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**MILL CREEK – FISH PASSAGE  
6<sup>TH</sup> AVENUE EXTENSION**

**PROJECT # 18-2090**

**DRAFT - BASIS OF DESIGN REPORT**

**Prepared for**  
TSS



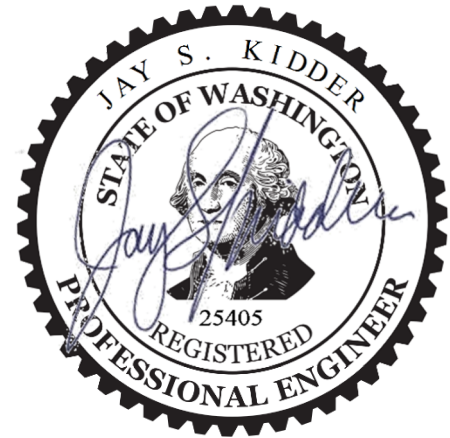
**Prepared by**  
Chinook Engineering



**May 2020, revised Final March 30, 2022**

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The technical material and data contained in this report were prepared under the supervision and direction of the undersigned, whose seal as a professional engineer licensed to practice as such in the State of Washington, are affixed below.



A handwritten signature of Jay S. Kidder, written in cursive, positioned above a horizontal line.

Jay S. Kidder, P. E.

Civil Engineer  
and Fisheries Biologist

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## **1 INTRODUCTION**

This fish passage sub-project of the Mill Creek Fish Passage Project Extends from 6<sup>th</sup> Avenue to 3<sup>rd</sup> Avenue (~975 feet), just upstream of the 6<sup>th</sup> Avenue Bridge fish passage work that was completed in 2016. Target species for design are Spring Chinook adults, Steelhead adults, and Bull trout juvenile.

This new work will connect the downstream end of the concrete channel at 9<sup>th</sup> Avenue to the 3<sup>rd</sup> Avenue bridge, where the channel goes underground. Several bends and channel narrowing occurs in this reach. Three bridges cross the channel. For the purpose of this design and design report, it is assumed the 6<sup>th</sup> Avenue and 5<sup>th</sup> Avenue bridges and center piers will be removed from the Mill Creek Channel as anticipated. The City of Walla Walla plans to replace the 4<sup>th</sup> avenue bridge. Because the City has not decided on a plan of action at the 6<sup>th</sup> Avenue bridge, the design incorporates the fish passage treatment of installation of roughness panels and resting pools and channel baffles as if there is no center pier or bridge at these locations, and an alternate design to be revised when a contract is bid showing the details of the fish passage if the pier remains.

The reach starts at STA 19+50 and ends at STA 30+94 upstream. These stations correspond to the original USCOE stationing for the Mill Creek Flood Channel project. This new project ties into the existing fish passage work just upstream of the 6<sup>th</sup> Avenue bridge (N 9<sup>th</sup> Avenue Extension, #13-1387) and is adjacent to an existing roughness panel that is overlaid with some concrete to provide wheel space for maintenance vehicles. Overlay of roughness panels has been determined to not be a viable passage solution and the areas that have been overlaid with concrete for vehicles will be rebuilt and the channel moved or widened in these areas.

Multiple bends are included in the channel alignment and are detailed in this project.

## **2 PROPOSED DESIGN**

The proposed design for fish passage will be a continuation of previous work with baffles, roughness panels and resting pools. The fish passage route will remain on the left bank. This presents some minor design challenges at the areas where the left over-bank width is narrow for maintenance vehicles.

The 4<sup>th</sup> Avenue Bridge exhibited a clearance issue during the preliminary design phase but will now be removed and the clearance problem for truck under passing is not an issue. Upon funding for construction, and During Final Contract Document preparation this clearance subject must be validated to verify vehicle clearance. It is possible that a vehicle ramp must be included in the scope of work.

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### **3 HYDRAULIC MODELING**

A HEC RAS 1D model was created to analyze the existing and proposed conditions along this reach. The purpose of the model is to calculate fish passage velocities at the design flows and then to check for a no rise flood flow analysis. Resting pools are spaced based on providing passage for Bull Trout at 194 cfs and are spaced at 80' for the approximate 1.1% sloped channel in this reach.

