US Army Corps of Engineers ®
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WEST PASCO WATER TREATMENT PLANT NEW WATER INTAKE STRUCTURE

MCNARY LOCK AND DAM

PM-EC-2013-0074

Biological Assessment

for

Threatened and Endangered Species,
Critical Habitat, and Essential Fish Habitat

Under the Jurisdiction of:
National Marine Fisheries Service
and
U.S. Fish and Wildlife Service

U.S. Army Corps of Engineers
Walla Walla District
Environmental Compliance Section

August 8, 2014

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Acronym Glossary

BGEPA	Bald and Golden Eagle Protection Act
CFR	Code of Federal Regulations
cfs	Cubic feet per second
Corps	U.S. Army Corps of Engineers
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
ESA	Endangered Species Act of 1973, as amended
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FPC	Fish Passage Center
FWCA	Fish and Wildlife Coordination Act
HMU	Habitat Management Unit
HUC	Hydrologic Unit Code
MBTA	Migratory Bird Treaty Act
MGD	Million Gallons Per Day (1 MGD = 694.4 gallons per minute)
MPG	Major Population Group
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
PCE	Primary Constituent Element
RM	River Mile
USFWS	U.S. Fish and Wildlife Service
WPWTP	West Pasco Water Treatment Plant

Summary

The U.S. Army Corps of Engineers, Walla Walla District (Corps), proposes to grant an easement to the City of Pasco (Pasco), WA for a pipeline which will cross under Corps managed Federal land adjacent to and under the north side of the I-182 Bridge over the Columbia River. Pasco's request for an easement is associated with its plans to construct a new river water intake, a pump station, and connection piping to increase the supply of water to the West Pasco Water Treatment Plant (WPWTP) and municipal irrigation system. River water will be conveyed through the intake pipe to a concrete wet well, then pumped from the well to the WPWTP. The entire facility is a part of Pasco's long-term water comprehensive plan to provide increasing water needs of the community.

From 2000 to 2013, Pasco's population increased from about 32,000 to 65,000. It is projected to continue growing. The new intake and water treatment facility will accommodate future population growth. The new system is needed to provide additional raw water capacity for the WPWTP to provide potable water which will support Pasco's growing population and provide a backup water source if one source fails.

This Biological Assessment (BA) has been prepared to document the potential effects associated with the proposed action (granting the easement) to biological resources protected by various environmental laws including the Endangered Species Act (ESA), Magnuson-Stevens Fishery Conservation and Management Act (MSA), Fish and Wildlife Coordination Act (FWCA), Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Potential effects from any interrelated or interdependent activities (e.g. modification of the existing intake, construction and operation of the intake facilities), as well as cumulative effects (e.g., water withdrawals), are also discussed.

ESA-listed species within Franklin County include: Upper Columbia River spring Chinook and steelhead, Middle Columbia River steelhead, bull trout, gray wolf; pygmy rabbit, Ute ladies'-tresses, White Bluffs bladderpod and yellow-billed cuckoo (proposed). Candidate species include Washington ground squirrel. Critical habitat has been designated for all of the listed fish species as well as for White Bluffs bladderpod.

The Corps has determined the proposed action **"may affect and is likely to adversely affect"** Upper Columbia River spring Chinook and steelhead as well as Middle Columbia River steelhead. This determination is based on the negative impacts of sound waves in the water and increased turbidity associated with driving steel H-piles and sheet piles. The action **may have a temporary negative effect on** critical habitat for these species based on the temporary loss of the cofferdam area during construction (even though it is minimal). A very limited number of bull trout could be present in the Columbia River, especially during winter months. Any bull trout present would likely be adult or sub-adult fish which could easily move away from the work site, but due to the duration of the pile driving, effects could occur. The Corps has determined the action **"may affect, and is likely to adversely affect"** bull trout. The Columbia River is designated as bull trout critical habitat, but since the number of bull trout is expected to be so low and the amount of habitat is virtually unlimited, the Corps has determined the

proposed action **"is not likely to adversely affect"** their designated critical habitat. The Corps has also determined there will be **"no effect"** on any of the ESA-listed terrestrial species including pygmy rabbit, gray wolf, Ute ladies'-tresses, White Bluffs bladderpod and yellow-billed cuckoo. Likewise, there will be **"no effect"** on Washington ground squirrel.

Finally the Corps has determined there will be no adverse effects to Essential Fish Habitat under the MSA, the FWCA does not apply to this action there will be no take under the Migratory Bird Treaty Act, and there will be no disturbance or take under the Bald and Golden Eagle Protection Act.

Impact minimization measures for this action include the following:

1. Sheet piles or other protective works shall be constructed, maintained, and removed using materials and methods which do not produce siltation or other degradation of the water quality of the river or stream which exceeds the limits of applicable Federal, state and local regulations.
2. During construction and cofferdam placement and removal, the contractor shall provide proper buoys and other warning markers at construction boundaries to exclude recreational and commercial boating activities around the intake site.
3. All materials excavated from the river shall be placed onto a floating barge.
4. The contractor shall contain all spoils and slurry in trucks, tanks, or other containers at all times. Dumping of spoil or slurry on the ground, into stormwater channels, or discharge into the shafts or into the Columbia River will not be permitted.
5. Spill kits will be available on the work barge and on the construction site.
6. If vegetation removal is required, native vegetation will be replanted at the site.
7. No construction materials or runoff from the site will be discharged into the river.
8. Pumped water will not be allowed to discharge directly to the Columbia River without a suspended solids removal treatment system.
9. A catch basin with an oil/water separator will be installed and the treated stormwater will be combined with the stormwater from the roof and conveyed to an infiltration trench on site.
10. Stormwater runoff generated on the street will be collected in a catch basin at the curb with an oil/water separator and the treated stormwater will be conveyed to an infiltration swale located behind the sidewalk on site.
11. If vegetation is to be removed between March 15 and August 15, the area to be disturbed, including all vegetation to be removed, must be monitored by a biologist familiar with migratory bird monitoring techniques to ensure no take of birds or nests protected by the Migratory Bird Treaty Act occurs.
12. The in-water work window – is July 16 to September 30 and/or December 15 to March 15.

This action will require further review in order to re-analyze the potential adverse effects on federal resource species or habitats if any significant changes in the action are proposed or occur after the date of this document.

1. Introduction

Under the authority of Title 10 of USC 2668, the U.S. Army Corps of Engineers, Walla Walla District (Corps), proposes to grant an easement to the City of Pasco, WA for a water pipeline which will cross under Corps managed Federal land adjacent to and under the north side of the I-182 Bridge over the Columbia River (Figure 1). Pasco's request for an easement is associated with their plans to construct a new river water intake, a pump station, and connection piping to increase the supply of water to the West Pasco Water Treatment Plant (WPWTP). Water will be conveyed from the river, through the intake pipe to a concrete wet well, then pumped from the well to the WPWTP. The entire facility is a part of Pasco's long-term water comprehensive plan to provide increasing water needs of the community. The existing water intake will be used for the city's municipal irrigation system and a backup water source.

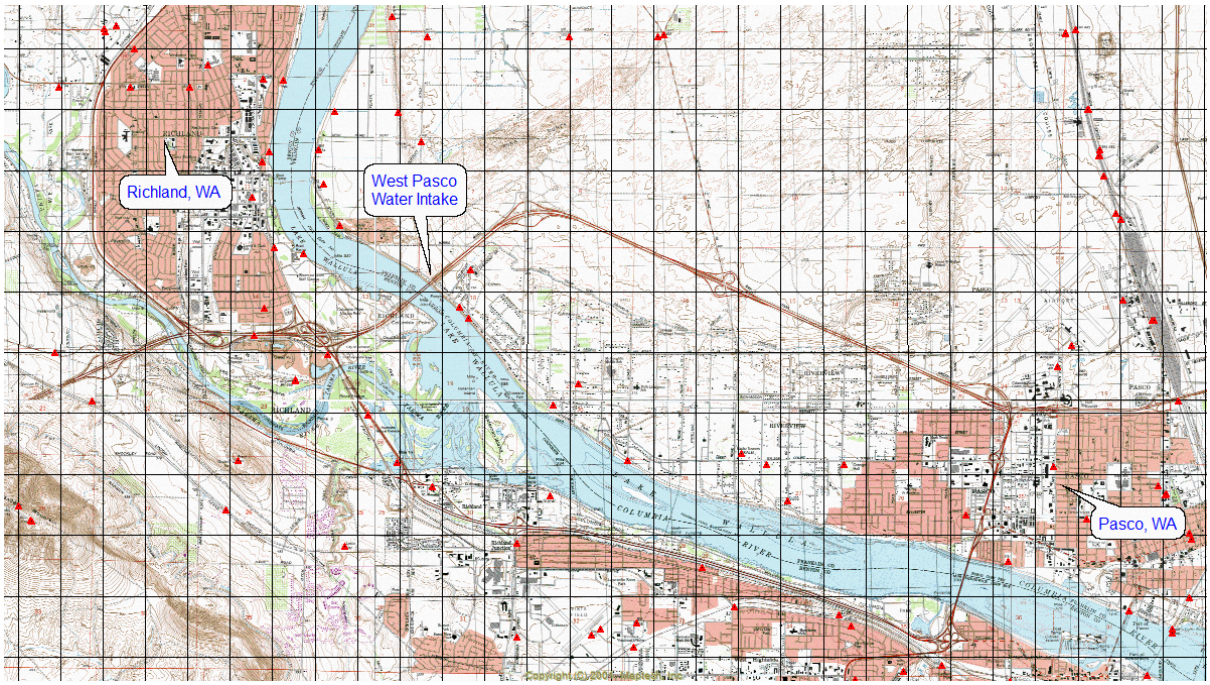


Figure 1. Location of the proposed West Pasco water intake.

From 2000 to 2013, Pasco's population increased from about 32,000 to 65,000. The new intake and water treatment facility will accommodate their projected future growth. The new system is needed to provide additional raw water capacity for the WPWTP to provide potable water which will support Pasco's growing population and provide a backup water source if another source fails. The City of Pasco water system is supplied from surface water withdrawals from the Columbia River. Pasco currently draws water through their existing Columbia River intake which is located directly downstream from the proposed new intake site. The new system will

be used for their raw water supply to the WPWTP and the existing intake plant will be used for their municipal irrigation system.

The proposed easement does not grant Pasco any right to use/withdraw water from the Columbia River. The State of Washington decides where (and for what purpose) water within the state will be put to beneficial use, not the Corps. Pasco's right to withdraw water is the result of state issued/recognized water rights. If Pasco was unable to withdraw such water at the proposed location, it is reasonable to believe Pasco would find an alternative withdrawal site or the state would designate a different beneficial use for such water elsewhere (consumptive or in-stream). This BA, therefore, does not assess potential effects associated with water intake withdrawals as part of the potential direct/indirect effects of the proposed easement action. Such effects are considered in the cumulative effects analysis (Section 4.4).

2. Action Description

2.1. Action Location

The action is located in Section 18, of Township 9 North, Range 29 East, W.M., Franklin County, WA (Figure 1). The site is located at Columbia River Mile 336.1. The address is 11416 West Court Street, Pasco. The site is just upstream and adjacent to the I-182 Bridge on the north side of the Columbia River.

The new pump station building will be located on the upland portion of a lot owned by Pasco adjacent to I-182 in West Pasco. The new pump station site will cover approximately 8,500 square feet. The site for the proposed new intake is immediately adjacent to the existing intake (Figure 2). The property is bordered by: the Columbia River to the southwest; a residential property to the northwest; Court Street to the northeast; and the Washington Department of Transportation right of way for I-182 to the southeast. More specifically, Parcel # 118221120. Currently the land portion of the site is used for small scale agriculture purposes.

The action area is from Priest Rapids Dam to the confluence of the Snake and Columbia Rivers. This area has been defined because of the localized impacts related to construction of the intake structure.

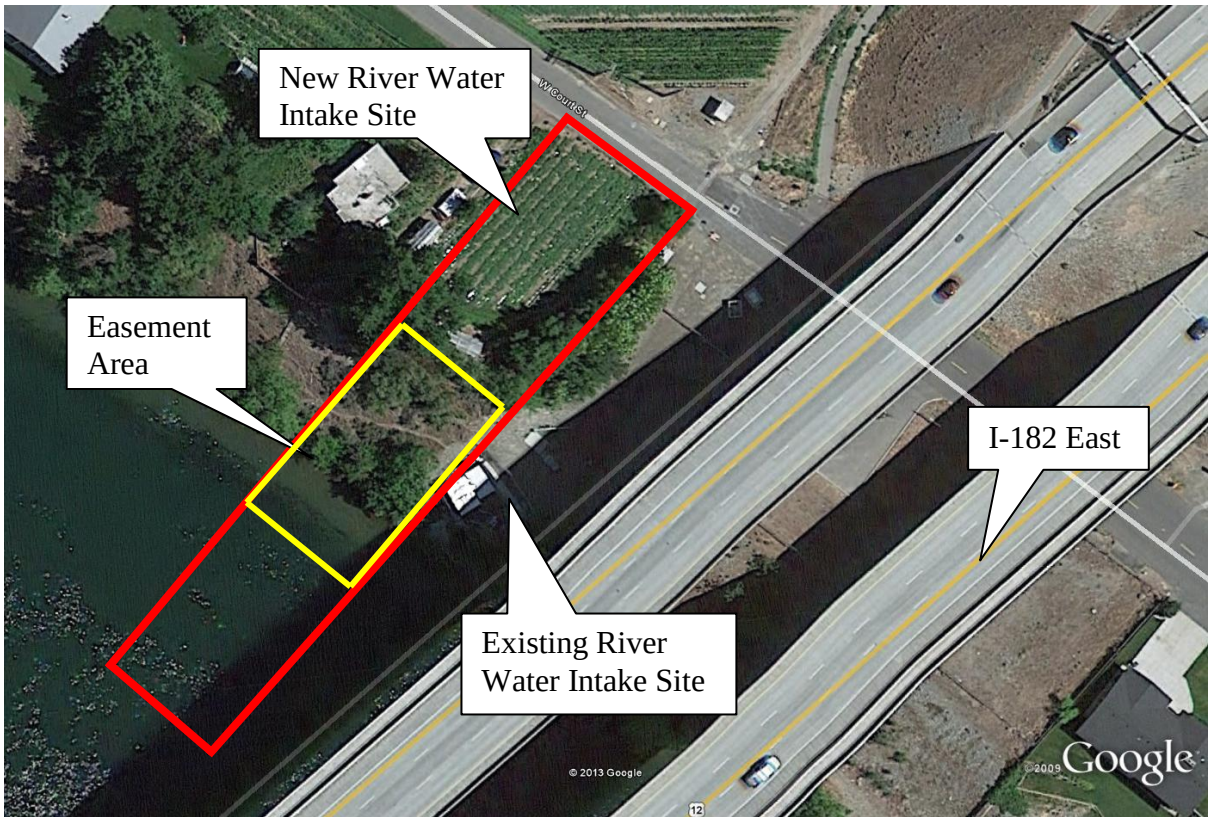


Figure 2. Aerial photo of new river water intake site.

A temporary construction staging and storage area will be located on the upland portion of the lot where the pump station building and concrete wet well will be constructed. The staging/storage area will be approximately 500 square feet.

2.2. Action Description

The **proposed action** is to grant an easement to Pasco to construct a water intake facility under Corps managed land.

Interrelated actions are activities that are part of the proposed action and depend on the proposed action for their justification. **Interdependent actions** are activities that have no independent utility apart from the action under consultation. An interrelated action associated with the proposed action is the modified use of the existing intake structure and pump plant from providing raw river water for both the municipal supply and for irrigation to being used only for irrigation. After the new intake is complete the entire quantity of water withdrawn from the existing intake structure (up to 9 MGD (14 cfs)) could be used for Pasco's irrigation system (if demand increases and applicable water rights are obtained) and as a backup system should the new intake facility fail. Currently approximately 3 MGD (4.6 cfs) is used in the irrigation system.

