Chief Joseph Dam Turbine Runner Replacement
Bridgeport, Douglas County, Washington
Draft Environmental Assessment
January 30, 2005

Responsible Agency: The responsible agency for this project is the Seattle District, U.S. Army Corps of Engineers (Corps).

Abstract: This draft environmental assessment evaluates the potential impacts of the proposed replacement of up to 16 turbine runners at Chief Joseph Dam near Bridgeport, Washington. The proposed work would start in 2008 and conclude in 2014.

THE OFFICIAL COMMENT PERIOD ON THIS ENVIRONMENTAL ASSESSMENT ENDS ON MARCH 1, 2006.

This document is available online under Chief Joseph Dam Runner Replacement at:
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DRAFT ENVIRONMENTAL ASSESSMENT
for
TURBINE RUNNER REPLACEMENT
at
CHIEF JOSEPH DAM, BRIDGEPORT, WASHINGTON

January 30, 2005

US Army Corps
of Engineers ®
Seattle District

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BPA: Bonneville Power Administration
CCT: Colville Confederated Tribes
CFR: Code of Federal Regulations
cfs: cubic feet per second
DPS: distinct population segment
EFH: Essential Fish Habitat
ESA: Endangered Species Act
FCRPS: Federal Columbia River Power System
NEPA: National Environmental Policy Act
POV: privately-owned vehicle
SR: State Route
TDG: total dissolved gas
US: United States
USC: United States Code
USGS: United States Geological Survey

1. INTRODUCTION

The United States (US) Army Corps of Engineers (Corps) proposes replace up to 16 turbine runners at Chief Joseph Dam located near Bridgeport, Washington. In accordance with the National Environmental Policy Act (NEPA; 42 USCA §§ 4321-4370e, Sec. 102(C)), this environmental assessment examines the potential impacts of the proposed project and alternatives.

2. BACKGROUND

2.1. Project Location

Chief Joseph Dam is located on the main stem Columbia River in north central Washington and about 545 miles upstream from the river mouth. The powerhouse is located on the south side of the dam, the spillway on the north. The reservoir impounded by the dam is named Lake Rufus Woods.

2.2. Project Authority

The proposed project is authorized under the National Energy Policy Act 1992, Section 2406. Under this authority, the Corps and Bonneville Power Administration (BPA), a federal department under the U.S. Department of Energy, signed subagreement #00GS-75057 to determine appropriate capital investment decisions regarding turbine upgrades.

2.3. Need and Purpose

Since completion the original construction of Chief Joseph Dam in 1958, several significant changes have affected project performance by modifying the design conditions for the turbines in Units 1 through 16. These changes include 1) tailwater rise due to construction of Wells Dam, located about 30 miles downstream, in 1967; 2) addition of Units 17 through 27 to the powerhouse between 1977 and 1979; 3) a 10-foot pool raise in 1981; 4) deterioration of the runners associated with 50 years of use; and 5) generator rewinding of Units 1 through 16 in the 1980s. With these changes, Units 1 through 16 cannot achieve nameplate generation capacity during high flow conditions and they require extensive maintenance to repair cavitation damage on a recurring basis.

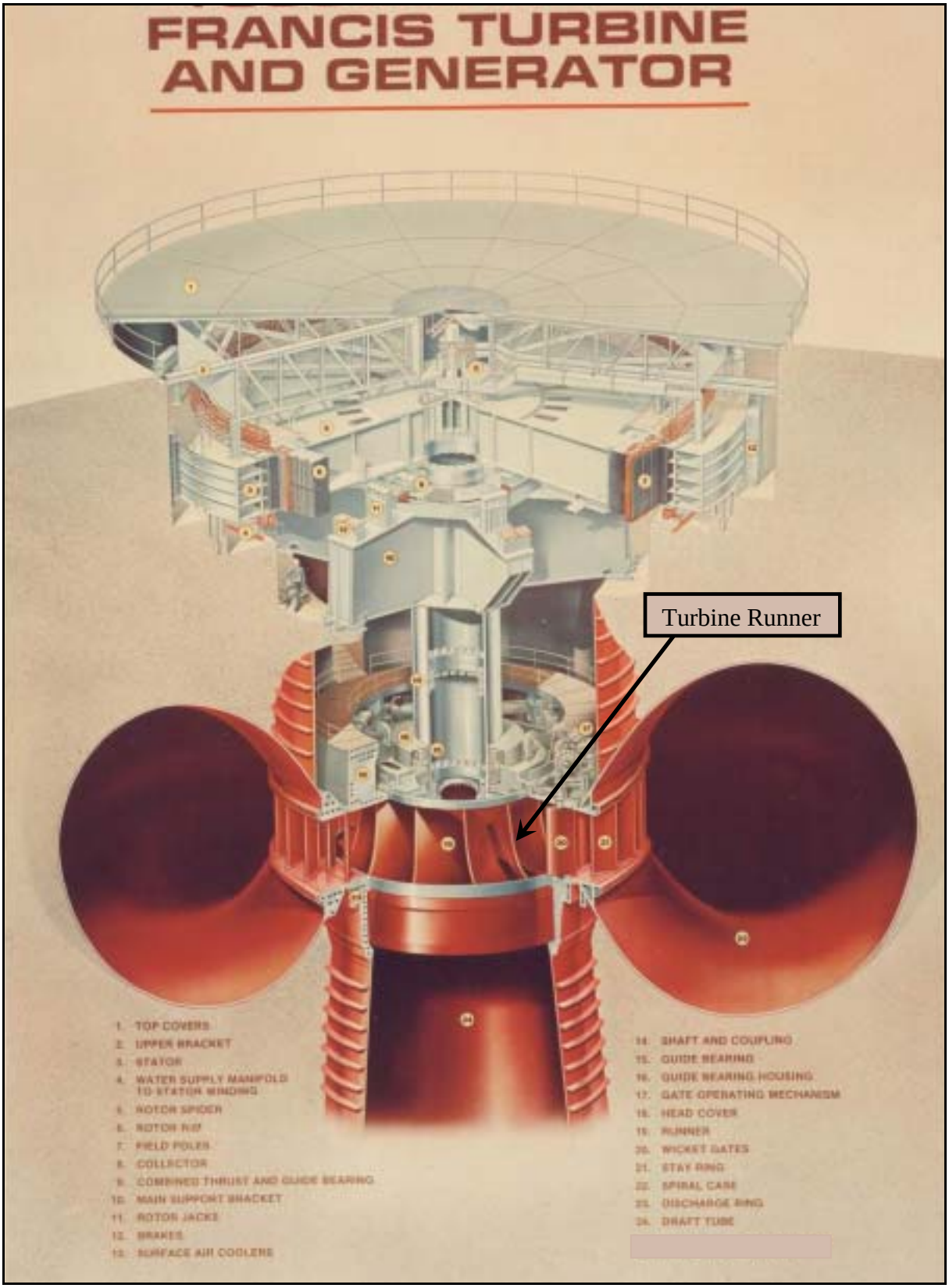
Under normal operating conditions, the existing Chief Joseph Powerplant cannot reach its installed nameplate generating capacity of 2,614 megawatts and recent turbine performance tests have shown that degradation in efficiency has occurred (Corps and BPA 2005). The purpose of the proposed work is to increase the overall efficiency of hydropower generation at Chief Joseph Dam to allow the powerplant to produce the installed nameplate capacity and increase annual energy production.