Results of the modeling was presented in the Mill Creek N. 9th Avenue Extension Basis for Design Report work and was also modeled in the physical model built to describe this fish passage work (August 2013 and 2014.) The fish passage project from 9<sup>th</sup> Avenue to 6<sup>th</sup> Avenue was constructed and later validated to determine if the as-built condition was meeting the fish passage criteria established earlier. The computer modeling and prototype As-Built conditions agree nicely with water velocity validation measurements and preliminary design estimates for fish passage criteria in that reach. For that reason the extension of the Reach Type 3 channel fish passage construction is anticipated to provide the same acceptable fish passage pathway for migration along the left over bank for the target species in the extended reach for this project between 6<sup>th</sup> to 3<sup>rd</sup> Avenue.

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#### **4 COST ESTIMATE**

This will be the fifth project constructed in Mill Creek of similar design depending on the date of delivery and completion. The cost estimate is based on actual costs and bids received. The highest level of uncertainty involves three items, 1) construction access and staging and 2) pumping groundwater from the excavated areas, especially the pools, and 3) the removal or not of the 6<sup>th</sup> and 5<sup>th</sup> Street Bridges and in channel piers.

Each sub project of the overall fish passage project has improved incrementally with regards to these risk items. For this site, the potential for a single access point may lead to difficult access or streamlined material delivery and staging. Groundwater is not anticipated to be difficult at this reach based on adjacent work but, ground conditions can vary drastically within proximity. The greatest unknown risk and potential cost impact for funding and schedule is the removal of the 6<sup>th</sup>, 5<sup>th</sup>, and 4<sup>th</sup> Avenue Bridges before this work begins as assumed.

The estimated construction cost is \$2,150,000.

**Mill Creek Passage - Project Cost Template 6th to 3rd Extension**

3-30-2022 Updated by JSK

By: JSK  
 Design Level: 100%  
 Total Project Length (ft): 1156 start 1950  
 Resting Pools: 13 end 3106  
 Length w/o Resting Pools: 1000  
 Roughness Panels: 101  
 Baffles (7') 61  
 Baffles (3') 10  
 Bridge Ramps 0

Description	Unit	CAD		Bid		Cost	Amount	Sub Total
		Quantity	t (in)	Mult	Quantity			
<b>Mob, Access and Water Management</b>								<b>\$443,000</b>
Mobilization	L.S.	1		1	1	\$140,000.00	\$140,000	
Access to Flume	L.S.	1		1	1	\$45,000.00	\$45,000	
Sumps Pumps	L.S.	1		1	1	\$60,000.00	\$60,000	
Sediment Control	L.S.	1		1	1	\$18,000.00	\$18,000	
Diversion Dam and Pipe	L.S.	1		1	1	\$180,000.00	\$180,000	
<b>Concrete Demolition</b>								<b>\$192,881</b>
Concrete Slab cutting	L.F.	2353		1	2353	\$26.00	\$61,183	
Concrete Wall cutting (plain)	L.F.	0	18	1	0	\$7.00	\$0	
Concrete Wall cutting (with rebar)	L.F.	0	18	1	0	\$11.45	\$0	
Blades	ea.	5		1		\$625.00	\$3,125	
Concrete Removal	C.Y.	278		1.1	306	\$420.00	\$128,573	
Remove Whole Pieces	ea.	0				\$140.00	\$0	
Loading Concrete	C.Y.	109				\$200.00	\$0	
Hauling	C.Y.	109				\$7.00	\$0	
Concrete Disposal	C.Y.	109				\$10.00	\$0	
<b>Reinforced Concrete Form and Pour</b>								<b>\$1,024,253</b>
Excavation and Disposal	C.Y.	541		1.1	596	\$90.00	\$53,602	
Disposal	C.Y.	0				\$30.00	\$0	
Gravel Backfill	C.Y.	91		1.2	109	\$242.00	\$26,359	
Concrete Underpinning	C.Y.	0				\$2,100.00	\$0	
CIP	C.Y.	0				\$1,300.00	\$0	
Epoxy dowels	ea.	0			0	\$25.00	\$0	
Roughness Panels (Form and Pour)	ea.	101		1	101	\$3,400.00	\$343,400	
Install Roughness Panels	ea.	101		1	101	\$650.00	\$65,650	
CIP Concrete	C.Y.	226		1.1	249	\$2,100.00	\$522,762	
Enclosure Curbs/Perpend. To Flow	C.Y.	9.1				\$0.00	\$0	
Enclosure Curbs/Parallel To Flow	C.Y.	100.0				\$0.00	\$0	
7' Baffles	C.Y.	12.4				\$0.00	\$0	
3' Baffles	C.Y.	0.8				\$0.00	\$0	
Resting Pools	C.Y.	104.0				\$0.00	\$0	