An interdependent action related to granting of the Federal easement is construction of a new pump station building to house the pumps and related equipment. This building will be designed to appear like a single-family residential structure. The project layout is shown in Figures 3, 4

and 5. Construction on the site will include: a cast-in-place concrete wet well, 30-feet in diameter, extending vertically approximately 85 feet below finished grade and a horizontally-bored intake pipe. The pump station building will sit atop the new wet well. The building and wet well will be located on the upland portion of the site, away from the river, avoiding impacts to the riparian area. The new 36-inch diameter intake pipe will be tunneled from where it connects to the concrete wet well to the point where it emerges from the riverbed. The intake pipe will be installed behind a micro-tunnel boring machine (MTBM) (Figure 6). Open trenching and placement of pipe will connect the pump station to the WPWTP.

The applicable contract specifications (60%), which include provisions to limit effects to the environment, have been included in this description and are preceded by the section number and are underlined.

(2140) - The CONTRACTOR shall submit plans for disposal of water pumped for the intake shaft excavation and construction. Pumped water will not be allowed to discharge directly to the Columbia River without a suspended solids removal treatment system, approved by the [City's] ENGINEER. It shall be the sole responsibility of the CONTRACTOR to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence of surrounding soils and property. Water shall be settled and/or filtered using an approved method to remove sand and fine suspended solid soil particles before disposal into any drainage system.

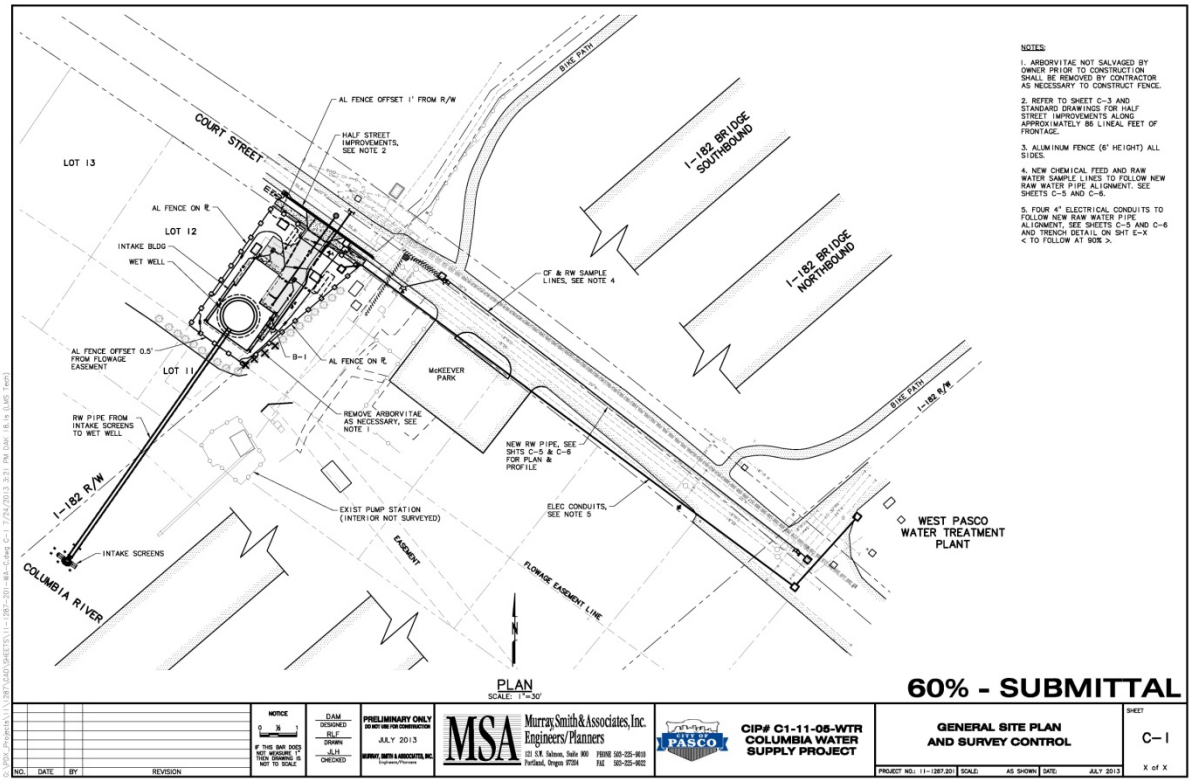


Figure 3. Project Layout plan view

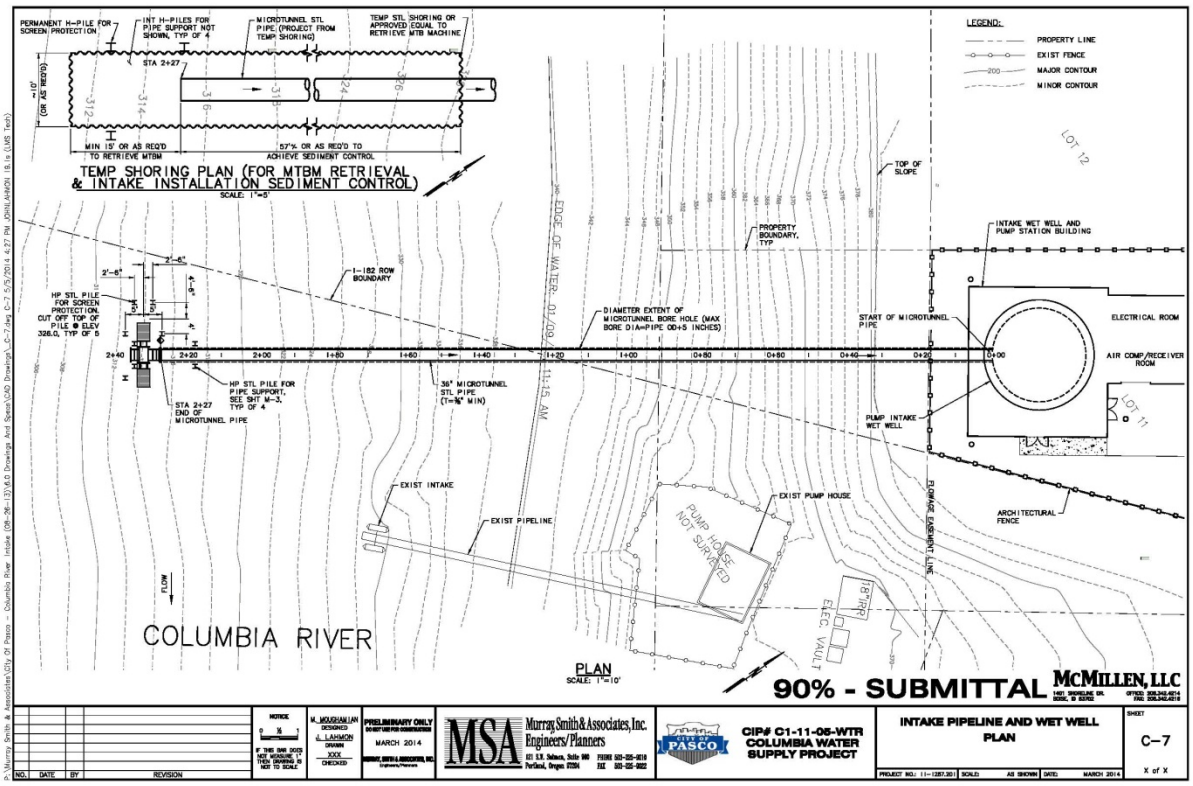


Figure 4. Plan view including temporary shoring plan.

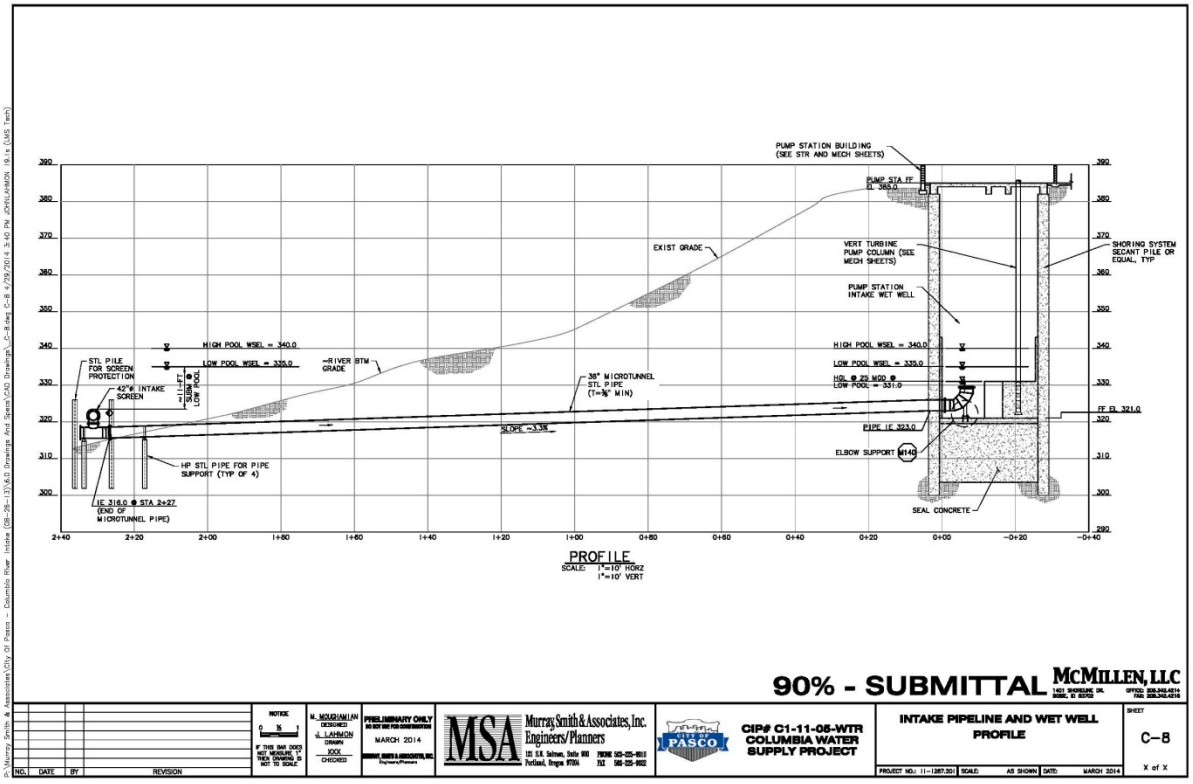
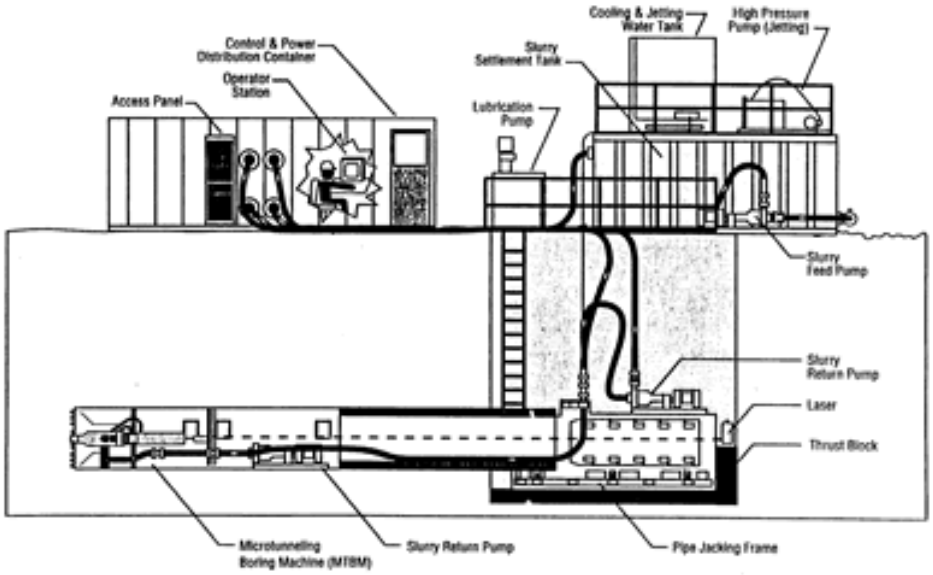


Figure 5. Project Layout profile view.



Microtunneling

Figure 6. Diagram of a typical micro-tunneling system.

A barge-mounted, impact pile driver will be used to install 9 permanent steel H-piles in the riverbed. The H-piles will be approximately 14 x 14 inches wide. A geotechnical evaluation of the site determined a vibratory pile driver is not likely to drive the piles to the necessary depth. The H-piles will serve a dual purpose. Initially they will be used to provide bracing to support temporary shoring of the riverbed. Temporary shoring steel sheet piles (up to 82 sheet piles) will also be installed with the impact pile driver and will contain sediment inside the shoring while receiving the micro-tunnel boring machine where it emerges from the riverbed. It is expected to take 10-20 days to drive all of the piles to the necessary depth. The temporary shoring area will cover about 1,200 square feet. The temporary shoring will be used to isolate the work area where the intake pipe intersects the riverbed. The shoring will also be used to facilitate the in-water construction necessary to connect a fish exclusion screen to the end of the raw water intake pipe.

The second purpose of the H-piles is to support and protect the fish screen. When the temporary shoring sheet piles are removed, the piles used for bracing the temporary shoring will be cut below the normal water surface, but at an elevation slightly higher than the top of the fish screens to protect the screens and the short portion (approx 15 feet) of the exposed raw water intake pipe. New stainless steel fish screens which meet current National Marine Fisheries Service design criteria (NMFS 2011) will be attached to the intake pipe located in the river (Figure 7). The design includes an automatic air-burst cleaning system (See contract specifications at the end of this document).

(2170) - It is anticipated that the CONTRACTOR may need to utilize temporary cofferdam construction at the intake site, within the Columbia River, in order to retrieve the MTBM utilized in the micro-tunneling process. During construction and cofferdam placement and removal,

CONTRACTOR shall provide proper buoys and other warning markers at construction boundaries to exclude recreational and commercial boating activities around the intake site. Remove all of temporary cofferdams or other temporary protective works upon completion of the facilities located in or adjacent to bodies of water.

Cofferdams or other protective works shall be constructed, maintained, and removed using materials and methods which do not produce siltation or other degradation of the water quality of the river or stream which exceeds the limits of applicable federal, state and local regulations.