3. ALTERNATIVES

3.1. Background

The Chief Joseph Powerplant includes 27 main units and 2 station service units. The existing units at Chief Joseph Dam all have Francis turbines (Figure 1). The original 16 units were

Figure 1. Schematic of a Francis Turbine and Generator



brought online between 1955 and 1958. Eleven additional units (17 through 27) were added between 1977 and 1979. Generators on Units 1 through 16 were upgraded between 1983 and 1988 by rewinding the generators, upgrading transformers, and ancillary equipment. With these upgrades, the capability of generators 1 through 16 now exceeds the capability of the existing turbine runners for these units. In addition, testing has revealed that there is substantial degradation of the efficiency of the turbines for these units due to normal wear.

The Chief Joseph powerhouse is divided into three "families" of units. The first family, units 1 through 4, 15, and 16, is identical in design and manufactured by S. Morgan Smith Company. The second family, units 5 through 14, is identical in design and manufactured by Newport News. The third family, units 17 through 27, was manufactured by Hitachi and is relatively new.

3.2. No Action Alternative

Under the "No Action Alternative," the existing turbine runners (Figure 2) would remain in place and the generation capacity and efficiency of the power plant would continue to deteriorate due to increased frequencies of unscheduled and scheduled outages.[1] Reliability would decrease. The "No Action Alternative" would not meet the need and purpose of the project.

3.3. Preferred Alternative

The proposed project, which is the preferred alternative, consists of replacement of turbine runners in Units 1 through 16. Replacement of the turbine runners would use design criteria reflecting current operating conditions and would allow full generator capacity and efficiency to be optimized under the most probable hydraulic conditions. Units 17 through 27 are not subject to the proposed action since those units are relatively new and designed to operate efficiently under the current project conditions.

The proposed work would require separate testing of scale model runners and appurtenances for both the Newport News and S. Morgan Smith units. Following successful scale model testing, full scale prototype runner replacements would be installed in one of each of the two unit families at Chief Joseph Dam for full-scale field performance tests. If the prototype units meet contracted hydraulic performance criteria, runners on the remaining units of each family would be replaced.

The proposed project schedule has work commencing on the Newport News units, after which work, including model and prototype work, would commence on the S. Morgan Smith units. The first full scale new runner is scheduled for installation for the summer and fall of 2008. After successful prototype tests, replacement runners would be installed at a rate of up to four runners each year. Runner installation could occur on up to two units at a time. Each runner installation would take up to 6 months. Runner replacement on all 16 units is scheduled to be complete by the end of 2014. To the maximum possible extent, work on the units would be scheduled to fit within existing maintenance schedules for units at the project, but the time

[1] Under the current conditions, the level of deterioration of efficiency and capacity of the units has created a high enough economic rate of return to justify runner replacement. Additional deterioration would serve to increase the economic justification for replacing the runners.

required for runner installation would be about four months longer than the typical routine maintenance period for each unit.

To replace the runners, the units would be disassembled to access the turbines. The existing turbine runners would then be removed and transported to a staging area where they would be dismantled. The parts would either be recycled or disposed at approved landfills. New turbine runners would be shipped from the manufacturer by truck (or potentially by rail) to Chief Joseph Dam.

After installation, the new turbine runners would be expected to last about 50 years.

Figure 2. Turbine Runner at Chief Joseph Dam (pulled from unit housing)

4. EXISTING CONDITIONS

The existing conditions at and near Chief Joseph Dam have been recently reported in detail in previous environmental assessments on the Chief Joseph Dam Dissolved Gas Abatement Project (Corps, 2000; Corps 2005a). These documents are hereby incorporated by reference and should be referred to for information about the existing conditions relating to climate, physical and geologic environment, biological resources (except fish and aquatic organisms), cultural resources, flood control, and recreation. The following section provides additional pertinent details specific to the proposed turbine runner replacement work.

