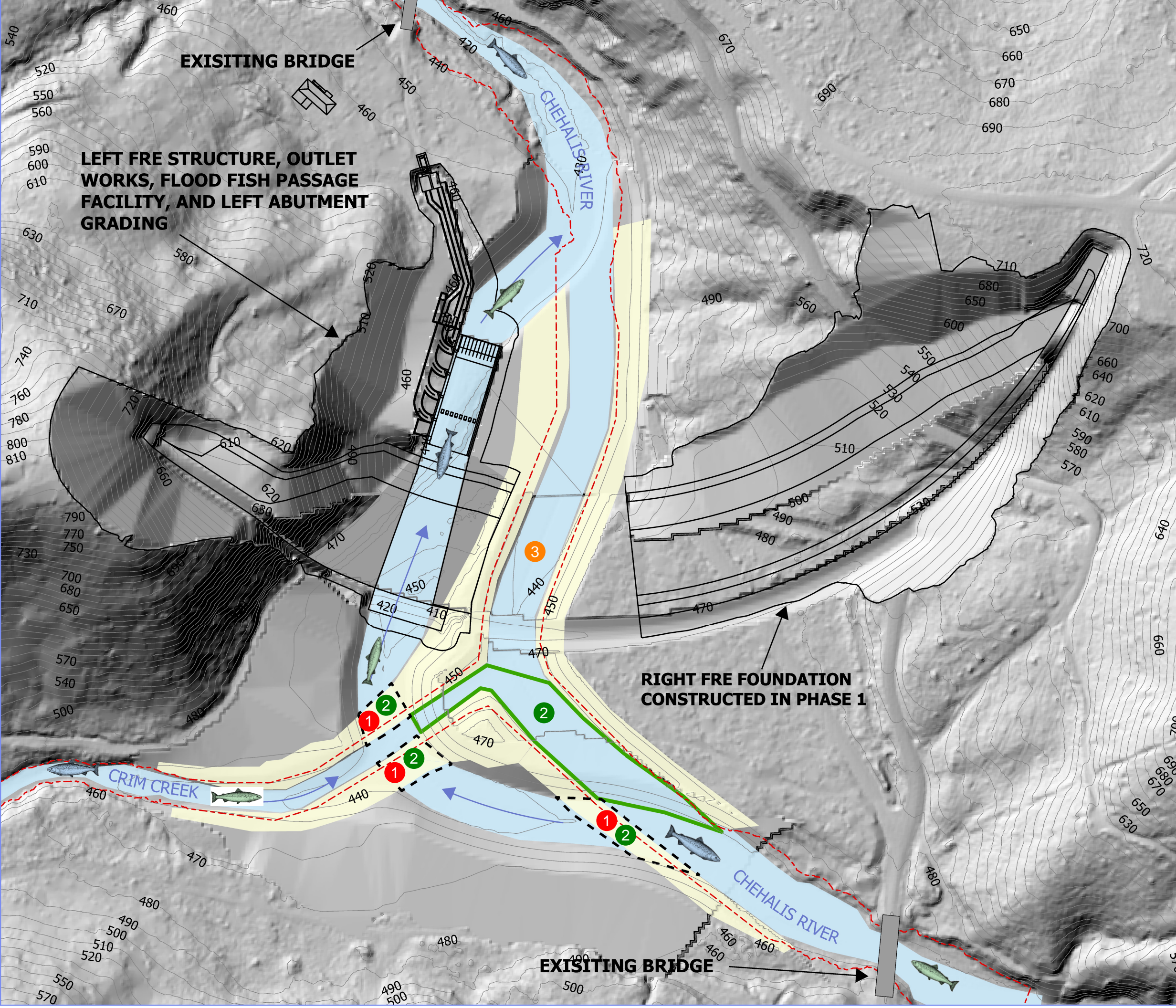
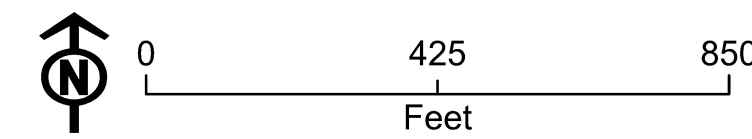
YEAR 3
IN-WATER WORK WINDOW 2
TRANSITION FROM PHASE 2 TO PHASE 3
STEP 2