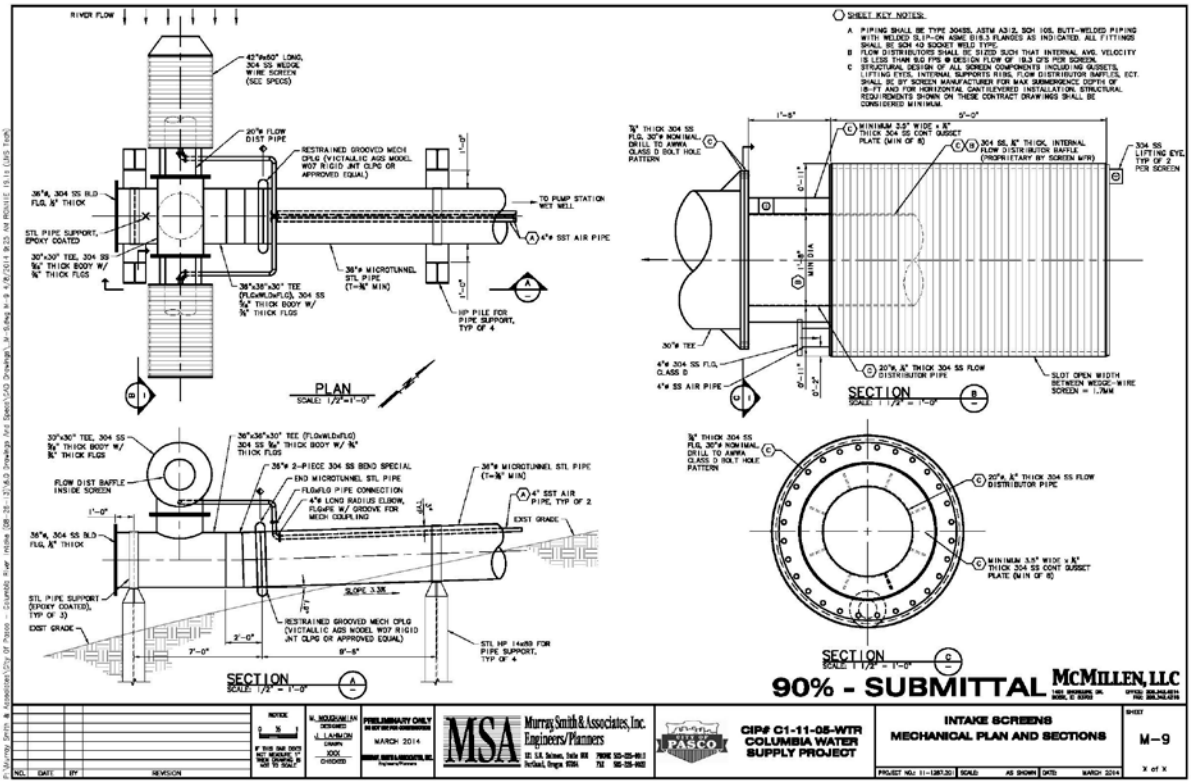


Figure 7. Fish Exclusion Screens.

(2345) - Remotely controlled and guided microtunneling equipment with a slurry spoil removal system capable of maintaining proper positive face pressure, shall be employed to directly install the water intake pipeline.

If Underwater Retrieval is selected by the CONTRACTOR, a retrieval pit shall be excavated by the CONTRACTOR in the riverbed of the Columbia River, at the location shown on the CONTRACT Drawings. All materials excavated from the river shall be removed onto a floating barge. Such a retrieval pit may require the installation of some temporary sheet piling to deflect river currents around the retrieval pit during retrieval of the MTBM and also during installation of the new intake piping and screens.

A lubrication system shall be provided to inject pipe lubricant around the jacking pipe to decrease required jacking forces and to reduce groundwater inflows through the annulus to the shaft. Lubrication materials shall be comprised of a mixture of bentonite and water.

The microtunneling system shall include a slurry separation plant that can achieve the rates of spoil separation and slurry cleaning required by the CONTRACTOR to achieve planned production rates. The CONTRACTOR is advised that the ground conditions include gravel, river cobbles and boulders. The CONTRACTOR is advised that the separation plant must fit within the new fenced-in area at the new intake as shown on the Contract Drawings and that excavated slurry pits or ponds will not be allowed.

The CONTRACTOR shall contain all spoils and slurry in trucks, tanks, or other containers at all times. Dumping of spoil or slurry on the ground, into stormwater channels, or discharge into the shafts or into the Columbia River will not be permitted.

Rescue shafts cannot be excavated to access the face of the MTBM should the MTBM be unable to complete the bore for any reason. The CONTRACTOR shall demonstrate that the MTBM can be retrieved without need for a rescue shaft if continued forward progress is not possible.

The CONTRACTOR shall install the intake screens on the pipelines in the river via the use of qualified, experienced divers.

Fish Screen Design - (11337) - Cylindrical single screens shall be compatible with the installation shown on the contract drawings and shall conform to the following requirements:

1. Shape of Screen Assemblies: **single, cylindrical**
2. Screen Type: **welded, continuous slot, V-wire**
3. Screen Assembly: **Motion static – non-rotating**
4. Screen Ends: **flanged w/bolt-holes to ANSI B-16.5 or AWWA C-207 - Class D pattern**
5. Number of independent screens: **2**
6. Fluid Service: **Unfiltered, raw fresh water (Columbia River)**
7. Average Suspended Solids Loading: **< 30 mg/l**
8. Operation: **Continuous**
9. Cleaning Method: **Air burst thru diffuser system**

Design the cylindrical screens in accordance with the following dimensions and criteria:

- Max Design Flow per screen (cfs/screen): **19.3 (12.5 MGD each)**
- Screen nominal outside diameter (inches): **42**
- Min. length of screen element (inches): **60**
- Min. total screen surface area (sq. ft): **55**
- Avg. approach velocity at max flow (fps): **0.35**
- Minimum Screen open area (%): **50**
- Wedge-wire slot width (inches): **0.069 (1.75 mm)**
- Wedge-wire orientation: **Vertical, continuous slot**

- Internal flow modifier / distributor min diameter to connecting pipe (inches): **20**
- Discharge flange nominal diameter (inches): **30**
- Discharge flange min. thickness (inches): ¾
- Max Head-loss (measured from outside screen across the internal flow baffle and up to the discharge flange) (feet): **1.0**
- Max hydrostatic differential loading at any or all points along screen (feet): **10.0 (4.4 psig)**
- Maximum allowable design stress in structural members (% of yield stress): **66**

Cylindrical screens shall be of wrapped-wire construction welded and fabricated from stainless steel. The screen surface shall be of smooth wedge-wire shape with inwardly enlarging openings to minimize the likelihood of debris entrapment. Screen wedge wires shall be continuous over the circumference of each panel. The ends of the screen panel may be covered with a solid, minimum 12 gauge stainless steel plate with stainless steel stiffeners that are flush with the surface of the screen surface. The flat panel portion of the screen panel, if any, shall have the same structural capacity as the wedge wire screen portion of the panel.

The screen shall provide, as part of the overall intake screen system, an air backwash system, complete and skid mounted, designed to remove debris from the screen surface by delivering a suitable volume of compressed air to the inside of the screen body. The exiting air shall scour the screen surface to maintain adequate design flow and through slot velocity characteristics. The air backwash system shall be capable of automatic operation via controls provided within the screen's local control panel (LCP). The controls shall allow the Operator to select one of the following three modes of operation at the LCP:

a. Automatic based upon elapsed time
b. Automatic based upon pressure differential setpoint across the intake screens
c. Manual based upon Operator initiation of the air backwash cycle locally at the LCP.

2.3. Construction Sequence

1. Drive 9, 14 inch H-piles in river at the river intake location with an impact pile driver.
2. Set up temporary shoring with up to 82 steel sheet piles (24 inches wide) on the riverbed where the intake will emerge from the riverbed, also driven with an impact pile driver.
3. Construct wet well on shore (110 feet from river).
4. Bore from wet well to the riverbed with a micro-tunnel boring machine. A slurry of water and bentonite will be used as a cutting lubricant. This slurry will be captured and not allowed to enter the river.
5. Install 36” steel pipe behind boring machine.
6. Once the boring machine emerges from the river bed, remove boring machine and finish installing intake pipe.
7. Remove all temporary sheet piles.
8. Cut off all of the H-piles several feet (15 foot minimum) below the ordinary low water line to support fish screen.
9. Attach stainless steel fish screen to end of intake pipe.

10. Construct upland facilities.
11. Trench to and install piping (600 feet) to the existing water treatment building.
12. Backfill trench and reseed as needed.

The project is anticipated to generate approximately 2,600 cubic yards of spoil material from 1) drilling of a secant pile shoring system for construction of a 30-foot diameter by 85 feet deep, buried wet well; 2) excavating within the shoring system for the wet well; and 3) micro-tunnel boring from the wet well toward the river for installation of the 36-inch diameter pipe between the wet well and the river. All of the spoil material will be disposed of offsite. The project does not include any fill, excavation or dredging within the river, except the intersection where the intake tunnel connects with the river. No shoreline vegetation will be removed for this work. There will be no trenching or open excavation below the normal high water level.

Construction off the main part of the site will include approximately 600 linear feet of 30-inch ductile iron pipe within the Court Street right of way to the WPWTP along the alignment of an existing 24-inch raw water pipe. The ductile iron pipe will be installed by open trench excavation to remove the existing pipe and install the larger pipe in that alignment. Erosion control measures will be used to mitigate any possible erosion. This portion of the work will not affect the river in any way. There will also be improvements on half of Court Street including curb and gutter and a sidewalk.

Approximately 19% of the site will be covered with impervious pavement, including asphalt access drive and concrete walkways. Approximately 22% of the site will be covered with impervious roof structure. A catch basin with an oil/water separator will be installed and the treated stormwater will be combined with the stormwater from the roof and conveyed to an infiltration trench on site. Soils on the site are highly permeable. Stormwater runoff generated on the street will be collected in a catch basin at the curb with an oil/water separator and the treated stormwater will be conveyed to an infiltration swale located behind the sidewalk on site.

The existing intake will be used entirely for the municipal irrigation system service after the new river water intake system is constructed. Initially 3 MGD will be withdrawn. The site is sized to withdraw up to 9 MGD. It is not known if or when the city would ever withdraw that much for the irrigation system.

2.4. Project Timeline

The proposed work is scheduled to begin as soon as all necessary permits are in place. The in-water portion of the work is scheduled to begin during the summer in-water work window of July 16 to September 30, 2015, but could also be conducted during the winter in-water work window (December 15 to March 15, 2016).

2.5. Action Area Baseline

Major effects have occurred near the action area from the construction of a series of dams. Mainstem Columbia River conditions include impaired fish passage, altered water temperature and thermal refuges, and changes in mainstem nearshore habitat. The proposed action area is

bounded by Priest Rapids Dam upstream and the Columbia/Snake River confluence downstream. The dams created reservoir habitat where there had been river habitat and inundated thousands of acres of terrestrial habitat, affecting many resources including native fish species. The natural hydrograph has been altered by storage dams upstream. The Columbia River average daily flow is shown in Figure 8.

Average annual runoff below Priest Rapids Dam is about 77 million acre-feet. The Yakima River adds about 4 million acre-feet (at Kiona (2000-2009)[1]. Water development in the Columbia basin has resulted in a dramatic change in the river's annual hydrograph, greatly reducing flows during May through July while increasing fall and winter flows. In aggregate, stream flow depletions have contributed to the decline of Columbia basin salmon species and may pose an impediment to recovery.

This particular reach of the Columbia River is used for salmonid rearing, holding and foraging habitat. No salmonid spawning occurs near the project site because of the heavy modification and flow conditions. Effects from this modification will continue into the future.

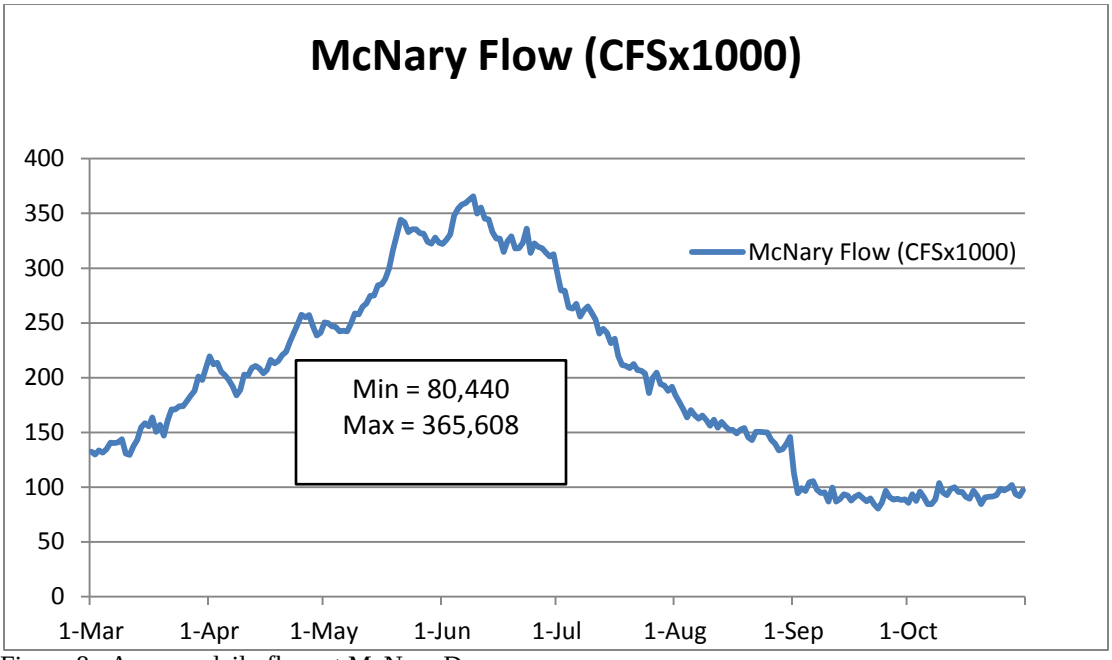


Figure 8. Average daily flow at McNary Dam.

Water withdrawals also impact the river. However, the Corps does not manage, monitor or control water rights associated with this action (or any others). The Washington Department of Ecology (Ecology) manages water within the state to ensure maximum net benefits from water use. It is the state's policy to promote the use of the public waters to obtain maximum net benefits arising from both diversionary uses and the retention of waters within streams and lakes in sufficient quantity and quality to protect instream and natural values and rights (RCW 90.03.005). Water withdrawals in the action area are included in the cumulative effect

[1] http://www.usbr.gov/pn/programs/yrbwep/2010workgroup/meetings/2010-08-25/waterresources.pdf

discussion. There has not been a formal adjudication process for the Columbia River Basin, so a precise measurement of water withdrawn, whether by legal certificate or illegally, is not possible. It is unclear exactly how much water is withdrawn from, or discharged to, the Columbia River in the action area. Currently up to 9 MGD is withdrawn by Pasco from the existing water intake just downstream of the proposed new intake. Initially the new intake will use the same amount of water (6 MGD for the new facility and 3 MGD for the existing facility).

Demand for water in the area follows a seasonal pattern of summer highs and winter lows, increasing during the growing season as those customers without access to separate irrigation water utilize City water (CH2M Hill, 2010). Summertime (June – September) demand is typically over three times higher than wintertime (November – March) demand. Water rights will have a major impact on Pasco over the next 10 to 20 years. The maximum instantaneous limit is 16,784 gpm (24.2 MGD, 37.4 cfs). The total existing annual water right of 9,659 ac-ft per year relates to an Average Day Demand of 10.24 MGD. The existing average day demand is 11.48 MGD (CH2M Hill, 2010).

3. Status of Species and Critical Habitat

3.1. Species List

The Corps reviewed the list of threatened and endangered species that pertain to the area under the jurisdiction of the NMFS and the USFWS on 10 April 2014 (Table 1). It was determined the proposed action would have "No Effect" on the following species: pygmy rabbit, Ute ladies'-tresses, gray wolf, White Bluffs bladderpod, Washington ground squirrel, and yellow-billed cuckoo. As a result, these species will not be discussed in detail.

3.2. Status of Species

Table 1. ESA-listed species and critical habitat in Franklin County, WA.