4.1. Hydrology

Chief Joseph Dam is a run-of-river project with limited capacity for water storage that operates to pass project inflows on a daily basis (i.e. the daily dam discharge volume is roughly equivalent to the daily volume of water flowing into Lake Rufus Woods). The hydraulic capacity of the powerhouse is 219,000 cubic feet per second (cfs). The project operates in a forebay elevation

range of 950 to 956 feet.[2] The limited flexibility in the Chief Joseph forebay elevation allows for storage of higher inflows into the reservoir on a short-term basis, which helps provide flow re-regulation of discharges from Grand Coulee Dam (located about 60 miles upstream). Mean daily flows at Bridgeport range from just more than 70,000 cfs during October to about 200,000 cfs during June. Between 1952 and 2004, the peak gauged streamflow of 488,000 cfs occurred in June, 1956 (USGS 2005).

4.2. Water Quality

Under the Washington State 1997 version of the water quality standards for surface water, the Columbia River is classified as a Class A (excellent) surface water from Grand Coulee Dam to its mouth (WAC 173-201A-130). The Colville Confederated Tribes (CCT) classify Lake Rufus Woods as a Class I (extraordinary) water body and the Columbia River below Chief Joseph Dam as a Class II (excellent) water body.

Surface water temperatures in the Columbia River in the vicinity of Chief Joseph Dam typically range from just above freezing during the winter to about 20°C during the late summer.

Spill at Chief Joseph Dam occurs primarily during the spring and summer snowmelt period and can elevate total dissolved gas (TDG) levels above 110% TDG saturation, the Washington and Colville Confederated Tribe maximum water quality standard, in some years. Given the close proximity of Chief Joseph Dam to Grand Coulee Dam, TDG levels in this reach of the river during spill events are influenced by incoming gas levels from Grand Coulee. To manage the effects of the resulting increased spills at Chief Joseph Dam to a level no greater than 120% TDG saturation, the Corps will begin constructing flow deflectors in early 2006. They are scheduled for completion in 2008. An operational change will accompany the completed deflectors as well, because of the higher propensity of Grand Coulee Dam to generate high TDG concentrations compared to Chief Joseph Dam. The spill priority list is being adjusted so that when involuntary spill is required, Chief Joseph will spill while Grand Coulee assumes the extra generation load, except during relatively rare high flow events. This will add to the benefit of the deflectors by affording otherwise-unavailable protection from high TDG levels for Lake Rufus Woods (Chief Joseph Reservoir) and the Grand Coulee tailrace. In fact, this operation has already been informally instituted, but has not actually been exercised yet due to lack of need to spill. During construction of the deflectors at Chief Joseph, an interim water control plan will be implemented so that spill can be managed in relation to spillway bays which may not be available at any given time.

4.3. Aquatic Organisms

A variety of native and non-native fish species currently occur above and below Chief Joseph Dam. Species include northern pikeminnow, kokanee, rainbow trout, mountain and lake whitefish, peamouth, redside shiner, suckers, bluegill, smallmouth and largemouth bass, yellow perch, walleye, brown bullhead, steelhead trout, chinook salmon, bull trout, and sculpin (Corps

[2] All elevations in this document are based on feet above mean sea level.

2000). Chief Joseph is currently the upper limit for anadromous fish migration in the Columbia River.[3]

Chief Joseph operations likely entrain an unquantified number of resident fish. Studies of entrainment at Grand Coulee Dam revealed the following species, roughly in order of overall abundance, in the Grand Coulee forebay: kokanee, rainbow trout, walleye, smallmouth bass, lake whitefish, yellow perch, eastern brook trout, blackmouth (Chinook), bridgelip sucker, and burbot (LeCaire, 1999). A similar assemblage of fish likely is susceptible to entrainment at Chief Joseph Dam. According to Cada (2001), "the survival of turbine-passed fish depends greatly on characteristics of both the hydropower plant (e.g., the type and size of the turbine, environmental setting, and the mode of operation) and the entrained fish (species, size, physiological condition)." Survival of small fish for turbine types with larger water passages (e.g., Francis turbines) is commonly 70% or greater.[4]

In addition, two companies currently operate commercial net pen operations in Lake Rufus Woods. The net pen operators currently raise rainbow/steelhead trout, though coho and Atlantic salmon have been raised in the past (Corps 2000).

Aquatic plants in the project vicinity include elodea, Eurasian water milfoil, pondweed, and water cress, with elodea being the most abundant. Phytoplankton, macrophytes, and a wide variety of benthic and pelagic invertebrates provide a food and prey base for the aquatic food web.

4.4. Threatened and Endangered Species

In accordance with Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed and proposed threatened or endangered species. Several species protected under the Act are potentially found in the vicinity of Chief Joseph Dam.[5] No listed fish species occur upstream of Chief Joseph Dam (GEI Consultants 2004).

[3] The Colville Confederated Tribes are working with the Corps to investigate potential establishment of anadromous fish passage at Chief Joseph Dam. Future decisions and timelines for any fish passage facilities are dependent on a number of factors that are outside the scope of the turbine runner replacement project.

[4] The existing units at Chief Joseph Dam all utilize Francis turbines. In general, these turbines are viewed as less "fish friendly" than Kaplan-type turbines (Odeh 1999) such as those utilized at many of the main stem Columbia River projects further downstream.

[5] A number of other threatened and endangered fish species occur in downstream portions of the Columbia River, and outside of areas that could potentially be affected by the proposed work.

