

APPENDIX A – FIGURES

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LIST OF FIGURES

Figure 1.1-1.	Location of Goldendale Energy Storage Hydroelectric Project.....	A-1
Figure 2.2.3-1.	Plant power during generating and pumping cycles – 14,745 MWh scenario	A-2
Figure 2.2.3-2.	Plant power during generating and pumping cycles – maximum capacity scenario 3	A-2
Figure 3.3.1-1.	Geology of the Goldendale Project area	A-3
Figure 3.3.4-1.	Vegetation cover types in the project area	A-4
Figure 3.3.4-2a.	Priority habitat and rare plant habitat mapping in the southern/lower portion of the project area.....	A-5
Figure 3.3.4-2b.	Priority habitat and rare plant habitat mapping in the northern/upper portion of the project area.....	A-6
Figure 3.3.4-3a.	Delineated wetlands and waterbodies in the southern/lower portion of the project area.....	A-7
Figure 3.3.4-3b.	Delineated wetlands and waterbodies in the northern/upper portion of the project area.....	A-8
Figure 3.3.4-4a.	Direct impacts of project construction on delineated wetlands and waterbodies in the southern/lower portion of the project area (Source: Ecology, 2022a).	A-9
Figure 3.3.4-4b.	Direct impacts of project construction on delineated wetlands and waterbodies in the northern/upper portion of the project area.....	A-10
Figure 3.3.6-1.	Wind turbine locations relative to the upper reservoir	A-11
Figure 3.3.7-1.	Key observation points for the Goldendale Pumped Storage Project.....	A-12
Figure 3.3.7-2.	View of proposed lower reservoir area from State Route 14.....	A-13
Figure 3.3.7-3.	View in vicinity upper reservoir area	A-13
Figure 3.3.7-4.	Photo-simulation of the upper reservoir from the intersection of Hoctor Road and Highway 97	A-14
Figure 3.3.7-5.	Photo-simulation of the upper reservoir from the intersection of Willis Road and Hoctor Road	A-15
Figure 3.3.7-6.	Photo-simulation of the lower reservoir from the Columbia Hills at Juniper Point	A-16
Figure 3.3.7-7.	Photo-simulation of the lower reservoir from State Route 14	A-17
Figure 3.3.7-8.	Photo-simulation of the lower reservoir from the bank of the Columbia River in Giles French/John Day Dam Park as seen from KOP-5	A-18
Figure 3.3.11-1.	Decibel scale and examples of commonly encountered noise sources.....	A-19
Figure 3.3.12-1	The 7 identified environmental justice communities within a 5-mile buffer of the Goldendale project area.....	A-20

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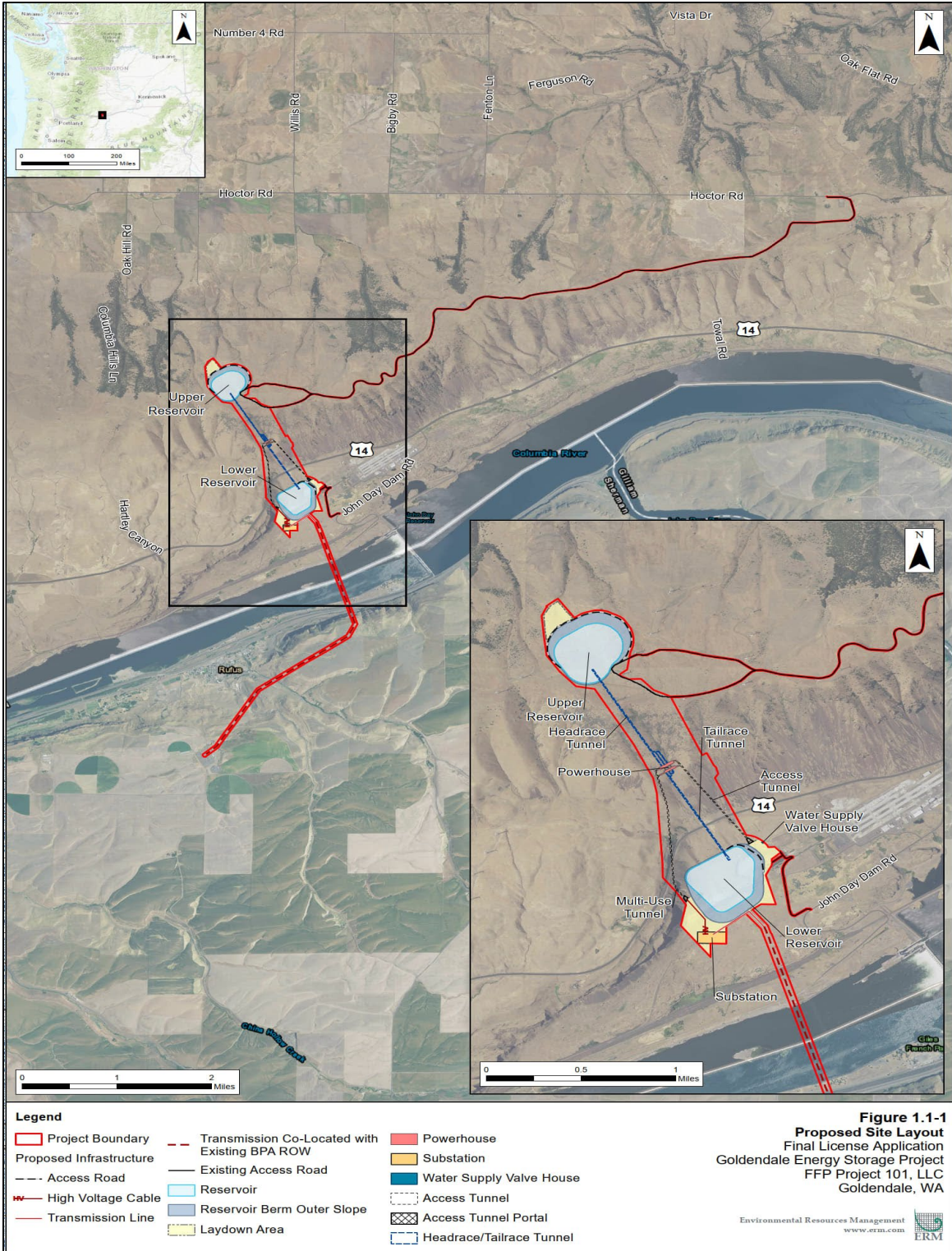


Figure 1.1-1. Location of Goldendale Energy Storage Hydroelectric Project (Source: FFP, as modified by staff).

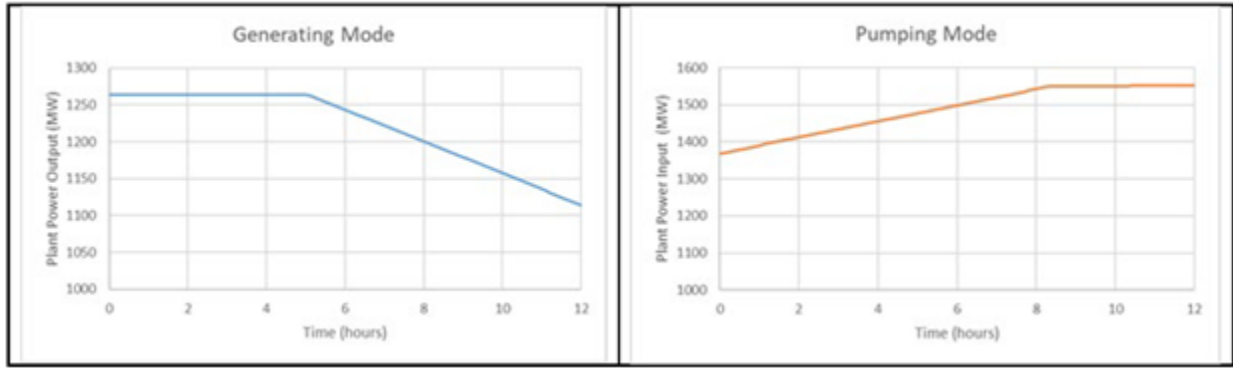


Figure 2.2.3-1. Plant power during generating and pumping cycles – 14,745 MWh scenario (FFP, 2021a).

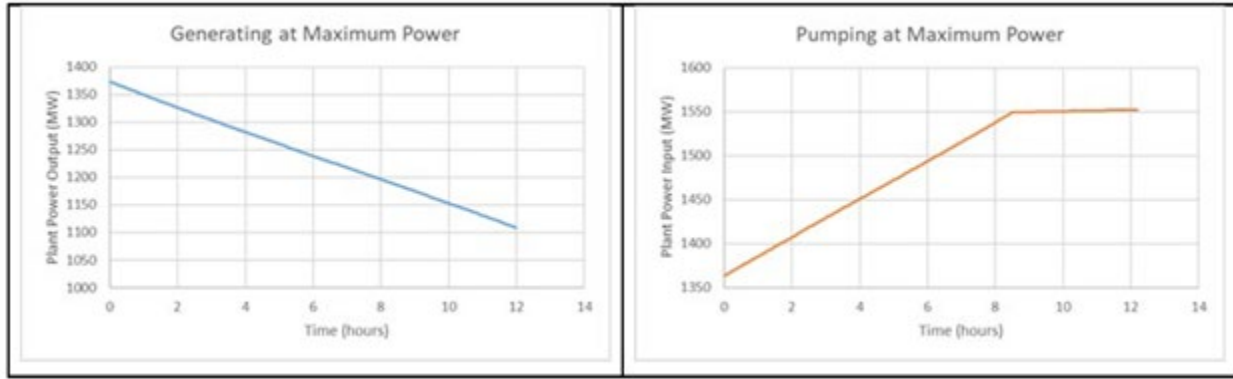


Figure 2.2.3-2. Plant power during generating and pumping cycles – maximum capacity scenario 3 (FFP, 2021a).

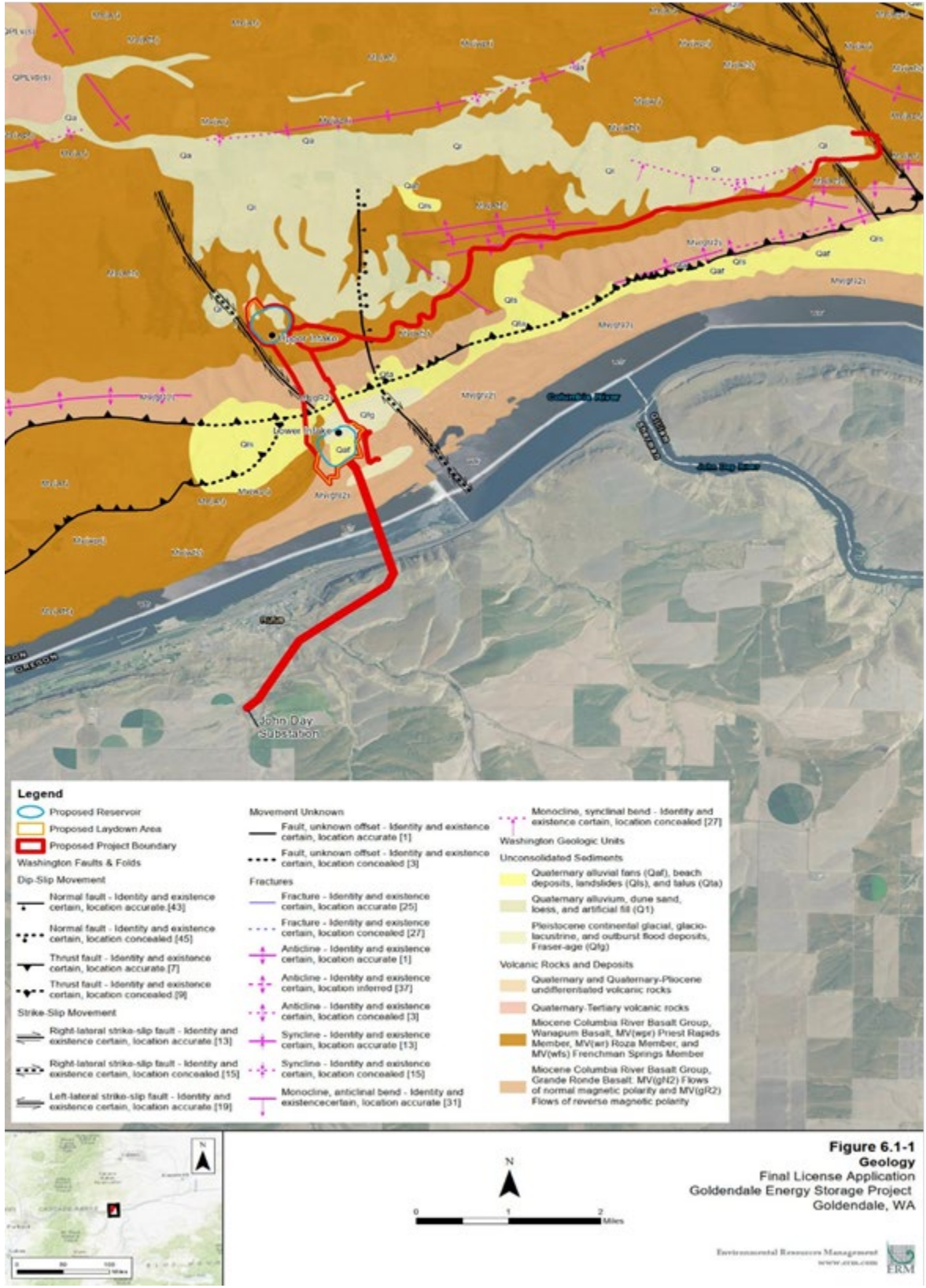


Figure 3.3.1-1. Geology of the Goldendale Project area (Source: FFP, 2020).

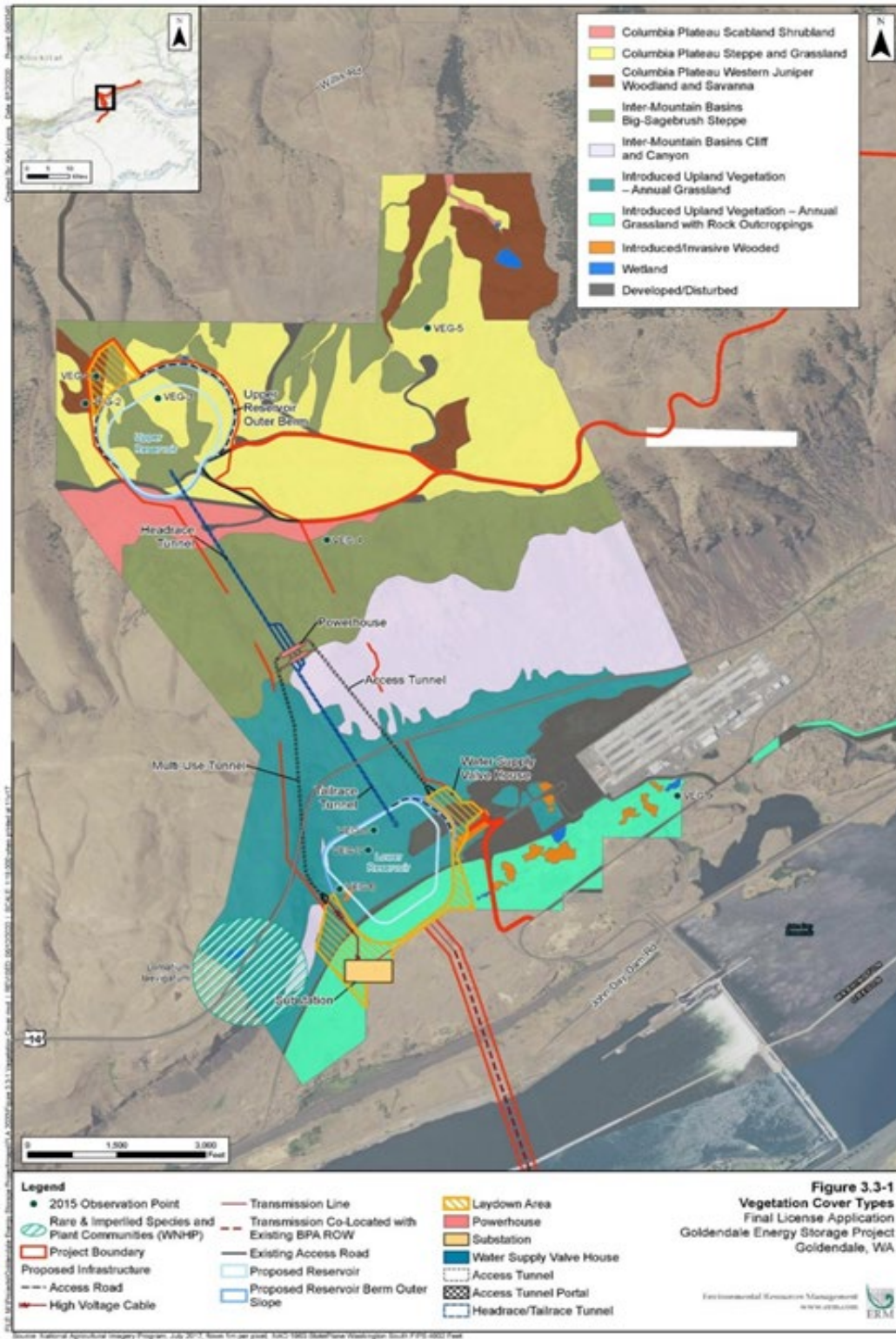
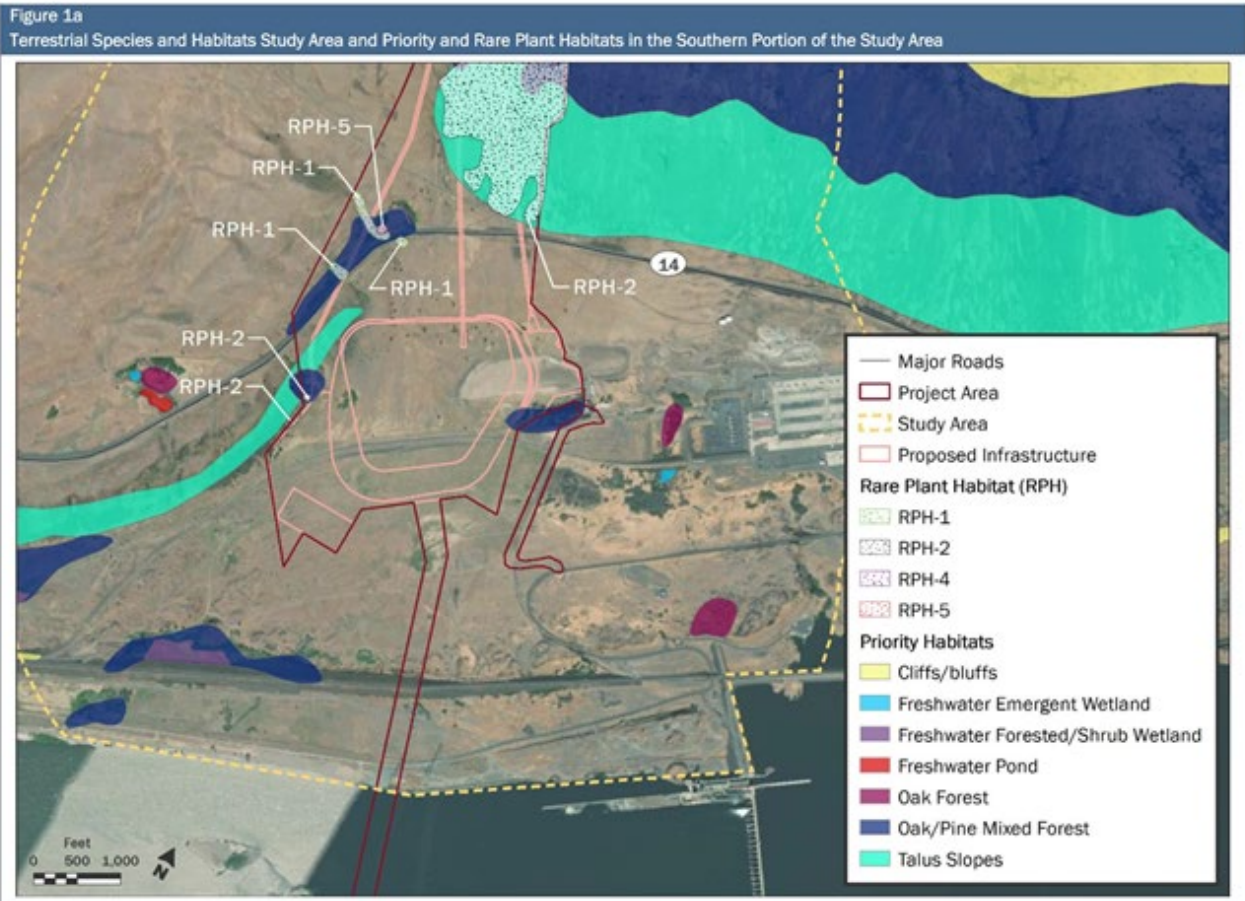


Figure 3.3.4-1. Vegetation cover types in the project area (Source: FFP, 2020).



Sources: FFP 2021; WDFW 2021a

Note: Unmapped habitat classification areas are shown in Attachment 1. The Pacific Flyway and Columbia Hills Important Bird Area overlap with the entire study area.

Terrestrial Species and Habitats Resource Analysis Report
Proposed Goldendale Energy Storage Project

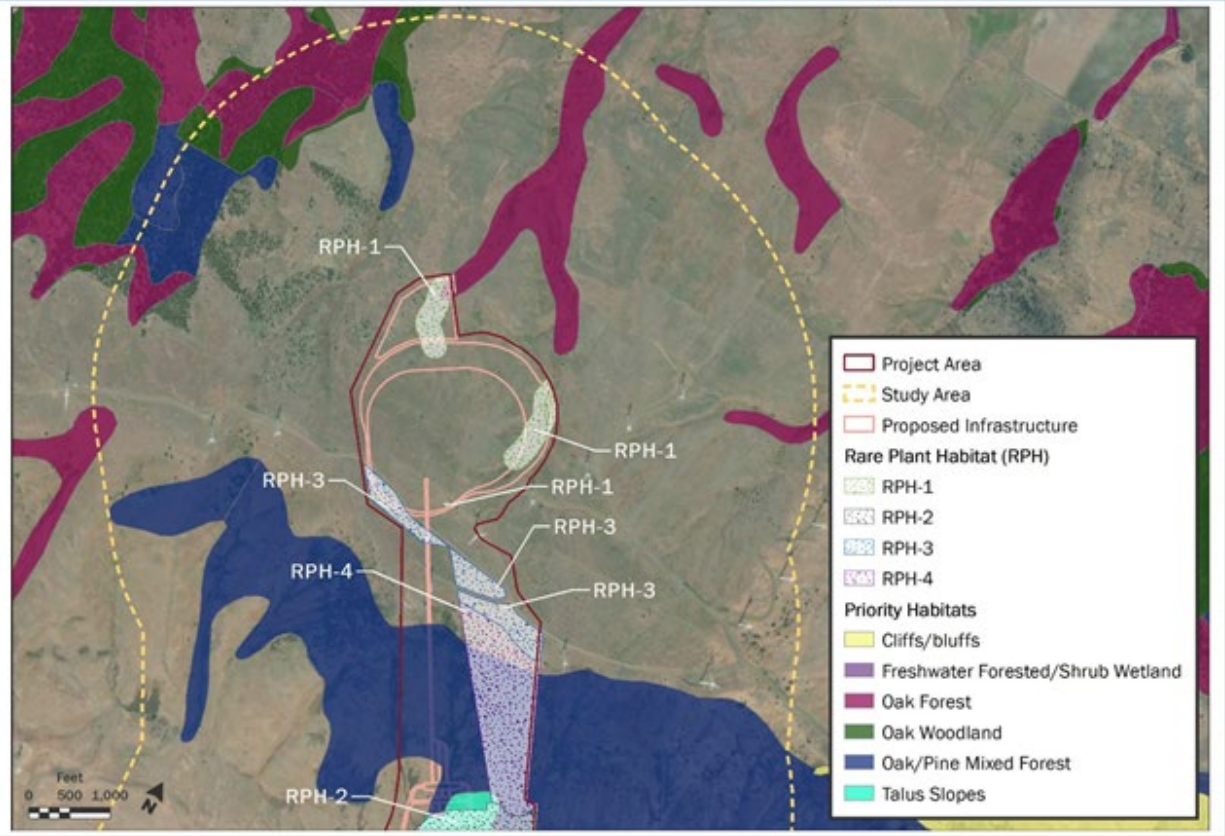
4

June 2022
Methodology

Figure 3.3.4-2a. Priority habitat and rare plant habitat mapping in the southern/lower portion of the project area (Source: Ecology, 2022a).

Figure 1b

Terrestrial Species and Habitats Study Area and Priority and Rare Plant Habitats in the Northern Portion of the Study Area



Sources: FFP 2021; WDFW 2021a

Note: Unmapped habitat classification areas are shown in Attachment 1. The Pacific Flyway and Columbia Hills Important Bird Area overlap with the entire study area.