Species	Listing Status	Critical Habitat
Chinook salmon (*Oncorhynchus tshawytscha*)		
Upper Columbia River spring run	Endangered	Yes
steelhead (*O. mykiss*)		
Upper Columbia River	Threatened	Yes
Middle Columbia River	Threatened	Yes
bull trout (*Salvelinus confluentus*)		
Columbia River DPS	Threatened	Yes
pygmy rabbit (*Brachylagus idahoensis*)		
Columbia Basin DPS	Endangered	None Designated
Ute ladies'-tresses (*Spiranthes diluvialis*)		
Contiguous U.S. DPS	Threatened	None Designated
Gray Wolf *(Canis lupus)*		
Outside NRM DPS	Endangered	None Designated

White Bluffs Bladderpod (*Physaria douglasii* subsp. *tuplashensis*)		
Franklin County, Washington	Threatened	Yes
Yellow-billed Cuckoo (*Coccyzus americanus*)		
Franklin County, Washington	Proposed Threatened	None Designated
Washington Ground Squirrel (*Urocitellus washingtoni*)		
Franklin County, Washington	Candidate	None Designated

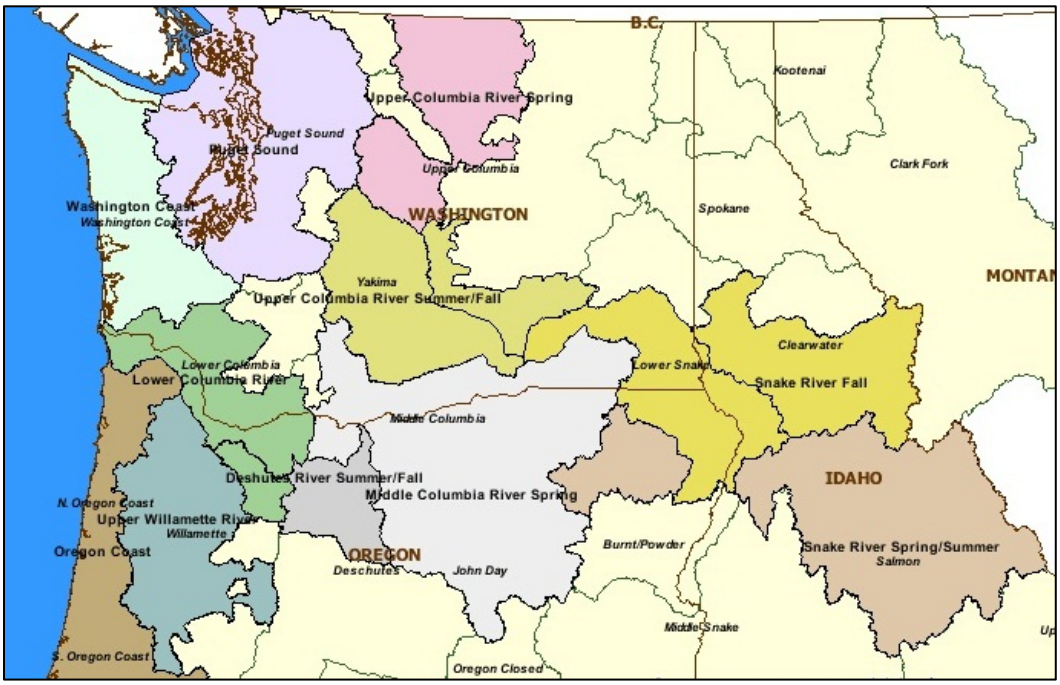


Figure 9. Chinook salmon distribution in the Snake and Columbia River Basins.

3.2.1. Upper Columbia River Spring Chinook

3.2.1.1. Listing History

This Evolutionarily Significant Unit (ESU) includes all naturally spawned populations of spring Chinook salmon in all river reaches accessible to spring Chinook salmon in Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington (Figure 9). Upper Columbia River spring Chinook salmon were listed as endangered on August 2, 1999 (64 FR 41835) and reaffirmed as endangered on June 28, 2005 (70 FR 37160). Critical habitat for this ESU was designated on September 2, 2005 (70 FR 52630).

3.2.1.2. Life History/Biological Requirements

Adult Upper Columbia River spring Chinook begin returning from the ocean in the early spring, with the run into the Columbia River peaking in mid-May (Chapman et al. 1995). Spring Chinook enter the Upper Columbia tributaries from April through July. After migration, they hold in freshwater tributaries until spawning occurs in the late summer, peaking in mid to late August. Juvenile spring Chinook spend a year in freshwater before migrating to salt water in the

spring of their second year of life. Most Upper Columbia spring Chinook return as adults after two or three years in the ocean.

3.2.1.3. Distribution

There are three independent populations of spring Chinook within the Upper Columbia ESU (Wenatchee, Entiat, and Methow), with one extirpated stock of spring Chinook identified in the Okanogan subbasin. The action area is used only for rearing and as a migration corridor to and from the Upper Columbia Basin.

3.2.1.4. Factors for Decline

Populations of spring Chinook and steelhead within the Upper Columbia River Basin were first affected by the intensive commercial fisheries in the lower Columbia River. These fisheries began in the latter half of the 1800s and continued into the 1900s and nearly eliminated many salmon and steelhead stocks. Dam and diversion construction blocked some salmon migrations, and killed upstream and downstream migrating fish. Early hatcheries constructed to mitigate for fish loss at dams and loss of spawning and rearing habitat were operated without a clear understanding of population genetics, where fish were transferred without consideration of their origin. Although hatcheries may have increased the abundance of some stocks, they may have decreased the diversity and productivity of populations they intended to supplement.

Some of these factors continue to limit the recovery of ESA-listed fish species in the Upper Columbia Basin. Habitat alterations, overutilization, disease or predation, inadequacy of existing regulations, and other natural or human-made factors affect the continued existence of spring Chinook salmon and their habitat in some locations in the Upper Columbia Basin.

3.2.1.5. Local Empirical Information

At the time of listing (1999), spring Chinook in the Upper Columbia Basin ESU exhibited very low abundance. Redd counts were declining severely and individual populations within the ESU were small, with none averaging more than 150 adults annually. Trends were mostly downward and a few local populations exhibited rates of decline exceeding 20% per year. Since 2000, adult spring Chinook numbers have increased in the Upper Columbia Basin.

From 1960 to 2003, abundance of age 3+ spring Chinook in the Upper Columbia River Basin ranged from 102 to 14,794 fish (UCSRB 2007). As of 2010, the number of 3+ spring Chinook in the Upper Columbia River Basin was estimated at 4,600.

3.2.1.6. Ongoing Monitoring

There are numerous monitoring programs associated with salmon that pass through Lake Wallula. Adult salmon are counted at Priest Rapids and McNary Dams. Sample counts of juveniles are also taken to estimate the number of juveniles passing through the lake.

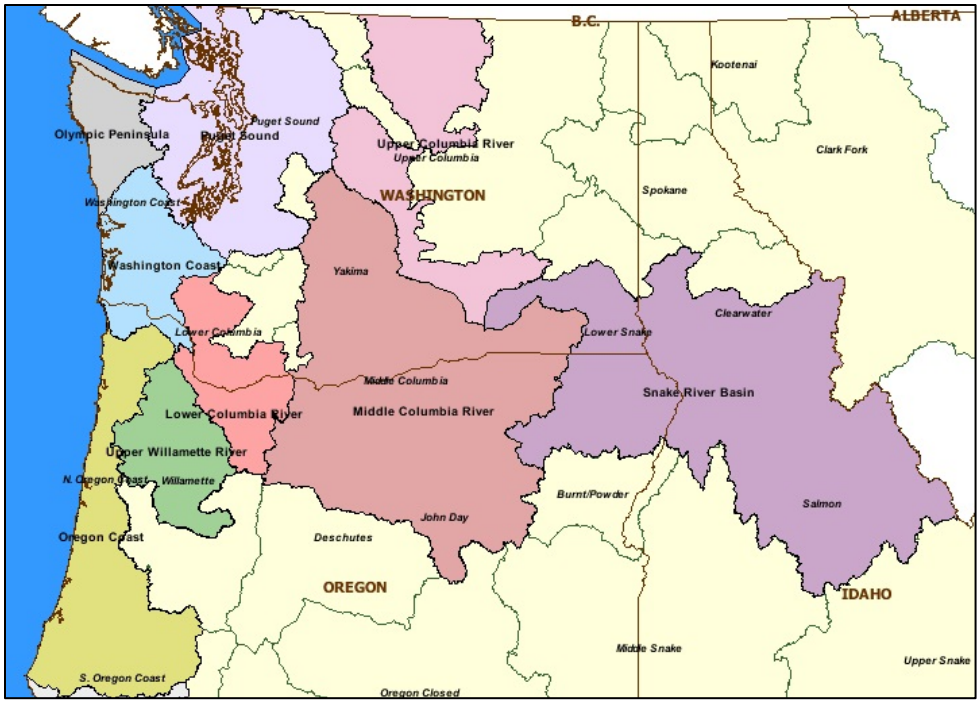


Figure 10. Steelhead distribution in the Columbia and Snake River basins.

3.2.2. Upper Columbia River Steelhead

3.2.2.1. Listing History

Upper Columbia River steelhead were first listed as endangered August 18, 1997 (62 FR 43937) and protective regulations were issued on February 1, 2006 (71 FR 5178). On January 5, 2006 the distinct population segment (DPS) was reclassified as threatened (71 FR 834). However, in June 2007, a federal judge set aside the threatened listing and the decision reinstated the endangered status of the Upper Columbia steelhead DPS. The court decision was appealed, and on March 16, 2009 the court ruled that the down-listing did not violate the ESA. Consequently, on June 18, 2009 the district court revised its ruling, effectively re-instating Upper Columbia River steelhead to threatened status (74 FR 42605). Critical habitat for this DPS was listed on September 2, 2005 (70 FR 52630).

3.2.2.2. Life History/Biological Requirements

Upper Columbia River steelhead spawn in cool, clear streams with suitable gravel size, depth, and current velocity. Adult Columbia River steelhead pass McNary Lock and Dam between July and November. In general, adults in this ESU spawn later than in most downstream populations, often remaining in freshwater for a year before spawning. Depending on water temperature, steelhead eggs may incubate for 1.5 to four months before hatching. Rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Some older juveniles move downstream to rear in larger tributaries and main stem rivers. (See also the life history presented for mid-Columbia steelhead.)

3.2.2.3. Distribution

The Upper Columbia River steelhead ESU includes all naturally spawned populations of steelhead in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S./Canada border (Figure 10). Five populations are identified for the Upper Columbia River *O. mykiss* ESU: the Wenatchee River, Methow River, Entiat River, Okanogan Basin, and Crab Creek populations. These populations were placed into the single major population grouping (Upper Columbia River) based on life history type and ecological spawning zone.

3.2.2.4. Factors for Decline

Historic pressures on Upper Columbia steelhead include overexploitation; various farming and ranching practices; dams built for hydropower, flood control, and irrigation; water diversions for agricultural, municipal, or commercial requirements; and degraded spawning and rearing habitat. Although land and water management activities have improved, factors such as dams, diversions, roads and railways, agriculture, residential development, and historic forest management continue to threaten steelhead and their habitat in some locations in the Upper Columbia Basin. In addition, increases in non-native predator species (e.g., walleye and smallmouth bass), northern pikeminnow, avian predators, and pinnipeds also continue to affect the survival of steelhead.

3.2.2.5. Local Empirical Information

Upper Columbia River steelhead utilize the action area for migration and rearing habitat. Peak migration dates for adult Upper Columbia River steelhead typically occur in August and September, while juvenile fish migrate downstream through the action area between March and August. Some rearing or overwintering may occur in Lake Wallula.

Passage of adult and juvenile steelhead is monitored at the Columbia River dams. There are also several other monitoring programs by other Federal, state and tribal organizations throughout the watershed. Adult migration estimates from Rock Island dam are highly variable with counts as high as 30,000 in some years. However, 5-year mean trends reveal a general increase in the number of adult steelhead from about 15,000 in 2000 to over 22,000 by 2012.

3.2.3. Middle Columbia River Steelhead

3.2.3.1. Listing History

Middle Columbia River steelhead were first listed as threatened March 25, 1999 (64 FR 14517) and reaffirmed as threatened on January 5, 2006 (71 FR 834). Protective regulations were issued on June 28, 2005 (70 FR 37160) and critical habitat for this DPS was listed on September 2, 2005 (70 FR 52630).

3.2.3.2. Life History/Biological Requirements

Steelhead exhibit perhaps the most complex suite of life history traits of any species of Pacific salmonid. These fish can be anadromous (migratory) or freshwater residents (and under some circumstances, apparently yield offspring of the opposite form). Steelhead can spawn more than once (iteroparous), whereas most other salmonids spawn once and then die (semelparous).

Within the range of West Coast steelhead, spawning migrations occur throughout the year, with seasonal peaks of activity. Most steelhead can be categorized as one of two run types, based on their sexual maturity when they re-enter freshwater and how far they go to spawn. In the Columbia River, summer steelhead enter freshwater between May and October and require several months to mature before spawning; winter steelhead enter freshwater between November and April with well developed gonads and spawn shortly thereafter. Winter steelhead are called ocean-maturing or coastal type, and summer steelhead, stream-maturing or inland type. The Middle Columbia River steelhead DPS in the action area includes fish from the Yakima River.

Steelhead spawn in clear, cool streams with suitable gravel size, depth, and current velocity. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood. Steelhead may enter streams and arrive at spawning grounds weeks or even months before they spawn and are therefore vulnerable to disturbance and predation. They need cover, in the form of overhanging vegetation, undercut banks, submerged vegetation, submerged objects such as logs and rocks, floating debris, deep water, turbulence, and turbidity.

Young steelhead typically rear in streams for some time before migrating to the ocean as smolts. Steelhead smolts have been shown to migrate at ages ranging from 1 to 5 years throughout the Columbia Basin, but most steelhead generally smolt after 2 years in freshwater (Busby et al. 1996). Some juveniles move downstream to rear in larger tributaries and mainstem rivers. Most steelhead spend 2 years in the ocean before migrating back to their natal streams. Once in the river, adult steelhead rarely eat and grow little, if at all.

3.2.3.3. Distribution

Middle Columbia River steelhead include all naturally spawned populations of steelhead in drainages upstream of the Wind River, Washington, and the Hood River, Oregon, up to and including, the Yakima River, Washington. Major drainages in this DPS are the Deschutes, John Day, Umatilla, Walla Walla, Yakima, and Klickitat river systems. The Cascade Mountains form the western border of the plateau in both Oregon and Washington, while the Blue Mountains form the eastern edge. The southern border is marked by the divides that separate the upper Deschutes and John Day basins from the Oregon High Desert and drainages to the south. The Wenatchee Mountains and Palouse areas of eastern Washington border the Middle Columbia on the north (NMFS 2009).

3.2.3.4. Factors for Decline

All populations of Middle Columbia steelhead use the mainstem Columbia River to migrate to and from the ocean, and all are affected by the mainstem Federal dams, as well as by other forms

of development that alter the river environment. Mainstem Columbia River conditions include impaired fish passage, altered water temperature and thermal refuges, and changes in mainstem nearshore habitat (NMFS 2009). In addition, changes in the Columbia River have altered the relationships between salmonids and other fish, bird, and pinniped species. Increases in competition with other fish species and predation from non-native fishes, birds, and pinnipeds continues to limit recovery of salmonid species in the Columbia River.

3.2.3.5. Local Empirical Information

Only the Yakima River major population group (MGP) of the mid-Columbia DPS might utilize the river near the project. The mouth of the Yakima River is just downstream of, and across the river from, the project work area. The remaining population groups utilize habitat in the Walla Walla River and below McNary Lock and Dam and will not enter the project work area. The Yakima River MPG could utilize the project area for migration and rearing habitat. Peak migration dates for adult mid- Columbia River steelhead typically occur in August and September, while juvenile steelhead generally migrate downstream through McNary Dam between March and August. Some rearing or overwintering may occur in Lake Wallula.