Table 1. ESA Protected Species Potentially Occurring in the Project Vicinity

Species	Listing Status	Critical Habitat Designated
Bald Eagle *Haliaeetus leucocephalus*	Threatened	N
Columbia Basin Bull Trout *Salvelinus confluentus*	Threatened	Y
Upper Columbia Spring Chinook Salmon *Oncorhynchus tshawytscha*	Endangered	Y
Upper Columbia Steelhead *Oncorhynchus mykiss*	Endangered	Y

4.5. Noise

Noise in the vicinity of Chief Joseph Dam is generated primarily by vehicle traffic on State Routes (SRs) 17 and 173 and on project roads. Spill at Chief Joseph Dam can elevate noise levels near the project considerably above ambient noise levels. Noise levels within some areas of the powerhouse typically require use of ear plugs by project personnel working in the building.

4.6. Visual/Aesthetic environment

The open landscape around Chief Joseph Dam allows unobstructed view of the project from many locations in the area, including dedicated viewpoints along both sides of the river, and the SR 17 bridge located just downstream of the project. In contrast to much of the Columbia River corridor, the project and associated facilities (including project offices, roadways, and shoreline bank protection) represent the heavily developed nature of a major main stem hydropower dam (see cover photograph).

4.7. Safety and Occupational Health

Given the era when the dam was constructed, the project likely contains lead-based paint and asbestos-containing materials. Maintenance activities on generating units also commonly involve management and/or disposal of potentially hazardous materials such as hydraulic fluids or petroleum products that are integral to unit performance. Given their nature, project facilities also encompass potentially hazardous conditions posed by confined spaces, potential fall hazards, and electrical equipment. Activities at the dam are planned and executed in compliance with all appropriate and relevant safety and occupational health requirements.

4.8. Hydropower

Chief Joseph Dam is the second largest hydropower-producing dam in the United States and the largest hydropower-producing project operated by the Corps of Engineers. The combined generator capacity of the 27 units is 2,614 megawatts. Annual generation is approximately 11,800,000 megawatt-hours under average water conditions. Power from Chief Joseph is marketed as part of the Federal Columbia River Power System (FCRPS) by the BPA. BPA

serves the Pacific Northwest through operating an extensive electricity transmission system and marketing wholesale electrical power at cost from federal dams.

4.9. Transportation

State Routes 17 and 173 provide vehicle access to the project roads at Chief Joseph Dam. SR 173 passes through the heart of the town of Bridgeport just west of the junction with SR 17. U.S. Highway 97 provides primary vehicle access to the northern Douglas County area from the southwest, west, or north; U.S. Highway 2, SR 174, and SR 17 provide the primary vehicle access from the east; SR 17 provides the primary vehicle access from the south. The Cascade and Columbia River Railroad provides the railway access nearest the dam, with a station located at Chief Joseph, Washington, located near the mouth of the Okanogan River about 9 miles downstream of Chief Joseph Dam.

4.10. Socioeconomics

Table 2 presents general socioeconomic and demographic information for counties and municipalities in the vicinity of Chief Joseph Dam. Agriculture, government, retail, and forestry industries are the dominant employers in both Douglas and Okanogan counties. On the Colville Indian Reservation along the north side of the river in the project area, major tribal business enterprises and employers include the timber and construction industries and social and tribal services. The tribe also operates a number of boat ramps, a campground, and two marinas under contract with the National Park Service.

Table 2. Selected Demographic and Socioeconomic Information

	Population Estimate[1]	**Median Per Capita Income[2]**	**% of Median State Income[2]**	**% Below Poverty Line[2]**	**% Minority Population[2]**
Washington State	6,131,445	$22,973	n/a	10.6%	18.2%
Douglas County	33,753	$17,148	74.6%	14.4%	15.3%
Bridgeport	2,051	$10,302	44.8%	33.2%	39.2%
Okanogan County	39,134	$14,900	64.9%	21.3%	24.7%
Brewster	2,154	$9,555	41.6%	31.7%	45.1%

1 U.S. state and county populations estimates are for 2003 from U.S. Census Population Estimates, release date: April 9, 2004. U.S. city/town population estimates are for 2003 from U.S. Census Annual Population Estimates for Incorporated Places, release date: June 24, 2004.

2 Data on income, poverty, and minority population are for 1999 from the 2000 Census.

4.11. Dam Safety

Dam safety refers to protecting the structural integrity of dams. Seattle District maintains a dam safety program for all its operating projects. The dam safety program outlines maintenance actions required to avoid potential future problems and provides an avenue to address unforeseen issues that may arise. At Chief Joseph, dam safety considerations have played prominently in the design of the spillway deflectors that will be constructed over the next several years.

5. EFFECTS OF THE PROPOSED ACTION

Potential effects of the alternatives on the various resources are discussed in this section. Effects are not anticipated to occur to climate, physical and geologic environment, water quality (except dissolved gases), biological resources (except fish and aquatic organisms), cultural resources, flood control, and recreation.

5.1. Hydrology

Under the no-action alternative, operations at Chief Joseph Dam would remain unchanged. River flows would be discharged through the powerhouse except in years with high spring and summer flows when some spillway flows would likely occur.

With the preferred alternative, total dam discharges would not change, and the allocation of discharge between the powerhouse and the spillway would remain very similar to the no-action alternative. Modeling of powerhouse capacity and efficiency[6] indicates that the addition of 16 new turbine runners would not change powerhouse flows about 97 percent of the time. For the remaining 3 percent of the time when model simulations indicate that the new runners could change the allocation of river flows between the powerhouse and the spillway, the modeling of the addition of 16 new runners shows:

1) A potential increase in powerhouse flows for 1.1% of the time with a potential increase of up to 5,500 cfs (about 2 percent of total project flow[7]), which could result in a corresponding decrease in potential spillway flows.