Terrestrial Species and Habitats Resource Analysis Report
Proposed Goldendale Energy Storage Project

5

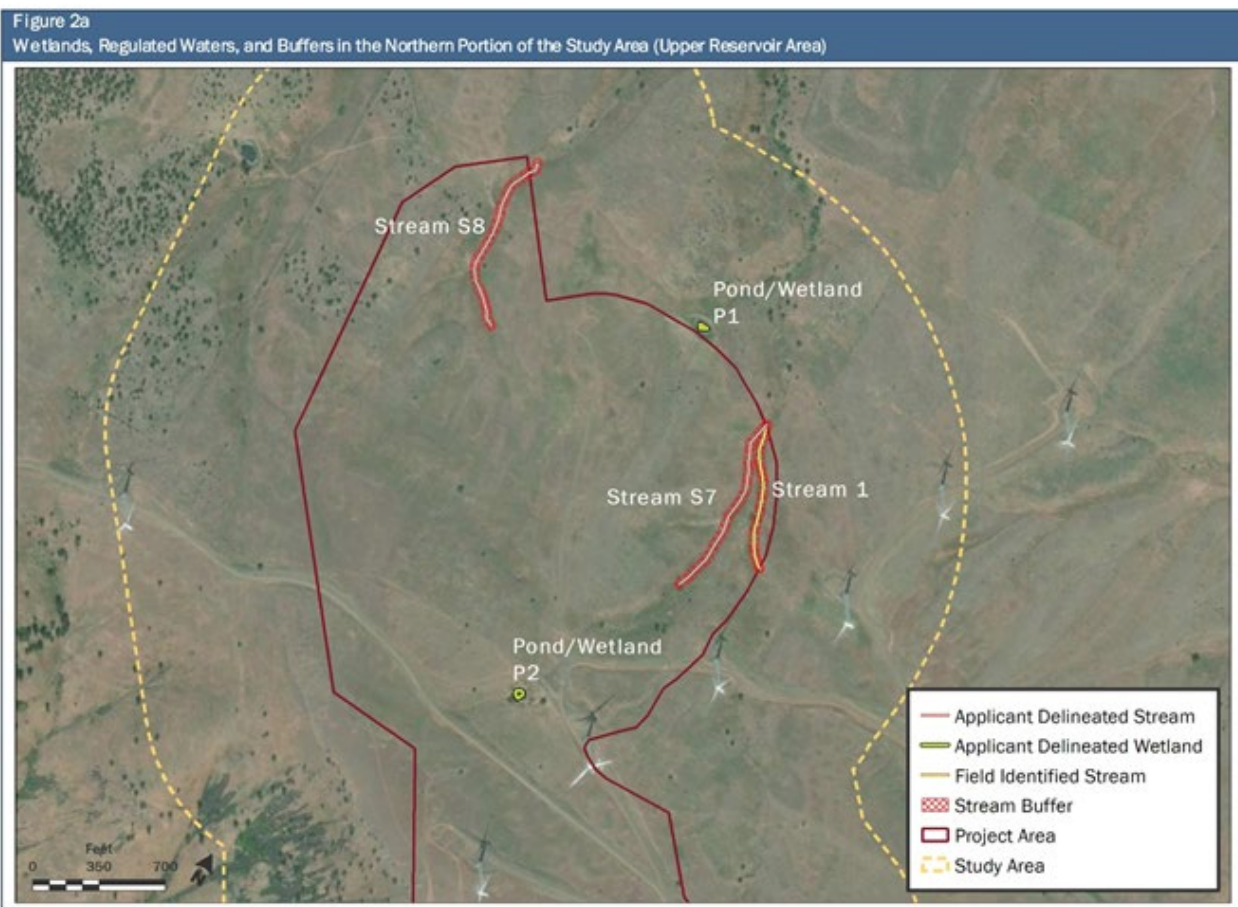
June 2022
Methodology

Figure 3.3.4-2b. Priority habitat and rare plant habitat mapping in the northern/upper portion of the project area (Source: Ecology, 2022a).



Sources: FFP 2021; PGG 2013; field knowledge gained through site visits performed by Anchor QEA and Ecology July 2021

Figure 3.3.4-3a. Delineated wetlands and waterbodies in the southern/lower portion of the project area (Source: Ecology, 2022a).



Source: FFP 2021; field knowledge gained through site visits performed by Anchor QEA and Ecology July 2021

Figure 3.3.4-3b. Delineated wetlands and waterbodies in the northern/upper portion of the project area (Source: Ecology, 2022a).

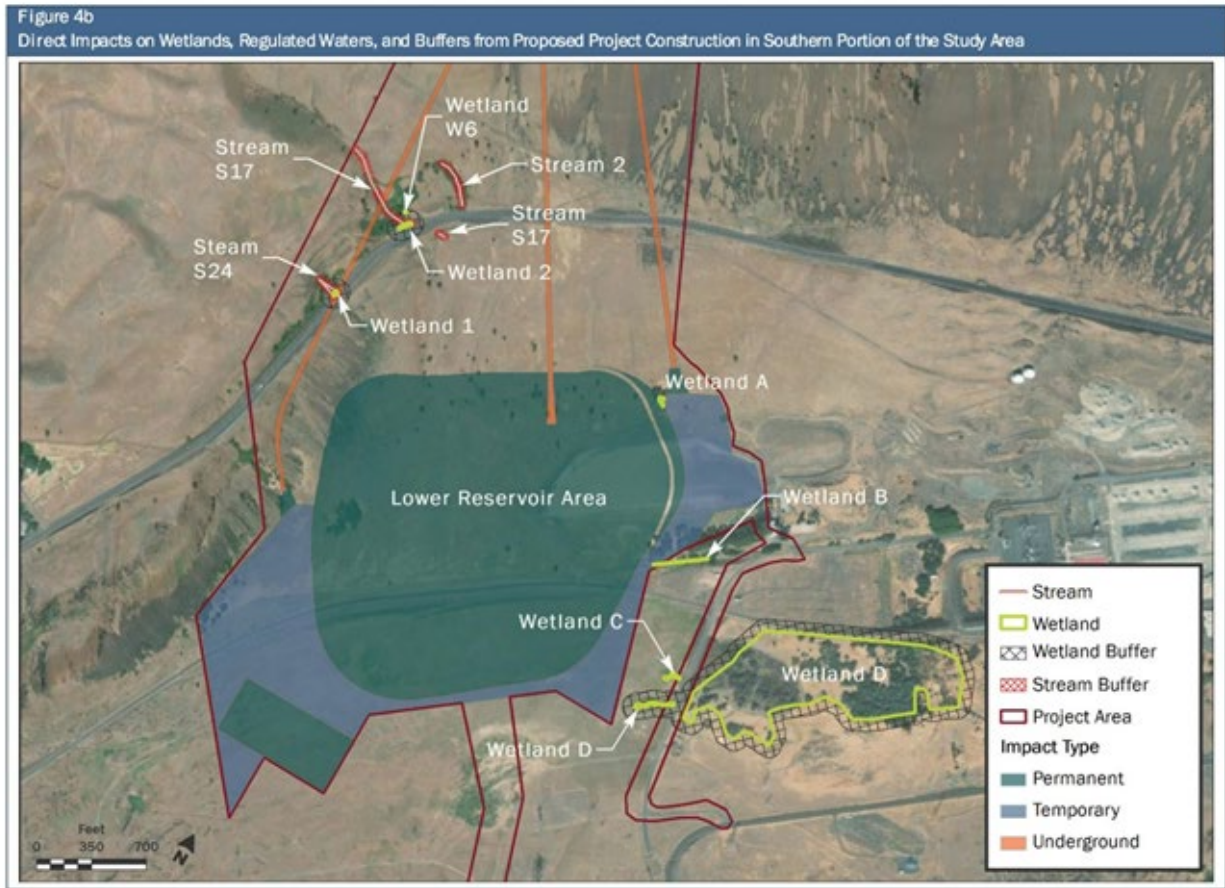
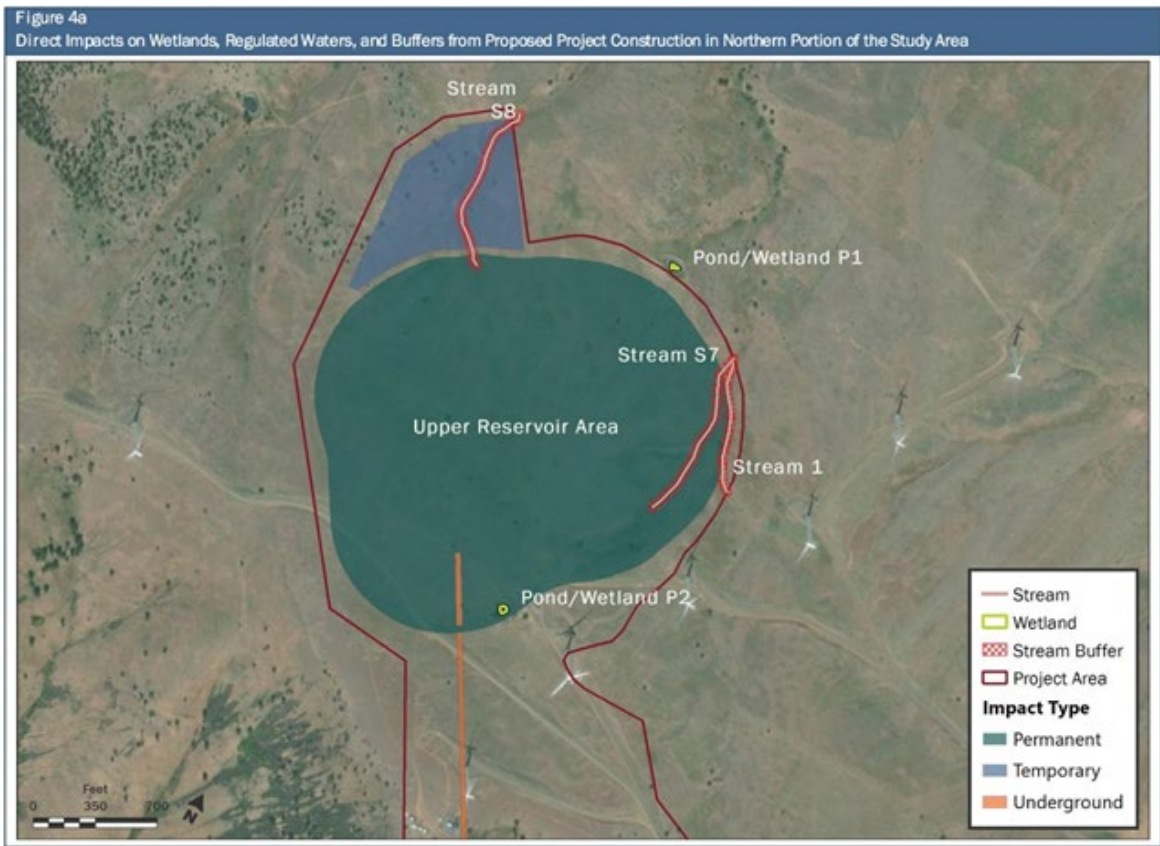


Figure 3.3.4-4a. Direct impacts of project construction on delineated wetlands and waterbodies in the southern/lower portion of the project area (Source: Ecology, 2022a).



Sources: FFP 2021; field knowledge gained through site visits performed by Anchor QEA and Ecology July 2021

Figure 3.3.4-4b. Direct impacts of project construction on delineated wetlands and waterbodies in the northern/upper portion of the project area (Source: Ecology, 2022a).

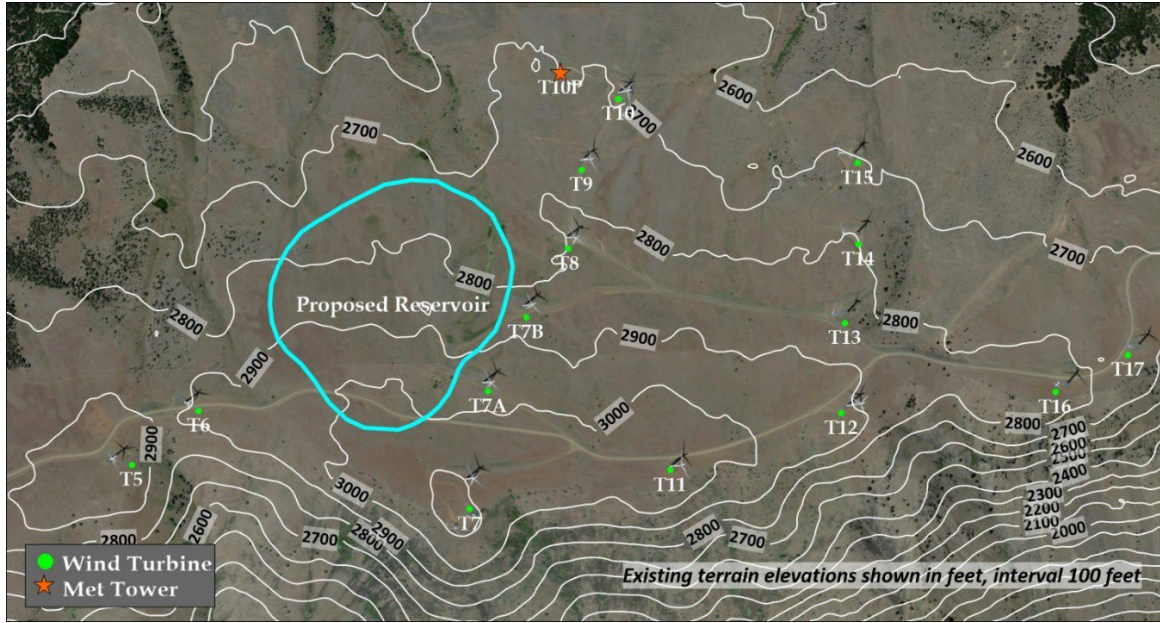


Figure 3.3.6-1. Wind turbine locations relative to the upper reservoir (Source: ERM, 2021b).

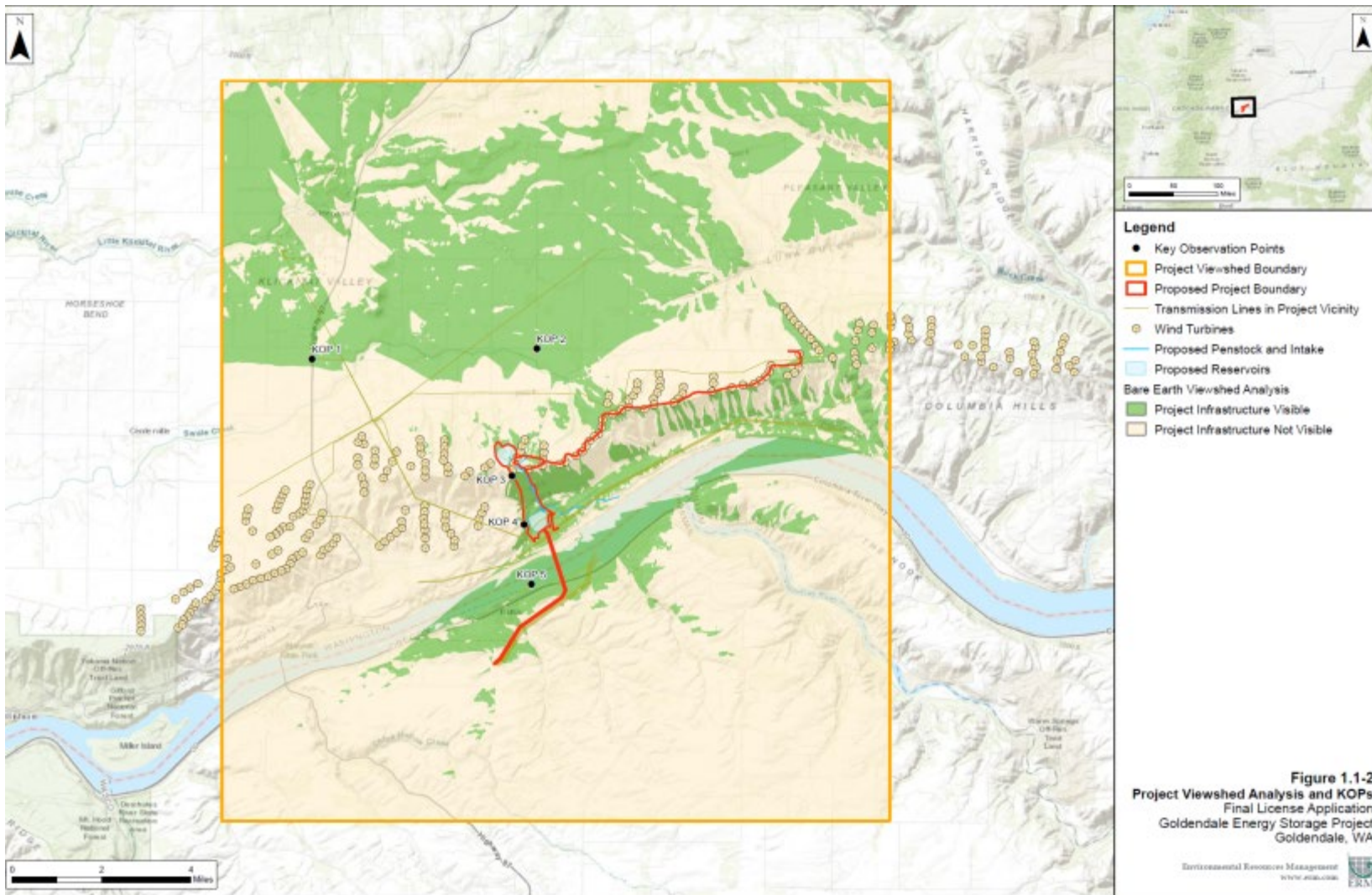


Figure 3.3.7-1. Key observation points for the Goldendale Pumped Storage Project (Source: FFP June 2020).



Figure 3.3.7-2. View of proposed lower reservoir area from State Route 14 (Source: FFP, 2020).



Figure 3.3.7-3. View in vicinity upper reservoir area (Source: FFP, 2020).



Figure 3.3.7-4. Photo-simulation of the upper reservoir from the intersection of Hocter Road and Highway 97 as seen from KOP 1 (Source: FFP, 2020).



Figure 3.3.7-5. Photo-simulation of the upper reservoir from the intersection of Willis Road and Hocter Road as seen from KOP 2 (Source: FFP, 2020).



Figure 3.3.7-6. Photo-simulation of the lower reservoir from the Columbia Hills at Juniper Point as seen from KOP 3 (Source: FFP, 2020).



Figure 3.3.7-7. Photo-simulation of the lower reservoir from State Route 14 as seen from KOP 4 (Source: FFP, 2020).



Figure 3.3.7-8. Photo-simulation of the lower reservoir from the bank of the Columbia River in Giles French/John Day Dam Park as seen from KOP-5 (Source: FFP, 2020).

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet		
	100	
Gas lawnmower at 3 feet		
	90	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 100 feet	70	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60	
		Large business office
Quiet urban daytime	50	Dishwasher in next room
Quiet urban nighttime	40	Theater, large conference room (background)
Quiet suburban nighttime		
	30	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20	
		Broadcast/recording studio
	10	
	0	

Figure 3.3.11-1. Decibel scale and examples of commonly encountered noise sources (Source: Caltrans, 2013).

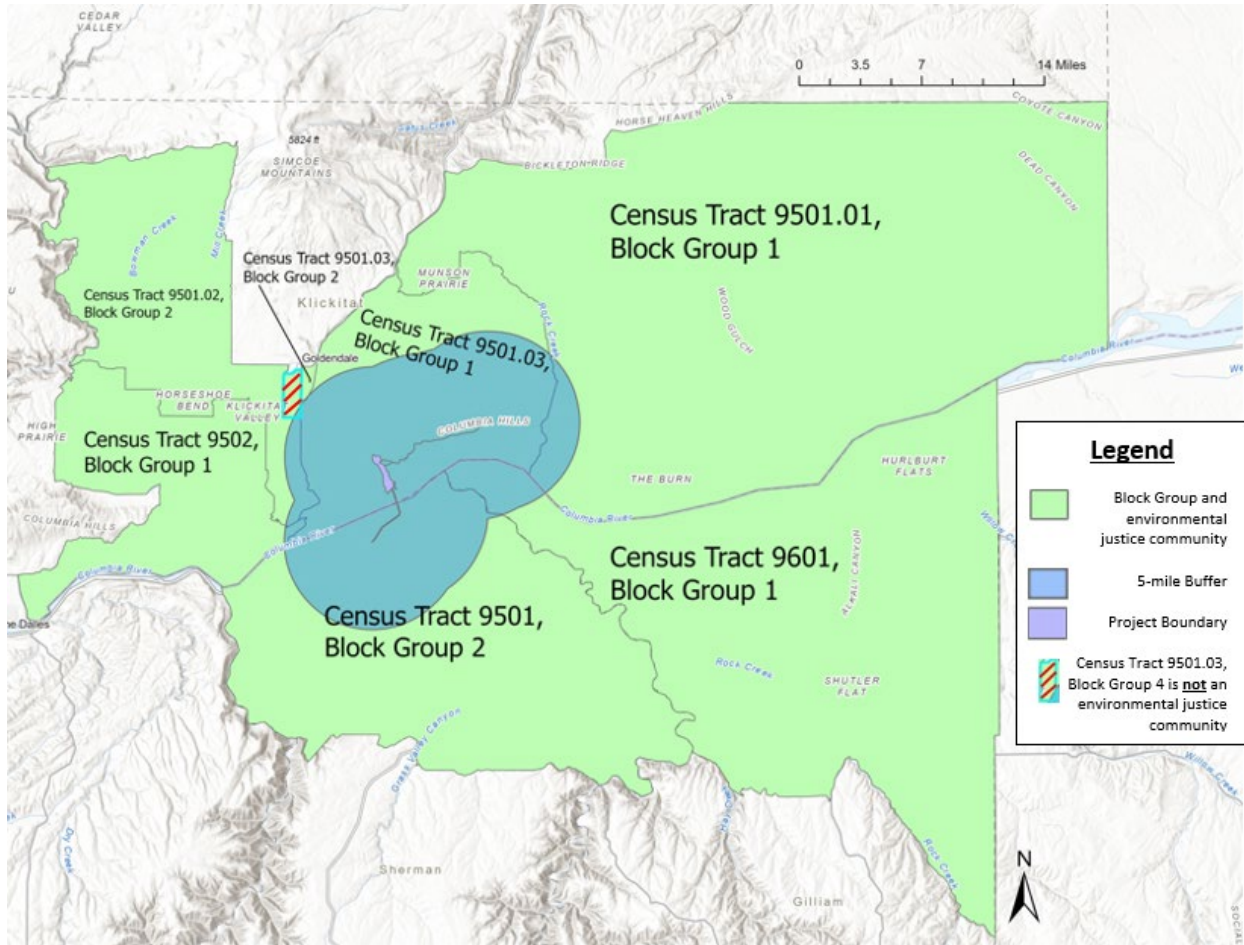


Figure 3.3.12-1 The 7 identified environmental justice communities (Census Tract 9501.01, Block Group 1; Census Tract 9501.02, Block Group 2; Census Tract 9501.03, Block Group 1; Census Tract 9501.03, Block Group 2; Census Tract 9502, Block Group 1; Census Tract 9501, Block Group 2; and Census Tract 9601, Block Group 1) within a 5-mile buffer of the Goldendale project area.

APPENDIX B – TABLES

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LIST OF TABLES

Table 3.3.1-1.	Soil erodibility characteristics.....	B-1
Table 3.3.2-1.	Monthly discharge metrics (thousand cfs) for the Columbia River at The Dalles, OR.....	B-2
Table 3.3.2-2.	Ecology’s water quality standards required for surface waters of freshwater environments to support the aquatic life (salmon spawning, rearing, and migration) designated use.....	B-2
Table 3.3.3-1.	Minimum instantaneous flows specified by the Washington Administrative Code for the John Day Dam	B-3
Table 3.3.3-2.	Passage timing for years 2012 through 2021 of wild PIT-tagged juvenile and adult salmonids at the John Day Dam and The Dalles Dam.....	B-4
Table 3.3.4-1.	Special status plant species known to occur in Klickitat County.....	B-6
Table 3.3.4-2.	Special status and culturally important plant species documented or with potential to occur in the project area	B-7
Table 3.3.4-3.	Wetlands and waterbodies in the project area.....	B-15
Table 3.3.4-4.	Special status wildlife with the potential to occur at the project.....	B-22
Table 3.3.4-5.	Temporary and permanent effects on vegetation from the proposed project.....	B-28
Table 3.3.4-7.	Direct wetland and waterbody effects from project construction	B-29
Table 3.3.5-1.	Spring (April 1–June 5) salmonid passage counts at John Day Dam (1990–2022).....	B-31
Table 3.3.5-2.	Summer (June 6–August 5) salmonid passage counts at John Day Dam (1990–2022).....	B-32
Table 3.3.5-3.	Fall (August 6–October 31) salmonid passage counts at John Day Dam (1990–2022).....	B-34
Table 3.3.5-4.	ESA-listed fish species with designated ^a critical habitat in the vicinity of the proposed Goldendale Project	B-36
Table 3.3.8-1.	Goldendale Project archaeological resources.....	B-37
Table 3.3.8-2.	Project-related effects on archaeological resources within the APE.....	B-38
Table 3.3.9-1.	Klickitat and Sherman County population, race and housing demographics	B-39
Table 3.3.9-2.	Study area total revenues	B-39
Table 3.3.9-3.	Housing units and vacancy rates in Klickitat, Sherman, and Wasco Counties	B-40
Table 3.3.10-1.	Goldendale environmental justice data table using 2020 5-year estimates for Klickitat County.....	B-41

Table 3.3.10-2	Goldendale environmental justice data table using 2020 5-year estimates for Sherman and Gilliam counties.....	B-42
Table 3.3.11-1.	Existing noise environment at proposed construction sites near the Upper and Lower Reservoir facilities	B-43
Table 3.3.11-2.	Average noise levels from common construction equipment at a reference distance of 50 feet	B-43
Table 3.3.11-3.	Air quality thresholds for construction and operation phases total emissions: average tons per year.....	B-44
Table 3.3.11-4.	Estimated construction noise levels at selected receptors.....	B-45

Table 3.3.1-1. Soil erodibility characteristics (Source: FFP, 2020).