Passage of adult and juvenile steelhead is monitored at the Columbia River dams. Adult migration estimates from Yakima Basin show dramatic increases since 1990. Adult counts in 1990 were essentially 0, while counts for 2012 show over 400 adults passed Roza Dam on the Yakima River (DART 2012).

3.2.4. Bull Trout

3.2.4.1. Listing History

The USFWS issued a final rule listing the Columbia River population of bull trout as threatened on June 10, 1998 (63 FR 31647). Bull trout are currently listed throughout their range in the U.S. as a threatened species. In the Columbia River Basin, bull trout historically were found in about 60% of the basin. They now occur in less than half of their historic range. Populations remain in portions of Oregon, Washington, Idaho, Montana, and Nevada. Bull trout critical habitat was designated in 2010. The mainstem Columbia River is included in the designation.

3.2.4.2. Life History/Biological Requirements

Individual bull trout may exhibit resident or migratory life history strategies. Resident bull trout carry out their entire life cycle in the stream in which they spawn and rear. Migratory bull trout spawn in tributary streams, but eventually travel to larger streams (or lakes) where they mature. Habitat components that appear to influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates and migratory corridors (with resting habitat). All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders and deep pools.

Bull trout normally reach maturity in four to seven years and may live as long as twelve years. Migratory bull trout may travel over one hundred miles to their spawning grounds. They

generally spawn from August to November during periods of decreasing water temperatures. Egg incubation is normally 100 to 145 days and fry remain in the substrate for several months.

Bull trout are opportunistic feeders. Their diet requirements vary depending on their size and life history strategy. Resident and juvenile bull trout prey on insects, zooplankton and small fish. Adult migratory bull trout mainly eat other fish.

3.2.4.3. Distribution

Wydoski and Whitney (2003) indicate that all four life history types of bull trout (anadromous, adfluvial, fluvial, and resident) require water temperatures below 15°C (59° F). They also note that bull trout are occasionally collected in the tailraces of Priest Rapids and Wanapum Dams on the mainstem Columbia River. The action area may be used as migratory and overwintering habitat for bull trout, and a few bull trout could be located near the proposed action area. These fish would most likely be migrants from the Walla Walla or Yakima rivers and would be most likely found in the action area in winter when lower water temperatures are more conducive to bull trout requirements. Detailed information on bull trout use of the Columbia River is scarce.

3.2.4.4. Factors for Decline

Bull trout are estimated to have occupied about 60 percent of the Columbia Basin and presently occur in only about 45 percent of their historic range. The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices and the introduction of non-native species. Declining salmon and steelhead populations could also negatively impact bull trout populations by reducing the number of juvenile salmon and steelhead that bull trout might prey on. Altered flow regimes, sedimentation rates, bank erosion and reduced channel complexity all reduce the quality of bull trout habitat. Barriers between isolated populations continue to be a limiting factor for most of the bull trout subpopulations in the Columbia Basin.

3.2.4.5. Local Empirical Information

The few remaining bull trout strongholds in the Columbia River basin tend to be found in large areas of contiguous habitats in the Snake River basin of the central Idaho Mountains, upper Clark Fork and Flathead Rivers in Montana, and several streams in the Blue Mountains in Washington and Oregon. Populations also exist in the Yakima River watershed. Very little is known about the number of bull trout within the action area. Bull trout are most likely to occupy the Columbia and Snake Rivers during winter months, and in very low numbers (Anglin et al. 2010). Fish passage at Snake River dams is monitored for part of the year. Bull trout observations are recorded, though few are seen in any year. Numbers of bull trout captured at spawning stations throughout the basin are also regularly recorded. The mainstem Columbia and Snake Rivers are used by bull trout for foraging, migration, and overwintering.

3.2.5. Pygmy Rabbit

The pygmy rabbit was listed as endangered on November 30, 2001 (66 FR 59769). These small rabbits occur in the semiarid shrub steppe biome of the Columbia Basin, Great Basin, and adjacent intermountain regions of the western United States. Within this broad biome, pygmy rabbits are typically found in habitat types that include tall, dense stands of sagebrush (*Artemesia* spp.), upon which they are highly dependent for food and shelter throughout the year. The pygmy rabbit is one of only two rabbit species in North America that digs its own burrows and therefore is most often found in areas that also include relatively deep, loose soils that allow burrowing (USFWS 2007).

The pygmy rabbit's historical range includes portions of California, Oregon, Nevada, Idaho, Montana, Wyoming, Utah, and Washington. However, there are no pygmy rabbit populations in the action area. Currently, pygmy rabbits are only known to survive in five isolated fragments of suitable habitat in Douglas County. ***Because the project occurs entirely within a previously disturbed area and in-water, and there are no pygmy rabbits in the action area, there will be no effect on pygmy rabbits.***

3.2.6. Ute ladies'-tresses

Ute ladies'-tresses was listed as threatened in 1992 in its entire range. In 2004, USFWS prepared a comprehensive status review of this species. A final draft of the status review was completed in October 2005. USFWS determined that a petition to remove Ute ladies'-tresses from Federal protection under the ESA provides substantial biological information to indicate that removal may be warranted. However the USFWS has not acted on a delisting action.

Ute ladies'-tresses was first discovered in Washington at Wannacut Lake in Okanogan County in 1997. In 2000, the species was also found along a reservoir bordering the Columbia River near Chelan in Chelan County (Chief Joseph watershed) within the Columbia Plateau ecoregion (Fertig et al. 2005). There are five known subpopulations of this species within Washington. The sites are in Okanogan and Chelan counties. There may also be a subpopulation located in Klickitat County[2].

Since 1992, at least 26 new populations of Ute ladies'-tresses have been documented from perennial stream, river, lakeshore, and spring sites directly associated with human-developed dams, levees, reservoirs, irrigation ditches, reclaimed gravel quarries, roadside barrow pits, and irrigated meadows. In all, 33 of 61 documented populations (54%) occur in sites in which natural hydrology has been influenced by dams, reservoirs, or supplemental irrigation. Even some sites with undisturbed hydrology have been influenced by human agricultural practices, urban development, or road and dam construction (Fertig et al. 2005).

Based on the habitat requirements and the geographic distribution of Ute ladies'-tresses, the proposed action has no potential to affect any individual plants of this species. ***Because the proposed action is in a previously disturbed area and in-water, and there is no suitable habitat for this plant in the work area, there will be no effect on Ute ladies'-tresses.***

[2] http://www.wanativeorchids.com/Spiranthes/index.html

3.2.7. Gray Wolf

The gray wolf was listed as an endangered species on January 4, 1974 (39 FR 1171). On April 2, 2009 the USFWS identified Idaho, Montana, Wyoming, the eastern third of Washington and Oregon, and a small portion of Utah as the Northern Rocky Mountain (NRM) DPS (74 FR 15123). On May 5, 2011, wolves were delisted and managed under state authority in the NRM DPS (76 FR 25590). Outside the NRM DPS (which includes Franklin County, WA), wolves remain listed as endangered.

Gray wolves were once common throughout parts of Washington. Records exist of wolves in the vicinity of the Walla Walla Valley. Currently, wolf packs and individuals have been confirmed in the Selkirk Mountains of northeastern Washington and in the northern Cascade Mountains (WDFW 2009). Wolves have also recently been reported in southeast Washington.

Habitat conditions, the high level of human habitation, and a non-existent prey base in the area that is part of this proposed action make the habitat unsuitable for wolves***. The proposed action is in a developed area and in-water in a human populated area. There are no local populations of gray wolves in the project work area so there will be no effect on gray wolves as a result of the proposed action.***

3.2.8. White Bluffs Bladderpod

White Bluffs bladderpod was designated as a threatened species in 2013. Critical habitat for the species was also designated, though none exists in the project work area.

White Bluffs bladderpod is a low growing, herbaceous, perennial plant with a sturdy tap root and a dense rosette of broad gray-green pubescent (having any kind of hairs) leaves (WDNR 2011). The species produces showy, yellow flowers on relatively short stems in May, June and July. White Bluffs bladderpod is found in a single population that occurs along the upper edge of the White Bluffs above the Columbia River. The size of the population varies considerably between years. Monitoring data shows population numbers as low as 9,650 plants in 2010 and has high as 58,887 plants in 2011. Current threats include fire, invasive non-native plants, and human traffic. There are no known populations of White Bluffs bladderpod in the project work area. ***Because the proposed action will take place in-water and in previously disturbed areas, and there is no habitat in the project work area that would support this plant, there will be no effect to any individuals of this species or their critical habitat.***

3.2.9 Yellow-billed Cuckoo

Western yellow-billed cuckoo was proposed for listing as a threatened species on October 3, 2013. Some of these birds were known to have occurred in Washington, but were rare east of the Cascade Mountains. The last confirmed breeding records in Washington were in the 1930s. The bird may now be extirpated from Washington.

There are no known populations or individuals of yellow-billed cuckoo in the project area. Only the existing arborvitae shrubs on the top of the slope will be removed for this project. All of the trees and shrubs on the slope down to the river will not be removed. The project will have no effect on yellow-billed cuckoo.

3.2.10 Washington Ground Squirrel

Washington ground squirrel was designated as a candidate species under the ESA in 2006. This small mammal occupies areas with a greater grass and forb cover than adjacent surrounding areas. They spend much of their time underground. Adults emerge from hibernation between January and early March. Their active time is spent in reproduction and fattening for their six-month or longer dormancy. Adults return to their burrows by late May to early June, and juveniles return about a month later.

There is no suitable ground squirrel habitat near the project work area. The proposed action will have no effect on Washington ground squirrels.

3.3. Status of Critical Habitat

The species addressed in this document occupy the same geographic areas and have similar life history characteristics and, therefore, require many of the same habitat functions provided by critical habitat. Primary Constituent Elements (PCEs) for Upper Columbia River spring Chinook, Upper Columbia River steelhead, and Middle Columbia River Steelhead are shown in table 2.

Table 2. Primary constituent elements of critical habitats designated for Upper Columbia River spring Chinook, Upper Columbia River steelhead, and Middle Columbia River Steelhead, and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site Type	**Site Attribute**	
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence Fry/parr growth and development
Freshwater migration	Free of artificial obstructions Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration, holding Kelt (steelhead) seaward migration Fry/parr seaward migration
Estuarine areas	Forage Free of obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation Adult “reverse smoltification” Adult upstream migration, holding Kelt (steelhead) seaward migration Fry/parr seaward migration Fry/parr smoltification Smolt growth and development

		Smolt seaward migration
Nearshore marine areas	Forage Free of obstruction Natural cover Water quantity Water quality	Adult sexual maturation Smolt/adult transition
Offshore marine areas	Forage Water quality	Adult growth and development

3.3.1. Upper Columbia River Spring Chinook

Critical habitat for upper Columbia River spring Chinook includes all streams and rivers in the upper Columbia River basin, including the following subbasins: Chief Joseph, Methow, Upper Columbia/Entiat, Wenatchee, and the Columbia River corridor. Critical habitat borders on or passes through the following counties in Oregon: Clatsop, Columbia, Gillium, Hood River, Morrow, Multnomah, Sherman, Umatilla, and Wasco; and the following counties in Washington: Benton, Chelan, Clark, Cowlitz, Douglas, Franklin, Grant, Kittitas, Klickitat, Okanogan, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima.

3.3.2. Upper Columbia River Steelhead

Critical habitat for upper Columbia River steelhead includes streams, rivers and lakes in the upper Columbia River basin, including the following subbasins: Chief Joseph, Okanogan, Similkameen, Methow, Upper Columbia/Entiat, Wenatchee, Lower Crab, Upper Columbia/Priest Rapids, and the Columbia River corridor. Critical habitat borders on or passes through the following counties in Oregon: Clatsop, Columbia, Gilliam, Hood River, Morrow, Multnomah, Umatilla, and Wasco; and the following counties in Washington: Adams, Benton, Chelan, Clark, Cowlitz, Douglas, Franklin, Grant, Kittitas, Klickitat, Okanogan, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima.

3.3.3. Middle Columbia River Steelhead

Critical habitat for middle Columbia River steelhead includes streams, rivers and lakes in the middle Columbia River basin, including the following subbasins: Upper Yakima, Naches, Lower Yakima, Middle Columbia/Lake Wallula, Walla Walla, Umatilla, Middle Columbia/Hood, Klickitat, Upper John Day, North Fork John Day, Middle Fork John Day, Lower John Day, Lower Deschutes, Trout, Upper Columbia/Priest Rapids and the Columbia River corridor. Critical habitat borders on or passes through the following counties in Oregon: Clatsop, Columbia, Crook, Gilliam, Grant, Hood River, Jefferson, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, Wasco, and Wheeler; and the following counties in Washington: Benton, Clark, Cowlitz, Columbia, Franklin, King, Kittitas, Klickitat, Lewis, Pacific, Pierce, Skamania, Wahkiakum, Walla Walla, and Yakima.

3.3.4. Bull Trout

3.3.4.1. Geographical Extent of Designated Critical Habitat

Bull trout critical habitat was designated in 2005. The USFWS revised the designation in 2010. A final rule was published on October 18, 2010 and took effect on November 17, 2010. A total of 19,729 miles of stream and 488,251 acres of reservoirs and lakes are designated as bull trout critical habitat. The Columbia River is designated as bull trout critical habitat.

3.3.4.2. Essential Elements of Designated Critical Habitat

Based on the needs identified in 50 CFR 17 (75 FR 63898) and the current knowledge of the life-history, biology, and ecology of the species and the characteristics of the habitat necessary to sustain the essential life history functions of the species, the USFWS has identified the PCEs in Table 3 as bull trout critical habitat.

Table 3. Primary constituent elements of critical habitats designated for bull trout.

Bull Trout PCEs		
1	Water Quality	Springs, seeps, groundwater sources, and subsurface water connectivity (hyporehic flows) to contribute to water quality and quantity and provide thermal refugia.
2	Migration Habitat	Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.
3	Food Availability	An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
4	Instream Habitat	Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these environments, with features such as large wood, side channels, pools, undercut banks and clean substrates, to provide a variety of depths, gradients, velocities, and structure.
5	Water Temperature	Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.
6	Substrate Characteristics	In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.
7	Stream Flow	A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.
8	Water Quantity	Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.
9	Nonnative Species	Sufficiently low levels of occurrence of nonnnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

4 Effects of the Action

This section includes an analysis of general action-related direct and indirect effects of the proposed action (easement), as well as specific potential effects on the species and critical habitat PCEs. Potential effects from any interrelated, interdependent and cumulative (e.g., water withdrawals) activities are also discussed.

4.1 Action Effects

The primary Federal action of issuing an easement will not have any direct impacts on any ESA-listed species. Indirect effects to listed species would be from driving nine permanent H-piles and driving, then removing, up to 82 temporary sheet piles into and from the riverbed. These piles will need to be driven with an impact pile driver to achieve the required depth through layers of cobble. In addition to the increased noise, turbidity will increase a short distance downstream of the project work area. During construction, the work area will be isolated from the flowing river water by the temporary sheet pile cofferdam so impacts due to turbidity will be minor. Removal of the temporary sheet piles would cause a local increase in turbidity.

Effects of the construction on ESA-listed salmonids would be limited because of the minor amount of work taking place and the use of the summer or winter in-water work windows.