2) A potential decrease in powerhouse flows for 1.9% of the time with a potential increase in spillway flows of up to 2,800 cfs (about 1 percent of total project flow).

Given the precision of the modeling and the ability to adaptively manage flows in real-time to address inflows in relation to project discharge, even the maximum indicated differences in discharge allocation between the powerhouse and spillway are negligible. Considering both the relatively rare potential occurrence of differences in spillway/powerhouse flow allocation and the negligible differences in these flows when they do occur, the preferred alternative would not affect hydrology.

5.2. Water Quality

Water temperatures would not change from current conditions under either the no-action or preferred alternative. The lone avenue for potential water quality effects that could relate to the proposed action is changes in spillway discharge patterns which could alter TDG levels downstream of the project. Under the no-action alternative, Chief Joseph Dam would continue to spill water under relatively rare occasions and with the same frequency, magnitude, and duration as presently occurs. Compared to the no-action alternative, no changes to TDG levels

[6] In addition to turbine performance criteria, Corps and BPA modeling for the economic evaluation (Corps and BPA 2005) included assumptions on maintenance schedules, which affects differences in flow allocation between the powerhouse and spillway. Considering turbine performance alone, powerhouse flows at maximum output with the 16 new runners would be about 2,000 cfs less than with the existing runners, a difference of less than 1% of total flow.

[7] The percentage of total project flow is based on the model output for total regulated flow that corresponds to the specified maximum potential increase or decrease in powerhouse flows with new runners.

and other water quality parameters with the installation of 16 new turbine runners are expected due to the negligible changes in spillway discharges (Section 6 - Cumulative Effects, provides more information on how flow deflector construction is independent from turbine runner replacement).

5.3. Aquatic Organisms

In general, effects on aquatic organism would be similar under either the no-action or preferred alternatives.

The primary mechanism for potential effects on aquatic organisms relates to fish entrainment through turbines at Chief Joseph Dam. Francis runners like those used at Chief Joseph Dam are minimum gap by design, which helps reduce fish injury and mortality. The survival of entrained fish is largely dependent the amount of head differential and resulting pressure gradients that fish would experience when passing through the turbines– aspects of Chief Joseph Dam which would remain unchanged by any runner design.

Under the no-action alternative, entrainment effects of dam operations on aquatic organisms would remain the same as current conditions.

Entrainment effects under the preferred alternative would be similar to existing conditions, at worst. Minimal changes in flow through the powerhouse and resulting entrainment rates would occur with the new runners (see Section 5.1). Entrainment survival would likely increase with the new runners and refinished wetted surfaces because current cavitation damage would be eliminated thus eliminating rough surfaces. Future rough surfaces would be minimized because the turbines would be operating at design head therefore minimizing the cavitation and ensuing damage which causes rough surfaces.

5.4. Threatened and Endangered Species

Under the no-action alternative, threatened and endangered species would continue to utilize the project area the same way as they currently do. Under the preferred alternative, the project operations would be very similar to existing conditions. Activities related to project construction would occur on existing roadways and developed areas, or interior to the powerhouse and would not produce disturb ambient conditions in the vicinity. Listed fish do not occur upstream of Chief Joseph Dam and thus are not vulnerable to entrainment through the powerhouse or spillway. Negligible changes in the amount and duration of spillway flows would occur with the proposed work and thus dissolved gas levels downstream of the project would not change due to the project. Accordingly, the work under the preferred alternative would not affect bald eagles, or Columbia Basin bull trout, Upper Columbia spring Chinook salmon, or Upper Columbia steelhead and their designated critical habitat. More detailed discussion of the “no effect” determination can be found in the biological evaluation for the project.

5.5. Noise

Under the no action alternative, exterior noise in the vicinity of the project would remain similar to levels currently experienced. Under the preferred alternative, exterior noise levels in the vicinity of the project may increase to a slight extent when project equipment and the new runners are delivered and the old equipment is disposed. Given the industrial nature of the site

and the existing network of roads and railways that would be used for deliveries, the duration and magnitude of any short-term increase in noise would be minor, short-duration, and extremely transient. Most of the project work would occur interior to the project, an area with typically high levels of noise. During work, noise control and noise levels would conform to requirements set forth in the appropriate regulations, including EM 385-1-1, Section 05.C (Corps of Engineers Safety and Health Requirements, Hearing Protection and Noise Control), 29 CFR 1910.95 (Occupational Safety and Health Standards, Occupational Noise Exposure), 29 CFR 1926.52 and .101 (Safety and Health Regulations for Construction, Occupational Noise Exposure and Hearing Protection, respectively). The most conservative requirement would govern. Noise levels outside of the project area would not be affected by the proposed work.

5.6. Visual/Aesthetic environment

Under the no-action alternative, the visual characteristics and aesthetic environment in the vicinity of Chief Joseph Dam would remain unchanged. Under the preferred alternative, more activity in staging areas external to the powerhouse and within the project lands of Chief Joseph Dam may be apparent while the work is performed, but such activities would not alter the general visual characteristics of Chief Joseph Dam. Thus, no adverse impacts to visual characteristics or the aesthetic environment are expected to occur.

5.7. Safety and Occupational Health

Under both the no-action and preferred alternatives, maintenance and construction activities would continue to be governed by the appropriate and relevant safety and occupational health requirements, including 29 CFR 1910 (Occupational Safety and Health Requirements), 1926 (Safety and Health Regulations for Construction), and EM 385-1-1 (Corps of Engineers Safety and Health Requirements). Contract specifications detail requirements for contractor proposals with particular details on fall protection; protection of the public; use of boom, tower, and floating cranes; fire prevention; electrical safety; confined space protocols; eye, face, and respiratory protection; asbestos abatement; lead-based paint removal; ventilation; and handling and disposal of hazardous materials.