Name of Primary Soils	Range of Water Erosion Factors		Wind Erodibility Group	Wind Erodibility Index
	Kw	Kf		
<i>Lower Reservoir Area</i>				
Ewall	0.10	0.10	2	134
Dallesport	0.02-0.28	0.02-0.43	3-7	38-56
Haploxerolls	0.15-0.32	0.32	3	86
Horseflat	0.10-0.20	0.37-0.43	6	48
<i>Upper Reservoir Area</i>				
Goldendale	0.37-0.43	0.37-0.43	5	56
Lorena	0.37-0.43	0.37-0.43	5	56
Rockly	0.10	0.37	8	0
<i>Slope between Reservoir Areas</i>				
Haploxerolls	0.15-0.32	0.32	3	88
Horseflat	0.10-0.20	0.37-0.43	6	48
Onyx	0.15-0.43	0.37-0.43	5	56
Rockly	0.10	0.37	8	0

Notes:

Water Erosion Factors: Kf = Fine fraction soil (grain size less than 2 millimeters) erosion rate of tons per acre per year; Kw = Whole soil erodibility

Range of Kw and Kf erosion potential factors: 0.02–0.15 = Low, 0.16–0.28 = Moderately Low, 0.29–0.43 = Moderate, 0.44–0.55 = Moderately High, 0.56–0.69 = High

Wind Erosion Factors: Wind Erosion Group is a dimensionless score ranging from 1 (highly erodible) to 8 (not erodible)

Wind Erodibility Group scoring: 1–2 = High, 3–4 = Moderately High, 5–6 = Moderately Low, 7–8 = Low

Wind Erodibility Index estimates susceptibility to wind erosion in tons per acre per year.

Wind Erodibility Index ranges: 0–62 = Low, 63–124 = Moderately Low, 125–186 = Moderate, 187–248 = Moderately High, 249–310 = High

Table 3.3.2-1. Monthly discharge metrics (thousand cfs) for the Columbia River at The Dalles, OR (1990–2019) (Source: USGS, 2022).

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Annual
Mean	108	128	152	169	176	188	228	289	282	192	144	104	180
Median	105	124	146	163	160	173	222	271	262	179	140	100	160
Max	151	192	233	250	280	348	398	498	472	328	233	156	498
Min	72	89	96	107	105	104	114	155	143	107	89	67	67

Table 3.3.2-2. Ecology’s water quality standards required for surface waters of freshwater environments to support the aquatic life (salmon spawning, rearing, and migration) designated use (Source: Washington State Legislature, 2022a).

Water quality parameter	Standard
Temperature	The 7-day average daily maximum (7-DADM) shall not exceed 17.5°C (63.5°F)
Dissolved Oxygen	The daily minimum shall not be less than 10 mg/L or 90% saturation.
Turbidity	Turbidity shall not exceed: <ul style="list-style-type: none"> • 5 Nephelometric Turbidity unit (NTU) over background when the background is 50 NTU or less; or • A 10% increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas	Total dissolved gas shall not exceed 110% saturation at any point of sample collection
pH	pH shall be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

Table 3.3.3-1. Minimum instantaneous flows specified by the Washington Administrative Code for the John Day Dam (Washington State Legislature, 2022b).

Period	Minimum Instantaneous Flow (1,000 cfs)
January	20
February	20
March	50
April 1-15	50
April 16-25	70
April 26-30	70
May	70
June 1-15	70
June 16-30	50
July 1-15	50
July 16-31	50
August	50
September	50
October 1-15	50
October 16-31	50
November	50
December	20

Table 3.3.3-2. Passage timing for years 2012 through 2021 of wild PIT-tagged juvenile and adult salmonids at the John Day Dam and The Dalles Dam (Source: NMFS, 2022a; Columbia Basin Research, 2022a).

Associated Dam	Lifestage	Species	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	
John Day	Juvenile														
		Snake River Fall-run Chinook			■	■	■	■	■	■	■	■			
		Snake River Spring Summer-run Chinook				■	■	■	■	■	■				
		Snake River Sockeye					■	■	■						
		Snake River Steelhead				■	■	■	■	■					
		Upper Columbia River Spring-run Chinook				■	■	■	■	■	■				
		Upper Columbia River Steelhead				■	■	■	■						
		Middle Columbia River Steelhead			■	■	■	■	■						
The Dalles	Adult	Snake River Fall-run Chinook							■	■	■				
		Snake River Spring Summer-run Chinook				■	■	■	■	■	■				
		Snake River Sockeye						■	■						
		Snake River Steelhead		■	■	■	■	■	■	■	■	■	■	■	
		Upper Columbia River Spring-run Chinook				■	■	■	■	■					
		Upper Columbia River Steelhead					■	■	■	■	■	■	■		

Associated Dam	Lifestage	Species	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
		Middle Columbia River Steelhead												

Note: Light gray shading indicates the full range of detections, while dark gray shading indicates the middle 90% of detection. Adult passage timing is provided for The Dalles Dam because it is the nearest location to the proposed project where specific 10-year historical run timing data are available.

Table 3.3.4-1. Special status plant species known to occur in Klickitat County (Source: FFP, 2020).

Common Name	Scientific Name	Status
California's broomrape	<i>Orobanche californica</i> ssp. <i>grayana</i>	State-endangered
Hot-rock penstemon	<i>Penstemon deustus</i> var. <i>variabilis</i>	State-endangered
Obscure buttercup	<i>Ranunculus tritermatus</i>	State-endangered
Wormskiold's northern wormwood	<i>Artemisia campestris</i> var. <i>wormskioldii</i>	State-endangered
Inch-high rush	<i>Juncus uncialis</i>	State-threatened
Smooth desert-parsley	<i>Lomatium laevigatum</i>	State-threatened
Bolander's linanthus	<i>Leptosiphon bolanderi</i>	State-sensitive
Common bluecup	<i>Githopsis specularioides</i>	State-sensitive
Douglas' draba	<i>Cusickiella douglasii</i>	State-sensitive
Few-flowered collinsia	<i>Collinsia sparsiflora</i> var. <i>bruceae</i>	State-sensitive
Nuttall's quillwort	<i>Isoetes nuttallii</i>	State-sensitive
Smooth goldfields	<i>Lasthenia glaberrima</i>	State-sensitive
Suksdorf's desert-parsley	<i>Lomatium suksdorfii</i>	State-sensitive
Western ladies' tresses	<i>Spiranthes porrifolia</i>	State-sensitive

Note: Within 3 miles of the project area, Washington NHP has recorded two occurrences of smooth desert-parsley. Smooth desert parsley is a state-threatened and Tribally important plant.

Table 3.3.4-2. Special status and culturally important plant species documented or with potential to occur in the project area (Source: FFP, 2020 and Ecology, 2022a).

Common Name	Species Name	Heritage Rank	State Status	Federal Status	Distribution Pattern/Habitat ^a	Study Area ^b
Gray's broomrape	<i>Aphyllon californicum</i> var. <i>grayanum</i> or <i>Orobanche grayana</i> or <i>Orobanche californica</i> ssp. <i>grayana</i>	G4T3T4, S1	E	-	Peripheral; Vernal moist meadows and lower montane meadows, parasitic on sagebrush	Potentially present but not observed during botanical or cultural survey
Wormskiold's northern wormwood	<i>Artemisia campestris</i> var. <i>wormskioldii</i> or <i>Artemisia campestris</i> ssp. <i>borealis</i> var. <i>wormskioldii</i>	G5T1, S1	E	-	Regional Endemic; Arid shrub steppe on basalt, usually flat terrain, floodplain of Columbia River	Potentially present but not observed during botanical or cultural survey
Few-flowered collinsia	<i>Collinsia sparsiflora</i> var. <i>sparsiflora</i> or <i>Collinsia sparsiflora</i> var. <i>bruceae</i>	G4T4, S1	S	-	Peripheral; Thin soils over basalt on almost flat to steep, generally south-facing slopes; moist in spring, but becoming dry by summer	Potentially present but not observed during botanical or cultural survey
Douglas' draba	<i>Cusickiella douglasii</i> or <i>Draba douglasii</i>	G4G5, S1	S	-	Peripheral; Windswept rocky ridges, granitic rock screes, loose volcanic hillsides, red barren hills, rocky flats, and serpentine ridges	Potentially present but not observed during botanical or cultural survey
Common bluecup	<i>Githopsis specularioides</i>	G5, S2S3	S	-	Sparse; Dry, open places at lower elevations, such as thin soils over bedrock outcrops, grassy balds, talus slopes, and gravelly prairies	Potentially present but not observed during botanical or cultural survey
Diffuse stickseed	<i>Hackelia diffusa</i> var. <i>diffusa</i>	G4T3, S2	T	-	Regional Endemic; Bottoms of mossy talus and scree slopes, shaded areas, cliffs, roadsides, and other disturbed sites	Potentially present but not observed during botanical or cultural survey

Common Name	Species Name	Heritage Rank	State Status	Federal Status	Distribution Pattern/Habitat ^a	Study Area ^b
Nuttall's quillwort	<i>Isoetes nuttallii</i>	G4?, S2	S	-	Sparse; Terrestrial in seasonally wet ground, seepages, temporary streams, and mud near vernal pools	Potentially present but not observed during botanical or cultural survey
Inch-high rush	<i>Juncus uncialis</i>	G3G4, S2	T	-	Sparse; Vernal pools and pond edges, often in channeled scablands, or biscuit-swale topography	Potentially present but not observed during botanical or cultural survey
Smooth goldfields	<i>Lasthenia glaberrima</i>	G5, S1	S	-	Peripheral; Margins of vernal pools, wet or muddy stream banks, wetlands, and winter-flooded meadows	Potentially present but not observed during botanical or cultural survey
Bolander's linanthus	<i>Leptosiphon bolanderi</i> or <i>Linanthus bakeri</i>	G4G5, S2	S	-	Peripheral; Dry, rocky places and open or partially vegetated slopes with scattered basalt rocks	Potentially present but not observed during botanical or cultural survey
Basalt biscuitroot (Smooth Desert Parsley)	<i>Lomatium laevigatum</i>	G3, S2S3	T	-	Local Endemic; Ledges and crevices of basalt cliffs along the Columbia River and adjacent rocky slopes of sagebrush steppe	Potentially present and observed during cultural survey but not overserved during botanical survey
Suksdorf's biscuitroot	<i>Lomatium suksdorfii</i>	G3, S3	S	-	Local Endemic; Semiopen to open, dry, rocky hillsides on moderate to steep slopes at elevation of 90 to 1100 meters (300-3,600 feet)	Potentially present but not observed during botanical or cultural survey
Hot-rock penstemon	<i>Penstemon deustus</i> var. <i>variabilis</i>	G5T2, S1	E	-	Regional Endemic; Dry foothills and lowlands, on open, dry, thin soils over basalt	Potentially present but not observed during botanical or cultural survey

Common Name	Species Name	Heritage Rank	State Status	Federal Status	Distribution Pattern/Habitat ^a	Study Area ^b
Obscure buttercup	<i>Ranunculus tritermatus</i> or <i>Ranunculus glaberrimus</i> var. <i>reconditus</i> o <i>Ranunculus reconditus</i>	G5T2, S1S2	E	-	Local Endemic; Meadow steppe habitat dominated by bunchgrasses and forbs.	Potentially present but not observed during botanical or cultural survey
Western ladies-tresses	<i>Spiranthes porrifolia</i> or <i>Spiranthes romanzoffiana</i> var. <i>porrifolia</i>	G4, S2	S	-	Sparse; Wet meadows, bogs, streams, and seepage slopes. Elevation in Washington: 3-2,075 meters (10-6,800 feet)	Potentially present but not observed during botanical or cultural survey
Yarrow	<i>Achillea millefolium</i>	-	-	-	Grows in wet to dry soil in meadows, open places, in all elevations	Potentially present and observed during cultural survey but not observed during botanical survey
Tapertip onion	<i>Allium acuminatum</i>	-	-	-	Grows in open, usually rocky places below 6,000 feet	Potentially present and observed during cultural survey but not observed during botanical survey
Barestem biscuitroot	<i>Lomatium nudicaule</i>	-	-	-	Grows in open areas with dry rocky clay or sandy soils from near coastline to mid elevations	Potentially present and observed during cultural survey but not observed during botanical survey
Nine-leaf biscuitroot	<i>Lomatium triturnatum</i>	-	-	-	Grows on open or sagebrush slopes, ridges, pine woodlands in vernal-wet spots, often in serpentine areas	Potentially present and observed during cultural survey but not observed during botanical survey

Common Name	Species Name	Heritage Rank	State Status	Federal Status	Distribution Pattern/Habitat ^a	Study Area ^b
Pungent desert parsley	<i>Lomatium papilioniferum</i> (<i>L. grayi</i>)	-	-	-		Potentially present and observed during cultural survey but not observed during botanical survey
Biscuit root	<i>Lomatium macrocarpum</i>	-	-	-	Grows in rocky slopes, woodlands, at low elevations	Potentially present and observed during cultural survey but not observed during botanical survey
Fernleaf biscuitroot	<i>Lomatium dissectum</i>	-	-	-	Grows in wooded or brushy slopes, talus and steep rocky slopes, at low to high elevations	Potentially present and observed during cultural survey but not observed during botanical survey
Arrowleaf balsamroot	<i>Balsamorhiza sagittata</i>	-	-	-	Grows in deep rich soils in ponderosa pine and sagebrush habitats, often in huge patches, at mid elevations	Potentially present and observed during cultural survey but not observed during botanical survey
Black Hawthorne	<i>Crataegus</i> spp. (<i>C. suksdorfii</i> or <i>C. douglasii</i>)	-	-	-		Potentially present and observed during cultural survey but not observed during botanical survey
Smooth sumac	<i>Rhus glabra</i>	-	-	-	Grows in disturbed soils and grasslands near water in dry areas	Potentially present and observed during cultural survey but not observed during botanical survey

Common Name	Species Name	Heritage Rank	State Status	Federal Status	Distribution Pattern/Habitat ^a	Study Area ^b
Western juniper	<i>Juniperus occidentalis</i>	-	-	-	In Oregon and Washington found in elevations between 500 to 5,000 feet (150-1,500 meters) (OSU 2021)	Potentially present and observed during cultural survey but not observed during botanical survey
Ponderosa pine	<i>Pinus ponderosa</i>	-	-	-	In the Pacific Northwest it is most commonly found east of the Cascades, however in Oregon it is common in the western valleys of the Willamette, Umpqua, and Rogue Rivers (OSU 2021)	Potentially present and observed during cultural survey but not observed during botanical survey
Strict buckwheat	<i>Eriogonum strictum</i> <i>var. proliferum</i>	-	-	-	Grows in rocky places in shrublands, mountains, at low to high elevations (OSU 2021)	Potentially present and observed during cultural survey but not observed during botanical survey
Thyme-leaved buckwheat	<i>Eriogonum thymoides</i>	-	-	-	Grows in dry or rocky soils in sagebrush, on rocky ridges	Potentially present and observed during cultural survey but not observed during botanical survey
Arrowleaf buckwheat	<i>Eriogonum compositum</i>	-	-	-		Potentially present and observed during cultural survey but not observed during botanical survey
Columbia Gorge broad-leaf lupine	<i>Lupinus latifolius</i>	-	-	-	Grows in moist, open to shady woods and meadows	Potentially present and observed during cultural survey but not observed during botanical survey

Common Name	Species Name	Heritage Rank	State Status	Federal Status	Distribution Pattern/Habitat ^a	Study Area ^b
Rubber rabbitbrush	<i>Ericameria nauseosa</i>	-	-	-	Grows in dry soils in many habitats below 10,500 feet	Potentially present and observed during cultural survey but not observed during botanical survey
Chocolate lily	<i>Fritillaria camschatcensis</i>	-	-	-	Grows in wet soils that never dry in coastal areas and rain forest	Potentially present and observed during cultural survey but not observed during botanical survey
Nootka rose	<i>Rosa nutkana</i>	-	-	-	Grows in moist flats at low to mid elevations	Potentially present and observed during cultural survey but not observed during botanical survey
Brodiaea	<i>Triteleia hyacinthina</i>	-	-	-	Grows in spring-wet grasslands from coast to mid-elevations	Potentially present and observed during cultural survey but not observed during botanical survey
Wavyleaf thistle	<i>Cirsium undulatum</i>	-	-	-	East-Side Forest, Shrub-Steppe, Meadow, grows in open dry areas at low to mid elevations	Potentially present and observed during cultural survey but not observed during botanical survey
Slender hawksbeard	<i>Crepis atribarba</i>	-	-	-	Grows in dry, grassy, open areas, pine forests in steppe	Potentially present and observed during cultural survey but not observed during botanical survey

Common Name	Species Name	Heritage Rank	State Status	Federal Status	Distribution Pattern/Habitat ^a	Study Area ^b
Northern mule-ears	<i>Wyethia amplexicaulis</i>	-	-	-		Potentially present and observed during cultural survey but not observed during botanical survey
Bitterroot	<i>Lewisia rediviva</i>	-	-	-	Grows in rocky soils in open places from just above sea level to alpine	Potentially present and observed during cultural survey but not observed during botanical survey
Common stork's-bill	<i>Erodium cicutarium</i>	-	-	-		Potentially present and observed during cultural survey but not observed during botanical survey
Miner's lettuce	<i>Claytonia perfoliata</i>	-	-	-	Grows in spring-damp, often shady places in the south, open to shady places in the north, often on disturbed soils, from sea level to mid-elevations	Potentially present and observed during cultural survey but not observed during botanical survey
Spreading dogbane	<i>Apocynum androsaemifolium</i>	-	-	-	Grows in rocky places, dry open areas in conifer forests and adjacent shrub-steppe and prairies, at low to subalpine elevations	Potentially present and observed during cultural survey but not observed during botanical survey
Silver puffs	<i>Uropappus lindleyi</i>	-	-	-	Grows in loose soils in meadows, woods, steppe or deserts, at low and mid elevations	Potentially present and observed during cultural survey but not observed during botanical survey

Common Name	Species Name	Heritage Rank	State Status	Federal Status	Distribution Pattern/Habitat ^a	Study Area ^b
Menzies' fiddleneck	<i>Amsinckia menziesii</i>	-	-	-	Abundant over a wide range in open ground from coastline to mid elevations, Meadow, West-Side Forest, Shrub-Steppe	Potentially present and observed during cultural survey but not observed during botanical survey
Netleaf hackberry	<i>Celtis laevigata</i>	-	-	-		Potentially present and observed during cultural survey but not observed during botanical survey
Nuttall's larkspur	<i>Delphinium nuttallianum</i>	-	-	-	Grows in open meadows, near streams, ponderosa pine woodlands, sagebrush, at low to high elevations	Potentially present and observed during cultural survey but not observed during botanical survey
Western serviceberry	<i>Amelanchier alnifolia</i>	-	-	-	Grows in open meadows, fencerows, woodlands, streambanks, conifer forests, at low to high elevations	Potentially present and observed during cultural survey but not observed during botanical survey

Notes:

^a Unless otherwise noted, plant habitat and distribution information are from WNHP, 2021.

^b Presence in the study is based on the applicant's 2015 and 2019 habitat and botanical surveys (FFP 2020d,g) and on a study area cultural survey (Shellenberger et al. 2019).

Heritage Rank: WNHP uses the ranking system developed by NatureServe to assess global and state conservation status of each plant species, subspecies, and variety. Taxa are ranked on a scale of 1 to 5 (from highest to lowest conservation concern).

G = Global Rank: rangewide status of a full species; T = Trinomial Rank: rangewide status of a subspecies or variety; S =

State Rank: status of a species, subspecies, or variety within the state of Washington

1 = Critically Imperiled – at very high risk of extirpation due to very restricted range, very few occurrences, very steep declines, very severe threats, or other factors; 2 = Imperiled – at high risk of extirpation due to restricted range, few

occurrences, steep declines, severe threats, or other factors; 3 = Vulnerable – at moderate risk of extirpation due to a fairly restricted range, relatively few occurrences, recent and widespread declines, threats, or other factors; 4 = Apparently secure – at fairly low risk of extirpation due to an extensive range or many occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors; 5 = Secure – at very low risk of extirpation due to a very extensive range, abundant occurrences, and little to no concern from decline or threats

H = Historical– known from only historical occurrences (prior to 1978) but still with some hope of rediscovery

State Status: E = Endangered, in danger of becoming extinct or extirpated from Washington; T = Threatened, likely to become Endangered in Washington; S = Sensitive, vulnerable or declining and could become Threatened or Endangered in Washington; Extirp = possibly extinct or extirpated in Washington (includes state historical species)

Federal Status: E = Endangered, A species, subspecies, or variety in danger of extinction throughout all or a significant portion of its range; T = Threatened, A species, subspecies, or variety likely to become Endangered in the foreseeable future; Prop = Proposed, A species, subspecies, or variety formally proposed for listing as Endangered or Threatened (a proposal has been published in the Federal Register, but not a final rule); Cand = Candidate, A species, subspecies, or variety being evaluated by FWS for potential listing as Threatened or Endangered under the ESA, but no formal proposal has been published yet.

Table 3.3.4-3. Wetlands and waterbodies in the project area (Source: FFP, 2020 and Ecology, 2022a).

Feature	NHD Classification	NWI Classification^a	Field Description	Cowardin Classification^a	Surface Connection to Other Waters?	Area (Acres)
<i>Northern/Upper Portion of the Project Area (Swale Creek Watershed/Upper Reservoir Area)</i>						
Stream S7	Perennial water course	R5UBH	Intermittent stream with ephemeral upstream extent; channel is 16 to 24 inches wide, 1 to 3 inches deep, and extends approximately 995 feet into the project boundary; no flowing water was observed, but	N/A	Yes	0.046

Feature	NHD Classification	NWI Classification^a	Field Description	Cowardin Classification^a	Surface Connection to Other Waters?	Area (Acres)
			much of the substrate was covered with algal matting			
Stream S8	Perennial water course	R5UBH	Intermittent stream; channel is 12 to 24 inches wide, 1 to 3 inches deep, and extends approximately 990 feet into the project boundary; no flowing water was observed, several pockets of standing water were observed, and much of the substrate was covered with algal matting	N/A	Yes	0.045
Stream 1	Not identified	Not identified	Ephemeral stream: channel is 8 to 12 inches wide, 1 to 3 inches deep, and about 773 feet long; no flowing water was observed in the channel, but much of the substrate was covered with algal matting	N/A	Yes	0.018
Pond/Wetland P1 ^b	Perennial pond	PUBHx	Perennial excavated pond for cattle with wetland characteristics; Unidentified emergent vegetation was observed	PUBFx	No	0.010

Feature	NHD Classification	NWI Classification^a	Field Description	Cowardin Classification^a	Surface Connection to Other Waters?	Area (Acres)
			growing in 1 to 2 feet of standing water.			
Pond/Wetland P2	Perennial pond	Not identified	Excavated pond for cattle with wetland characteristics; edges of the pond are largely unvegetated, and no emergent vegetation was observed growing within the water. Historic aerial imagery suggests that the pond dries up entirely most years	PUBCx	No	0.027
Area Subtotal						0.0146
<i>Southern/Lower Portion of the Project Area (Columbia Tributaries Watershed/Lower Reservoir Area)⁴</i>						
Stream S17	Intermittent	R4SBC/PSS1A	Intermittent stream; channel about 24 inches wide, 1 to 3 inches deep; Flowing water 1 to 3 inches deep was observed above the highway; however, no water was observed exiting the culvert at the outlet on the southeast side of the highway.	R4SBJ	No	0.031

Feature	NHD Classification	NWI Classification^a	Field Description	Cowardin Classification^a	Surface Connection to Other Waters?	Area (Acres)
Stream S24	Not identified	Not identified	Intermittent stream; appears to be a groundwater seep located along the excavated hillside above Highway 14. Water flows down the hillside into a roadside drainage ditch and into a culvert that conveys the water to east side of the highway. No flowing water was observed existing the culvert outlet	R4SBJ	No	0.060
Stream 2	Not identified	Not identified	Intermittent stream; channel 24 inches wide, 1 to 3 inches deep, and approximately 316 feet long. No water was observed in the channel	R4SBJ	No	0.015
Wetland W6	Not identified	Not identified	Herbaceous wetland; both flowing and standing water was observed but there appears to be no surface connection to Stream S17, which is located about 70 feet downslope.	PEM1C	No	0.003

Feature	NHD Classification	NWI Classification^a	Field Description	Cowardin Classification^a	Surface Connection to Other Waters?	Area (Acres)
Wetland 1	Not identified	Not identified	Scrub-shrub/herbaceous wetland; stream does not appear to cross SR 14, and water collects in a depression formed by the road fill embankment	PSS/PEM1C	Yes	0.020
Wetland 2	Not identified	Not identified	Scrub-shrub/herbaceous wetland; The stream does not cross SR 14 due to a damaged culvert	PSS/PEM1C	Yes	0.037
Wetland A	Not identified	Not identified	Herbaceous wetland; fed by a spring that has been piped to an overflowing livestock watering trough. Site observations and aerial photography indicates the wetland has seasonal hydrology and no surface connection to other wetlands or waters	PEM1C	No	0.028
Wetland B	Not identified	Not identified	Scrub-shrub wetland located in an excavated ditch fed by stormwater that drains from the north through ditches to the wetland, but the wetland has no surface water outlet	PSS1C	No	0.051

Feature	NHD Classification	NWI Classification ^a	Field Description	Cowardin Classification ^a	Surface Connection to Other Waters?	Area (Acres)
Wetland C	Not identified	Not identified	Herbaceous wetland; isolated depression that has seasonal standing water likely provided by a high groundwater table, direct precipitation, and overland runoff.	PEM1C	No	0.049
Wetland D ^c	Not identified	PEM1Ch	Scrub-shrub wetland fed by a seasonal spring, which flows into a small pond and then continues west through a culvert to a small depression. The spring likely provides water to the wetland throughout the year, although much of the wetland dries out in the summer.	PSS1C	No	13.784
Area Subtotal						14.078
<i>Aerial Transmission Line Right of Way^d</i>						
Stream S20 (Columbia River/Lake Celilo)	Perennial water course	L1UBHh	Impounded pool of Columbia River	N/A	Yes	Not Calculated
Stream S23	Intermittent water course	R4SBC	Ephemeral unvegetated swale	R4SBC	No	Not Calculated

Feature	NHD Classification	NWI Classification^a	Field Description	Cowardin Classification^a	Surface Connection to Other Waters?	Area (Acres)
Stream S21	Intermittent water course	R4SBC	Scott Canyon	R4SBC	No	Not Calculated
Stream S22	Intermittent water course	R4SBC	Gerking Canyon	R4SBC	No	Not Calculated
Total Area						14.224

- ^a Cowardin system wetland codes: L1UBHh = Lacustrine, limnetic, unconsolidated bottom, permanently flooded, diked/impounded; PEM1C = palustrine, emergent, persistent, seasonally flooded; PEM1Ch = palustrine, emergent, persistent, seasonally flooded, diked/impounded; PSS1A = palustrine, scrub-shrub, broad-leaved deciduous, temporary flooded; PSS1C = palustrine scrub-shrub, broad-leaved deciduous, seasonally flooded; PSS/PEM1C = palustrine scrub-shrub/palustrine emergent, persistent, seasonally flooded; PUBCx = palustrine, unconsolidated bottom, seasonally flooded, excavated; PUBHx = palustrine, unconsolidated bottom, permanently flooded; PUBFx = palustrine, unconsolidated bottom, semipermanently flooded, excavated; R4SBC = riverine, intermittent, streambed, seasonally flooded; R5UBH = riverine, unknown perennial, unconsolidated bottom, permanently flooded
- ^b Pond/Wetland P1 extends outside the project area to the north.
- ^c Wetland D extends outside the project area to the east.
- ^d Surface waters in the proposed aerial transmission line ROW were assessed using desktop methods and were not verified or delineated in the field.