Impact Minimization Measures

Impact minimization measures for this project include the following:

1. A sheet pile cofferdam or other protective works shall be constructed, maintained, and removed using materials and methods which do not produce siltation or other degradation of the water quality of the river or stream which exceeds the limits of applicable federal, state and local regulations.
2. During construction and cofferdam placement and removal, the contractor shall provide proper buoys and other warning markers at construction boundaries to exclude recreational and commercial boating activities around the intake site.
3. All materials excavated from the river shall be placed onto a floating barge.
4. The contractor shall contain all spoils and slurry in trucks, tanks, or other containers at all times. Dumping of spoil or slurry on the ground, into stormwater channels, or discharge into the shafts or into the Columbia River will not be permitted.
5. Spill kits will be available on the work barge and on the construction site.
6. If vegetation removal is required, native vegetation will be replanted at the site.
7. No construction materials or runoff from the site will be discharged into the river.
8. Pumped water will not be allowed to discharge directly to the Columbia River without a suspended solids removal treatment system.
9. A catch basin with an oil/water separator will be installed and the treated stormwater will be combined with the stormwater from the roof and conveyed to an infiltration trench on site.
10. Stormwater runoff generated on the street will be collected in a catch basin at the curb with an oil/water separator and the treated stormwater will be conveyed to an infiltration swale located behind the sidewalk on site.

11. If vegetation is to be removed between March 15 and August 15, the area to be disturbed, including all vegetation to be removed, must be monitored by a biologist familiar with migratory bird monitoring techniques to ensure no take of birds or nests protected by the Migratory Bird Treaty Act occurs.
12. The in-water work window – is July 16 to September 30 and/or December 15 to March 15.

4.2 Effects on Listed Species

The Corps anticipates that action-related effects will be similar for all listed fish species that may occur within the action area, and will, therefore, be analyzed collectively.

4.2.1 Sound

Installation of the steel H-piles and temporary sheet piles will create noise which will travel through the water and could be harmful to any fish in the immediate area. The range of potential effects from intense sound sources, such as pile driving ranges from no impact, to tissue damage that might make the fish less fit until healing takes place, resulting in lower chances of survival, to immediate death. There is also the potential for temporary hearing loss due to exposure to intense sound sources and this too could lower fitness until hearing recovers. Behavioral changes might also occur, resulting in fish leaving rearing areas (Popper and Hastings, 2009).

Although it has been argued that fish can be killed if they are sufficiently close to pile driving, there are insufficient controlled data to indicate the percentage of fish killed, whether there are any species that are more susceptible to the sounds than others, and the distance at which fish are killed (reviewed in Hastings & Popper 2005). It is possible that fish outside of any kill zone are damaged and that this damage would lead to death, but there are no known data to support or refute this. Moreover, there are numerous complexities with pile driving that might impact the effects on fish. For example, different types of piles (steel or concrete) have different response characteristics and sound spectra. It is not known whether such characteristics will cause a difference in effects, nor is it known whether there is a cumulative effect from being exposed to multiple pile strikes. The effect might result in death, tissue damage, or hearing loss (Popper and Hastings, 2009).

Even though the noise-causing, in-water work will occur during established in-water work windows, some ESA-listed adult and juvenile salmonids could be near the project area year-round. We conclude the action "may affect, and is likely to adversely affect" ESA-listed salmon, steelhead and bull trout.

4.2.2 Sedimentation and Turbidity

Installation of the pilings and water intake pipe could disturb sediment and increase turbidity for a short period of time. Most of the stream bottom disturbance caused by the project should be contained by the temporary cofferdam, but turbidity may increase downstream from the work site for a short period of time. Removal of the temporary sheet pile cofferdam will likely generate the highest turbidity. However, sediment disturbance is expected to occur within the in-

water work window when few listed species will be affected by the action and when water flows at project sites are low. The negative effects caused by the proposed action will be minimal. ***While expected to be minor, we conclude the short term increase in turbidity "may affect, and is likely to adversely affect" ESA-listed salmon, steelhead and bull trout. The action also "may affect, but is likely to adversely affect" salmon and steelhead critical habitat (discussed below).***

There will be runoff generated from the roof of the pump station building and from the impervious access drive and concrete walkways within the site. Storm runoff generated on the site by the access drive and walkways will be conveyed to a catch basin with an oil/water separator and the treated storm water will be combined with the storm water from the roof and conveyed to an infiltration trench on site. Soils on site are highly permeable. Storm runoff generated on the street will be collected in a catch basin at the curb with an oil/water separator and the treated storm water will be conveyed to an infiltration swale located behind the sidewalk on site. ***We conclude sedimentation due to runoff from the site "may affect, but is not likely to adversely affect" ESA-listed salmon and steelhead and bull trout.***

4.3 Effects on Critical Habitat

There is no White Bluffs bladderpod critical habitat in the project area, so there will be no effect on it. Critical habitat is not designated for the remainder of the terrestrial species addressed in this assessment.

The PCEs for listed salmon and steelhead in the project area are broken into three groups based on similar life history requirements; 1) freshwater spawning, 2) freshwater rearing, and 3) freshwater migration. Critical habitat and effect determinations for Upper Columbia River spring Chinook, Upper Columbia River steelhead, and Middle Columbia River steelhead are shown in table 4. Because the proposed action occurs upstream of McNary Dam it does not impact some of the PCEs for listed species. Specifically, estuarine areas, nearshore marine areas, and offshore marine areas in table 4 are not within the project area. Only those PCEs that may be affected will be discussed further.

4.3.1 Freshwater Spawning

Spawning habitat for the affected species occurs in tributary streams well upstream of the proposed action. No ESA-listed fish species spawn near the project area. ***Therefore, there will be no effect on spawning habitat for ESA-listed salmonids due to the proposed action.***

4.3.2 Freshwater Rearing

Juvenile spring Chinook salmon and upper and middle Columbia River steelhead have been documented using backwater areas of Lake Wallula for rearing and overwintering. The temporary cofferdam will isolate a small area of substrate (720 ft^2). This will decrease the foraging area for juvenile salmonids slightly for the duration of the work. This habitat type would be repopulated with macroinvertebrates within a few weeks after the cofferdam is removed. Water quality could also be reduced (increased turbidity) during installation of the permanent H-piles and installation and removal of the temporary sheet piles. ***These actions will***

cause minor negative effects. We have determined the proposed action may have a temporary negative effect on this PCE for ESA-listed salmon and steelhead.

Table 4. Effects of the proposed action to PCEs of critical habitats for Upper Columbia River spring Chinook, Upper Columbia River steelhead, and Middle Columbia River steelhead, and corresponding species life history events.

Primary Constituent Elements		Effects of Proposed Action
Site Type	**Site Attribute**	
Freshwater spawning	Substrate	No Effect - Spawning habitat does not occur in the project area
	Water quality	No Effect – Spawning habitat does not occur in the project area
	Water quantity	No Effect – Spawning habitat does not occur in the project area
Freshwater rearing	Floodplain connectivity	No Effect
	Forage	Not Likely to Adversely Affect
	Natural cover	No Effect
	Water quality	Temporary Negative Effect (though minimal)
	Water quantity	Not Likely to Adversely Affect
Freshwater migration	Free of artificial obstructions	Temporary Negative Effect (though minimal)
	Natural cover	No Effect
	Water quality	Temporary Negative Effect
	Water quantity	Not Likely to Adversely Affect
Estuarine areas	Forage	No Effect
	Free of obstruction	
	Natural cover	
	Salinity	
	Water quality	
	Water quantity	
Nearshore marine areas	Forage	No Effect
	Free of obstruction	
	Natural cover	
	Water quantity	
	Water quality	
Offshore marine areas	Forage	No Effect
	Water quality	

4.3.3 Freshwater Migration

All steelhead and salmon listed within the action area use the project area for adult and juvenile migration. The placement of a temporary cofferdam and a floating work platform may disturb sediments in the immediate work area and would have a short term effect on water quality, and possibly aquatic organisms that provide forage for ESA-listed fish.

The presence of the new intake and screen will create a minor artificial obstruction along the shoreline. Adult fish could easily avoid the area. Juvenile fish may use the shoreline and pass by the intake and screen. The screen will be designed to avoid impacts to juvenile salmonids, but there could be a minimal effect on this PCE attribute. ***We have determined the proposed action may have a temporary negative effect on this PCE attribute, though the effects will be minimal.***

The proposed work will have an effect on water quality during construction. Turbidity in the immediate area around the work site will increase. This increase will be mainly due to the installation of the H-piles and sheet piles. Once the sheet piles are in place, turbid water will be confined within the temporary cofferdam. The MTBM will emerge from the riverbed within the cofferdam, so turbidity shouldn't increase for this action. Turbidity is also likely to increase when the temporary sheet piles are removed. Turbidity is not expected to travel in a noticeable plume more than 200 feet from the disturbance site. ***We have determined the proposed action may have a temporary negative effect on this PCE attribute.***

To minimize effects to migrating habitat, a temporary cofferdam will be employed. ***Effects to artificial obstructions and water quality from the installation and use of a barge-mounted work platform on migration habitats are expected occur, but will be minor. We conclude the proposed work may have a temporary negative effect on this PCE.***

4.3.4 Bull Trout

<u>*Water quality*</u>: The installation of H-piling and sheet piling will disturb sediments and would have a short term effect on water quality. The turbidity plume created is likely to follow the shoreline and is not expected to move more than 200 feet downstream of the work area. Therefore, effects to water quality will be insignificant to any bull trout which might be in the area. If any bull trout are present, they could easily avoid the work area. ***There will be no long-term effect on water quality. The proposed action "is not likely to adversely affect" this PCE for bull trout.***

<u>*Migration corridors*</u>: Bull trout would most likely be present in the Columbia River during the winter and spring months and in low numbers. They could easily avoid the work area and migrate further out in the main channel. ***We conclude the proposed action "is not likely to adversely affect" this PCE for bull trout.***

<u>*Food availability*</u>: The placement of permanent H-pilings and installation and removal of the temporary sheet piles may disturb sediments in, and would have a short term effect on, water quality and possibly a negative effect on organisms that provide food for bull trout. However, these effects to food availability will be insignificant because of the small area to be impacted. ***We conclude the proposed work "is not likely to adversely affect" this PCE for bull trout.***

<u>*Instream habitat*</u>: The area of substrate lost to macroinvertebrates due to the project will be very minimal. The amount of instream habitat will be insignificant to bull trout, though it won't be zero effect. ***We conclude the proposed action "is not likely to adversely affect" bull trout instream habitat.***

<u>*Water temperature*</u>: The proposed withdrawal rate is so small compared with the river flow that there will be no measureable change in water temperature. We conclude the project will have "***no effect"*** on water temperature**.** The water withdrawal is under the jurisdiction of Ecology. The Corps does not manage, monitor or control the amount of water withdrawn from the river.

Substrate characteristics: This PCE specifically addresses the effects to substrate in spawning and rearing habitats. The proposed action will not occur in bull trout spawning habitat and very few bull trout use this reach of the Columbia River for rearing habitat. While the project effects on this PCE are extremely low, they are not zero. ***We have determined the project "is not likely to adversely affect" substrate characteristics of bull trout rearing habitat.***

Stream flow: During the lowest required minimum flow (50,000 cfs), the proposed maximum withdrawal rate of 25 MGD (39 cfs) will reduce river flow by less than 0.077%. ***We conclude this small amount is insignificant. Our determination is that the action "is not likely to adversely affect" this PCE for bull trout.*** The water withdrawal is under the jurisdiction of Ecology. The Corps does not manage, monitor or control the amount of water withdrawn from the river.

Water quantity: There will be a very minor increase in the amount of water withdrawn from the river. Up to 25 MGD (39 cfs) could eventually be withdrawn at this new location. An additional 9 MGD (14 cfs) could eventually be withdrawn for the existing municipal irrigation system intake just downstream from the project site. ***We conclude the proposed action "is not likely to adversely affect" this PCE for bull trout.*** The water withdrawal is under the jurisdiction of Ecology. The Corps does not manage, monitor or control the amount of water withdrawn from the river.

Nonnative species: ***The proposed action will not contribute to the presence of nonnative species. There will be "no effect" on this PCE for bull trout.***

4.4 Cumulative Effects

Cumulative effects are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Act. These types of actions are discussed in this section because they could have effects on ESA-listed species which will occur in the future. The main focus discussed in this section is other water withdrawal actions. There are other ongoing actions discussed in NMFS 2008 (as referenced in NMFS 2014) which will not be repeated here.

In 2006, Washington enacted legislation creating the Columbia River Basin Development Account to support new water supplies for both instream and out-of-stream uses. Under that account, Ecology's Office of the Columbia River (OCR) is actively investigating an array of new water developments that total about 6 million acre-feet. While the state of Washington is investigating several new storage projects, the state estimates it needs about 1 million acre-feet in new water storage to meet demands through 2030. Newly developed storage under this program is to be apportioned between instream and out-of-stream uses (1/3 of new storage for improving stream flows to benefit fish and 2/3 of new storage for new out-of-stream uses). It is unknown if any Federal assistance (likely from the Bureau of Reclamation) will be needed to complete such projects.

There has been some recent discussion on breaching the Bateman Island causeway (Tri-City Herald April 14, 2014) to allow for improved water circulation and decreased summertime water temperatures at the mouth of the Yakima River. No funding source for this project is known at this time so it is not reasonably certain to occur. No other future state, local or private actions related to the proposed action area which could cause cumulative effects on ESA-listed fish species were identified.

Water withdrawn from existing diversion/intake points are part of the environmental baseline, but their continued use in the future will have cumulative effects. There has not been a formal adjudication process for the Columbia River Basin, so a precise measurement of water withdrawn, whether by legal certificate or illegally, is not possible. It is unclear exactly how much water is withdrawn from, or discharged to, the Columbia River in the action area.

There are hundreds of water withdrawal locations within the Tri-Cities area from both wells and from surface waters. A total accounting of all the withdrawals has not been completed for this analysis. The Ecology website[3] summarizes a total of about 5,708 cfs of diversionary flows with certificates, permits, claims or new applications which could be used as the upper limit of water withdrawn from the McNary pool. If this amount were being withdrawn, it would be 11.4% of the required total minimum instream flow (50,000 cfs). It is 7.1% of the minimum average daily flow (80,440 cfs). Pasco's new intake would withdraw about 25 MGD (39 cfs) which is 0.077% of the total required minimum instantaneous instream flow and 0.05% of the minimum average daily flow.

Hundreds of water rights applications for new diversions from the Columbia River are pending, some for over a decade. The Columbia River Water Management Act (RCW 90.90) directs Ecology to "aggressively pursue the development of water supplies to benefit both instream and out-of-stream uses." The intent of the Columbia River Water Management Program is to increase water supply in the project area to provide additional streamflows for fish, and to meet community and economic needs. Improved water supplies may expand agriculture and municipal development in the project area.

Minimum Columbia River flows within McNary pool have been developed to protect fish and other water-dependent resources. Table 5 shows the minimum flows for various periods through the year. The river has minimum instream flows that have been established under WAC 173-563-040(1). These instream flows place constraints on water rights and permits that have been issued with restrictions that limit use of the water.

[3] http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/wtrbud/mcnary.pdf

Table 5. Minimum instantaneous flows for instream uses within the McNary pool. WAC 173-563-040(1). The lowest minimum instream flow is (50,000 cfs). Actual average minimum daily flow (80,440 cfs) is higher than the required minimum flow.

Date	In-River CFS	In-River MGD	% of flow for the new withdrawal
April 1-15	50,000	32,316	0.077%
April 16-25	70,000	45,242	0.055%
April 26-30	70,000	45,242	0.055%
May 1-31	70,000	45,242	0.055%
June 1-15	70,000	45,242	0.055%
June 16-30	50,000	32,316	0.077%
July 1-15	50,000	32,316	0.077%
July 16-31	50,000	32,316	0.077%
August	50,000	32,316	0.077%
September	50,000	32,316	0.077%

Quad Cities Water Right

The Quad Cities Water Right (QCWR) application is a joint application by Pasco, Kennewick, Richland, and West Richland. The initial application was suspended by Ecology in 2002. After litigation, Ecology and the Quad Cities signed the Quad City Water Right on September 15, 2003 for 178 cfs and 96,619 acre-feet. The Cities prepared a new application (dated November 28, 2011 for 86,983 ac-ft (165 cfs). The 2011 Quad City population to be served was Pasco 61,000; Kennewick 69,178; Richland 48,850; and West Richland 12,200. The 20 year projected populations were: Pasco 83,300; Kennewick 93,306; Richland 62,981; and West Richland 21,164 (Quad Cities Water Right Application, November 28, 2011).