Materials that would require disposal, including the old turbine runners, would be processed in accordance with all appropriate and relevant regulations. Disassembly of the units and removal of the turbine runners would take place at Chief Joseph Dam. Runners would then likely be transported off-site (most likely to Brewster) where they would be processed and shipped to an appropriate disposal or recycling center. Because the Corps will comply and will require its contractors to comply with all applicable safety regulations, no adverse impacts to worker or public safety are anticipated from either the proposed installation or material disposal.

5.8. Hydropower

Under the no-action alternative, hydropower generation at Chief Joseph Dam would continue to deteriorate from present conditions.

Corps and BPA (2005) analyzed potential energy generation recovery associated with turbine runner replacement under the preferred alternative. The annual gain in generation with 16 new runners would be 344.3 gigawatt-hours. The incremental energy recovery gains in project annual generation tend to decrease as an increasing number of runners are replaced. This

happens because the available flow during much of the year will not support operation all 27 units at Chief Joseph Dam.

Corps and BPA (2005) also evaluated energy losses associated with unit outages during runner replacement. Results indicate that the per unit outage loss in annual energy would range between 6.0 and 33.5 gigawatt-hours, with an average annual outage loss of 21.1 gigawatt-hours per unit. Total estimated annual outage loss for replacement of all 16 runners would be about 335 gigawatt-hours. These losses would be compensated for by increased generation after completion of the runner replacement.

5.9. Transportation

Under the no-action alternative, no impacts to transportation would occur compared to existing conditions. Under the preferred alternative, use of public highways to transport replacement runners and associated equipment would meet all conditions established for use of existing roadways and haul routes by entities having jurisdiction, including seasonal or other limitations or restrictions, and the payment of excess size and weight fees. Prior to use, work involving use of public roadways would be coordinated with authorities having jurisdiction over public streets and highways. Potential use of railway services for equipment transport would utilize pre-existing infrastructure and would not alter or otherwise affect rail or other transportation services in the area.

Personnel working on the project at Chief Joseph dam would be required to park privately-owned vehicles (POV) in the parking area just west of the Foster Creek bridge that accesses the powerhouse. Contractor vehicles would be limited to the bare minimum and would be used to transport personnel and equipment to all areas past the POV parking area. No new access roads would be constructed.

5.10. Socioeconomics

Under the no-action alternative, socioeconomic factors would not be affected locally or regionally. Chief Joseph Dam would remain an important component of the local economy, primarily due to the relatively large workforce employed at the facility.

In general, the preferred alternative would provide socioeconomic benefits to the locale where the new runners are manufactured and to the immediate vicinity of Chief Joseph Dam. While manufacture of the new runners and appurtenances would likely occur at the manufacturer's facilities (which would be determined during the contracting process), additional personnel (likely contractors to the Corps) would be living in the area during the project as they work on the installation and testing of the new runners. These personnel, numbering less than 100 at any given time, would need accommodations, food, and various other products and services that would be supplied, in large part, from the local business community. Some positions required by the work would likely be filled by local residents. Given the skilled nature of the work and the wage requirements for government contracts (i.e. Davis-Bacon Act), wages for the project would be higher than the prevailing median per capita income for Douglas or Okanogan counties and workers would return a portion of that income to the local economy in the form of payments for goods and services. The increased sales of goods and services to workers would help support these businesses and the local economy.

The new runners would generate a positive economic return in terms of hydropower sales and a relatively high benefit to cost ratio (Corps and BPA 2005).

5.11. Dam Safety

Under the no-action alternative, no effects to dam safety would occur. The work under the preferred alternative would affect only the generating units and would not affect performance of the dam structure, its stability, or any other dam safety concern.

6. CUMULATIVE EFFECTS

The NEPA defines cumulative effects as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR §1508.7).

The most obvious past impact with bearing on the proposed action is construction of Chief Joseph Dam and the rest of the FCRPS. Development of the FCRPS provides many benefits to the region and the proposed work would assist in balancing the multipurpose uses of the FCRPS by maximizing efficiency of hydropower generation at the Chief Joseph Dam, with resulting economic benefits.

Impacts from turbine runner replacement are essentially independent from potential impacts from the planned flow deflector construction at Chief Joseph Dam. By substantially decreasing TDG levels below Chief Joseph Dam when spill does occur, flow deflectors would help minimize adverse impacts from spillway discharges under either the no-action or preferred alternative. In combination with the deflectors, potential improved survival of entrained fish with the new runners would provide complementary benefits for resident and potential anadromous fish populations, including threatened and endangered fish species that occur in the vicinity of the project.

7. IRRETRIEVABLE AND IRREVERSIBLE COMMITMENTS OF RESOURCES

No federal resources would be irreversibly and irretrievably committed to the proposed action until this Environmental Assessment is finalized and a “Finding of No Significant Impact” has been signed.

8. ENVIRONMENTAL COMPLIANCE

Several Federal statutes, executive orders, and executive memoranda apply to the development of Federal projects. These laws and regulations, and their applicability to the proposed project are described in the sections below.

8.1. Archeological Resources Protection Act

The Archeological Resources Protection Act (ARPA) (16 U.S.C. 470aa-470ll) provides for the protection of archeological sites located on public and Indian lands, establishes permit requirements for the excavation or removal of cultural properties from public or Indian lands, and establishes civil and criminal penalties for the unauthorized appropriation, alteration,

exchange, or other handling of cultural properties. The proposed action would not affect any resources protected by ARPA.