Table 3.3.4-4. Special status wildlife with the potential to occur at the project (Source: FFP, 2020; Ecology, 2022a).

Common Name	Species Name	State Status	Federal Status	Habitat	Potential Occurrence in Project Area ^a
<i>Birds</i>					
American peregrine falcon	<i>Falco peregrinus anatum</i>	PS (WA) SS (OR)		Historic populations have been reported along the Columbia River basin in the project boundary; observed in the project vicinity.	Yes
Bald eagle	<i>Haliaeetus leucocephalus</i>	SS (OR)	BCC; BGEPA	Found primarily near coastlines, rivers, reservoirs, and lakes. Bald eagles principally eat fish, but also feed on carrion, waterfowl, and small mammals. Use large trees as nest sites and hunting perches. Documented along the Columbia River basin and observed in the project vicinity.	Yes
Bufflehead	<i>Bucephala albeola</i>	PS (WA)		Cavity-nesting duck. Documented mortality at Columbia Plateau windfarms.	Yes
Cassin's finch	<i>Carpodacus cassinii</i>		BCC	Conifer belts of North America's western interior mountains, from central British Columbia to northern New Mexico and Arizona	Yes
Chukar	<i>Alectoris chukar</i>	PS (WA)		Dry high-elevation shrublands between 4,000 and 13,000 feet. They usually occur on steep, rocky hillsides with a mixture of brush, grasses, and forbs. They also occur across barren plateaus and deserts with sparse grasses	Yes
Columbian sharp-tailed grouse	<i>Tympanuchus phasianellus columbianus</i>	SS (OR)		Bunchgrass prairies with deciduous shrubs and trees. Potential habitat present in the project area.	Yes
Common nighthawk	<i>Chordeiles minor</i>	SS (OR)		Sagebrush, prairies, plains, grasslands, and open forests. Potential habitat present in the project area	Yes
Ferruginous hawk	<i>Buteo regalis</i>	SE (WA) SS (OR)		Breed in grasslands, sagebrush, shrublands, and edges of pinyon-juniper forests (Cornell 2015). Observed in the project vicinity.	Yes

Common Name	Species Name	State Status	Federal Status	Habitat	Potential Occurrence in Project Area ^a
Flammulated owl	<i>Otus flammeolus</i>	SC (WA) SS (OR)		Forests of large diameter (>50 cm diameter at breast height) ponderosa pine/Douglas-fir or grand fir with ponderosa pine in the overstory.	Yes
Golden eagle	<i>Aquila chrysaetos</i>	SC (WA) SS (OR)	BGEPA	Associated with steep terrain and found grasslands, shrub-steppe, and dry open forests of eastern Washington, canyonlands, and high-elevation alpine zones. Hunts for prey in grasslands and shrublands. Nests on cliff ledges, rocky outcrops, large trees, or human-made structures.	Yes
Grasshopper sparrow	<i>Ammodramus savannarum</i>	SS (OR)		Grasslands, prairies, little to no shrub cover, potentially in the project area.	Yes
Great blue heron	<i>Ardea herodias</i>	PS (WA)		Found in freshwater and saltwater habitats and forage in grasslands and agricultural fields	Yes
Lewis' woodpecker	<i>Melanerpes lewis</i>		BCC	Breed in ponderosa pine forests or oak/pinyon-juniper woodlands. When not breeding, they occur in cottonwoods near streams, orchards, and oak woodlands.	Yes
Loggerhead shrike	<i>Lanius ludovicianus</i>	SC (WA) SS (OR)		Open country, including shrub-steppe and grasslands throughout eastern Washington. They generally nest in dense, thorny trees, or shrubs.	Yes
Long-billed curlew	<i>Numenius americanus</i>	SS (OR)		Summer in sparse short shortgrass and mixed-grass prairies as well as agricultural fields.	Yes
Long-eared owl	<i>Asio otus</i>		BCC	Dense vegetation for nesting and forage in open grasslands or shrublands; also open coniferous or deciduous woodlands.	Yes
Mallard	<i>Anas platyrhynchos</i>	PS (WA)		Lakes and Ponds and almost any wetland habitat	Yes
Northern pintail	<i>Anas acuta</i>	PS (WA)		Nests in seasonal wetlands, croplands, grasslands, wet meadows, and shortgrass prairies. Forage in nearby shallow wetlands, lakes, and ponds.	Yes

Common Name	Species Name	State Status	Federal Status	Habitat	Potential Occurrence in Project Area ^a
Pileated woodpecker	<i>Dryocopus pileatus</i>	SC (WA) SS (OR)		Mature deciduous or mixed deciduous-coniferous woodlands of nearly every type and can be found in suburban areas.	Yes
Prairie falcon	<i>Falco mexicanus</i>	PS (WA)		Inhabits the arid environments of eastern Washington, nesting on cliffs and hunting in steppe and shrub-steppe habitat	Yes
Ring-necked pheasant	<i>Phasianus colchicus</i>	PS (WA)		Agricultural areas west of the Cascades, but the grain-producing lands on the east side of the state provide the best habitat and the highest populations.	Yes
Rufous hummingbird	<i>Selasphorus rufus</i>		BCC	Open or shrubby areas, forest openings, yards, and parks, and sometimes in forests, thickets, swamps, and meadows.	Yes
Sage thrasher	<i>Oreoscoptes montanus</i>	SC (WA)		Large patches and expanses of sagebrush for breeding, as well as small fragments of sagebrush among agricultural. Required dense ground cover.	Yes
Sagebrush sparrow	<i>Artemisiospiza nevadensis</i>	SC (WA)		Sagebrush/bunchgrass shrub-steppe landscapes with shrubs up to 6-feet tall. Can nest in sagebrush-juniper habitat bordering sagebrush steppe; in winter migration use dry shrublands or grasslands.	Yes
Swainson's hawk	<i>Buteo swainsoni</i>	SS (OR)		Open areas for foraging, prairie, grassland.	Yes
Western bluebird	<i>Sialia mexicana</i>	SS (OR)		Open woodlands, edges of woods, and disturbed areas.	Yes
Western grebe	<i>Aechmophorus occidentalis</i>	SC (WA)		Large freshwater lakes, reservoirs, and marshes in eastern Washington during the summer breeding season.	Yes
Western meadowlark	<i>Sturnella neglecta</i>	SS (OR)		Open grasslands, shrub-steppe, and meadows.	Yes
White-headed woodpecker	<i>Dryobates albolarvatus</i>	SC (WA) SS (OR)		Montane coniferous forests dominated by pine. Usually associated with ponderosa pine.	Yes

Common Name	Species Name	State Status	Federal Status	Habitat	Potential Occurrence in Project Area ^a
Yellow-breasted chat	<i>Icteria virens</i>	SS (OR)		Dense shrubbery like blackberry bushes in shrub-steppe habitats	Yes
<i>Mammals</i>					
California myotis	<i>Myotis californicus</i>	PS (WA) SS (OR)		Deserts, canyons, shrub-steppe, arid grasslands, and dry interior forests, as well as moister environments such as coastal and montane forests comprised of deciduous or coniferous trees, riparian forests, and mountain meadows.	Yes
Hoary bat	<i>Lasiurus cinereus</i>	SS (OR)		Mostly forest associated, can occur in open areas like grasslands.	Yes
Little brown bat	<i>Myotis lucifugus</i>	PS (WA)		Conifer and hardwood forests, but also occupies open forests, forest margins, shrub-steppe, clumps of trees in open habitats, sites with cliffs, and urban areas	Yes
Long-legged myotis	<i>Myotis volans</i>	SS (OR)		Mostly occur in coniferous forests, moist or dry, but also occur in riparian forests and dry rangeland.	Yes
Pallid bat	<i>Antrozous pallidus</i>	SS (OR)		Prefers drier areas like shrub-steppe, deserts, canyons, and dry coniferous forest, can occur in oak woodland; commonly associated with cliffs, rock outcrops and water sources.	Yes
Preble's shrew	<i>Sorex preblei</i>	PS (WA)		Open areas, woodlands, and forests; occurs in southwest Washington.	Yes
Silver-haired bat	<i>Lasionycteris noctivagans</i>	SS (OR)		Forests and riparian zones; may occur in shrub-steppe areas during migration.	Yes
Spotted bat	<i>Euderma maculatum</i>	SS (OR)		Dry climates, roost in high cliffs.	Yes

Common Name	Species Name	State Status	Federal Status	Habitat	Potential Occurrence in Project Area ^a
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	SC (WA)		Conifer-hardwood forests, ponderosa pine forest, and woodlands, shrub-steppe and riparian forest/wetlands and open fields. Roosts include caves, abandoned mines, buildings, concrete bunkers, tunnels, and bridges.	Yes
Western gray squirrel	<i>Sciurus griseus</i>	ST (WA)		Distribution closely correlated with Oregon white oak habitat, probably due to squirrels' dependence on acorns as a winter food source. Known populations of western gray squirrel exist in the oak woodlands to the northeast of the study area.	Yes
White-tailed jackrabbit	<i>Lepus townsendii</i>	SC (WA)		Prairies and the semi-arid portions of the Columbia Plateau.	Yes
<i>Reptiles</i>					
California mountain kingsnake	<i>Lampropeltis zonat</i>	SC (WA)		The Columbia River Gorge is considered the northern extreme of its range	Yes
Sagebrush lizard	<i>Sceloporus graciosus</i>	SC (WA)		Vegetated sand dunes and associated sandy habitats that support shrubs and have large areas of bare ground.	Yes
Striped whipsnake	<i>Masticophis taeniatus</i>	SC (WA)		Shrub-steppe obligates and occur primarily in the driest areas of the central Columbia Basin.	Yes
Western rattlesnake	<i>Crotalus oreganus</i>			Deserts and shrub-steppe and open forests.	Yes
<i>Amphibians</i>					
Western toad	<i>Anaxyrus boreas</i>	SC (WA) SS (OR)		Wide range of habitat, forests, mountain meadows, desert flats	Yes

Common Name	Species Name	State Status	Federal Status	Habitat	Potential Occurrence in Project Area ^a
<i>Invertebrates</i>					
Columbia Oregonian (snail)	<i>Cryptomastix hendersoni</i>	SC (WA)		East end of the Columbia Gorge on Oregon and Washington sides.	Not Known
Dalles sideband snail	<i>Monadenia fidelis minor</i>	SC (WA)		Cool, moist talus habitat and upland forest areas that are near seeps and springs.	Yes
Juniper hairstreak	<i>Callophrys gryneus</i>	SC (WA)		Old fields, bluffs, barrens, juniper and pinyon-juniper woodlands, and cedar breaks.	Yes
Monarch butterfly	<i>Danaus plexippus</i>		CS	Upland, wetland, and riparian habitats	Yes

^a No wildlife studies have been conducted specifically for the proposed project, and no wildlife studies have been conducted in the lower reservoir area of the study area. Where presence is documented near the study area it is based on wildlife surveys conducted for the nearby wind farm or from available Washington DFW data.

State Designations: SE = State, ST = State Threatened, SC = State Candidate, SS = State Sensitive, PS = State Priority Species, only for Washington, includes all listed species and those the Washington DFW (2015) State Wildlife Action Plan's lists as Species of Greatest Conservation Need.

Federal Designations (FWS 2021c): FE = Federal Endangered, FT = Federal Threatened, CS = Candidate Species, BCC = Bird of Conservation Concern, BGEPA = protected by the Bald and Golden Eagle Protection Act

Table 3.3.4-5. Temporary and permanent effects on vegetation from the proposed project
 (Source: FFP, 2021a).

Vegetation Type	Temporary Disturbance (acres)	Permanent Disturbance (acres)
Columbia Plateau Steppe and Grassland	7.5	49.6
Columbia Plateau Scabland Shrubland	0	1.8
Inter-Mountain Basins Cliff and Canyon	0	0.6
Inter-Mountain Basins Big Sagebrush Steppe	8.1	40.8
Columbia Plateau Western Juniper Woodland and Savanna	0.8	0.2
Introduced/Invasive Annual Grassland	37.1	90.4
Introduced/Invasive Wooded	0	0.9
Developed/Disturbed	0.8	9.3
Total	54.3	193.6

Table 3.3.4-7. Direct wetland and waterbody effects from project construction (Source: Ecology, 2022a).

Feature	Area of Stream Impact (Acres)	Area of Buffer Impact (Acres)	Duration	Cause of Impact
<i>Northern/Upper Portion of the Project Area (Swale Creek Watershed/Upper Reservoir Area)</i>				
Stream S7	0.041	1.006	Permanent	Construction of the upper reservoir would result in excavation and backfilling portions of Stream S7 and its buffer area.
Stream S8	0.037	0.886	Temporary	Portions of Stream S8 and its buffer area would be affected by temporary laydown areas for stockpiling upper reservoir excavated materials .
Stream S8	0.003	0.100	Permanent	Construction of the upper reservoir would result in excavation and backfilling portions of Stream S8 and its buffer area.
Stream 1	0.004	0.289	Permanent	Construction of the upper reservoir would result in excavation and backfilling portions of Stream 1 and its buffer area.
Pond/Wetland P1	0	0	N/A	N/A
Pond/Wetland P2	0.027	N/A	Permanent	Construction of the upper reservoir would result in excavation and backfilling of all Pond/Wetland P2.
<i>Southern/Lower Portion of the Project Area (Columbia Tributaries Watershed/Lower Reservoir Area)</i>				
Stream S17	0	0	N/A	N/A
Stream S24	0	0	N/A	N/A
Stream 2	0	0	N/A	N/A
Wetland W6	0	0	N/A	N/A
Wetland 1	0	0	N/A	N/A

Feature	Area of Stream Impact (Acres)	Area of Buffer Impact (Acres)	Duration	Cause of Impact
Wetland 2	0	0	N/A	N/A
Wetland A	0.013	N/A	Temporary	Portions of Wetland A would be affected by temporary laydown areas for stockpiling excavated materials near the lower reservoir
Wetland A	0.015	N/A	Permanent	Construction of the lower reservoir would result in excavation and backfilling a portion of Wetland A.
Wetland B	0.009	N/A	Temporary	Portions of Wetland B would be affected by temporary laydown areas for stockpiling excavated materials near the lower reservoir.
Wetland C	0	0	N/A	N/A
Wetland D	0	0	N/A	N/A
<i>Aerial Transmission Line Right of Way⁴</i>				
Stream S20 (Columbia River/Lake Celilo)	0	0	N/A	N/A
Stream S23	0	0	N/A	N/A
Stream S21	0	0	N/A	N/A
Stream S22	0	0	N/A	N/A

Table 3.3.5-1. Spring (April 1–June 5) salmonid passage counts at John Day Dam (1990–2022) (Source: Columbia Basin Research, 2022b).

Year	Adult Chinook	Jack Chinook	Steelhead	Sockeye	Adult Coho	Jack Coho	Shad	Lamprey	Bull Trout	Chum
1990	42350	777	4054	2	0	0	181043	0	0	0
1991	20014	1833	3311	0	0	0	17012	0	0	0
1992	43716	1741	1837	68	0	0	692910	0	0	0
1993	55552	592	4460	8	0	0	75822	0	0	0
1994	9551	194	2767	0	0	0	122645	0	0	0
1995	4601	1175	2130	13	0	0	250403	0	0	0
1996	18651	2948	2188	9	0	0	2797	0	0	0
1997	62253	327	3157	15	0	0	565	0	0	0
1998	21800	377	5477	4	0	0	7944	0	0	0
1999	15409	5089	3564	3	0	0	8776	120	0	0
2000	86553	12157	3468	325	2	0	156134	42	0	0
2001	264177	6208	2791	143	0	0	688262	108	0	0
2002	139887	2403	8422	7	0	0	183742	180	0	0
2003	101436	10206	1662	48	0	0	312488	734	0	0
2004	112153	6367	2290	463	0	0	0	287	0	0
2005	56027	2715	1487	50	0	0	0	120	0	0
2006	50313	2093	2492	8	0	0	0	15	0	0
2007	43384	13663	2344	92	1	0	0	89	0	0
2008	81772	14925	3475	61	0	0	0	57	0	0
2009	76806	49733	3356	132	0	0	0	75	0	0
2010	179446	11794	2747	347	0	0	0	18	0	0

Year	Adult Chinook	Jack Chinook	Steelhead	Sockeye	Adult Coho	Jack Coho	Shad	Lamprey	Bull Trout	Chum
2011	103401	39823	2850	1	0	0	0	2	0	0
2012	107655	6755	2005	272	0	0	0	4	0	0
2013	56991	28957	1025	135	0	0	0	41	0	0
2014	123204	19096	883	54	0	0	0	139	0	0
2015	166015	11514	702	626	0	0	0	139	0	0
2016	93659	8262	422	1223	0	0	0	358	0	0
2017	46675	12475	533	124	0	0	0	353	0	0
2018	50561	5054	162	121	0	0	0	167	0	0
2019	35127	6000	244	51	0	0	0	44	0	0
2020	39076	4035	225	274	0	0	0	35	0	0
2021	51223	10193	263	44	0	0	0	27	0	0
2022	98744	17562	166	173	0	0	0	24	0	0

Table 3.3.5-2. Summer (June 6–August 5) salmonid passage counts at John Day Dam (1990–2022) (Source: Columbia Basin Research, 2022b).

Year	Adult Chinook	Jack Chinook	Steelhead	Sockeye	Adult Coho	Jack Coho	Shad	Lamprey	Bull Trout	Chum
1990	18384	2148	14362	41974	0	0	1459663	0	0	0
1991	14274	2598	18361	63516	0	0	1364334	0	0	0
1992	11242	2668	16048	69539	0	0	1269050	0	0	0
1993	17493	871	14436	61109	0	0	570340	0	0	0
1994	12025	910	9406	11155	0	0	813067	0	0	0
1995	10376	1100	10641	8641	0	0	782805	0	0	0

Year	Adult Chinook	Jack Chinook	Steelhead	Sockeye	Adult Coho	Jack Coho	Shad	Lamprey	Bull Trout	Chum
1996	11830	1318	18176	25671	0	0	955695	0	0	0
1997	20508	1261	19917	35642	0	0	1006678	0	0	0
1998	16246	1534	12665	9726	0	0	1016809	0	0	0
1999	22210	2504	27078	14780	0	0	753533	2032	0	0
2000	23023	8033	31071	87997	0	0	695204	2726	0	0
2001	64186	10049	78376	107611	68	3	1108306	2453	0	0
2002	105354	5615	54961	41888	0	0	1666463	11916	0	0
2003	95542	10073	34602	35298	0	0	2421241	13662	0	0
2004	72518	10542	28538	112964	0	0	0	7912	0	0
2005	64034	5405	31763	69654	0	0	0	5754	0	0
2006	73814	4150	19711	35284	2	-2	0	6417	0	0
2007	36191	11717	21947	24037	0	1	0	3987	0	0
2008	63649	13680	57570	193235	0	0	0	3251	0	0
2009	65989	33147	52193	157147	2	7	0	1582	0	0
2010	70955	12475	88875	323702	8	3	0	999	0	0
2011	75375	35544	58074	143464	0	1	0	1357	0	0
2012	60814	10415	38574	393725	9	0	0	2302	0	0
2013	75248	19714	25186	155160	2	1	0	3958	0	0
2014	86033	17655	35529	556809	0	0	0	5743	0	0
2015	108768	10988	14507	363019	0	0	0	6083	0	0
2016	90259	7715	13891	288114	0	0	0	6267	0	0
2017	60416	7363	3757	65701	0	0	0	17522	0	0

Year	Adult Chinook	Jack Chinook	Steelhead	Sockeye	Adult Coho	Jack Coho	Shad	Lamprey	Bull Trout	Chum
2018	42835	4293	7038	168140	1	0	0	6948	0	0
2019	39000	8116	5393	52348	13	1	0	3367	0	0
2020	70466	9069	12407	309481	0	0	0	1895	0	0
2021	55817	10292	3431	126304	0	0	0	4778	0	0
2022	65893	10747	10317	604500	0	0	0	3755	0	0

Table 3.3.5-3. Fall (August 6–October 31) salmonid passage counts at John Day Dam (1990–2022) (Source: Columbia Basin Research, 2022b).

Year	Adult Chinook	Jack Chinook	Steelhead	Sockeye	Adult Coho	Jack Coho	Shad	Lamprey	Bull Trout	Chum
1990	73384	19270	89433	101	1521	1502	1237	0	0	0
1991	55987	24215	138585	244	6692	1329	663	0	0	0
1992	54983	17675	177309	124	1710	923	1100	0	0	0
1993	59039	8158	76746	101	2679	316	935	0	0	0
1994	86202	17763	80902	15	2455	387	246	0	0	0
1995	68108	21917	110475	13	1913	204	519	0	0	0
1996	88050	7805	135638	18	3289	990	770	0	0	0
1997	86805	14086	133964	173	3518	711	653	0	0	0
1998	78237	11834	140405	107	7646	851	291	0	0	0
1999	106052	12018	134672	26	11901	1331	698	7720	0	0
2000	102903	36702	185789	50	20563	3404	260	3094	0	0
2001	124747	41620	402242	115	48802	2308	258	1444	0	0
2002	164920	29550	326917	20	7669	1603	737	14725	0	0

Year	Adult Chinook	Jack Chinook	Steelhead	Sockeye	Adult Coho	Jack Coho	Shad	Lamprey	Bull Trout	Chum
2003	215501	34327	249912	71	34453	4124	1379	6526	0	0
2004	213936	30787	196371	70	32627	2128	0	3464	0	0
2005	179634	14748	189924	66	30869	3328	0	2438	0	0
2006	135831	22233	194919	95	28866	4912	0	3168	0	1
2007	73443	35936	202907	148	33018	6208	0	1668	0	0
2008	136743	32183	216117	113	39975	4923	0	3317	0	0
2009	145069	81230	526096	123	64891	6839	0	387	0	0
2010	214344	45233	192190	79	21498	1763	0	645	0	0
2011	180404	63224	196421	140	62795	2872	0	2207	0	0
2012	166974	91523	121504	169	30207	3643	0	2281	0	0
2013	437516	89119	124744	203	16161	1364	0	2674	0	0
2014	440511	79692	164426	668	107853	7987	0	2695	0	0
2015	533979	60314	164297	2719	18762	3066	0	2148	0	0
2016	267446	39747	116313	639	17019	2616	0	3144	0	0
2017	165526	21431	78963	216	29080	5166	0	5529	0	0
2018	105939	18901	63810	208	16485	2885	0	1427	0	0
2019	137537	24190	45317	127	29834	4263	0	1175	0	0
2020	195255	35312	67071	204	45989	9117	0	1111	0	0
2021	169970	28474	51086	360	132057	13562	0	1383	0	0

Table 3.3.5-4. ESA-listed fish species with designated^a critical habitat in the vicinity of the proposed Goldendale Project (Source: NMFS, 2022b and FWS, 2022d).