Pasco

The City of Pasco continues working towards obtaining additional water rights through all options available (CH2M Hill 2010). The City of Pasco water system is currently supplied from surface water withdrawals from the Columbia River. Pasco did have four groundwater wells located in West Pasco near Road 108 which served as an emergency backup supply. These emergency backup groundwater wells have now been abandoned. The City of Pasco has concluded that no other alternative to the Columbia River is currently available as a reliable source of supply for domestic water. Although groundwater is present within the service area, the quality of the groundwater is not as desirable as treated Columbia River water (CH2M Hill 2010). The potable water system has about 13.5 million gallons of available water storage. There is a 10 million gallon reservoir located in the middle of the system, a 1 million gallon reservoir on Broadmoor Boulevard, and a 2.5 million gallon elevated tank next to the city's irrigation system reservoir (City of Pasco WRMP, 2014).

As the service area continues to grow and demand for water increases, Pasco will be required to expand treatment capacity to meet the needs of the service area. Based on population projections, Pasco will need to plan for a service area population of up to 106,573 in the year 2027. The projected Average Day Demand in Year 2027 is 22.6 MGD and the projected Maximum Day Demand is 47.7 MGD or about 18 MGD greater than the current reliable capacity of the Butterfield Water Filtration Plant (30 MGD) (CH2M Hill 2010). Based on the population and demand projections, with an additional 13,866 ac-ft/yr from the Quad City Water Right, the City should have adequate water rights to serve until the Year 2027 (CH2M Hill, 2010).

The new WPWTP pump station is expected to be expanded in the future as water demand increases. Though the new intake will be sized to handle 25 MGD, the currently planned diversion is 6 to 9 MGD. Expansion of future withdrawal activities at the site will not require any site work exterior to the building structure that will be constructed under this project. In the future, three more raw water pumps and associated piping and valves can be installed inside the building structure. Up to 25 MGD (39 cfs) could ultimately be withdrawn from the river at this location. Pasco also withdraws water from the Columbia River for its Butterfield water filtration plant. About 26.6 MGD (roughly 41 cfs) is withdrawn for the southern portion of the city.

Construction and operation of the new intake and facility will allow the existing water intake to be used strictly for irrigation purposes. It is Pasco's policy (UT-1-D) to encourage using raw water for residential irrigation where available to decrease the amount of potable water used for maintaining lawns and landscaping.

Pasco currently uses more water in its potable water system than allowed by its current water rights (City of Pasco Water Resource Management Plan (WRMP), March 2014) (Tables 6 and 7). The city currently has a total of 9,659 ac-ft of annual domestic water rights (Table 7). This is from a combination of surface water and ground water rights. The city recently secured contracts for an additional 4,500 ac-ft of annual water surface supply from Ecology's Office of the Columbia River (City of Pasco WRMP, March 2014). It is estimated that this will provide an adequate potable water supply to Pasco through 2020. The city also has a total of 7,152.8 ac-ft of annual irrigation water rights (City of Pasco WRMP, March 2014).

Table 6. Pasco's Annual Water System Production

Year	Potable (ac-ft)	Irrigation (ac-ft)
2006	12,423.8	3,001.4
2007	12,860.2	3,513.9
2008	12,908.8	4,063.2
2009	13,616.5	4,526.6
2010	13,347.8	4,766.0
2011	13,477.8	5,438.1
2012	13,528.5	5,784.9

Table 7. Pasco's Water Right Summary from the Columbia River (City of Pasco WRMP, 2014).

Certificate Number	Flow (ac-ft)	Location
(SW)11660*	7,000	WTP Inlet
GW Cert.7205-A(A)**	76.2	Well Field
(SW) 10192(B)	132.8	WTP Inlet
G3-26081C(A)	291.3	Well Field
G3-25177C(A)	--	Well Field
G3-26081C(B)	190	Well Field
G3-25177C(B)	158.7	Well Field
S4-30976	1,810	WTP Inlet
Total	**9,659**	

*S indicates a surface water withdrawal
**G indicates a ground water withdrawal

Pasco has designed the project to be constructed to minimize impacts. The intake pipe will be installed to a depth of approximately 15 feet below the ordinary water level. This pipe will be horizontally bored under the riparian vegetation and will not disturb the shoreline.

Richland

By 1964 the City of Richland had built a 22 MGD (34 cfs) water treatment plant to supply potable water directly from the Columbia River. By 1979 Richland's population had grown to the point it had to upgrade the water treatment plant to a capacity of 30 MGD (roughly 46 cfs). Today's supply capacity is 70 MGD (108 cfs). Water is supplied by 11 wells and the Columbia River.

West Richland

West Richland's water system is comprised of 8 groundwater wells, 7 of which produce approximately 6.5 MGD (10 cfs). West Richland also has a water interconnect with Richland's water system that can be utilized to supply 1 MGD (2 cfs) to West Richland.

Kennewick

Kennewick relies on a combination of groundwater and surface water sources to meet peak summer demands. The present maximum source capacity from all sources is 30 MGD (46 cfs). Kennewick's two primary groundwater sources are Ranney Collector No. 4 (1.2 MGD) and No. 5 (13.8 MGD). These sources have a combined capacity of 15 MGD (23 cfs). Both of these sources are located directly adjacent to the Columbia River. The original Ranney Collectors No. 1, 2, and 3 are no longer in service. Kennewick also withdraws water directly from the Columbia River. The original (1980) capacity of this source was 7.5 MGD (12 cfs), but was sized for expansion up to 30 MGD (46 cfs). It currently operates at about 15 MGD (23 cfs). Kennewick's total maximum daily use is currently about 30 MGD.

The City of Kennewick is testing a pilot project on the feasibility of storing water in an aquifer during winter months when flows in the river are adequate and demand is lower, and then using

the water during the summer when water is limited and demand is up. It could be a way to provide water for future growth while keeping water in the Columbia River during critical times. It could also be a way for Ecology to try to create new water rights.

Irrigation Systems

Irrigation water is also withdrawn from the Columbia or Yakima Rivers. Water used for irrigation is sometimes unmetered at the service and restricted only by flow control devices, if at all. The seasonal variation in flow shows three to five times higher water use during a peak month compared to a winter month. Currently, a majority of residential customers in Pasco use domestic water for irrigation purposes.

There are irrigation networks in Kennewick operated by the Columbia Irrigation District (CID) and the Kennewick Irrigation District (KID). Each deliver untreated Yakima River water through open and closed gravity-flow conduits to agricultural and residential customers. The cities of Richland (south) and Kennewick basically have a small river flowing through them. KID flows around 150 MGD (240 cfs) of water though the cities from April 1st to October 31st.

Franklin County Irrigation District No. 1 (FCID) was formed in 1919 to supply irrigation water to homes and farms in a rural section of Franklin County, west of Pasco. There is a FCID water pumping station 1,200 feet down-river from the proposed intake and pumping facility. This facility operates with a 125 horsepower (hp) pump, a 300 hp pump, and a 450 hp pump depending on demand. The FCID withdraws about 18,300 acre-feet (25.3 cfs), from the Columbia River for irrigation purposes. They also withdraw from wells in the area. FCID has permits or certificates for about 30,000 ac-ft as per FCID (FCID personnel communication 10/10/13.)

There are approximately 40 private water systems in the area drawing from both wells and the river. The majority of these systems serve small commercial businesses and trailer parks in areas that were not served with city water when they were developed. It is expected that these systems will eventually connect to the city water utility as their infrastructure reaches the end of its design life, or as a city system expands into their area. Connection of existing water systems to the city water utility may require transfer of the owner's water right to the city if the owner's intent is to relinquish all use of an existing water source (CH2M Hill, 2010).

Some new water projects are likely to be pursued, but most water developments incur Federal permitting obligations, such as Corps CWA Section 404 permits, and would be subject to future consultations. We are not aware of any specific plans for additional water developments in the action area that qualify as cumulative effects and are "reasonably certain to occur".

Effects from these water withdrawals

The municipal and irrigation water withdrawals discussed above have a small impact the river environment. The approximate total withdrawal amount from each of the cities and the major irrigation suppliers is 577 cfs (415 MGD). The Ecology website shows a total diversionary withdrawal amount of 5,708 (3,689 MGD) which is 11.4 % of the minimum required instream

flow. It is 7.1% of the minimum average daily flow. These relatively small diversions could have some impact on migrating salmonids, but the effects would be minimal. Ecology is in the process of trying to find even more water which could be used for beneficial uses, both instream and out of stream.

4.5 Effect Determinations

4.5.1 Listed Species

The Corps determined that the proposed action **"may affect, and is likely to adversely affect"** Upper Columbia River spring Chinook, Upper Columbia River steelhead, Middle Columbia River steelhead and bull trout. The project will have **"no effect"** on pygmy rabbit, Ute ladies'-tresses, gray wolf, White Bluffs bladderpod, yellow-billed cuckoo, and Washington ground squirrel.

The effects of the action will include an increase in noise due to pile driving and minor, temporary increases in turbidity and sediment transport during installation and removal of the pilings for the water intake and screen. Although sediment effects can be harmful to ESA-listed fish species, they will be limited in intensity, extent, and duration, and will occur in the in-water work window(s) when few listed salmonids will potentially be in the project area. Potential impacts to bull trout are very low due to the limited distribution of bull trout in the project area and the minor effects anticipated from the proposed action. Effect determinations for listed species are summarized in table 8.

4.5.2 Critical Habitat

The effects of the proposed action on PCEs for the anadromous species affected by the proposed action will be minor because of the limited access to the action area by anadromous fish species during the winter and summer in-water work windows. Additionally, the nature/extent of the proposed action is not expected to result in any alteration that appreciably diminishes the conservation value of critical habitat for listed species. Since some rearing anadromous salmonids could be in the area even in the work windows, the Corps determined the proposed action may have a temporary negative effect on some salmon and steelhead critical habitat PCEs. However, there would be no destruction or adverse modification of critical habitat.

Because of the limits on the intensity, extent and duration of the negative effects on the environment, the PCEs of bull trout critical habitat in the action area are likely to remain functional and serve the intended conservation role for the species. Therefore, the Corps has determined that the proposed action **"is not likely adversely affect" bull trout critical habitat.** The action will cause no destruction or adverse modification to critical habitat. Effect determinations for critical habitat are summarized in table 8.

Table 8. Effect determinations for listed species that may occur in the project area.

Species	Species Determination	Critical Habitat Determination
NMFS		
Upper Columbia River Spring Chinook	May Affect, Likely to Adversely Affect	No Destruction or Adverse Modification
Upper Columbia River Steelhead	May Affect, Likely to Adversely Affect	No Destruction or Adverse Modification
Middle Columbia River Steelhead	May Affect, Likely to Adversely Affect	No Destruction or Adverse Modification
USFWS		
Bull trout	May Affect, Likely to Adversely Affect	Not Likely to Adversely Affect
Pygmy Rabbit	No Effect	None Designated
Ute ladies'-tresses	No Effect	None Designated
Gray Wolf	No Effect	None Designated
White Bluffs Bladderpod	No Effect	No Effect
Washington Ground Squirrel	No Effect	None Designated
Yellow-billed Cuckoo	No Effect	None Designated

5 Magnuson-Stevens Act - Essential Fish Habitat

The consultation requirement of section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) directs Federal agencies to consult with NMFS on all actions, or proposed actions that may adversely affect Essential Fish Habitat (EFH). Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

The mid Columbia – Lake Wallula, Hydrologic Unit Code (HUC 17070101) sub-basin has been identified as EFH for Chinook salmon and Coho salmon.

Based on information provided above, and the analysis of effects presented in the ESA portion of this document, the proposed action may result in minor adverse effects on some habitat parameters. These adverse effects are:

- An increase in construction related sound levels.
- Short term increases in turbidity and suspended sediments during pile installations and removal.

- Reduction of stream flow by the removal of up to 34 MGD (52.6 cfs).
- Temporary loss of 720 square feet of river bottom substrate.

Based upon the project design, the short-term and long-term impacts associated with the project, and the proposed conservation measures, **the Corps has determined there would be some adverse effects to EFH.**

6 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§ 703-712, as amended) prohibits the taking of and commerce in migratory birds (live or dead), any parts of migratory birds, their feathers, or nests. Take is defined in the MBTA to include by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof without a permit.

The in-water work is to be conducted during the summer or winter in-water work window when most birds would no longer be nesting. Migratory birds would likely avoid the work area while work is being performed. Vegetation to be removed only includes several arborvitae. If vegetation is to be removed between March 15 and August 15, the area to be disturbed, including all vegetation to be removed, must be monitored by a biologist familiar with migratory bird monitoring techniques to ensure no take of birds or nests protected by the MBTA occurs. ***Because the work will be conducted when most migratory birds are no longer nesting, or monitoring will be conducted, there would be no take of migratory birds as a result of the proposed action.***

7 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) authorizes the USFWS to evaluate the impacts to fish and wildlife species from proposed Federal water resource development projects that could result in the control or modification of a natural stream or body of water that might have effects on the fish and wildlife resources that depend on that body of water or its associated habitats. ***The proposed action does not modify a natural body of water and therefore does not involve activities subject to the FWCA.***

8 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) prohibits the taking or possession of and commerce in bald and golden eagles, with limited exceptions, primarily for Native American Tribes. Take under the BGEPA includes both direct taking of individuals and take due to disturbance. Disturbance is further defined in 50 CFR 22.3.

There is a new bald eagle nest located about a mile southwest of, and across the Columbia River from the work site. This nest is near a highly traveled highway. Some bald eagles can also be found near the project area during the winter months. They can often be found roosting and hunting along the Columbia River. Bald eagles could be encountered within a mile of the project area during the construction of the proposed action, especially during winter. However, the

adjacent I-182 carries approximately 56,000 vehicles each day. Because of this high amount of disturbance, eagles are not likely to come close to the proposed work area. Construction activities are not expected to adversely affect eagles or cause delay in forage activities. In addition, suitable foraging habitat is available in the adjacent areas. The construction related noise and activities will be short term. Eagles would likely habituate to the long term noise of the new pumps.

Golden eagles are distributed worldwide and occupy habitats from alpine meadows to arid deserts. Washington supports nesting golden eagles east and west of the Cascade Mountains, as well as a winter migratory population from nesting populations in Canada and Alaska. There are no golden eagle nests near the project area. Golden eagles are not likely to be found near the project area.

Because the proposed action is located so close to I-182, eagles are not likely to be found near the work site. The Corps has determined there will be no disturbance or take of eagles as a result of the proposed action.

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SECTION 11337 – CYLINDRICAL SUBMERGED SCREENS & AIR BACKWASH SYSTEM

PART 1 -- GENERAL

1.1 SUMMARY

A. The CONTRACTOR's Intake Screen Supplier (ISS) shall provide cylindrical submerged screen and air-burst backwash systems, complete and in place, in accordance with the Contract Documents.

B. Specification Section 11000 – Equipment General Provisions applies to this Section.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Reference Standards

ASTM A276 Stainless and Heat-Resisting Bars and Shapes

1.3 QUALITY ASSURANCE

A. **Intake Screen Supplier's Experience:** The single manufacturer supplying this equipment must be able to furnish proof of over (20) successful, trouble-free installations and (10) years of manufacturing equipment of similar technology systems.