8.2. Clean Air Act

The proposed activities (primarily construction phase activities involving transport of materials and personnel) would not involve discharge of air pollutants that exceed *de minimis* levels of direct emissions of a criteria pollutant or its precursors. Accordingly, the activities are exempted by 40 CFR Part 93.153. Any emissions that are indirectly facilitated by increased hydropower production are generally not within the Corps continuing program responsibility and generally cannot be practicably controlled by the Corps. For these reasons, a conformity determination is not required for this project.

8.3. Clean Water Act

The proposed work would not result in a discharge of dredged or fill material into waters of the United States and is not subject to Sections 401 or 404 of the Clean Water Act (33 U.S.C. §§ 1251-1387). Additionally, the proposed work would not result in a point-source discharge of pollutants, not any appreciable change in the nature of the present powerhouse and spillway flows, and therefore is not subject to Section 402 of the Clean Water Act.

8.4. Endangered Species Act

In accordance with Section 7(a)(2) of the ESA of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species. The proposed action will not affect threatened or endangered species or their designated critical habitat (see Paragraph 5.4 for more details).

8.5. Environmental Justice

Executive Order 12898 directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects of agency programs and activities on minority and low-income populations. No tribal resources would be harmed. No adverse effects to minority or low-income populations would result from the implementation of the proposed project. The six year construction project provides potential employment opportunities in an economically distressed county.

8.6. Essential Fish Habitat

In accordance with the Essential Fish Habitat (EFH) requirements of the Magnuson-Stevens Fishery Conservation and Management Act, the Corps has determined that the proposed work would not affect EFH utilized by Pacific salmon. We have determined that the proposed action would not adversely affect EFH for federally managed fisheries in Washington waters. The project's biological evaluation provides supporting documentation for our determination.

8.7. Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC 470) requires that wildlife conservation receive equal consideration and be coordinated with other features of water resource development projects. This goal is accomplished through Corps funding of U.S. Fish and Wildlife Service

habitat surveys evaluating the likely impacts of proposed actions, which provide the basis for recommendations for avoiding or minimizing such impacts. A Fish and Wildlife Coordination Act Report is not required for this work.

8.8. National Environmental Policy Act

Section 1500.1(c) and 1508.9(1) of the implementing regulations for the National Environmental Policy Act of 1969 (42 USC §§ 4321 through 4375, as amended) requires federal agencies to "provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact" on actions authorized, funded, or carried out by the federal government to insure such actions adequately address "environmental consequences, and take actions that protect, restore, and enhance the environment". This assessment evaluates known environmental consequences from the proposed replacement of turbine runners at Chief Joseph Dam near Bridgeport, Douglas County, Washington. More detailed information resulting from design and testing of new turbine runners would likely become available as that work is performed. In the event that this information indicates that more detailed analysis of potential impacts of the remaining work is appropriate pursuant to the NEPA, a supplemental NEPA document would be prepared prior to commencing follow-on construction. For example, prototype testing may produce information that would help identify potential impacts that are currently unknown or only generally discussed in the document at hand (for example, impacts concerning aquatic organisms, water quality, hydropower, or safety and occupational health). Several Federal statutes, executive orders, and executive memoranda apply to the development of Federal projects. These laws and regulations, and their applicability to this EIS are described in the sections below.

8.9. National Historic Preservation Act

The National Historic Preservation Act (16 USC 470) requires that the effects of proposed actions on sites, buildings, structures, or objects included or eligible for the National Register of Historic Places must be identified and evaluated. Chief Joseph Dam is eligible for listing in the National Register under criterion A for critical associations with hydroelectric development, irrigation, and recreational history. The facility also merits eligibility under criterion C for distinctive engineering features and attributes, specifically for its unique site adaptations, production capacity, and for the role of noted Northwest architect, Paul Thiry, in final design work.

The document, "Chief Joseph Hydroelectric Project, Bridgeport, 1875-1955" was prepared for the Seattle District, U.S. Army Corps of Engineers, Operations Division to serve as an historic context for the purposes of evaluating the National Register eligibility of historic properties in the immediate upstream environment. The historic context statement and evaluation for the dam complex identified eligible historic properties associated with the exploration/settlement period and extending through the era of the Chief Joseph hydroelectric project.[8]

The dam and spillway possess numerous physical attributes, some of which are visible and some of which are not. As an eligible property, Chief Joseph derives its eligibility primarily from outward physical characteristics such as external design and functional features, profile, massing,

[8] "Chief Joseph Hydroelectric Project, 1875-1955" was prepared by Lauren McCroskey for the Seattle District, U.S. Army Corps of Engineers, Operations Division, April 2005, and is on file with the Environmental Resources Section, and the Operations Division.

surface appearance, and site layout. Non-visible mechanical components such as turbine elements (runners), while functionally important, are not essential to the dam's National Register eligibility. Therefore, replacement of the sixteen original turbine runners will have *no effect* on the dam's National Register eligibility and no further consultation regarding architectural properties should be required.

8.10. Pacific Northwest Electric Power Planning and Conservation Act

The Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act) was passed by Congress on December 5, 1980 (16 U.S.C. 829d-1). Under the Northwest Power Act, the Corps is required to exercise its responsibilities for operating the FCRPS in a manner that provides equitable treatment for fish and wildlife with other purposes for which the Corps facilities are operated and managed. This draft EA considers potential impacts of the proposed action on all resources, including fish and wildlife.