Species	Critical Habitat Reach
Snake River Fall-run Chinook ESU	Columbia River from the mouth upstream to Snake River Confluence and Snake River
Snake River Spring/Summer-run Chinook ESU	Columbia River from the mouth upstream to Snake River Confluence and Snake River
Snake River Sockeye ESU	Columbia River from the mouth upstream to Snake River Confluence and Snake River
Snake River Steelhead DPS	Columbia River from the mouth upstream to Snake River Confluence and Snake River
Upper Columbia River Spring-run Chinook ESU	Columbia River
Upper Columbia River Steelhead DPS	Columbia River
Middle Columbia River Steelhead DPS	Lower most 12 miles of Swale Creek, Klickitat River, Columbia River
Lower Columbia River Steelhead DPS	Columbia River from the mouth upstream to the Hood River Confluence
Lower Columbia River coho salmon ESU	Columbia River from the mouth upstream to the Hood River Confluence
Lower Columbia River Chinook ESU	Columbia River from the mouth upstream to the Hood River Confluence
Columbia River chum ESU	Columbia River from the mouth upstream to the Hood River Confluence
Bull trout	Columbia River, Klickitat River, John Day River

^a Critical habitat for Snake River Sockeye salmon, Snake River spring/summer Chinook salmon, and Snake River fall Chinook salmon was designated on December 28, 1993 (58 FR 68543); for Snake River steelhead, Upper Columbia River spring-run Chinook, Upper, Middle, and Lower Columbia River Steelhead, Lower Columbia River Chinook, and Columbia River chum on September 2, 2005 (70 FR 52629); for Lower Columbia River coho salmon on February 25, 2016 (81 FR 9251); and for bull trout on October 18, 2010 (75 FR 63898).

Table 3.3.8-1. Goldendale Project archaeological resources (Source: adapted from FFP, 2021b).

District/Site/ Isolated Find	Recordation	Type	Description	National Register Eligibility
45DT241	Previous	Precontact/Historic	Columbia Hills Archaeological District	Eligible
45KL566	Previous	Precontact	Lithic Scatter	Eligible (A, B, D)
45KL567 (including 45KL569/570)	Previous	Precontact	Lithic Scatter	Eligible (A, B, D)
45KL744 (including 45KL745)	Previous	Precontact/Historic	Lithics, historic debris and features	Eligible (A, B, D)
45KL746	Previous	Precontact/Historic	Lithic scatter, historic debris and features	Eligible (A, B, D)
45KL2476	New	Precontact	Lithic scatter	Eligible (A, B, D)
45KL772	Previous	Precontact	Single lithic flake (Isolated find)	Not relocated
45KL1712	Previous	Precontact	Lithic Scatter (single artifact in APE)	Not relocated
45KL1296	Previous	Precontact	Single lithic flake (Isolated find)	Unevaluated; out of affected area
45KL1297	Previous	Precontact	Lithic biface (Isolated find)	Unevaluated; out of affected area
45KL1298	Previous	Precontact	Lithic scatter	Unevaluated; out of affected area
45KL2026	Previous	Precontact	Lithic scatter	Unevaluated; out of affected area

Table 3.3.8-2. Project-related effects on archaeological resources within the APE (Source: adapted from FFP, 2021b).

District/Site/ Isolated Find	Description	Project-related effects
45DT241	Columbia Hills Archaeological District	None. Effects are limited to the five individual archaeological sites
45KL566	Lithic Scatter	Adverse: Reservoir and berm construction
45KL567 (incl.45KL569/570)	Lithic Scatter	Adverse: Reservoir and berm construction, laydown, access road
45KL744 (incl. 45KL745)	Lithics, historic debris and features	Adverse: Reservoir, berm, and tunnel construction, laydown area
45KL746	Lithic scatter, historic debris and features	Adverse: Reservoir and berm construction, laydown area
45KL2476	Lithic scatter	Adverse: Reservoir and berm construction
45KL772	Single lithic flake (isolated find)	Not relocated during 2019 survey
45KL1712	Lithic scatter (single artifact in APE)	Not relocated during 2019 survey
45KL1296 (ISO)	Single lithic flake (isolated find)	None anticipated
45KL1297 (ISO)	Lithic biface (isolated find)	None anticipated
45KL1298	Lithic scatter	None anticipated
45KL2026	Lithic scatter	None anticipated

Table 3.3.9-1. Klickitat and Sherman County population, race and housing demographics (Source: U.S. Census Bureau, 2020).

	Klickitat County	Sherman County	Total
Population			
2020 Census Population	22,735	1,870	24,605
2010 Census Population	20,318	1,765	22,083
% Change	11.9%	5.9%	11.4%
Racial Demographics			
	Klickitat County	Sherman County	Weighted Total
White	92.8%	94.4%	92.9%
Black or African American	0.7%	0.3%	0.7%
American Indian and Alaska Native	2.6%	2.5%	2.6%
Asian	1.0%	0.7%	1.0%
Native Hawaiian and Other Pacific Islander	0.2%	0.1%	0.2%
Two or more other races	2.7%	2.1%	2.7%
Housing and Family			
	Klickitat County	Sherman County	
Persons per Household (2016–2020)	2.35	2.30	

Table 3.3.9-2. Study area total revenues (Source: Oregon DOR, 2022).

	FY2017	FY2018	FY2019	CAGR
Klickitat County Revenue	\$43,189,096	\$41,057,573	\$44,752,139	1.2%
City of Goldendale Revenue	\$4,743,926	\$5,665,742	\$5,582,466	5.6%
Sherman County Revenue	\$3,682,951	\$2,189,012	\$2,146,228	-16.5%
City of Wasco Revenue	\$197,423	\$202,790	\$235,735	6.1%

Table 3.3.9-3. Housing units and vacancy rates in Klickitat, Sherman, and Wasco Counties
 (Source: U.S. Census Data, n.d.).

	Total Housing Units (number)	Total Vacancies (number)	Vacant Housing Units (%)
Klickitat County	10,626	1,358	13%
- Goldendale	1,764	142	8%
- Wishram	249	25	10%
Sherman County	905	178	20%
- Rufus	141	32	23%
- Wasco	450	61	14%
Wasco County	11,712	1,379	12%
- The Dalles	9,167	635	7%

Table 3.3.10-1. Goldendale environmental justice data table using 2020 5-year estimates for Klickitat County (WA) (Source: U.S. Census Data, n.d.).

Geographic Area	Total Population	White (%) ^a	African American/Black (%) ^a	American Indian/Alaska Native (%) ^a	Asian (%) ^a	Native HI & Other Pacific Islander (%) ^a	Some Other Race (%) ^a	Two or More Races (%) ^a	Hispanic Origin (any race) (%) ^a	Total Minority Population (%) ^a	Households in Poverty (%) ^b
WASHINGTON	751,2465	67.5%	3.7%	1.0%	8.7%	0.7%	0.3%	5.2%	12.9%	32.5%	9.8%
Klickitat County*	22,055	82.0%	1.2%	1.7%	0.5%	0.0%	0.0%	2.7%	12.0%	18.0%	12.5%
Census Tract 9501.01, Block Group 1	864	70.8%	0.3%	0.0%	0.0%	0.0%	0.0%	3.0%	25.8%	29.2%	18.8%
Census Tract 9501.02, Block Group 2	947	94.1%	0.0%	3.9%	0.0%	0.0%	0.0%	1.0%	1.1%	5.9%	23.2%
Census Tract 9501.03, Block Group 1	1526	79.2%	12.5%	2.0%	0.0%	0.0%	0.0%	4.3%	2.0%	20.8%	11.2%
Census Tract 9501.03, Block Group 2	1388	96.6%	<0.1%	0.0%	0.0%	0.0%	0.0%	0.4%	2.9%	3.4%	19.4%
Census Tract 9501.03, Block Group 4	1042	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Census Tract 9502, Block Group 1	975	85.0%	1.7%	7.0%	0.5%	0.0%	0.0%	4.5%	1.2%	15.0%	26.7%

* Reference Community

^a Percent of Total Population (Table B03002 – Hispanic or Latino Origin by Race. 2020 ACS 5-Year Estimates Detailed Tables. U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates: <https://data.census.gov/cedsci/table?q=B03002&d=ACS%205-Year%20Estimates%20Detailed%20Tables>). Accessed December 19, 2022.

^b Percent of Households (Table B17017 – Poverty Status in the Past 12 Months by Household Type and Age of Householder. 2020 ACS 5-Year Estimates Detailed Tables. U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates: <https://data.census.gov/cedsci/table?q=B17017%3A%20POVERTY%20STATUS%20IN%20THE%20PAST%2012%20MONTHS%20BY%20HOUSEHOLD%20TYPE%20BY%20AGE%20OF%20HOUSEHOLDER&d=ACS%205-Year%20Estimates%20Detailed%20Tables&tid=ACSDT5Y2020.B17017>). Accessed December 19, 2022.

Gray shading denotes an Environmental Justice community.

Table 3.3.10-2 Goldendale environmental justice data table using 2020 5-year estimates for Sherman and Gilliam counties
(Source: U.S. Census Data, n.d.).

Geographic Area	Total Population	White (%) ^a	African American/Black (%) ^a	American Indian/Alaska Native (%) ^a	Asian (%) ^a	Native HI & Other Pacific Islander (%) ^a	Some Other Race (%) ^a	Two or More Races (%) ^a	Hispanic Origin (any race) (%) ^a	Total Minority Population (%) ^a	Households in Poverty (%) ^b
OREGON	417,6346	74.9%	1.8%	0.9%	4.4%	0.4%	0.3%	4.1%	13.2%	25.1%	12.0%
Sherman County*	1,686	88.4%	<0.1%	0.7%	0.0%	1.2%	0.0%	3.2%	6.5%	11.6%	10.9%
Census Tract 9501, Block Group 2	852	84.6%	0.0%	0.8%	0.0%	0.0%	0.0%	3.9%	10.7%	15.4%	13.4%
Gilliam County*	1,896	86.8%	0.0%	3.4%	0.9%	0.6%	2.1%	1.7%	4.5%	13.2%	15.8%
Census Tract 9601, Block Group 1	843	83.6%	0.0%	7.6%	1.1%	1.3%	0.0%	1.4%	5.0%	16.4%	9.1%

* Reference Community

^a Percent of Total Population (Table B03002 – Hispanic or Latino Origin by Race. 2020 ACS 5-Year Estimates Detailed Tables. U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates: <https://data.census.gov/cedsci/table?q=B03002&d=ACS%205-Year%20Estimates%20Detailed%20Tables>). Accessed November 10, 2022.

^b Percent of Households (Table B17017 – Poverty Status in the Past 12 Months by Household Type and Age of Householder. 2020 ACS 5-Year Estimates Detailed Tables. U.S. Census Bureau, 2016-2020 American Community Survey 5-Year Estimates: <https://data.census.gov/cedsci/table?q=B17017%3A%20POVERTY%20STATUS%20IN%20THE%20PAST%2012%20MONTHS%20BY%20HOUSEHOLD%20TYPE%20BY%20AGE%20OF%20HOUSEHOLDER&d=ACS%205-Year%20Estimates%20Detailed%20Tables&tid=ACSDT5Y2020.B17017>). Accessed December 19, 2022

Gray shading denotes an Environmental Justice community.

Table 3.3.11-1. Existing noise environment at proposed construction sites near the Upper and Lower Reservoir facilities (Source: staff).

Construction Site	Nearest Receptor Description	Distance from Construction Site	Estimated Existing Daytime Leq (dBA)	Estimated Existing Nighttime Leq (dBA)
Upper Reservoir	Residence on Oak Hill Road	5,600 feet northwest	40	30
Upper Reservoir	Residences on Hector Road	11,000 feet north	40	30
Lower Reservoir	Residences on Rt. 14	1,300 feet west	40	30
Lower Reservoir	Railroad Island Park	3,750 feet east	40	30
Lower Reservoir	Giles French Park	6,300 feet south	40	30
Lower Reservoir	Residences in Rufus	8,000 feet southwest	40	30

Table 3.3.11-2. Average noise levels from common construction equipment at a reference distance of 50 feet (Source: FHWA, 2011).

Construction Equipment	Typical Average Noise Level at 50 feet (dBA)
Blasting	94.0
Concrete Batch Plant	83.0
Concrete Mixer Truck	78.8
Concrete Pump Truck	81.4
Dozer	81.7
Crane	80.6
Excavator	80.7
Dump Truck	76.5
Front End Loader	79.1

Table 3.3.11-3. Air quality thresholds for construction and operation phases total emissions: average tons per year (Source: Washington DOE, 2022a, as modified by staff).

Pollutant	Construction Total (tons)	Total Stationary and NOC-Construction Emissions^a	Total Operation (tons)	Total Stationary and NOC-Operational Emissions^a	NOC Threshold	Comparison to NOC Threshold Construction /Operation	Title V Permit Threshold^b	PSD Major Source Threshold^c	Comparison to PSD and Title thresholds^d Construction/Operation
PM10	1,086.20	4.39	1.07	0.70	0.75	Above/Below	100	250	Below/Below
PM2.5	118.17	4.39	1.07	0.70	0.50	Above/Above	100	250	Below/Below
NOx	216.92	89.79	36.69	24.14	2.0	Above/Above	100	250	Below/Below
CO	176.72	20.58	8.41	5.53	5.0	Above/Above	100	250	Below/Below
SO2	1.56	0.00	1.86E-06	1.22E-06	2.0	Below/Below	100	250	Below/Below
VOCs	11.81	2.64	1.08	0.71	2.0	Above/Above	100	250	Below/Below
CO2	19,318.09	NA	1,773.37	NA	NA	NA	NA	NA	NA
Methane	0.78	NA	7.19E-02	NA	NA	NA	NA	NA	NA
NO2	0.16	NA	1.44E-02	NA	NA	NA	NA	NA	NA
CO2 ^{e,f}	17,584 metric tons	NA	1,614 metric tons	NA	NA	NA	NA	NA	NA

Notes: NA = not applicable; NOC = Ecology Notice of Construction; PSD = Prevention of Significant Deterioration

- a Stationary emissions include non-fugitive and stationary construction emissions, which are limited to the concrete batch plant and generators.
- b Title V operation permit thresholds codified in C.F.R. 40.40.
- c PSD major source thresholds codified in C.F.R. 40.51.
- d Comparison to both thresholds does not include fugitive emissions or mobile source emissions.
- e CO₂e calculated based on Global Warming Potentials in table A-1 IPCC AR6 table 7.SM.7 for 100-year time horizon.
- f GHG emissions related to off-site production of cement are considered indirect emissions and are not included in this table. Those emissions are quantified to be approximately 59,642 tons of CO₂e total.

Table 3.3.11-4. Estimated construction noise levels at selected receptors (Source: staff).

Receptor	Activity	Noise Level (dBA L10)
Residence along Oak Hill Road	Upper Reservoir Excavation	42.0
	Upper Reservoir Lining	41.0
Residences along Rt. 14	Lower Reservoir Excavation	55.3
	Lower Reservoir Lining	51.1
Railroad Island Park	Lower Reservoir Excavation	46.1
	Lower Reservoir Lining	41.9

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APPENDIX C – STATUTORY AND REGULATORY REQUIREMENTS

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Federal Power Act

Section 18 Fishway Prescription

Section 18 of the FPA, 16 United States Code (U.S.C.) § 811, states that the Federal Energy Regulatory Commission (Commission) is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of the U.S. Department of Commerce or the U.S. Department of the Interior (Interior).

By letter filed May 23, 2022, Interior requests that a reservation of authority to prescribe fishways under section 18 be included in any license issued for the project.

Section 10(j) Recommendations

Under section 10(j) of the FPA, 16 U.S.C. § 803(j)(1), each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions in any subsequent license unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

Washington Department of Fish and Wildlife (Washington DFW), Interior, and National Marine Fisheries Service (NMFS) timely filed recommendations under section 10(j) on May 18, 2022, May 19, 2022, and May 23, 2022, respectively. These recommendations are included in appendix I, and are discussed in section 5.1, *Comprehensive Development and Recommended Alternative* and section 5.3, *Fish and Wildlife Agency Recommendations*.

Under section 10(a) of the FPA, each hydroelectric license issued by the Commission must be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce; for the improvement and utilization of waterpower development; for the adequate protection, mitigation, and enhancement of fish and wildlife; and for other beneficial public uses, including irrigation, flood control, water supply, recreation, and other purposes.

On May 23, 2022, NMFS filed one recommendation under section 10(a). We discuss the U.S. Department of Commerce's section 10(a) recommendation regarding effluent discharge into the Columbia River during project construction or operation in section 3.3.2, *Water Resources*.

Clean Water Act

Under section 401(a)(1) of the Clean Water Act (CWA), 33 U.S.C. § 1341(a)(1), a license applicant must obtain either a water quality certification (WQC) from the appropriate state pollution control agency verifying that any discharge from a project would comply with applicable provisions of the CWA, or a waiver of such certification. A waiver occurs if the state

agency does not act on a request for a WQC within a reasonable period of time, not to exceed one year after receipt of such request.

On June 24, 2020, FFP applied to the Washington State Department of Ecology (Ecology) for a WQC for the project. On June 23, 2021, Ecology denied FFP's request without prejudice, citing a lack of sufficient information to make a decision. On May 23, 2022, FFP submitted a new request for certification, which Ecology received the same day. Ecology has not yet acted on the certification request. The certification is due by May 23, 2023.

Endangered Species Act

Section 7 of the Endangered Species Act (ESA), 16 U.S.C. § 1536, requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. On February 3, 2023, we accessed FWS's Information for Planning and Consultation database to determine whether any federally listed species could occur at the project. Review of the database identified federally listed aquatic species that potentially occur in the Columbia River include the endangered Upper Columbia River spring-run Chinook salmon (*Oncorhynchus tshawytscha*) evolutionary significant unit (ESU) and the Snake River sockeye salmon (*O. nerka*) ESU; and the threatened Lower Columbia River, Snake River fall-run, and Snake River spring/summer-run Chinook salmon ESUs; bull trout/Dolly Varden (*Salvelinus confluentus*); Columbia River chum salmon (*O. keta*) ESU; the Lower Columbia River coho salmon (*O. kisutch*) ESU; and the Lower, Middle, and Upper Columbia and Snake River steelhead (*O. mykiss*) distinct population segments (DPS).

The database also indicates that the endangered gray wolf (*Canis lupus*), the threatened yellow-billed cuckoo (*Coccyzus americanus*), the proposed threatened wolverine (*Gulo luscus*), and the candidate monarch butterfly (*Danaus plexippus*), may also be present in the project vicinity. There are no designated critical habitats for terrestrial species within the project area.

Our analyses of project effects on threatened and endangered species are presented in section 3.3.5, *Threatened and Endangered Species*, and our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*. Based on available information, we conclude that licensing the proposed project may affect, but is not likely to adversely affect Snake River Fall-run Chinook salmon ESU, Snake River Spring/Summer-run Chinook salmon ESU, Snake River sockeye salmon ESU, Snake River steelhead DPS, Upper Columbia River spring-run Chinook salmon ESU, Upper Columbia River steelhead DPS, Middle Columbia River steelhead DPS, Lower Columbia River steelhead DPS, Lower Columbia River coho salmon ESU, Lower Columbia River Chinook salmon ESU, Columbia River chum salmon ESU, Bull trout, and these species' critical habitat.

Licensing of the project would not affect the gray wolf because it is unlikely to occur or use the habitats surrounding the project. Licensing the project would not affect the cuckoo or wolverine because there no suitable habitat to support these species at the project.

Magnuson-Stevens Fishery Conservation and Management Act

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires federal agencies to consult with the Secretary of Commerce regarding any action or proposed action authorized, funded, or undertaken by the agency that may adversely affect Essential Fish Habitat (EFH) identified under the Act. There are four salmon evolutionary significant units (ESU) that are not listed under the ESA with EFH within the project area: (1) Upper Columbia summer/fall Chinook salmon, (2) Middle Columbia River spring Chinook salmon, (3) Okanogan River sockeye salmon, and (4) Lake Wenatchee sockeye salmon. Our analyses of project effects on EFH are presented in section 3.3.5, *Threatened and Endangered Species*, and our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*. Based on available information, we conclude that licensing the proposed project is not expected to adversely affect Chinook or sockeye salmon EFH.

Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. §1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

Washington coastal zone includes all lands (except for federal and tribal lands) and waters within the state's 15 coastal counties but does not include Klickitat County where the project would be located. Oregon's coastal zone includes the state's coastal watersheds (except for federal and tribal lands) and extends inland to the crest of the coast range, with a few exceptions (i.e., such as in the Columbia River Basin where the boundary extends upstream to Puget Island on the Columbia River, approximately 130 miles west of where the project would be located). Attachment 8 of FFP's November 20, 2020, response to additional information includes emails from both Washington Ecology and Oregon Department of Land Conservation and Development confirming that the project is not within Washington or Oregon's coastal zone boundaries and that CZMA would not apply to the Goldendale Pumped Storage Project.

National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties (TCPs), and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

On March 21, 2019, Commission staff issued a notice stating that it was initiating consultation with the Washington State Historic Preservation Officer (Washington SHPO) and the Oregon State Historic Preservation Officer (Oregon SHPO), as required by section 106 of the NHPA and the implementing regulations found at 36 Code of Federal Regulations (C.F.R.) § 800.2. The notice also stated that the Commission was designating FFP as the Commission's

non-federal representative for carrying out day-to-day consultation pursuant to section 106. Subsequent letters to the Washington SHPO and Oregon SHPO on August 13, 2021, reiterated that the Commission had designated FFP as its representative and authorized FFP to initiate consultation with the Washington SHPO, Oregon SHPO, appropriate Native American Tribes, and other consulting parties, pursuant to 36 C.F.R. § 800.2(c)(4).

To meet the requirements of section 106, the Commission intends to execute a Programmatic Agreement (PA) for the protection of historic properties from the effects of the construction, operation, and maintenance of the Goldendale Project. The terms of the PA would ensure that FFP addresses and treats all historic properties identified within the project's area of potential effects (APE) through the finalization of a Historic Properties Management Plan (HPMP).

Pacific Northwest Power Planning and Conservation Act

Under section 4(h) of the Pacific Northwest Power Planning and Conservation Act, the Northwest Power and Conservation Council developed the Columbia River Basin Fish and Wildlife Program to protect, mitigate, and enhance the operation of the hydroelectric projects within the Columbia River Basin. Section 4(h) states that responsible federal and state agencies should provide equitable treatment for fish and wildlife resources, in addition to other purposes for which hydropower is developed, and that these agencies should consider, to the fullest extent practicable, the program adopted under the Pacific Northwest Power Planning and Conservation Act. The Council has designated over 40,000 miles of river in the Pacific Northwest region as not being suitable for hydroelectric development (protected area). Because the project would be a closed-looped system that would not be hydraulically connected to any surface waters, the project would not be located on or develop a protected area.

Wild and Scenic Rivers Act

Section 7(a) of the Wild and Scenic Rivers Act requires federal agencies to make a determination as to whether the operation of the project under a license would invade the area or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the designated river corridor. Public Law 99-663 (November 17, 1986) designated tributaries of the Columbia River as Wild and Scenic. The John Day River's confluence with the Columbia River is less than 3 miles up-river from the John Day Dam, located southeast from the proposed project area. This river system has designations under the National Wild and Scenic Rivers Act and the Oregon Scenic Rivers Act. Upstream of the project vicinity, sections of the Lower Deschutes River in Oregon are designated as a Wild and Scenic River. The Klickitat River in Washington, also a Wild and Scenic River, is more than 10 miles away from the project area. Its confluence with the Columbia River is approximately 28 miles downriver (west) of the project area. The project is not located on, nor would it directly affect, these designated river segments; therefore, it would have no effect on the values for which the river segments are designated.

Executive Orders 14008 and 12898

The U.S. Environmental Protection Agency's (EPA) environmental justice policies are directed, in part, by the recent Executive Order 14008, *Tackling the Climate Crisis at Home and*

Abroad,¹ and Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*,² as amended, which require federal agencies to consider if effects on human health or the environment from the programs, policies, or activities of federal agencies would be disproportionately high and adverse for environmental justice communities. The term “environmental justice community” could encompass: (1) populations of color; (2) communities of color; (3) Native communities; and (4) low-income rural and urban communities, which are exposed to a disproportionate burden of the negative human health and environmental effects of pollution or other environmental hazards.

Staff identified eight environmental justice communities within a 5-mile radius of the project boundary and considered how the communities may be affected by changes in air quality, noise, and aesthetics, from the construction and operation of the project. Construction-related activities and emissions would occur entirely within environmental justice communities. However, construction emissions would be temporary and minimized through appropriate control measures (e.g., dust control measures); therefore, project construction would have less than a significant impact on air quality in the environmental justice communities. Noise levels in environmental justice communities would be highest at residences in the immediate vicinity of construction activities and would diminish with distance from the work areas. The closest residence is 0.3 miles from the lower reservoir construction site. At the peak of construction, noise levels are not expected to exceed 55.3 dBA at the closest residences. Thus, construction noise is likely to be perceived at the residences but are not expected to rise to a level that would be annoying or disruptive. Therefore, the noise effects of project construction on nearby residents within the environmental justice communities would be less than significant. With respect to visual effects on environmental justice communities, project construction activities and the project reservoirs, substation, and transmission line would be visible by members of the environmental justice communities, primarily as they traverse local roads during the 5-year construction period. The upper and lower reservoir, substation and overhead transmission line would be permanent introductions to the viewshed, adding to the existing industrial development in area (e.g., wind turbines, smelter, transmission lines, John Day Dam). FFP’s proposed measures to reduce visual effects (e.g., use of vegetation screening, natural paint colors and surfacing materials that match the surrounding landscape and dull reflective surfaces that cannot be painted, and designed facility lighting) would reduce the contrast of the project facilities with landscape to the extent practicable, and reduce visual effects to less than significant levels.