B. The equipment manufacturer must maintain an ongoing quality assurance program, including ISO-9000 certification.

C. All welders must maintain certification to ASME Section IX. Copies of certifications shall be provided upon request

1.4 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01300 - Contractor Submittals.

B. **Shop Drawings**

1. Dimensional drawings of the screen, panels as applicable, and structural support/guiderail system, showing compliance with the requirements, including tolerances.

2. Design calculations for the screen, panels as applicable, and structural support/guardrail system, including loading conditions, support, anchorage, deflection, etc.

3. Storage and handling instructions.

C. **Tolerances:** Tolerances and clearances shall be shown on the Shop Drawings and shall be closely adhered to. Machine work shall be of high-grade workmanship and finish, with due consideration to the special nature or function of the parts.

D. **Experience:** Screen manufacturer shall furnish references (names and phone numbers) to a minimum of five (5) projects within North America, of similar design and application that have been successfully completed in the past 5 years.

PART 2 -- PRODUCTS

2.1 GENERAL

A. All WORK covered by this section shall be the responsibility of a single screen system Manufacturer.

B. The wedge-wire cylindrical screens and structural support system shall be designed and fabricated to meet the requirements of this Section and in coordination with the screen cleaning system. The screen shall be designed such that water openings through the screen surfaces or any other component do not exceed the maximum allowed slot width as defined below.

C. The screen manufacturer shall be responsible for fabricating and furnishing the complete screen system that includes all internal air burst piping and diffusers up to the identified flange connection, internal flow distributors, screen supports, and appurtenances as necessary for a complete and operable system.

2.2 CYLINDRICAL SINGLE SCREENS

A. **General:** Cylindrical screens shall be designed and furnished by an approved System Supplier and shall be of the single-unit screen style. The approved System Supplier shall provide a complete working system to function in the installation described herein and as shown in the contract drawings.

B. **Requirements:** Cylindrical single screens shall be compatible with the installation shown on the contract drawings and shall conform to the following requirements:

1. Shape of Screen Assemblies: single, cylindrical
2. Screen Type: welded, continuous slot, V-wire
3. Screen Assembly Motion Static – non-rotating
4. Screen Ends: flanged w/bolt-holes to ANSI B-16.5 or

AWWA C-207 - Class D pattern

5. Number of independent screens: 2

6. Fluid Service: Unfiltered, raw fresh water (Columbia River)

7. Average Suspended Solids Loading: < 30 mg/l

8. Operation: Continuous

9. Cleaning Method: Air Burst thru diffuser system

C. **Design Criteria & Dimensions:** Design the cylindrical screens in accordance with the following dimensions and criteria:

Max Design Flow per screen (cfs / screen)	19.3 (12.5 mgd each)
Screen nominal outside diameter (inches)	42
Min. length of screen element (inches)	60
Min. total screen surface area (sq. ft)	55
Avg. approach velocity at max flow (fps)	0.35
Minimum Screen open area (%)	50
Wedge-wire slot width (inches)	0.069 (1.75 mm)
Wedge-wire orientation	Vertical, continuous slot
Internal flow modifier / distributor min. diameter to connecting pipe (inches)	20
Discharge flange nominal diameter (inches)	30
Discharge flange min. thickness (inches)	3/4
Max Head-loss (measured from outside screen across the internal flow baffle and up to the discharge flange) (feet)	1.0
Maximum hydrostatic differential loading at any or all points along screen (feet)	10.0 (4.4 psig)

Maximum allowable design stress in structural members (% of yield stress)	60

D. **Materials:** Unless specific components are noted otherwise, the entire tee screen assembly, including internal flow baffle, wedge wire, wedge wire support members, end flanges, deflector cones, and all other metallic components shall be constructed of type 304 stainless steel, conforming to the requirements of ASTM A 276. All bolts and washers shall be Type 316 stainless steel, with bronze nuts as specified below.

E. **Bronze Nuts on SS Bolts**. Stainless steel bolts, anchor bolts, and washers on the submerged screen and center tee assemblies shall be of Type 316 stainless steel, with bronze nuts, or cap screws (where screwed into stainless steel), of copper-silicon alloy, conforming to ASTM B 98, alloy C 65100, designation H04, or alloy C 65500, designation H04.

1. Threads on stainless steel bolts shall be protected with an anti-seize lubricant suitable for submerged stainless steel bolts, meeting government specification MIL-A-907E.

2. Anti-seize lubricant shall be classified as acceptable for potable water use by the NSF.

F. **Internal Flow Modifiers**. Internal flow modifier design must be either an open-pipe style modifier or other large opening modifier to eliminate potential internal clogging of screen. Modifiers with orifices smaller than 2-inches in diameter shall not be permitted. The maximum allowable headloss across the flow modifier and associated piping shall be as defined under Part 2.2 of this Section.

G. **Cylindrical Wedge Wire Screen**: Cylindrical screens shall be of wrapped-wire construction welded and fabricated from stainless steel. The screen surface shall be of smooth wedge-wire shape with inwardly enlarging openings to minimize the likelihood of debris entrapment. Screen wedge wires shall be continuous over the circumference of each panel. The ends of the screen panel may be covered with a solid, minimum 12 gauge stainless steel plate with stainless steel stiffeners that are flush with the surface of the screen surface. The flat panel portion of the screen panel, if any, shall have the same structural capacity as the wedge wire screen portion of the panel.

1. Lifting slots or hooks shall be provided on the frame of each cylindrical screen for installation and/or removal of the screens. The screens shall be designed such that suspension of the screens under a load of twice the weight of the screens can be supported without deformation of the panel. A minimum of two (2) lifting slots or hooks shall be provided per screen.

H. **Construction and Structural Support System:** The structural support system shall be designed to support the screens in the steel piping system as shown on the Contract Drawings.

1. All structural support systems shall be of stainless steel.

2. The surface wire, support beam and stiffener structure shall be an all-welded matrix designed to provide the specific strength with minimal interference with the through screen flow pattern.

3. End plates and main screen body shall be a minimum of 0.188 inches thick. All structural butt welds shall be full penetration fillet welds and shall be the thickness of the thinner component.

4. The screen shall be designed by the screen Manufacturer with an entirely internal structural support system designed to support the wedge-wire screen and all other members from the inside of the screen housing. Mounting and welding details of the structural support system shall be provided with the Shop Drawings. The installed screens shall make a smooth and continuous screen surface with which the cleaning system can function properly.

5. The piping support system shall completely support the screens both individually and as a fully assembled unit. The systems shall cause the screens to be positioned properly when installed and shall hold the screen securely in position during operation.

6. Steel pile pipe support anchors will be provided underneath the tee piping and the microtunnel steel piping to support the main screens and the microtunnel piping, as shown on the Drawings. The CONTRACTOR shall be completely responsible for the fabrication of the screen support system in accordance with the Contract Drawings, with any support changes as recommended by the Screen Manufacturer for proper support requirements of their submerged screens, and with the submerged intake steel piping manifold, and the screen cleaning system.

I. **Slot Width Opening Tolerance:** The slot width opening shall be controlled and continuously monitored during manufacture, and shall be as follows:

1. For slot openings from 0.040 through 0.100 inches, the mean slot size shall be within +/- 0.003 inches with a standard deviation no greater than 0.003 inches throughout the assembly.

2. For slot openings greater than 0.100 inches, the mean slot size shall be within +/- 0.004 inches with a standard deviation no greater than 0.004 inches throughout the entire assembly.

J. **Tolerances:** The completed wedge wire screens and structural support system shall be within the tolerances below under the design conditions given in this Section.

1. The screen shall be circular to within plus or minus 1/8-inch when simply supported at one end under the maximum hydrostatic load.

2. The screen structural support system shall be designed such that maximum vertical deflection at the far end of the screen, opposite the flange connection, does not exceed 0.25 inches when in the dry (non-submerged) condition.

3. The screen face deflection under maximum hydraulic loading condition shall be less than 0.10-inch.

K. **ISS Manufacturers, or equal:**

1. Bixby-Zimmer, Galesburg, IL

2. Cook Screens Technology, Inc., Cincinnati, OH

3. Hendrick Screen Co., Owensboro, KY

4. USF - Johnson Screens, New Brighton, MN

2.3 AIR BACKWASH SYSTEM

A. **General:** The ISS shall provide, as part of the overall intake screen system, an air backwash system, complete and skid-mountings where called for, designed to remove debris from the screen surface by delivering a suitable volume of compressed air to the inside invert of the cylindrical screens. The exiting air shall scour the screen surface to maintain adequate design flow and thru-slot velocity characteristics.

B. **Components**. The air backwash system furnished by the ISS shall include, but not be limited to the following components:

1. Two (2) air compressor units as defined below, with interconnecting skid, air piping, and instrumentation as required

2. A local vendor control panel (VCP) mounted on each of the compressor unit skid system, with features no less than that shown on Contract Drawing P&IDs, and those listed below.

3. One (1) horizontal air-receiver tank as defined below

4. A separate air-dryer system, with pre and post filters, instrumentation, and a small air pressure receiver, as defined on the Contract Drawings.

5. Two (2) pneumatically actuated air isolation ball valves of 4-inch diameter, Ball valves shall be as specified under Sheet Keynote E on Drawing GM-01.

C. **Air Compressors and Vendor Control Panels (VCP)**. The ISS shall provide two (2) oil-less, rotary scroll air compressor units, each of total installed power of no less than 10 HP, each mounted in a vertical cabinet orientation, rated for 100% continuous duty according to the following requirements:

1. Shall be sized to recover from each intake screen backwash cycle in a time period not to exceed 40 minutes

2. The air backwash system compressor systems and two isolation ball valves shall be capable of remote automatic operation via software controls provided within the ISS's programmable logic controller (PLC).

3. Each compressor unit / cabinet shall be supplied with at least one aftercooler which shall be rated for an air flow capacity of no less than the combined capacity of all of the air compressor units within the cabinet. The aftercoolers shall function on either air or freshwater as the cooling fluid.

4. Each air compressor unit shall be supplied on an individual steel skid system with anchor brackets or feet for anchoring to a concrete equipment pad. The steel skid systems as well as the compressor system sound enclosure cabinets shall be polyester or epoxy powder coated. Sound enclosures shall limit external sound to no more than 60 dB measured at 10-ft away from the units.

5. Each unit shall come equipped with its own Vendor Control Panel (VCP) that is to be mounted on the same enclosure as the air compressor units. VCP shall have a touch screen digital display, power-on indicator light and shall have an “Auto / Off” selector switch for receiving of remote operation run signal from a CONTRCTOR furnished PLC. VCP shall have discrete outputs to relay the the On-Off status of each compressor to a remote PLC located in an adjacent room, approximately 40-ft away.

6. Each air compressor within the unit shall have the following features:

   a. Main bearing shall be housed in cast-iron housing and shall have a re-grease feature to allow for easy access / maintenance to grease the bearings.

   b. Total unit air output shall be at least 25 SCFM at 145 psig discharge pressure.

c. Each air compressor unit System shall be comprised of at least two (2) individual 5 HP compressor units for a total minimum installed HP rating of 10 HP for each unit. Units shall be automatically staged for on/off performance depending upon system demand. (Normal operation will be for all individual compressor units within one (1) cabinet to run until the large air-receiver tank is filled.)

d. Individual compressor units shall have TEFC, premium efficiency motors designed for continual duty and use on 480 VAC, 3-phase, 60-hz power supply.

e. Air cooled after cooler for each compressor unit

f. Internal vibration isolators on the entire unit

7. Each unit shall come equipped with the following features and instrumentation:

a. Air outlet connection piping of no less than 1-inch nominal diameter

b. High air temperature shutdown switch on each compressor unit with indication on the local display.

c. Full voltage starter with overload protection

d. System air pressure display

e. General compressor fault alarm with remote contacts for wiring to remote PLC

8. The maximum width of the steel skid system shall not exceed 42-inches, and the skid shall be designed and constructed such that one long edge of the skid can be mounted against a wall with access provided to the other 3 sides of the equipment skid.

9. Manufacturers, or Equal.

a. Powerex, **Model SED1007HP**

b. or Equal

D. **Air Receiver Tank**. The ISS shall provide one (1), ASME code, steel construction, horizontal air receiver tank according to the following requirements:

1. Tank shall be a minimum 660 gallon, horizontal receiver mounted on four (4) steel leg and foot assemblies. Feet assemblies shall be designed for

anchorage onto a 5-inch thick equipment pad furnished by the CONTRACTOR.

2. Tank shall be sized for the 4-inch diameter air system piping shown and to displace a minimum 3.0 screen volumes of air at one (1) intake screen during a backwash to provide suitable debris removal and cleaning.

3. Tank outside diameter shall be between 40 and 46 inches.

4. Tank shall be ASME coded for 200 psig (150 psig working pressure)

5. The duration of the air backwash event shall be adjustable at the main PLC panel provided by the ISS.

6. The air receiver shall be equipped with a 4-inch isolated and liquid filled pressure gauge (range from 0 to 250 psig), pressure safety valves, and an automatic condensate blow-down drain valve of no less than 1-inch diameter. The condensate blow-down drain valve shall be wired to the LCP furnished by the ISS.

E. **Air Piping.** All air piping on the ISS air compressor skid(s) shall be of painted black steel, type K hard copper, or 304 stainless steel, minimum schedule 20, and no less than 1-inch in diameter. For stainless steel piping, on-skid fittings shall be socket-weld style fittings. Interconnecting piping between the intake screen assembly and the air backwash System shall be by the CONTRACTOR.

F. **Air Supply to the Pneumatic Air Valves.** The ISS shall provide a total of two (2), 4-inch ball valves with pneumatic actuators as shown on the Contract P&ID Drawings. These ball valves shall be provided with fast acting full-open or full-closed pneumatic actuators (designed to operate on a dried air supply at between 60 and 120 psig). This air valve system shall have the following features:

1. Pneumatic actuators shall be capable of travelling from full close to full open in no more than 2 seconds.

2. The ISS shall provide a field adjustable pressure regulating valve upstream of the pneumatic actuators to reduce pressure to the recommended level for fast operation of the isolation ball valves), position indicator and mechanical or electric limit switches.

3. Electric power supply for the low voltage, DC powered solenoid valves within the automatic pneumatic actuators shall originate in the PLC panel located in the adjacent electrical room.

G. **Pressure Differential Monitoring of Intake Screens.** The CONTRACTOR shall provide, as part of the overall screen system, two an analog ultrasonic level indicating transmitters (LIT) measuring water levels as follows:

1. LIT-100 to measure the water level in the Columbia River within 200 ft of the intake.

2. LIT-101 to measure the water level in the wet well of the vertical turbine raw water pumps.

These LITs will be used in an algorithm to determine the pressure differential across the intake screens. Over time, this data can be used to track screen performance and assure that the air backwash system continues to operate as designed, in a clean condition without the need for underwater inspection or screen removal. The PLC shall perform computations to determine the approximate pressure differential across the intake screens.

3. If pressure differential across the intake screens rise to levels above the high setpoint, the PLC shall alarm the Operators that it is time for an air-burst backwash cycle to be initiated.

4. If pressure differential across the intake screens rise to levels above the high - high setpoint, the PLC shall alarm the Operators and automatically initiate an air-burst backwash cycle of each intake screen.

PART 3 -- EXECUTION

3.1 INSTALLATION AND FIELD ASSISTANCE

A. The CONTRACTOR shall be responsible for the installation of the screens in accordance with the Contract Documents.

B. The screen manufacturer's field representatives shall provide installation assistance, as necessary, to the CONTRACTOR.

C. A service training session for OWNER staff involved in the operation and maintenance of the screen shall be provided by the screen cleaning system supplier in conjunction with the field training for the cleaning system, for a time period on-site of no less than one (1) Day.

- END OF SECTION -