8.11. Pollution Control at Federal Facilities

The proposed action would comply with the standards contained in the following legislation pertaining to control of contaminants:

- The Safe Drinking Water Act, as amended (42 U.S.C. 300F et seq.).
- The Solid Waste Disposal Act (42 U.S.C. 6901 et seq.).
- Oil Pollution Act (33 U.S.C. 2701 et seq.).
- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended (42 U.S.C. 9601 [9615] et seq.).
- The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended (7 U.S.C. 136 et seq.).
- The Resource Conservation and Recovery Act (RCRA) of 1976, as amended (42 U.S.C. 6901 et seq.).
- Toxic Substances Control Act (TSCA), as amended; Title 40 CFR Part 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions" (15 U.S.C. et seq.)
- The Noise Control Act of 1972, as amended (42 U.S.C. 4901 et seq.).
- Occupational Health and Safety Act (29 U.S.C. 651 et seq.).

8.12. Rivers and Harbors Act

The Rivers and Harbor Act of 1899 regulates structures or work in or affecting navigable waters of the United States including discharges of dredged or fill material into waters of the United States. Structures include without limitation, any pier, boat dock, weir, revetment, artificial islands, piling, aid to navigation or any other obstacle or obstruction. No such structures, dredging or filling are planned as part of the proposed action.

9. REFERENCES

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USGS – See U.S. Geological Survey.

APPENDIX A

Draft Finding of No Significant Impact

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

CENWS-PM-PL-ER

Chief Joseph Dam Turbine Runner Replacement
Bridgeport, Douglas County, Washington

DRAFT FINDING OF NO SIGNIFICANT IMPACT

1. **Background.** The United States (U.S.) Army Corps of Engineers (Corps) proposes to replace up to 16 turbine runners at Chief Joseph Dam located near Bridgeport, Washington. The Chief Joseph Powerplant includes 27 main units and 2 station service units. The existing units at Chief Joseph Dam all utilize Francis turbines. The original 16 units were brought online between 1955 and 1958. Eleven additional units (17 through 27) were added between 1977 and 1979. Generators on Units 1 through 16 were upgraded between 1983 and 1988 by rewinding the generators and upgrading transformers and ancillary equipment. With these upgrades, the capability of generators 1 through 16 now exceeds the capability of the existing turbines for these units. In addition, testing has revealed that there is substantial degradation of the efficiency of the turbines for these units due to normal wear.

2. **Project Location.** Chief Joseph Dam is located on the main stem Columbia River in north central Washington and about 545 miles upstream from the river mouth. The powerhouse is located on the south side of the dam, the spillway on the north. The reservoir impounded by the dam is named Lake Rufus Woods.

3. **Proposed Action.** The proposed project consists of replacement of turbine runners in Units 1 through 16. Replacement of the turbine runners would use new design criteria that would allow full generator capacity and efficiency to be optimized under the most probable hydraulic conditions. Runner replacement on Units 17 through 27 is not subject to the proposed action since those units are relatively new and are configured to operate efficiently under the current project conditions.

   The proposed work would require separate model testing of scale runners and appurtenances for two different unit designs present in Units 1 through 16. Following successful scale model testing, prototype runner replacements would be installed in one of each type of unit at Chief Joseph Dam for full-scale field performance tests. If the prototype units meet specified hydraulic performance criteria, runners on the remaining units of each family would be replaced.

   The first new runner is scheduled for installation for the summer of 2008. Thereafter, replacement of runners would take place on up to four units each year. Runner installation would occur on two units at a time and runner installation on each unit would take about 6 months. Runner replacement on all 16 units is scheduled to be complete by the end of 2014. To the maximum possible extent, work on the units would be scheduled to fit within existing maintenance schedules for units at the project, but the time required for runner installation

would likely be about four months longer than the typical routine maintenance period for each unit.

To replace the runners, the units would be disassembled to access the turbines. The existing turbine runners would then be removed and transported to a staging area where they would be dismantled. The parts would either be recycled or disposed at approved landfills. New turbine runners would be shipped from the manufacturer by truck or rail to Chief Joseph Dam.

After installation, the new turbine runners would be expected to last about 50 years.

The potential effects of proposed action were compared to the no-action alternative in the draft environmental assessment that accompanies this Finding of No Significant Impact. The draft EA and FONSI will be available online under Chief Joseph Runner Replacement at <http://www.nws.usace.army.mil/ers/doc_table.cfm>. After a 30-day comment period, comments will be addressed in the course of preparing a final EA and FONSI.

4. **Summary of Impacts.** A draft environmental assessment (EA) has been prepared pursuant to the National Environmental Policy Act (NEPA) for the proposed action. The draft EA describes the environmental consequences of the proposed project, which are briefly summarized below.

   The proposed work will generally not affect overall dam operations. Changes in apportionment of flow between the powerhouse and the spillway will be negligible, as will associated changes in water quality above and below the dam. Aquatic organisms, primarily fish, will continue to be entrained through the turbines, but the new turbine runners will not result in significantly increased adverse effects (i.e. injury or mortality) to entrained fish, and may improve conditions. The project will result in no effect on species listed as threatened or endangered under the Endangered Species Act, or their designated critical habitat. All appropriate and relevant requirements for occupational health and safety will be followed, which will minimize potential adverse effects to workers and the general public from exposure to environmental hazards and hazardous materials. The proposed project will increase annual energy output from Units 1 through 16 and generate a positive economic return and a relatively high benefit to cost ratio. During construction, the work would likely benefit the local economy in the vicinity of Chief Joseph Dam from the increased sales/demand of goods and services from the increased workforce at the dam. No adverse effects to the visual/aesthetic environment, noise conditions, or dam safety will occur.

5. **Finding.** Based on the analysis detailed in the EA and summarized above, this project is not a major Federal action significantly affecting the quality of the human environment and, therefore, does not require preparation of an environmental impact statement.

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Date

_____
DEBRA M. LEWIS
Colonel, Corps of Engineers
District Engineer