Legend

- FRE FACILITY
- BYPASS CHANNEL EMBANKMENT
- 10 FT CONTOUR
- - - CHANNEL BREACH
- ← DIRECTION OF FLOW
- UPSTREAM FISH PASSAGE ROUTE
- DOWNSTREAM FISH PASSAGE ROUTE
- APPROX. SUMMERTIME WETTED AREA
- OHWM - 2YR WSEL
- CONSTRUCTED EMBANKMENT

- 1** PERFORM INITIAL BREACH OF BYPASS CHANNEL TO ALLOW CHEHALIS RIVER AND CRIM CREEK INTO THE PERMANENT CHEHALIS RIVER CHANNEL.
- 2** GRADUALLY WIDEN BREACHES OF BYPASS CHANNEL EMBANKMENTS WHILE SIMULTANEOUSLY CONSTRUCTING PERMANENT CHANNEL EMBANKMENTS. AS FLOW GRADUALLY DIVERTS INTO THE PERMANENT RIVER CHANNEL THE WSEL IN THE BYPASS CHANNEL WILL SLOWLY LOWER. PERFORM AQUATIC SPECIES RELOCATION CONTINUOUSLY THROUGHOUT IN-WATER WORK. WORK CONTINUES UNTIL BYPASS EMBANKMENT AREAS WITHIN THE PERMANENT CHANNEL FOOTPRINT ARE FULLY BREACHED, PERMANENT EMBANKMENTS ARE COMPLETE, AND FLOW IS FULLY DIVERTED FROM THE BYPASS CHANNEL TO THE PERMANENT CHANNEL.
- 3** AQUATIC SPECIES HAVE ACCESS TO BACKWATERED EXISTING CHEHALIS RIVER CHANNEL.

NOTES
1. REQUESTED IN-WATER WORK WINDOW: JULY 1 - SEPTEMBER 30.
2. VOLITIONAL UPSTREAM AND DOWNSTREAM AQUATIC SPECIES PASSAGE CONTINUES THROUGHOUT CONSTRUCTION.