<b>Habitat Boulders</b>	L.S.	<b>39.0</b>	1	39	\$320.00	\$12,480	
<b>Bridge Pass Ramps</b>					subtotal	<b>\$84,687</b>	<b>\$0</b>
Concrete Cutting	L.F.	310	1	310	\$15.00	\$4,650	
Concrete Removal	C.Y.	34	1.15	39	\$356.00	\$13,920	
Excavation and Disposal	C.Y.	41	1.15	47	\$88.00	\$4,149	
Gravel Backfill	C.Y.	15	1.25	19	\$242.00	\$4,538	
CIP Concrete	C.Y.	55	1.15	63	\$908.00	\$57,431	
<b>Construction Subtotal</b>							\$1,660,134
Contingency	10%						\$166,013
Sales Tax	8.9%						\$162,500
<b>Construction Total</b>							<b>\$1,988,600</b>
Construction Management	8.0%						\$159,100
<b>Project Total</b>							<b>\$2,147,700</b>
<b>Opinions of Probable Construction Cost</b>							
In providing opinions of probable construction cost, the Client understands that the Consultant (Chinook Engineering) has no control over the cost or availability of labor, equipment or materials, or over market condition or the Contractor's method of pricing, and the consultant's opinions of probable construction costs are made on the basis of the Consultant's professional judgment and experience. The Consultant makes no warranty, express or implied that the bids or the negotiated cost of the Work will not vary from the Consultant's opinion of probable construction cost.							
					<i>Cost Per Foot</i>	<b>\$1,720</b>	
					<i>Cost Per Foot Without Panel Purchase</i>	<b>\$1,645</b>	

**Figure 1 Construction Cost Estimate.**

## 5 REFERENCES

Bates, Ken. 2003. *Design of Road Culverts for Fish Passage*. Washington State Department of Fish and Wildlife.

Barnard, R. J., J. Johnson, P Brooks, K.M. Bates, B. Heiner, J.P. Klavas, D.C. Ponder, P.D. Smith, and P.D. Powers (2013). *Water Crossing Design Guidelines*. Washington Department of Fish and Wildlife. Olympia, WA. <http://wdfw.wa.gov/hab/ahg/culverts.htm>

National Marine Fisheries Service (NMFS). 2008. *Anadromous Salmonid Passage Facility Design*.

Northwest Hydraulic Consultants (NHC), 2011. Mill Creek Channel Improvement Physical Model Study Final Report.

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Powers, P. *Mill Creek Fish Passage Conceptual Design Final Report*. Walla Walla: Tri State Steelheaders, 2010.

P. Powers, J. Kidder. *Mill Creek Fish Passage – N 9<sup>th</sup> Avenue Extension – Basis of Design Report. Appendix B*. Walla Walla: Tri State Steelheaders, 2014.

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**APPENDIX A – SITE PHOTOS**



**Figure 2 Upstream end of project showing center wall and concrete footings just upstream of end of project and below the 3<sup>rd</sup> Avenue Bridge and USCOE Plaza. Looking up stream into the underground section of the Mill Creek. STA 31+06**



**Figure 3 4th Avenue Bridge looking Downstream with 5th Avenue Bridge in the background.**



**Figure 4 Upstream end of 5th Avenue Bridge and Pier assumed to be removed prior to this proposed reach work. Proposed access site is on the top left side of this photo.**



**Figure 5** Near the start of project STA 21+25 looking upstream just upstream of the 6th Avenue Bridge. Concrete overlay of the roughness panel for vehicle travel can be seen on the Mill Creek left bank on the lower center of the photo.



**Figure 6 6th Avenue Bridge looking Downstream**



**Figure 7 February 7, 2020 flooding looking up stream at the 3<sup>rd</sup> Avenue Bridge and the underground. Flow is approximately 4000 cfs.**





**Figure 8 The 4th Avenue bridge looking upstream. The proposed access site is shown on the right margin of the photo. Flow rate is approximately 4000 cfs.**



**Figure 9 5th Avenue Bridge during 4000 cfs flows.**



**Figure 10 6th Avenue Bridge looking downstream from the 5th Avenue Bridge toward the start of the project.**