Our analysis of the project’s effects on these communities are presented in section 3.3.10, *Environmental Justice*. In consideration of the census data, scope of the proposed project, and the environmental protection and enhancement measures for noise, air quality, and aesthetics, we conclude that the adverse effects of the project on these resources would predominately be borne by environmental justice communities and would result in a disproportionately high and adverse

¹ 86 *Federal Register* 7,619-7,633 (February 1, 2021).

² 59 *Federal Register* 7,629-7,633 (February 16, 1994). While the Commission is not one of the specified agencies in Executive Order 12898, the Commission nonetheless addresses environmental justice in its analysis, in accordance with its governing regulations and guidance, and statutory duty to evaluate all factors bearing on the public interest.

effect on environmental justice communities. However, the effects would be temporary and at a level that is less than significant with appropriate mitigation (e.g., erosion and dust control, and vegetation screening, lighting, and painting to reduce the contrast with the landscape).

**APPENDIX D – ALTERNATIVES CONSIDERED BUT ELMINATED
FROM DETAILED ANALYSIS**

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Alternative Locations

Without elaboration, Columbia Riverkeeper, Sierra Club, and Washington Environmental Council, American Rivers, and the Yakama Nation recommend that the Commission consider alternative geographic locations for the project.

FFP states in its license application that the proposed site was chosen due to the unique opportunity to re-use a previous industrial facility and the proximity to the John Day Substation and Bonneville Power Administration transmission lines. Additionally, Klickitat Public Utility District's existing intake pool, pump station, and conveyance pipes would supply water to the project without the need to construct a new intake, which FFP states would reduce the potential environmental effects of the project.

Our Analysis

The Commission does not design or site projects. Rather it determines whether a proposed project can be constructed and operated in a fashion that is the public interest and the best comprehensive use of the waterway. FFP did not consider any other sites for the reasons discussed above and no other sites have been recommended by another entity. Therefore, there is no basis on which to evaluate alternative site locations. Our environmental analysis considered FFP's proposal as well as measures recommended by stakeholders, including those that recommended operational design changes, or other measures designed to avoid or minimize impacts to specific resources.

Alternative Technologies

Columbia Riverkeeper, Sierra Club, and Washington Environmental Council recommended the Commission consider the following alternatives to pumped storage: (1) using lithium ion batteries; (2) using stacked blocks; (3) using liquid air; (4) using underground compressed air; (5) using flow batteries; and (6) using gravity batteries. Commenters noted that "stacked blocks" refers to storing energy by automating a robotic crane to stack thousands of purpose-built, monoliths into a "Babel-like tower" and dropping them down again to release the power. "Liquid air" refers to cooling down air and storing it in pressurized above-ground tanks to be used for grid storage. "Underground compressed air" refers to using excess electricity to pump compressed air into a suitable underground formation that acts like a giant storage tank which can allow for electricity generation when the pressurized air is released.

Our Analysis

The Commission may issue licenses under the Federal Power Act for the construction, operation, and maintenance of non-federal hydropower projects. The Commission does not have the authority to authorize the specific types of energy storage technologies cited by Columbia Riverkeeper, Sierra Club, and Washington Environmental Council. However, we do consider alternative technologies in selecting the most likely alternative source of power for the Goldendale Project for purposes of our developmental analysis (see Appendix E).

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APPENDIX E – DEVELOPMENTAL RESOURCES

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POWER AND DEVELOPMENTAL BENEFITS OF THE PROJECT

Table E-1 summarizes the assumptions and economic information used in the analysis. Most of this information was provided by the applicant in its license application. Some are developed by FERC staff. The values provided by the applicant are typically reasonable for the purposes of our analysis. If they are not, it is noted below. Cost items common to all alternatives include taxes and insurance costs; estimated capital investment required to develop the project; licensing costs; normal operation and maintenance cost; and Commission fees. All costs are adjusted to current year dollars.

Table E-1. Parameters for the economic analysis of the Goldendale Project (Source: FFP, 2021a, as modified by staff).

Parameter	Value
Installed Capacity	1,200 MW
Average annual generation	3,561,000 MWh
Period of analysis (years)	30
Federal tax rate	N/A
Local tax rate	N/A
Insurance, \$ ^a	N/A
Cost of money ^b	3.50%
Initial construction cost, \$ ^c	3,317,479,849
Application cost, \$ ^c	8,149,188
Operation and maintenance, \$/year ^c	238,838,043
Annual pumping costs ^d	\$130,410,000
Estimated Commission annual charges ^e	\$1,890,314
Alternative source of power's cost, \$/MWh ^f	181.7

^a Assumed included in O&M.

^b Assumed by staff.

^c Attachment 3, Exhibit D, as modified by staff.

^d Calculated by staff based on 4,347,000 MWh/year pumping energy and off-peak energy value of \$30/MWh, as used in the calculation of levelized cost of storage.

^e Calculated by staff based on FERC administrative fees.

^f In keeping with Commission policy as articulated in Mead, we use the most likely alternative source of power's cost.

MOST LIKELY ALTERNATIVE SOURCE OF POWER

Staff selected lithium-ion storage batteries as a likely source of alternative power to the Goldendale Project because it is a storage technology which can offer, configured appropriately, comparable benefits to that of pumped storage. These benefits include providing large amounts peak energy for periods up to 10 hours in duration, a quick response time in providing power, the ability to utilize renewable energy in production of peak energy thereby being considered a low-carbon technology, and a high efficiency in converting stored energy to usable power.

Staff estimated the cost of constructing and operating a lithium-ion battery storage facility sized similar to the Goldendale Project, (i.e., 1,200 MW), capable of providing up to 10 hours of peak energy daily, and generating an average of 3,561,000 MWh annually. Our cost is based on the levelized cost of storage (LCOS) for lithium-ion batteries as estimated by the U.S. Department of Energy in their 2022 report “2022 Grid Energy Storage Technology Cost and Performance Assessment”³ (DOE 2022). Staff combined the cost of 1,000 MW of battery storage and 100 MW of storage as reported in DOE 2022 for year 2021, to get a combined cost of \$158/MWh for a 1,200 MW installation. This value was then adjusted to 2023 dollars, using the consumers price index (CPI), for a total cost of \$181.70/MWh.⁴

Because of the many variables which must be considered, the real cost of battery storage is difficult to estimate. Most battery costs estimates are based on small installations of 100 MW or less, which may be difficult to scale to larger installations. Some estimates may not consider the quickly changing cost of battery technology,⁵ may not consider recent costs of inflation, and often include only the cost of a one-time installation. The LCOS estimates in DOE’s 2022 report includes the complete cost of an energy storage system over its project life, including any major overhauls and replacements required to maintain operation. It also includes capital costs, taxes, financing costs, operations and maintenance, and performance metrics such as cycle life and calendar life. For lithium-ion batteries, LCOS also considered decommissioning costs such as disconnection, site remediation, recycling, and disposal; however, DOE cautions that decommissioning costs are not highly developed at this time and may change as risks and environmental considerations change.

COMPARISON OF ALTERNATIVES

Table E-2 compares the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project

³ See Technical Report Publication No. PNNL-33283, August 2022; 2022 Grid Energy Storage Technology Cost and Performance Assessment, U.S. Department of Energy, Pacific Northwest National Laboratory.

⁴ Pumped-storage technologies are generally considered to be the lowest cost storage technology. For comparison purposes the estimated LCOS for a 1,200 MW pumped storage system in 2023 dollars is estimated to be \$121.9/MWh.

⁵ Lithium-ion battery systems have experienced significant cost declines over the last few years due to component cost declines, system integration improvements, and deployment advancements.

cost for each of the alternatives considered in this draft EIS: no action, the applicant’s proposal, and the staff alternative.

Table E-2. Summary of the annual cost of alternative power and annual project cost for the alternatives for the Goldendale Project (Source: staff).

	FFP LLC’s Proposal	Staff Alternative
Installed capacity (MW)	1,200	1,200
Annual generation (MWh)	3,561,000	3,561,000
Capacity benefit (MW)	N/A ^a	N/A ^a
Current alternative source of power’s cost	\$647,033,700	\$647,033,700
Total annual project cost	\$553,693,655	\$553,760,018
Difference between the alternative source of power’s cost and total annual project cost ^b	\$93,340,045	\$93,273,682

^a Captured in levelized cost of storage

^b This number denotes that the difference between the cost of alternative power and project cost is positive, thus the total project cost is less than the cost of alternative power.

No-action Alternative

Under the no-action alternative, the project would not be constructed and would not produce any electricity. The only cost associated with this alternative would be the cost to prepare the license application.

Applicant’s Proposal

FFP proposes numerous environmental measures, as presented in table F-1 in appendix F. Under FFP’s proposal, the project would have a total installed capacity of 1,200 MW and an average annual generation of 3,561,000 MWh. The alternative source of power’s current cost to produce the same amount of energy and provide the same capacity would be \$647,033,700. The total annual project cost would be \$553,693,655. Subtracting the total annual project cost from the alternative source of power’s current cost, the project’s cost to produce power and capacity is \$93,340,045 less than the alternative source of power’s cost.

Staff Alternative

Under the staff-recommended alternative, the project would have a total installed capacity of 1,200 MW and an average annual generation of 3,561,000 MWh. Table F-1 in appendix F shows the staff recommended additions and modifications to FFP’s proposed environmental protection and enhancement measures and the estimated cost of each.

The alternative source of power's current cost to produce the same amount of energy and provide the same capacity would be \$647,033,700. The total annual project cost would be \$553,760,018. Subtracting the total annual project cost from the alternative source of power's current cost, the project's cost to produce power and capacity is \$93,273,682 less than the alternative source of power's cost.

APPENDIX F – COSTS OF ENVIRONMENTAL MEASURE

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Table F-1. Cost of environmental mitigation and enhancement measures considered in assessing the effects of operating the Goldendale Project (Source: staff).

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$) ^a	Annual Cost (2023\$) ^a	Levelized Annual Cost (2023\$)
General				
1. Adaptive management plan that coordinates post-licensing monitoring and adaptive management measures as necessary	Columbia Riverkeeper, Sierra Club, and Washington Environmental Council	Unknown – the recommendation lacks sufficient detail on the monitoring and adaptive management measures to develop a cost	Unknown – the recommendation lacks sufficient detail on the monitoring and adaptive management measures to develop a cost	Unknown – the recommendation lacks sufficient detail on the monitoring and adaptive management measures to develop a cost
Geology and Soils				
2. Soil erosion control plan that includes FFP’s proposal to use dust palliatives to control fugitive windblown dust.	FFP; staff	\$110,597	\$0	\$6,013

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$)^a	Annual Cost (2023\$)^a	Levelized Annual Cost (2023\$)
3. Construction vibration monitoring program which includes: (a) conducting a baseline survey and assessment of existing utilities; (b) developing a detailed map of existing utilities; and (c) developing a construction vibration monitoring plan with contractor requirements, and vibration criteria to be followed.	FFP; staff	\$814,919	\$0	\$44,308
4. West Surface Impoundment Plan with methods and procedures for excavating and disposing of contaminated soils and liner materials associated with the West Surface Impoundment.	FFP; Columbia Riverkeeper, Sierra Club, and Washington Environmental Council; staff	\$11,758,115	\$0	\$639,304

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$)^a	Annual Cost (2023\$)^a	Levelized Annual Cost (2023\$)
Aquatic Resources				
5. Monitoring Well Plan that includes decommissioning 15 existing groundwater monitoring wells and installing new groundwater monitoring wells.	FFP; Columbia Riverkeeper, Sierra Club, and Washington Environmental Council; staff	\$640,293	\$0	\$34,814
6. Spill Prevention, Control, and Countermeasure Plan.	FFP; staff	\$23,283	\$0	\$1,266
7. Dewatering Plan during construction.	FFP; staff	\$23,283 ^b	\$0 ^b	\$1,266
8. Reservoir Water Quality Monitoring Plan.	FFP; Columbia Riverkeeper, Sierra Club, and Washington Environmental Council; staff	\$34,925	\$2,328	\$4,227
9. Stormwater Pollution and Prevention Plan.	FFP; staff	\$23,283	\$0	\$1,266

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$)^a	Annual Cost (2023\$)^a	Levelized Annual Cost (2023\$)
10. Include KPUD’s intake and conveyance pipe that would connect to the new reservoir fill line in the project boundary and file revised project boundary exhibits	Washington DFW; Interior	\$0 ^b	\$0 ^b	\$0
11a. Install and maintain fish screens on the KPUD intake works that meet NMFS and Washington DFW screening requirements and develop a plan to improve intake screens and/or develop solutions to direct fish species away from the project intake if operational problems with the intake and intake screens are identified	Interior; Columbia Riverkeeper Sierra Club, and Washington Environmental Council	Unknown. Costs would depend on engineering details that are not available	Unknown. Costs would depend on engineering details that are not available	Unknown. Costs would depend on engineering details that are not available

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$)^a	Annual Cost (2023\$)^a	Levelized Annual Cost (2023\$)
11b. Conform the intake to NMFS and Washington DFW fish screen criteria only if the currently installed intake fails and needs repairs.	Washington DFW	Unknown. Costs would depend on engineering details that are not available	Unknown. Costs would depend on engineering details that are not available	Unknown. Costs would depend on engineering details that are not available
11c. Conduct a fry and juvenile entrainment survey in KPUD's intake pool within 12 months of license issuance to inform the potential need for fish screening.	NMFS	\$75,000 ^c	\$0 ^c	\$4,078
12. Avoid withdrawing water from the Columbia River from March 15 to October 15 for initial fill and from March 1 to November 1 for annual re-fill	NMFS	\$593,114,225 ^d	\$0 ^d	\$32,248,410 ^d
13. Avoid placing any permanent structures or impoundments in the Columbia River.	NMFS	\$0 ^b	\$0 ^b	\$0

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$)^a	Annual Cost (2023\$)^a	Levelized Annual Cost (2023\$)
14. Avoid pile driving in the Columbia River any time between March 1 and November 1 to protect juvenile and adult migrants from high intensity sounds.	NMFS	\$0 ^b	\$0 ^b	\$0
15. Avoid releasing any effluent discharge into the Columbia River during project construction or operation.	NMFS	\$0 ^b	\$0 ^b	\$0
Terrestrial Resources				
16a. Vegetation Management Plan that includes preconstruction surveys for sensitive and invasive plants, weed control, revegetation protocols, monitoring, and reporting	FFP; staff	\$291,042	\$14,243	\$30,068

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$) ^a	Annual Cost (2023\$) ^a	Levelized Annual Cost (2023\$)
16b. Modify the Vegetation Management Plan to include: (1) survey for federal and state listed plants during the spring and early summer; (2) include shrubs and species of traditional cultural importance if they are available in the revegetation seed mix; (3) implement an integrated pest management approach to controlling noxious weeds; and (4) develop protocols for preventing and controlling wildfires during project construction and operation	Interior; staff	\$20,000 ^b	\$0 ^b	\$1,087

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$)^a	Annual Cost (2023\$)^a	Levelized Annual Cost (2023\$)
17. Wetland Mitigation Plan that includes establishing and rehabilitating a new stream on-site to mitigate for permanent impacts to federal jurisdictional stream S7; using BMPs to control erosion; revegetate disturbed areas with native seed mix; control noxious weeds; and monitoring revegetated areas for 10 years	FFP; staff	\$50,000 ^e	\$10,000 for years 5-10 ^e	\$5,243

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$) ^a	Annual Cost (2023\$) ^a	Levelized Annual Cost (2023\$)
18a. Wildlife Management Plan that includes (1) an environmental training program; (2) biological monitoring during construction; (3) wildlife deterrent measures around the reservoirs (8-foot fencing, plastic shade balls, vegetation management); bird and mammal monitoring; (4) design transmission line to be raptor-safe; (5) 3 pre-construction raptor nest survey/monitoring events; and (6) acquire and manage 177 acres of conservation lands.	FFP; Washington DFW; Columbia Riverkeeper Sierra Club, and Washington Environmental Council; staff	\$17,149,955 ^f	\$33,380 ^f	\$965,846
18b. Modify the Wildlife Management Plan to include surveying for peregrine falcons in addition to other raptors identified in the plan	staff	\$0 ^b	\$0 ^b	\$0

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$)^a	Annual Cost (2023\$)^a	Levelized Annual Cost (2023\$)
18c. Modify the Wildlife Management Plan to include conducting surveys for Dallas sideband snail, monarch butterfly, and juniper hairstreak butterfly prior to construction	Washington DFW; staff	\$0 ^{bm}	\$0 ^{bm}	\$0

<p>18d. Modify the Wildlife Management Plan to include a detailed bird and bat reservoir deterrent management plan that includes, in addition to FFP's proposed measures, monitoring methods, metrics for evaluating the effectiveness of the deterrents in reducing the attraction of the project reservoirs to birds, bats, and other wildlife, and criteria for deciding whether additional deterrents or modifications to the project are needed. Monitoring efforts would include point count surveys for birds, acoustic monitoring for bats, and fatality searches for one year prior to construction and 2 years following deployment of deterrent measures.</p>	<p>Washington DFW; staff</p>	<p>\$10,000 ^g</p>	<p>\$20,000 for years 1-3 ^g</p>	<p>\$3,590</p>
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Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$) ^a	Annual Cost (2023\$) ^a	Levelized Annual Cost (2023\$)
18e. Complete a baseline study assessing effects to golden eagles and an annual study that assesses any increase in bird strikes above baseline that occur with reservoirs built and operating	TID	\$20,000 ^h	\$20,000 ^h	\$21,087
18f. Modify the Wildlife management Plan to include a management plan for the 177-acre conservation lands that includes as appropriate noxious weed control, managing public access to avoid disturbing raptors, wildfire mitigation measures, fencing to protect and improve the habitat, and a wildlife water guzzler if there is an identified need for a source of water and procedures for updating the plan every 5 years.	Washington DFW; American Rivers; staff	\$130,000 ⁱ	\$2,000 every 5 years ⁱ	\$7,441

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$)^a	Annual Cost (2023\$)^a	Levelized Annual Cost (2023\$)
18g. Avian protection plan for the project transmission line that includes FFP's proposed protection measures but also includes procedures for monitoring bird fatalities and addressing problem poles and updating the plan as needed in consultation with FWS, Washington DFW, and Oregon DFW.	Interior, staff	\$10,000 ^b	\$2,000 ^b	\$2,544
Recreation				
19. Install an interpretive sign at a location providing views of the project and is accessible to persons with disabilities	FFP, staff	\$8,149	\$0	\$443
20. Fencing and/or public safety plan.	FFP, staff	\$10,000 ^b	\$0 ^b	\$544

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$) ^a	Annual Cost (2023\$) ^a	Levelized Annual Cost (2023\$)
21. Coordinate construction schedules and associated road closures or delays with Washington DOT, Klickitat County, Corps, BIA, and tribes to prevent interruption to recreational traffic	FFP; staff	\$0 ^b	\$0 ^b	\$0
Land Use				
22. Complete independent wind studies to establish preconstruction baseline wind (e.g., wind speeds, direction, turbulence) and turbine energy production data, using data provided by Siemens and wind readings taken at each of TID's wind turbines and compare baseline data to post-construction data as part of an ongoing annual study	TID	\$70,000 ^j	\$60,000 ^j	\$63,806

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$) ^a	Annual Cost (2023\$) ^a	Levelized Annual Cost (2023\$)
Cultural Resources				
23a. Draft HPMP filed on January 25, 2022 that includes conceptual measures developed by FFP for mitigating unavoidable adverse impacts to nine historic properties that would result from constructing, operating, and maintaining the project	FFP	\$0 ^k	\$0 ^k	\$0
23b. Revise the January 25, 2022 HPMP in consultation with the Washington SHPO and participating Tribes to include specific treatment measures for all affected archeological sites (including research design and site-specific data recovery plans, including analysis, and recordation), curation, and construction site monitoring.	staff	\$675,000 ^l	\$15,000 ^l	\$51,701

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$)^a	Annual Cost (2023\$)^a	Levelized Annual Cost (2023\$)
23c. Cultural resources management plan that includes all tribal recommendations and ensures Tribal member access to the area for gathering purposes is not hindered, encumbered, or otherwise interfered with.	Columbia Riverkeeper Sierra Club, and Washington Environmental Council	Unknown. Cost cannot be estimated without knowing what might be required by the affected tribes	Unknown. Cost cannot be estimated without knowing what might be required by the affected tribes	Unknown. Cost cannot be estimated without knowing what might be required by the affected tribes
24. Enforce existing Programmatic Agreement among BPA, Washington SHPO, and the Advisory Council on Historic Preservation for providing access to project lands for traditional root and plant gathering	Yakama Tribe	\$0. The Commission cannot require the enforcement of another agency's PA	\$0. The Commission cannot require the enforcement of another agency's PA	\$0. The Commission cannot require the enforcement of another agency's PA
Visual Resources				
25. Visual resources and recreation management plan that contains FFP's proposed visual resources protection measures	FFP; staff	\$23,283	\$0	\$1,266

Enhancement/ Mitigation Measures	Recommending Entities	Capital Cost (2023\$) ^a	Annual Cost (2023\$) ^a	Levelized Annual Cost (2023\$)
Traffic				
26. Traffic management plan containing applicable traffic control measures and protocols for coordinating construction schedules and any traffic control measures with Washington DOT and Klickitat County during project construction	FFP, Klickitat County; staff	\$10,000 ^b	\$0 ^b	\$544

^a Unless otherwise noted, all cost estimates are from FFP’s license application or subsequent additional information request responses. We reviewed these costs and determined that they are reasonable estimates, and then escalated the costs to 2023 dollars.

^b Staff estimate.

^c Staff estimate includes capital costs for periodically surveying for anadromous salmonids (including fry/juveniles) within the intake pool during the passage season.

^d The measure would likely delay filling of the reservoirs and the time that the project could begin generating by about 11 months. The project is expected to generate approximately 3,561,000 megawatt-hours (MWh) per year (which equates to an estimated 296,750 MWh per month). Thus, delaying generation by 11 months would result in 3,264,250 MWh (296,750 MWh x 11 months) of lost generation. Using a levelized cost of storage of \$181.7/MWh as an estimate of the project’s power value, 3,264,250 MWh of lost generation in the first year would be valued at \$593,114.225. Because of the small amount of water needed for refilling, we assume FFP would still be able to complete annual refill each year despite NMFS’ seasonal restriction so there would not be a significant annual cost with NMFS’s recommended seasonal restriction.

^e Cost estimate includes \$50,000 capital cost for establishing and rehabilitating a new stream on-site to mitigate for permanent impacts to federal jurisdictional streams. Costs for erosion control, revegetation, noxious weed management, and 5 years of monitoring are already included under the vegetation management plan. However, the Wetland Mitigation Plan would add 5 additional years of monitoring at \$10,000 per year for years 5-10.

- ^f Capital costs include the following costs provided by FFP and escalated to 2023 dollars: \$23,062 for developing plan, \$11,531 for training program, \$23,9845 for biological monitoring, \$1,729,650 for reducing wildlife attractants (deterrents, shoreline management, etc.), \$5,766 for ongoing consultation, \$5,766 for initial reservoir monitoring, \$288,275 for fencing around reservoirs, \$13,837,200 for installing shade balls, \$172,965 for raptor-safe transmission line construction measures, \$46,124 for three preconstruction raptor nest surveys/monitoring, \$11,531 for migratory bird risk assessment literature review, \$5,766 for carcass removals, and \$609,400 for acquiring golden eagle compensatory wildlife mitigation lands. Annual costs include the following costs provided by FFP and escalated to 2023 dollars: \$5,766 for annual reservoir monitoring for bird and mammal use, and \$17,297 annual cost for shade balls maintenance.
- ^g Cost estimate includes \$10,000 capital cost for developing the bird and bat monitoring plan, and \$20,000 annually for first three years for bat surveys and fatality searches. Capital and annual costs for bird monitoring within reservoirs and installing and maintaining shade balls in the reservoirs are already included as part of the costs for FFP's proposed Wildlife Management Plan.
- ^h Cost estimate includes \$20,000 for initial baseline study and \$20,000 each year for the life of the license for ongoing yearly fatality searches and reporting results.
- ⁱ Cost estimate includes \$10,000 capital cost for developing the plan and \$120,000 capital cost for installing fencing and noxious weed control. The capital cost for acquiring the land and annual cost for maintaining the mitigation lands are already included in the costs for FFP's Wildlife Management Plan. The cost estimate also includes \$2,000 for updating the plan every five years.
- ^j Cost estimate includes \$70,000 for conducting wind study in first year (\$60,000 for wind study as reported by FFP plus another \$10,000 for obtaining additional information from wind turbine manufacturer and incorporating it into the study) and ongoing costs of \$60,000 for an annual study conducted each year of the license term.
- ^k Capital and annual costs for implementing the draft HPMP were not provided in the license application. An estimate to prepare and file the HPMP (\$750,000) was provided in the applicant's July 7, 2021 response to the Commission's request for additional information, but actual capital and annual costs for implementing the HPMP were not provided but are dependent on the final measures that are ultimately selected.
- ^l Staff estimate includes costs for (a) appropriate consultation to revise the draft HPMP (\$25,000); (b) curation (\$500,000); and (c) tribal monitoring during construction (\$150,000). Cost estimate does not include costs associated with mitigation of historic properties. Costs associated with HPMP implementation and specific mitigation measures are dependent on the final measures that are ultimately selected.
- ^m Cost included in the rare plant survey of item 16b.