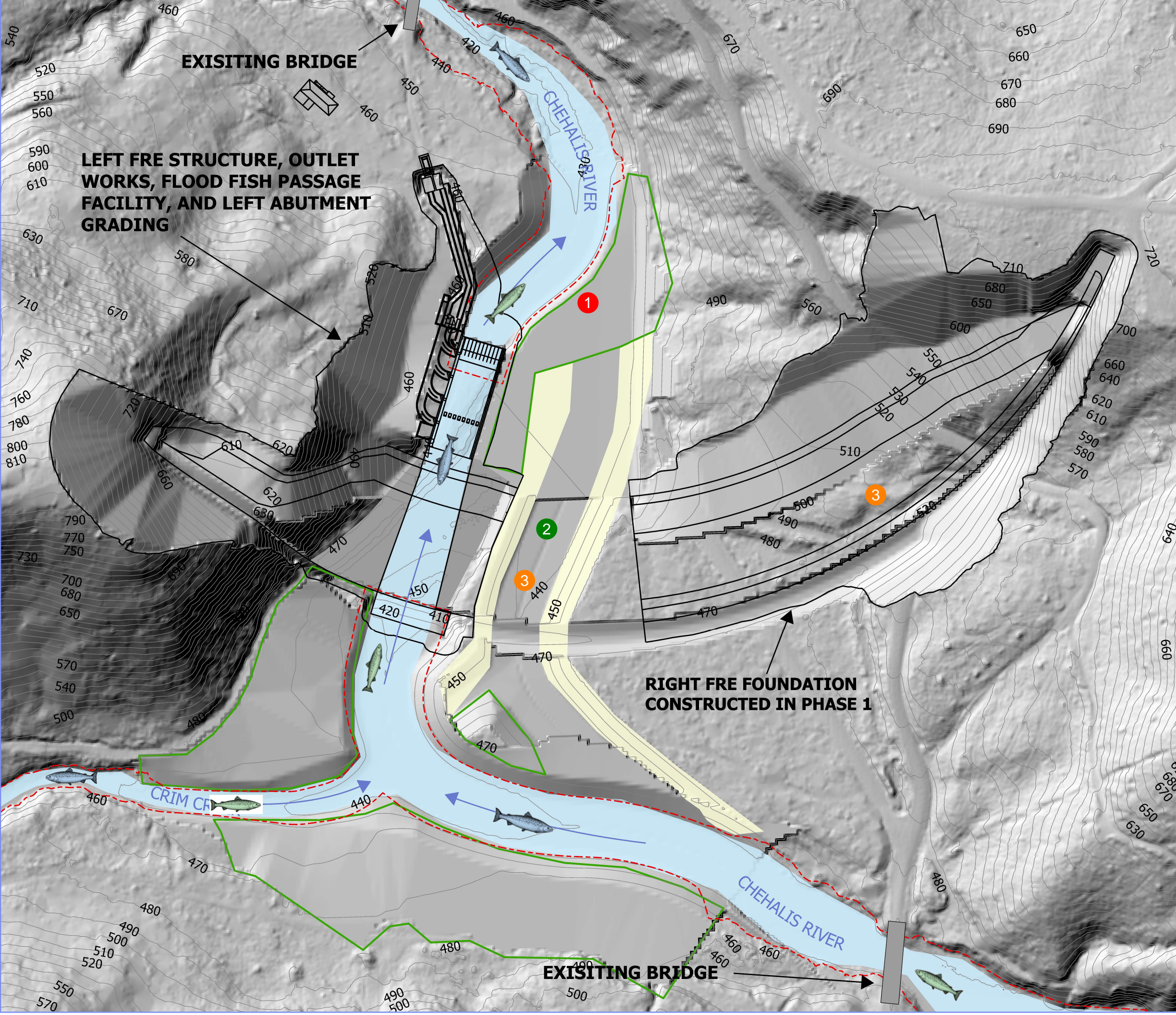




Attachment F. Phase 2-3 Transition, Step 3

CONSTRUCTION IN-WATER WORK STEPS

YEAR 3
IN-WATER WORK WINDOW 2
TRANSITION FROM PHASE 2 TO PHASE 3
STEP 3



Legend

- FRE FACILITY PROPOSED
- - - OHHM - 2YR WSEL
- 10 FT CONTOUR
- ← DIRECTION OF FLOW
- ▭ CONSTRUCTED EMBANKMENT
- ▭ BYPASS CHANNEL EMBANKMENT
- ▭ APPROX. SUMMERTIME WETTED AREA

- UPSTREAM FISH PASSAGE ROUTE
- DOWNSTREAM FISH PASSAGE ROUTE

- 1** EXCLUDE FISH FROM THE WORK AREA. GRADUALLY CONSTRUCT FINAL PERMANENT CHANNEL EMBANKMENT SIMULTANEOUSLY WITH AQUATIC SPECIES RELOCATION.
- 2** RELOCATE AQUATIC SPECIES FROM THE BYPASS CHANNEL AS WSEL DROPS WHILE PERMANENT EMBANKMENT IS CONSTRUCTED. PUMP REMAINING WATER OUT OF BYPASS CHANNEL AND RELOCATE AQUATIC SPECIES SIMULTANEOUSLY UNTIL BYPASS CHANNEL IS DRY AND FISH ARE SAFELY RELOCATED.
- 3** PHASE 3, INCLUDING CONSTRUCTION OF RIGHT SIDE OF FRE STRUCTURE AND FILLING OF DRY BYPASS CHANNEL, COMMENCES FOLLOWING CONCLUSION OF IN-WATER WORK WINDOW 2.

NOTES
1. REQUESTED IN-WATER WORK WINDOW: JULY 1 - SEPTEMBER 30.
2. VOLITIONAL UPSTREAM AND DOWNSTREAM AQUATIC SPECIES PASSAGE CONTINUES THROUGHOUT CONSTRUCTION.



LEFT FRE STRUCTURE, OUTLET WORKS, FLOOD FISH PASSAGE FACILITY, AND LEFT ABUTMENT GRADING

RIGHT FRE FOUNDATION CONSTRUCTED IN PHASE 1

EXISTING BRIDGE

EXISTING BRIDGE

CHEHALIS RIVER

CRIM CR

CHEHALIS RIVER