APPENDIX G – COMPREHENSIVE DEVELOPMENT

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As stated in Section 5.1 the following measures proposed by FFP would protect and enhance environmental resources and would be worth the cost:

Geology and Soils

- Develop a soil erosion control plan that best management practices for controlling wind and water erosion on project land.
- Develop a vibration monitoring plan to monitor for the effects of drilling the tunnels and powerhouse cavern during project construction on the foundations and underground utilities of nearby wind turbines.⁶
- Implement a West Surface Impoundment Plan filed on November 20, 2020, that includes methods and procedures for excavating and disposing of contaminated soils and liner materials during construction of the lower reservoir.

Water Resources

- Implement a Monitoring Well Plan filed on November 20, 2020, that includes decommissioning 15 existing groundwater monitoring wells that would be displaced to construct the lower reservoir and install new groundwater monitoring wells at locations selected in collaboration with Washington DOE.
- Implement a Spill Prevention, Control, and Countermeasure Plan filed on May 24, 2022, that includes protocols for handling and containing hazardous materials during project construction, operation, and maintenance.
- Implement a Dewatering Plan filed on May 24, 2022, that includes procedures for sampling and managing groundwater encountered while constructing the tunnels, powerhouse cavern, and lower reservoir.
- Implement a Stormwater Pollution and Prevention Plan filed on May 24, 2022, that includes best management practices for managing stormwater to prevent contamination of surface waters from construction, operation, and maintenance activities.
- Implement a Reservoir Water Quality Monitoring Plan filed on May 24, 2022, that include procedures for annually monitoring and reporting on water quality in the project reservoirs (i.e., dissolved solids, nutrients, and heavy metals) during project operation to determine the need for protection measures.

⁶ FFP would include in the plan a provision to conduct a construction baseline survey and include contractor requirements and vibration criteria to be followed to minimize effects on existing wind farm facilities.

Terrestrial Resources

- Implement a Vegetation Management Plan filed on June 23, 2020, that includes noxious weed management, surveys and protection of special status plants, and revegetation of disturbed areas with a native upland seed mix and monitoring for 5 years or until fully established.
- Implement a Wetland Mitigation Plan filed on May 24, 2022, that includes: (1) evaluating the viability of establishing and rehabilitating a new stream course on-site at a 1:1.1 ratio to mitigate for permanent impacts to the stream labeled S1, S7, and S8; (2) using BMPs to control erosion; (3) revegetating disturbed areas with a native seed mix; (4) using appropriate construction management to minimize the spread of invasive weeds; and (5) monitoring revegetated areas for a minimum of 10 years until specified performance standards are achieved.
- Implement a Wildlife Management Plan filed on June 23, 2020 that includes: (1) 2-years of pre-construction surveys to document bald eagle, golden eagle, and prairie falcon nesting and bald eagle roosting sites and to develop appropriate spatial and temporal restrictions on construction activities; (2) a training program to inform employees of sensitive biological resources; (3) procedures to limit the construction zone to avoid sensitive areas; (4) a construction monitor; (5) limiting construction activities to the hours of 8:00 a.m. to 6:00 p.m. to avoid disrupting crepuscular and nocturnal wildlife; and (6) project vehicle speed limits onsite to reduce wildlife collisions.
- To mitigate for the permanent loss of wildlife habitat, work with Washington DFW to select and purchase 277 acres of off-site land and manage the land for golden eagle nesting and foraging habitat.
- To deter wildlife from using the project reservoirs, implement the following measures filed as part of its Wildlife Management Plan, to: (1) install a chain link fence that is at least 8 feet high around the reservoirs; (2) mark all fences with vinyl strips and/or reflective tape to reduce avian collision risks; (3) prevent the establishment of vegetation around the reservoirs; (4) cover the reservoir surfaces with floating plastic shade balls to reduce the open-water habitat that could attract waterfowl, water birds and other raptor prey species; (5) monitor for and remove carcasses of livestock and other animals from the project area that may attract scavenging wildlife, foraging eagles, or other raptors; (6) develop a monitoring program to identify bird and mammal usage of the reservoirs and measure the effectiveness of wildlife deterrents in using the reservoirs; and (7) develop a reporting system to document wildlife mortalities, injuries, nuisance activity, and other interactions.
- To minimize avian electrocution and collision hazards with the project transmission line, construct the transmission line on existing poles and ensure there is 40 inches or more of vertical clearance and 60 inches or more of horizontal clearance between energized conductors or energized conductors and grounded hardware.

Recreation and Land Use

- Develop a fencing and/or public safety plan for restricting public access to hazardous areas and to protect recreationalists during construction and operation.
- Develop a visual and recreation resources management plan that includes installing an interpretive sign at a location that provides views of the project and is accessible to persons with disabilities. The signage would include a map of the project and information on pumped storage. The plan would also include a provision to coordinate construction schedules and any associated road closures or delays with Washington DOT and Klickitat County to prevent interruption to recreational traffic.

Aesthetic Resources

- Include in the visual and recreation resources management plan provisions to (1) use “engineering controls” during the design process, where practicable, and select natural paint colors and dulling reflective surfaces that cannot be painted to reduce the contrasts of the project structures with the landscape; (2) minimize footprints aboveground features to the furthest extent reasonably practicable; (3) ensure facilities are free of debris and store unused or damaged equipment offsite so it is not visible; (4) plant native vegetation and/or trees to break up the lines of roads and facilities and soften the visual effect on the landscape; and (5) install fully shielded, low pressure sodium lighting to protect the night sky from light pollution and use operational devices that allow surface night-lighting in the central project area to be turned on only as needed for safety.

We also recommend the following modifications or additions to FFP’s proposed measures:

Terrestrial Resources

- Modify the proposed Vegetation Management Plan to: (1) include surveys for federal and state listed plants during the spring and early summer; (2) include shrubs and species of traditional cultural importance if they are available in the revegetation seed mix; (3) implement an integrated pest management approach to controlling noxious weeds; and (4) develop protocols for preventing and controlling wildfires during project construction and operation.
- Modify the proposed Wildlife Management Plan to include (1) surveys for peregrine falcons (in addition to surveying other raptor species already identified in the plan) throughout the 5-year construction period; (2) surveys for Dalles sideband snail, monarch butterfly, and juniper hairstreak butterfly just prior to construction in areas where land disturbing activities would occur; (3) a management plan for the golden eagle mitigation lands; and (4) a detailed wildlife deterrent management plan for the project reservoirs that includes monitoring methods, metrics for evaluating the effectiveness of the deterrents in reducing the attraction of the project reservoirs to birds, bats, and other wildlife, and criteria for deciding whether additional deterrents or modifications to the project are needed.

- Develop an avian protection plan for the project transmission line that includes FFP’s proposed protection measures but also includes procedures for monitoring bird fatalities and addressing problem poles and updating the plan as needed in consultation with FWS, Washington DFW, and Oregon DFW.

Recreation Resources

- Include a provision in the visual and recreation resources management plan to coordinate construction schedules and any associated road closures or delays on John Day Dam Road with Corps personnel at John Day Dam, the Bureau of Indian Affairs, and tribal governments through the Columbia Inter Tribal Fish Commission, in addition to Klickitat County and Washington DOT.

Cultural Resources

- Revise the HPMP to include specific treatment measures for all affected archeological sites. The treatment should include research design and site-specific data recovery plans, including analysis, recordation, and curation, and a specific plan for construction site monitoring. Construction monitoring should include (1) identifying the specific areas that will be monitored during construction; (2) the location of the National Register-eligible cultural sites to be avoided and how they will be marked and avoided where possible; and (3) protocols for training construction workers on the importance of cultural sites, how to identify cultural sites, the need to avoid damage to cultural sites, and procedures to follow if previously unidentified cultural sites, including Indian graves, are encountered during construction.

Below we discuss the basis for our additional measures or modifications to FFP’s proposal. We also explain why we did not recommend certain measures.

Additional Measures Recommended by Staff

Project Boundary Modifications

FFP proposes to obtain water to fill the reservoir by purchasing the water from Klickitat PUD. FFP proposes to interconnect the project’s water fill line with Klickitat PUD’s existing piping infrastructure within a pump house near the lower reservoir. Klickitat PUD’s pump station is located in a pool formed by a railroad berm adjacent to the Columbia River about a mile west of the project. Washington DFW and Interior recommend pursuant to section 10(j) that Klickitat PUD’s current intake pool and pump station, which is hydrologically connected to the Columbia River, be included within the project boundary.

In its reply comments, FFP states Klickitat PUD’s facilities are existing, multi-use facilities currently supporting other uses in Klickitat County and would be unrelated to the project. Thus, FFP maintains that Klickitat PUD’s pump station and the intake pool are not project facilities and should remain outside of the project boundary. Klickitat PUD states that it “currently serves one commercial customer at the former smelter site” but that it anticipates

servicing other water system customers in the future consistent with its 2011 Cliffs Water System Plan and “strongly opposes” having any of its facilities included within the project boundary.⁷

A determination on whether the pump station and intake pool should be part of the license will be made in the license order.

Rare Plant Surveys

Project construction would temporarily disturb 54.3 acres of vegetation and remove 193.6 acres (table 3.3.4-5). Some of the habitats that would be disturbed are considered vulnerable by the state and could contain federal and state listed sensitive and rare plant species (e.g., California broomrape, smooth desert parsley, Douglas’ draba, and hot-rock penstemon). FFP’s surveys identified areas that could support these plants; however, its surveys were not conducted when they all would have been identifiable. In its draft Vegetation Management Plan, FFP proposes to survey for federally listed plants and sensitive plant communities within the areas to be disturbed prior to land-disturbing activities, and based on the survey results, limit construction-related disturbance of the communities by flagging or fencing off sensitive areas and designating specific areas for work and equipment movement. Interior recommends, pursuant to section 10(j), that the surveys be conducted in both upland shrub-steppe and riparian areas, that the surveys be conducted twice prior to ground-disturbing activities, once early in the spring and once in mid-summer to ensure that both early and late-blooming sensitive plants are identified, and that all sensitive plants be documented and avoided.

FFP does not specify when its pre-construction surveys would be conducted, but states that it would cover all disturbed areas, which include both shrub-steppe and riparian habitats referenced by Interior. Conducting pre-construction surveys in the spring and early summer would improve the probability of identifying sensitive plants and defining measures that would avoid or minimize those effects as proposed by FFP. Because FFP does not specify the frequency of its proposed surveys, we cannot tell how much additional effort would be needed to conduct two surveys relative to FFP’s proposal. Assuming FFP only proposes one survey, we estimate it would cost \$20,000 (\$1,087 annualized) for the additional survey and find that the benefits of identifying and protecting these rare plants to be worth the added cost. Therefore, we recommend that the Vegetation Management Plan be modified to specify that FFP shall survey for both state and federal listed plants twice, once in the spring and once in the summer prior to beginning construction.

Revegetation and Wildfire Control

As part of its draft Vegetation Management Plan, FFP proposes to hydroseed all temporarily disturbed vegetated areas with a native upland seed mix developed in consultation with Washington DFW and follow guidelines described in Benson et al. (2011). Interior recommends that FFP use a native seed mix that includes species from locally adapted plants and that Washington DFW, Washington NHP, and Oregon DFW be consulted prior to replanting to confirm the appropriate seed mix. Interior also recommends supplementing the revegetation

⁷ See Klickitat PUD’s letter dated May 12, 2020, filed as appendix K to FFP’s license application. A copy of the 2011 Cliffs Water System plan was included with the letter.

effort with supplemental plantings of containerized plants or bareroot nursery stock (including plants of cultural or spiritual importance) if available. Interior also recommends including in the plan fire suppression measures that would be implemented during construction and operation to minimize potential damage to wildlife habitat. FFP does not propose any fire suppression measures in its application.

The seed mix proposed by FFP includes grasses and forbs used locally by the USDA Forest Service at the Columbia River Gorge National Scenic Area that are known to provide good soil cover, prevent erosion, and are used by wildlife. However, including other species such as shrubs or other species of traditional cultural importance in the planting mix (e.g., juniper, yarrow, *Lomatium* spp., *Eriogonum* spp., Juniper, and serviceberry) if they are available as suggested by Interior could further improve habitat for wildlife (e.g., forage, cover), offset the loss of culturally important plants, and better achieve the revegetation goals of establishing self-sustaining, resilient, reproducing populations. Because FFP has not finalized its seed mix, consulting with resource agencies and tribes on the appropriate seed mix and including shrubs and culturally important plants if available in its revegetation efforts would have a nominal additional cost and should be included in the plan.

The arid environment and increasing probability of drought (Washington CIG, 2009) increases the potential for wildfires during clearing and grubbing for project construction, which would create slash that could build up concentrations of combustible material that could fuel wildfire. Developing protocols for preventing and controlling wildfires during project construction and operation, including promptly removing slash and maintaining appropriate clearances along the project transmission line right-of-way, would help to protect terrestrial and other resources. Including such protocols in the plan is prudent and would not increase the cost of revising the plan. Therefore, we recommend that FFP include wildfire control measures in its Vegetation Management Plan.

We estimate that staff's additional measures would increase the cost of FFP's proposal by \$20,000 (\$1,087 annualized) and find that the benefits of protecting rare plants and replacing plants with importance to the tribes to be worth the cost.

Pre-Construction Wildlife Surveys

To minimize construction effects on wildlife, FFP proposes in its draft Wildlife Management Plan to (1) conduct 2-years of pre-construction surveys (two nesting surveys from February 1 to April 30 and third survey from June through first week in July to evaluate productivity) to document bald eagle, golden eagle, and prairie falcon nesting and bald eagle roosting sites (between December and February) within 1 mile of the project. Based on the surveys, FFP would develop appropriate spatial and temporal restrictions on construction activities (e.g., avoiding on or near-surface blasting and helicopter use within 0.25 to 1 mile of an active nest, depending on the species), and monitor any documented nests to ensure construction activities avoid disturbing the nests.

Prairie falcons are also known to nest on the steep bluffs between the proposed upper and lower reservoirs. Disturbance during construction could cause nest abandonment or reduce the survival of young if present. Including prairie falcon in its survey efforts would not increase

survey costs because they could be looked for during FFP's proposed survey efforts. Therefore, we recommend that FFP also survey for prairie falcons and develop appropriate mitigation and monitoring measures for nesting prairie falcons.

Pre-Construction Surveys for Dalles Sideband Snail, Juniper Hairstreak, and Monarch Butterfly

Washington DFW recommends that FFP conduct pre-construction surveys for Dalles sideband snail (*Monadenia fidelis minor*) and juniper hairstreak butterfly (*Callophrys gryneus*). Washington DFW did not specifically recommend these surveys pursuant to section 10(j). Washington DFW states that it only recently became aware that these species may be present in the area. FFP did not conduct surveys for these species.

Both the Dalles sideband snail and juniper hairstreak butterfly are candidates for state-listing in Washington. Habitat in the Columbia Basin for these species has generally decreased due to wildfire, conversion of grasslands to agriculture, and wind and solar power development; however, pockets of protected habitat remain in dissected canyons and public land areas. Habitat for both species could be affected by constructing the upper reservoir.

The monarch butterfly is a candidate for listing under the Endangered Species Act and its distribution includes the project area. It is unknown whether habitat for the butterfly would be disturbed during project construction.

Surveying for these species prior to construction would determine if they are present and inform the need for any additional protective measures, such as flagging to prevent disturbance, potentially relocating affected species, or revegetating disturbed areas with suitable plants. These surveys could be done at the same time as the rare plant surveys discussed above, therefore, there would be no additional cost to look for these invertebrates if the field crew is trained to look for both plants and invertebrates. Therefore, we recommend that FFP survey for these invertebrates prior to beginning construction and file a report with any recommended measures for their protection, if needed.

Wildlife Habitat Management for the Mitigation Lands

To mitigate for the permanent loss of wildlife habitat, FFP proposes to work with FWS and Washington DFW to select and purchase 277 acres⁸ off-site lands and manage the land to provide golden eagle nesting and foraging habitat. The lands would be in an area of known golden eagle and prairie falcon nesting habitat and would provide forage species that benefit these birds. FFP states it is working with Washington DFW and FWS to identify suitable lands and would select parcels based on the following criteria: the parcels would include a golden eagle nest and/or foraging habitat within 6 km of a known nest, exhibit a mix of foraging habitat

⁸ Acreage is based on a ratio of 2:1 acres for permanent loss of habitat for the upper reservoir (92.36 acres) and a ratio of 1:1 for the loss of habitat for the lower reservoir (91.8 acres) because of its poorer habitat quality.

characteristics such as topographic variation (big cliffs or slopes) and lower elevations intermixed with ponderosa pine, and ideally would be located adjacent to WDFW land.

Washington DFW recommends the development of a management plan for the mitigation lands and that the plan be approved by Washington DFW and FWS and be updated every five years to reflect new information, new management needs, and updated implementation strategies. Washington DFW states that the plan should include measures to control noxious weeds, manage public access to avoid disturbing raptors, wildfire mitigation such as replanting of burned areas with native species, fencing to protect and improve the habitat, and development of a wildlife water guzzler if there is an identified need for a source of water for wildlife. EPA recommends the development of detailed steps that would be used to ensure that the proposed 277 acres for mitigation is adequate to offset the potential impacts from the project, as well as the plan to acquire, manage and maintain the mitigation area over time.

Acquiring and managing 277 acres of off-site land for the benefit of golden eagles that meet the criteria proposed by FFP would offset the permanent loss of eagle foraging and nesting habitat at the project. FFP estimates it would cost \$485,000 to acquire the land and \$10,000 per year to manage the land. While FFP's estimated costs for acquiring the land seem reasonable, until the parcel(s) are identified, and the habitats evaluated, it is not possible to determine what specific habitat management would be needed to achieve the intended purposes or to accurately estimate the costs for implementing the measures. However, it is likely that some habitat management will be required. Based on our understanding of the lands surrounding the project this could include controlling noxious weeds, managing public access to avoid disturbing raptors, fencing, and installing a wildlife water guzzler as recommended by Washington DFW. We estimate that initial site habitat improvements will likely be higher than that estimated by FFP, but \$10,000 per year for management thereafter may be reasonable. Updating the plan every 5 years based on new information and changing conditions is also prudent.

Therefore, we recommend that FFP develop a management plan for the parcel(s). The management plan should identify the parcel(s) to be acquired, the habitat values of the land, the specific land management objectives, and the habitat improvements that would be implemented on the parcel(s). To continue to meet its objectives, the land would need to be monitored and management objectives and treatments updated periodically. Therefore, we also recommend including in the management plan, a schedule for reviewing and updating the plan. We estimate the initial habitat improvement costs and to prepare the plan with staff modifications would cost \$130,000 more than FFP's estimated cost. We find the benefits of managing these lands for golden eagles to be worth the annualized cost of \$7,441.

Wildlife Deterrent Management Plan

Washington DFW, Interior, EPA, Yakama Tribe, and TID are concerned that by constructing the upper and lower reservoir FFP would create 124 acres of open water that could attract waterfowl and waterbirds which are prey for golden eagles and other raptors, and a water and prey source bats. The increased attraction to the reservoirs could in turn expose golden eagles and other raptors to increased mortality from wind turbine strikes and bats to increased mortality from strikes and barotrauma.

FFP proposes to reduce the attraction of the project reservoirs to wildlife by (1) installing a chain link fence that is at least 8 feet high around the reservoirs to prevent animals from gaining access to the reservoirs; (2) marking all fences with vinyl strips and/or reflective tape to reduce avian collision risks; (3) preventing the establishment of vegetation around the reservoirs to reduce their attraction to wildlife; (4) covering the reservoirs surface with floating plastic shade balls to reduce the open-water habitat that could attract waterfowl, water birds and other raptor prey species; (5) monitoring for and removing carcasses of livestock and other animals from the project area that may attract scavenging wildlife, foraging eagles, or other raptors; (6) developing a monitoring program to identify bird and mammal usage of the reservoirs and measure the effectiveness of wildlife deterrents; and (7) developing an reporting system to document wildlife mortalities, injuries, nuisance activity, and other interactions.

Washington DFW is supportive of the protection measures proposed in FFP Wildlife Management Plan, but recommends pursuant to section 10(j), that a specific bird and bat reservoir deterrent management plan (Wildlife Deterrent Management Plan) be developed in coordination with Washington DFW, FWS, and the Yakama Nation. The objective of a Wildlife Deterrent Management Plan would be “no net increase of birds and bats in the upper and lower reservoir areas for the time period prior to reservoir construction compared to post construction.” The plan would include the measures proposed by FFP but would also include monitoring bird and bat use of the reservoirs before and after deploying deterrents. Monitoring information would be used to decide to maintain, increase, modify or explore other options of deterrents. An annual report would be required that (1) identifies methods used to deter birds and bat use of the reservoirs, (2) whether the methods are successful in achieving the objective of the Wildlife Deterrent Management Plan, and (3) future deterrent measures needed if the objective is not achieved. TID recommends that that a new study be conducted to establish baseline, pre-construction data regarding average golden eagle strikes over the past 25 years. Then, prospectively, for the life of the surrounding wind turbines, an annual study would be performed to determine whether the proposed project is causing an increase in golden eagle strikes, when compared to the baseline data.

The new project reservoirs would be constructed in an area that supports eagles and other raptors and is located near the John Day Waterfowl Area. Therefore, it is reasonable to conclude that golden and bald eagles, falcons, bats, and other wildlife are likely to be attracted to the project reservoirs if FFP’s proposed deterrents (use of shade balls, alteration of shoreline habitat to reduce the quality of habitat) are not successful. There is some data that shows that the use of shade balls reduces the attraction of birds to surface waters, but there is no information how effective they might be to deter bats.

FFP proposes to monitor bird usage of the reservoirs and measure the effectiveness of bird deterrents but does not propose to monitor bat use or address bat mortality from the wind turbines. FFP does not propose any monitoring methods.

Counting bird use before and after constructing the reservoirs and installing the shade balls as recommended by Washington DFW and Interior would provide a means to determine if there was a change in bird use. Taking steps to deter waterfowl and raptors from using the project reservoirs is prudent, particularly since the number of golden eagles in John Day dam population appear to be declining and because wind energy development has been implicated as

a factor in the decline of golden eagles in Washington (Watson et al., 2020, FWS 2015). However, an increase in bird use and risk does not necessarily indicate an adverse effect that requires further deterrents because interacting with adjacent wind turbines does not necessarily mean that injury and mortality events are inevitable. TID notes that their wind farm has experienced only one golden eagle strike since it was commissioned in May 2009. Therefore, if bird use increases, further monitoring of avian interactions with the adjacent wind turbines may be needed to determine if there would be a significant adverse effect on golden eagles and other birds. This could require bird fatality searches both before constructing the project reservoirs and after installing the shade balls using methods like those described by Smallwood and Karas (2009). However, the Commission does not have the authority to require access across non-project lands to conduct the searches and so permission from the landowner would be needed to access those lands. In the alternative, FFP could consult with the landowner on any observed mortalities on their land.

The current use of the project site by bats and the current mortality rates of bats from the wind turbines is unknown. Bats appear to be attracted to wind turbines for a variety of hypothesized reasons, including auditory, heat, and insect abundance.⁹ However, the reasons for such attraction are not known and could be for reasons other than foraging (de Jong et al. 2021). In addition, the project reservoirs could attract bats and increase their risk of collision with nearby wind turbines. Year-round acoustic monitoring of bat use prior to constructing the reservoir and after installing the shade balls as recommended by Washington DFW would allow FFP to determine if bats are attracted to the reservoirs by nighttime insect activity, water, or other factors, and whether the proposed use of floating shade balls is effective in deterring bat foraging above the reservoirs. If monitoring shows that bats are attracted to the reservoirs, then bat deterrent measures (e.g., acoustic deterrents such as those used at wind farms) may be needed. However, some measure of bat fatality rates before and after project construction would be needed to determine if the rate of mortality increases because of the new reservoir and is significant enough to require further mitigation measures. Conducting bat mortality searches such as those done by Smallwood and Karas (2009) on project lands would aid in that determination. Again, because the Commission does not have the authority to require access to non-project lands to conduct such searches, in the alternative, FFP could consult with the landowner on any observed mortalities on their land.

An effective monitoring plan would need to include methods for documenting bird and bat use before and after constructing and filling the reservoirs, metrics for evaluating the effectiveness of the deterrents in reducing the attraction of the project reservoirs by birds, bats, and other wildlife, and criteria for deciding whether additional deterrents or modifications to the project are needed. We estimate modifying the wildlife plan to include a detailed Wildlife Deterrent Management Plan that includes a year of pre-construction surveys for birds and bats and two years of surveys following the start of project operation with the proposed deterrents in place would have an annualized cost of \$3,590. The survey methods should include acoustic

⁹ See article titled Why Bats Are Insanely Attracted to Wind Turbines?. Available online at: <https://electrical-engineering-portal.com/why-bats-are-insanely-attracted-to-wind-turbines#:~:text=9%20Hypotheses%20for%20Bat%20Attraction%20to%20Wind%20Turbines,8%208.%20Forest%20Edge%20Effect%20...%20More%20items>. Accessed March 22, 2023..

monitoring to monitor bat species and point count surveys to monitor bird species. It should also include consulting with the TID on any bird and bat fatality observed at the wind farm. We conclude the benefits of the efforts in protecting golden eagles and bats are worth the cost.

These efforts should be sufficient to determine whether the project is causing an increase in risk to eagles without requiring developing a baseline study and conducting annual monitoring for the life of the license as recommended by TID at an annualized cost of \$21,087. However, a potential outcome of the initial monitoring efforts could be recommendations for further monitoring.

Avian Protection Measures for the Project Transmission Line

The project would require constructing a 3.13-mile-long, overhead 500-kV transmission line. To minimize avian electrocution and collision hazards with the project transmission line, FFP proposes in its draft Wildlife Management Plan to ensure that the transmission line is sited on BPA's existing poles so that there is 40 inches or more of vertical clearance and 60 inches or more of horizontal clearance between energized conductors or energized conductors and grounded hardware. If the existing transmission lines already have visibility enhancement devices installed, no new ones will be added. If no visibility enhancement devices are on the existing lines, then FFP would install appropriate devices after proposes to construct consultation with the FWS and Washington DFW. Any new poles and lines will be designed with appropriate conductor spacing and visibility enhancement devices.

Interior recommends pursuant to section 10(j) that FFP develop an avian protection plan that requires constructing transmission structures according to bird protection standards and guidelines consistent with "Avian Protection Plan Guidelines" (APLIC, 2005), "Suggested Practices for Raptor Safety on Power Lines: The State of the Art in 1996" (APLIC, 1996), and Reducing Avian Collisions with Power Lines: The State of the Art in 2012.

FFP's proposed construction design measures are already consistent with these guidelines. However, FFP's measures do not include measures for documenting and reporting bird mortality and addressing problem poles. Developing an avian protection plan that includes monitoring and reporting procedures and addressing identified problem poles would be consistent with APLIC guidelines and better protect birds from electrocution and collision hazards. We estimate it would cost \$2,544 (annualized) to develop this plan and find that the benefits are worth the cost.

Recreation and Visual Resources Management Plan

Construction-related traffic would increase the volume of traffic on John Day Dam Road, which could create some delays for those recreationists trying to reach Corp's Cliffs Park and Railroad Island Park, tribal members trying to reach a BIA treaty fishing access site next to the Corps Railroad Island boat launch, and Corp personnel trying to reach or leave John Day Dam via this road. FFP proposes as part of its recreation and visual resources management plan to coordinate construction schedules and any associated road closures with Washington DOT and Klickitat County to prevent interruption to recreational traffic. FFP states "where temporary

disturbance to identified recreational resources are significant and unavoidable, mitigation measures will be identified and implemented.”

Coordinating with the Corps, BIA, and tribal governments (e.g., through the Columbia River Inter Tribal Fish Commission), in addition to the county and Washington DOT, would alert tribal members and Corp personnel at the John Day Dam to potential delays and closures, and minimize disruptions to treaty fishing rights and the Corps operations. Coordinating with these additional entities would not increase the cost of developing FFP’s proposed recreation and visual resources management plan.

Historic Properties Management Plan

Project construction would directly and indirectly adversely affect the five individual archaeological resources, the larger Columbia Hills Archaeological District, and the three TCPs (*Pushpum*, *Nch’ima*, and *T’at’aliyapa*). Direct effects include the destruction and removal of five archeological sites. These sites, consisting of lithic scatters and rock features, are not uncommon, but are eligible for listing on the National Register. They also represent a significant part of the Yakama and other tribal traditions and are contributing elements to the Columbia Hills Archaeological District and the TCPs. Indirect effects include additional permanent alterations to the viewshed (e.g., numerous wind turbines, John Day Dam, CGA smelter, transmission lines) that changes the setting and feeling of the TCPs and could alter the Yakama’s and other spiritual and cultural practices.

To mitigate these effects, FFP proposes to more fully develop an Historic Properties Management Plan (HPMP) in consultation with the Washington SHPO and the affected tribes. On January 25, 2022, FFP filed a draft HPMP. The draft HPMP provides a basic summary of cultural resources, including TCPs, the results of National Register evaluations and assessment of effects, and includes the following general management measures: (1) steps to designate a cultural resources coordinator; (2) procedures for review of activities requiring ground disturbance and a list of activities exempt from review; (3) procedures for reviewing activities with the potential to result in effects to historic properties, including additional surveys and/or expansion of the project APE as appropriate; (4) requirements for additional consultation with the SHPO(s); (5) plans for unanticipated discovery of archaeological resources and human remains; (6) requirements for annual reporting; (7) requirements for regular HPMP review and amendment; and (8) procedures for dispute resolution.

The Yakama state that no form of mitigation is acceptable because the archaeological sites and adverse effects to the TCPs are irreplaceable. The Conservation Groups recommend that FFP develop a cultural resources management plan in consultation with and with the approval of all affected Tribes that includes all tribal recommendations and ensures Tribal member access to the area for gathering purposes is not hindered, encumbered, or otherwise interfered with.

The HPMP does not identify the specific measures that would be implemented to mitigate the significant adverse effects to cultural resources that are valued by the Yakama, Umatilla, and Nez Perce. Instead, it includes general measures that would be implemented during operation to manage cultural sites, including procedures for addressing newly discovered

sites. FFP defers to post-licensing the selection of the final mitigation measures and offers some conceptual measures that are intended to facilitate subsequent consultations with the tribes.

Because site development would result in the complete removal of the five archeological sites, data recovery and curation would be the only option available to mitigate their loss.

Therefore, staff recommends that FFP revise the HPMP to include specific treatment measures for all affected archeological sites and TCPs. The treatment plans should include research design and site-specific data recovery or other agreed-upon treatment plans, including analysis, recordation, and curation, and specific plans for construction site monitoring. Construction site monitoring should include (1) identifying the specific areas that will be monitored during construction; (2) the location of the National Register-eligible cultural sites to be avoided and how they will be marked and avoided where possible; and (3) protocols for training construction workers on the importance of cultural sites, how to identify cultural sites, the need to avoid damage to cultural sites, and procedures to follow if previously unidentified cultural sites, including Indian graves, are encountered during construction.

Staff further recommends that the revised HPMP be implemented prior to any ground-disturbing actions that would destroy the sites. Revising the HPMP as staff recommends would entail further data recovery and recordation than that proposed by the applicant. We estimate that the recommended additional field testing and curation and construction monitoring recommended by staff would have a levelized annual cost of \$51,701 and find that these efforts would be needed to mitigate for adverse effects to the archaeological sites eligible for the National Register.

Staff also recommend that the HPMP be developed in consultation with the Washington SHPO, Council, the corps, and affected tribes. While FFP might develop additional measures to address adverse effects on the TCPs, there is insufficient information to determine what those measures might be or if any would be acceptable to the tribes. Therefore, we cannot evaluate their benefit or costs. Consequently, we do not recommend that the plan include all the measures recommended by the affected tribes as suggested by the Conservation Groups.

Measures Not Recommended by Staff

Some of the measures recommended by Interior, NMFS, Washington DFW, TID, Yakama Nation, and the Environmental Groups would not contribute to the best comprehensive use of the Columbia River water resources, do not exhibit sufficient nexus to project environmental effects, or would not result in benefits to non-power resources that would be worth their cost. The following discusses the basis for staff's conclusion not to recommend the measures.

Post-licensing Adaptive Management Plan

The Environmental Groups recommend that FFP develop an adaptive management plan that coordinates post-licensing monitoring and adaptive management measures as necessary to ensure license conditions are meeting previously established measurable objectives and otherwise performing as forecasted over the term of the new license. Such a plan must include

specific provisions for reopener in the event the project is not meeting measurable objectives as intended.

The Environmental Groups recommendation is vague. FFP's proposed plans already include monitoring efforts that provide a mechanism to review the results and implement additional measures if warranted. Where they are not specific (e.g., bird and bat detection plan), we recommend including in the monitoring plans specific metrics to evaluate the effectiveness of the protection measures.

Moreover, should the fish and wildlife agencies become aware of an unforeseen circumstance regarding project effects on fishery or wildlife resources during the term of any license issued for the project, Commission licenses include a standard license article that provides the agencies the opportunity to petition the Commission to reopen the license to consider additional mitigation measures, after notice and opportunity for hearing. For these reasons, we have no basis for recommending a post-license monitoring and adaptive management plan.

Effluent Discharges

To control erosion and sedimentation, manage stormwater and hazardous materials during construction, and manage non-stormwater discharges (i.e. dewatering activities and groundwater) during construction, FFP proposes to develop a soil erosion control plan and implement its draft Spill Prevention Plan, draft Stormwater Management Plan, and draft Dewatering Plan. The plans would contain specific measures and protocols to prevent discharges to the Columbia River and other surface waters during construction. Further, FFP would monitor and report water quality conditions in project reservoirs to determine the need for additional measures to protect water quality during operation as part of its proposed draft Reservoir Water Quality Monitoring Plan.

NMFS recommends pursuant to section 10(a) that the license prohibit FFP from releasing any effluent discharge into the Columbia River at any point during project construction or operation and, if discharges are necessary, that NMFS be consulted. FFP states that it does not anticipate the need to release effluent discharge into the Columbia River, as the project has been designed to avoid the need for these types of discharges.

FFP does not intend to discharge effluents into the Columbia River during project construction. Standard BMPs that would be implemented under FFP's plans are routinely implemented at projects requiring new construction and would be adequate at preventing unintended discharges to the Columbia River during construction to the extent practicable. Further, because the project would be operated as a closed-loop pumped storage project, no discharges to the Columbia River are anticipated during project operation. Therefore, it is not necessary to include a license condition expressly prohibiting effluent discharges.

Timing of Water Withdrawals

The proposed construction and operation of the Goldendale Project would require 7,640 acre-feet of water to initially fill the upper and lower reservoirs. Annual refill in the amount of 360 acre-feet would be needed to make up for evaporation and leakage. In place of constructing

water supply infrastructure, FFP instead proposes to purchase the needed water from Klickitat PUD's adjacent water supply facility. Klickitat PUD's facility withdraws water from the Columbia River. The water purchased for the Goldendale Project would not require Klickitat PUD to obtain new appropriations of water from the Columbia River as they would be purchased under Klickitat PUD's existing water right. FFP expects that it would take 6 to 12 months to initially fill the reservoirs based on Klickitat PUD's average delivery rate of 21 cfs and up to a maximum rate of 35 cfs, consistent with its water agreement with Klickitat PUD. FFP states it has some temporal flexibility in receiving make-up water each year from Klickitat PUD, because refill could be accomplished once per year or through multiple shorter withdrawals throughout the year.

NMFS recommends pursuant to section 10(j) that FFP not use water withdrawn from the Columbia River for the initial fill any time from March 15 through October 15 and not use periodic make-up water from the Columbia River any time from March 1 through November 1 to ensure there are sufficient Columbia River flows for out-migrating juvenile salmonids. NMFS states that Columbia River flows have been greatly diminished by a host of human activities and that the proposed water withdrawals would represent additional "substantial reductions to river flow." Further, NMFS believes that restricting the timing that FFP receives water would "help quell NMFS' concerns regarding the potential entrainment of ESA-listed salmonids in KPUD's intake pool."

Our analysis in section 3.3.3.2, *Fisheries Resources, Environmental Effects*, shows that ESA-listed anadromous salmonids migrate past the project from March through September each year but even if FFP were to receive water withdrawn by Klickitat PUD to fill the reservoirs during these months, the maximum rate at which FFP would receive the water (i.e., 35 cfs) represents approximately 0.03% of the median flow in the Columbia at the location Klickitat PUD would withdraw the water and 0.08% of the lowest Columbia River flow on record at this location. The volume needed for initial fill (7,640 acre-feet) represents approximately 0.01% of the median volume of water expected to pass through the Columbia River at this gage in a year and 0.02% of the minimum volume of water passing through at this location based on the period of record. The estimated 360 acre-feet needed each year for annual make-up water would be 0.0004% of the median volume of water passing through the Columbia River at this gage location in a year and 0.001% of the minimum volume of water passing through at this location based on the period of record. While these withdrawals would add to the losses occurring from irrigation and other withdrawals in the basin, they are relatively small, temporary (for initial fill) or periodic (for annual refill) withdrawals that are not expected to impede ESA-listed salmon smolt migration due to their relatively negligible amounts. We estimate NMFS' estimated timing restriction would likely delay filling the reservoir by approximately 11 months compared to FFP's proposal. We estimate that the levelized cost of delaying its initial fill and commencement of commercial operation would be \$32,248,410 and conclude that avoiding any type of project-related withdrawal by Klickitat PUD during the fish passage season would not be worth the costs. For these reasons, we do not recommend timing restrictions for filling the reservoirs.

Anadromous Fish Surveys in the Intake Pool

The source of water for the project would be Klickitat PUD's water supply facility which includes a pumping station that draws water from an "intake pool" separated from the Columbia River by a railroad embankment. According to Klickitat PUD, water is drawn into the "intake pool" from the Columbia River via seepage through the rock and gravel filled embankment. There is at least one culvert, possibly two, through the railroad embankment that may provide periodic fish passage into the pool from the Columbia River. Water flows about 30 feet from the intake pool through an infiltration gallery containing clean gravel to six vertical pumps installed 20 to 30 feet deep and in 48-inch diameter perforated casings.

NMFS states that while it has no evidence that ESA-listed salmon are regularly entering the intake pool, the culvert within the railway berm is likely submerged during the juvenile salmon smolt migration window of March through September and thus may provide passage for some ESA-listed fish to enter and subsequently become entrained within the intake pool and possibly encounter Klickitat PUD's pump station. To determine if screens meeting NMFS's criteria are needed, NMFS recommends pursuant to section 10j that FFP conduct a fry and juvenile entrainment survey within the intake pool.

The culvert end on the intake pool side is believed to be at 265 feet mean sea level (MSL) and the culvert end on the Columbia River side is believed to be at 255.2 feet MSL. The John Day Dam forebay is currently operated between 260 and 265 feet mean sea level (MSL) from November to June and operated between 265 and 268 feet MSL from July to October. We do not know what the infiltration rate into the pool is or how Klickitat PUD withdrawing 35 cfs to be sold to FFP to be used for the project might affect pool levels. Withdrawing water at a rate of 35 cfs is consistent with Klickitat PUD's existing water right and thus should not alter their existing operations and any associated effects on aquatic resources. If water levels in the pool drop below 265 feet, the culvert on the intake pool side may no longer be submerged until the water level rises again. In this case, any fish in the intake pool would only be able to re-enter the Columbia River through the railway berm. Based on the above operating levels for the John Day Dam forebay, this scenario is more likely during the months of November through June when John Day forebay water levels typically fluctuate between 260 to 265 feet.

In general, surveying for ESA-listed fry and juvenile fish in the intake pool during their migration period (March to September) would help to determine if they are entering the pool. However, even if they are periodically entering the intake pool, which is possible given the culvert elevations and John Day reservoir levels, it is unlikely that they would become entrained through Klickitat PUD's infiltration gallery. As discussed further in the next section, this is because fry and juveniles must pass through 30 feet of gravel to become entrained within Klickitat PUD's water delivery system, which due to the 30-foot thickness of the gravel, should be nearly impenetrable to even fry.

We estimate that conducting the fry and juvenile surveys would have a levelized annual cost of \$4,078. However, because the project would not cause Klickitat PUD to alter existing operation and fry are unlikely to become entrained into Klickitat PUD's water delivery pipes, we do not have sufficient rationale for recommending the surveys and therefore conclude, the information to be obtained from the surveys would not be worth the cost.

Intake Fish Screen

Klickitat PUD's existing pump station is located on the western shoreline of the intake pool, approximately 350 feet from the railway berm. It consists of a large infiltration gallery within an excavated channel approximately 28 feet deep and 93 feet wide containing six pumps in 48-inch diameter perforated casings surrounded by approximately 2,400 cubic yards of clean gravel. Water infiltrating the gravel is pumped up and enters Klickitat PUD's water conveyance pipes that currently service the former smelter cleanup site. When filling the reservoir, FFP would purchase water from Klickitat PUD who in turn would utilize its existing facilities to convey water from the infiltration gallery to a water supply vault approximately 2 miles north and west of the intake infiltration gallery where it would be conveyed to the project's lower reservoir via a new reservoir fill line.

Interior recommends pursuant to section 10(j) that FFP install and maintain fish screens on Klickitat PUD's intake works to meet NMFS and Washington DFW screening requirements. The Environmental Groups also recommend installing fish screens that meet or exceed NMFS and Washington DFW screening requirements. Washington DFW recommends that if Klickitat PUD's infiltration gallery fails, Klickitat PUD's infiltration gallery should be made to conform to NMFS's and Washington DFW fish screen criteria.

Both FFP and Klickitat PUD state that the infiltration gallery prevents fish entrainment from the intake pool into the pump station; thus, additional pump intake screening is not warranted.

Our analysis in section 3.3.3 indicates that even if fry and juvenile anadromous fish can enter Klickitat PUD's intake pool, it is unlikely that they would become entrained through the infiltration gallery and ultimately, into the project's reservoirs. This is because fry and juveniles must pass through 30 feet of gravel, which should be nearly impenetrable to even fry.

There is not enough design information on the Klickitat PUD's existing pump station to estimate how much it would cost to add fish screens to the existing infiltration gallery to further minimize the possibility of entrainment. Nevertheless, available information suggests that it is unlikely salmon fry and juveniles would become entrained through Klickitat PUD's infiltration gallery, thus we do not have a sufficient reason to recommend screening these structures. Further, unless we determine in the license order that these structures should be licensed, we would not have the authority to require screens on Klickitat PUD's pump station.

For these reasons, we do not recommend that FFP add fish screens or modify Klickitat PUD's existing pump station to meet agency screening criteria.

In-channel Project Construction

NMFS recommends pursuant to section 10(j) that FFP not place permanent structures or impoundments in the Columbia River or pile drive in the Columbia River anytime between 1 March and 1 November to protect juvenile and adult migrants from high intensity sounds and predation from new structures that would afford fish predators additional vantage points that would not be there otherwise.

FFP does not propose any in-channel structures or pile-driving during project construction. Instead, the project transmission line would utilize an available space on the existing BPA transmission structures that cross the Columbia River to connect with the John Day Substation in Oregon. Thus, no in-water work or new structures are proposed or required in the Columbia River. Therefore, we have no basis for recommending a license requirement that restricts placing permanent structures or impoundments in the Columbia River or restricts pile driving.

Wind Study

TID asserts that construction and operation of the proposed project could interfere with or reduce the output of its wind turbines. TID believes that the change in topography following the construction of the project reservoirs would cause a change in wind patterns, speed and turbulence that could reduce the output of the turbines and damage the turbines. TID recommends that FFP conduct a more robust wind analysis study that comports with industry practices and uses a multiple year data set to examine how the project would affect wind direction and stresses on its turbines.

FFP states that its wind analysis study reasonably demonstrates that project operation would not substantially alter wind patterns and opposes conducting further studies.

FFP contracted ERM (2021) to evaluate the changes in wind speed and direction and turbulence that would result from constructing the upper reservoir on the operation of the 15 turbines closest to the proposed upper reservoir, with a focus on the two closest to the upper reservoir (turbines 17A and 17B). The WRF model shows some increases and decreases in wind and TKE, but the average change would be near zero. Wind speed and direction changes, on average, are also close to zero at the locations of all turbines (ERM, 2021). The WRF model suggests, with reasonable certainty, that there would be only minor changes in wind and turbulence due to the presence of the upper reservoir.

For these reasons, we believe that construction and operation of the pumped storage project would have no measurable effect on the adjoining wind farm's operation and do not recommend further studies at an annualized cost of \$63,806.

**APPENDIX H – FISH AND WILDLIFE AGENCY SECTION 10(J)
RECOMMENDATIONS**

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Table H-1. Fish and wildlife agency recommendations for the Goldendale Project (Source: staff).

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
Include KPUD’s water pump station and intake pool within the project boundary and file revised project boundary exhibits	Washington DFW; Interior	No. Filing project boundary exhibits are an administrative matter, not a specific fish and wildlife measure.	\$0	A determination on whether the pump station and intake pool should be part of the license will be made in the license order.
If KPUD’s current infiltration gallery in the intake pool fails and needs repair, the infiltration gallery should be made to conform to NMFS and Washington DFW fish screen criteria.	Washington DFW	Yes, if the infiltration gallery is determined by the Commission to be a project facility.	Unknown. Costs would depend on engineering details that are not available	No. ^b No evidence that it is needed
Install and maintain fish screens on the project intake works (i.e., the Klickitat PUD’s infiltration gallery) in consultation with NMFS, FWS, and Washington DFW that meet NMFS and Washington DFW screening requirements including meeting or exceeding NMFS salmonid criteria for approach velocities and screen size; install a bubbler system to monitor the pressure drop both inside and outside the fish screens and automated cleaning system (automated air burst system) to blow air onto the screens to backflush and knock any debris off the screen surface; and install intake alarms to be notified of operational problems with the intake and screens.	Interior	Yes, if the infiltration gallery is determined by the Commission to be a project facility	Unknown. Costs would depend on engineering details that are not available	No. ^b

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
If operational problems with the intake and intake screens are identified and result in harm to fish, develop in consultation with a plan to improve intake screens and/or develop solutions to direct fish species away from the project intake.	Interior	No; future modifications to project structures would be a license amendment action. Section 10(j) only applies to the initial licensing of the project.	Unknown. Costs would depend on engineering details that are not available	No. ^b
Conduct a fry and juvenile entrainment survey in KPUD's intake pool within 12 months of license issuance	NMFS	No; this is a study that could have been done pre-filing	\$4,078	No. ^a
Avoid receiving water from KPUD for initial fill any time between March 15 and October 15 and for periodic make-up water at any time between March 1 and November 1 to ensure sufficient flows in the Columbia River for out-migrating juvenile salmonids	NMFS	Yes.	\$ 32,248,410	No. ^a
Avoid placing permanent structures or impoundments associated with the project transmission line in the Columbia River which can attract fish predators	NMFS	Yes.	\$0	No. ^b
Avoid underwater pile driving in the Columbia River anytime from March 1 through November 1 to protect juvenile and adult fish from high intensity noise produced by pile driving	NMFS	Yes.	\$0	No. ^b
Develop within 1 year of license issuance a bird and bat reservoir deterrent management plan that includes measures such as using	Washington DFW	Yes.	\$3,590 ^c	Yes.

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
shade balls to deter birds from using reservoirs, using acoustic bat deterrents to deter bats from using reservoirs, conducting acoustic monitoring of bats and point count surveys to monitor bird use in reservoirs year round, and provide an annual report to Washington DFW, FWS, Yakama Nation, and FERC.				
Develop within 1 year of license issuance a management plan for the conservation of the golden eagle lands that includes the following measures: ensure mitigation lands are located in an area of known golden eagle and prairie falcon nesting habitat and provide forage species that benefit these birds; control noxious weeds; manage public access to avoid disturbing raptors; wildlife mitigation measure such as replanting or burned areas with native species; fencing to protect and improve the habitat; and development of a wildlife water guzzler if there is an identified need for a water source. Update the plan every 5 years	Washington DFW	Yes.	\$7,441	Yes.
Develop and file within 1 year of license issuance and prior to onset of ground-disturbing activities an avian protection plan that includes the following: conducting preconstruction surveys for birds, nests or roosts; establishing buffers for construction activities; constructing transmission structures	Interior	Yes.	\$2,544	Yes.

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
<p>according to bird protection standards and guidelines; adjusting lighting systems to minimize disruption of nighttime foraging; marking fencing around the reservoirs to prevent avian collisions; ensure adequate insulation and other necessary measures to protect raptors from electrocution hazards; retrofit or rebuild power poles involved in a bird fatality in accordance with the most recent guidelines for avian protection (i.e. APLIC standards) to increase safety for large perching birds; and a provision to install bird flight diverters on any new transmission lines; update the plan as needed through adaptive management in consultation with the agencies</p>				
<p>Modify the proposed Vegetation Management and Monitoring Plan to include the following additional measure: perform two preconstruction surveys (once in the early spring and once in the mid-summer including within upland shrubsteppe and riparian areas) to identify and document any state or federally listed threatened, endangered, or sensitive plants within areas to be disturbed; invite Washington DFW, Oregon DFW, Washington National Heritage Program, and FWS to participate in the preconstruction surveys to assist in identifying botanical resources and plan avoidance measures; revegetate disturbed areas with native seed mix using locally</p>	Interior	Yes.	\$1,087	Yes.

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Adopted?
<p>adapted genetic materials and consult with the resource agencies prior to replanting including conducting supplemental plantings in applicable seasons if plants of cultural or spiritual importance are found; monitor all revegetated areas annually for five years and re-treat and re-monitor areas as needed; control Class A noxious weeds using appropriate mechanical, biological, and chemical treatments; and implement fire suppression measures during construction and operation to minimize potential damage to wildlife habitat.</p>				

- ^a Preliminary finding that recommendations found to be within the scope of section 10(j) are inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA are based on our determination that the costs of the measures outweigh the expected benefits.
- ^b Preliminary finding that recommendations found to be within the scope of section 10(j) are inconsistent with the substantial evidence standard of section 313(b) of the FPA.
- ^c Additional levelized cost for conducting bird and bat surveys. Remaining measures are proposed by FFP and included in its costs for developing and implementing the Wildlife Management Plan (\$965,846 levelized cost).

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APPENDIX I – LIST OF COMPREHENSIVE PLANS

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Section 10(a)(2)(A) of the FPA, 16 U.S.C. §803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with the federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed 69 comprehensive plans for the states of Washington and Oregon that are applicable to the Goldendale Project. No inconsistencies were found. The following plans were reviewed:

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