

**Bonneville Power Administration  
Fish and Wildlife Program FY99 Proposal Form**

**Section 1. General administrative information**

**Yakima Screens - Phase II - O & M**

**Bonneville project number, if an ongoing project** 9200900

**Business name of agency, institution or organization requesting funding**

Washington Dept. of Fish & Wildlife, Yakima Screen Shop

**Business acronym (if appropriate)** WDFW, YSS

**Proposal contact person or principal investigator:**

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**Subcontractors.**

<b>Organization</b>	<b>Mailing Address</b>	<b>City, ST Zip</b>	<b>Contact Name</b>

**NPPC Program Measure Number(s) which this project addresses.**

**7.11B.1**

**NMFS Biological Opinion Number(s) which this project addresses.**

**Other planning document references.**

**Yakama Indian Nation, WDFW=s anadromous fish co-manager, has been a supporting partner in this project from its inception and initial funding in FY1993.**

Subbasin.

Yakima

Short description.

YSS performs preventative maintenance and operational adjustments on completed Yakima Phase 2 fish screen facilities to assure optimal fish protection and to extend facility life, thereby protecting BPA=s capital investment.

## Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
X	Anadromous fish		Construction	X	Watershed
	Resident fish	X	O & M		Biodiversity/genetics
	Wildlife		Production		Population dynamics
	Oceans/estuaries		Research		Ecosystems
	Climate		Monitoring/eval.		Flow/survival
	Other		Resource mgmt		Fish disease
			Planning/admin.		Supplementation
			Enforcement		Wildlife habitat en-
			Acquisitions		hancement/restoration

Other keywords.

## Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
9107500	Yakima Phase II Screens - Construction (USBOR)	screen facility civil works construction
9105700	Yakima Phase 2 Screen Fabrication (WDFW, YSS)	screen & miscell. metalwork fabrication and installation
8506200	Passage Improvement Evaluation (PNNL)	biological and hydraulic evaluation of selected Phase 2 screens

## Section 4. Objectives, tasks and schedules

### Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Perform screen facility O&M necessary to optimize fish	a	Perform operational adjustments to minimize screen

	protection & extend facility life		approach velocity & maximize fish bypass efficiency
		b	Perform preventative maintenance and repairs to major facility components

**Objective schedules and costs**

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	10/1998	10/1999	100.0

**Schedule constraints.**

Delays in screen civil works construction caused by diversion water rights uncertainty (state court adjudication), engineering design bottlenecks, property acquisition delays or funding constraints affects the total number of new projects completed each year, and thus the total number of all operational Phase 2 projects that require O&M services in a budget cycle.

**Completion date.**

**On-going**

**Section 5. Budget**  
*FY99 budget by line item*

Item	Note	FY99
Personnel	field and shop O&M labor costs	54,400
Fringe benefits	@ 31% of labor costs	16,900
Supplies, materials, non-expendable property	includes WA sales tax @ 7.8%	8,100
Travel	service vehicle mileage charges	7,200
Indirect costs (local)	YSS indirect costs @ \$300/man-month	6,000
Other	wateruser reimbursements for O&M	10,000
<b>Subtotal</b>	<b>items applicable to administrative O/H</b>	<b>102,600</b>

Agency O/H	administrative overhead @ 19% of above subtotal	19,500
Capital Acquisitions (major equipment)	Phase 2 screen O&M 1-1/2 ton, 4WD service truck w/ enclosed utility box	34,000
<b>TOTAL</b>		<b>\$156,100</b>

**Outyear costs**

Outyear costs	FY2000	FY01	FY02	FY03
Total budget	130,000	140,000	150,000	150,000
O&M as % of total	100	100	100	100

**Section 6. Abstract**

Obsolete fish screens from the 1930's, 40's, 50's and 60's are being replaced or updated under the Yakima Phase 2 fish screen construction program to comply with current, regional fish screen biological protection criteria adopted by CBFWA's Fish Screening Oversight Comm. (FSOC) in 1995. The objective of the Phase 2 program is to provide protection approaching 100% for all species and life stages of anadromous (and resident) salmonids. Old screens in the Yakima basin may provide fair protection for large (4-6 inch long) yearling smolts, but poor protection for fry and fingerling life stages. Mortality of fry and fingerlings at irrigation diversions may reduce subsequent smolt production and inhibit efforts to restore depressed salmon and steelhead populations through natural production or hatchery supplementation. Biological evaluation of completed Phase 2 fish screen facilities by PNNL under Project# 8506200 has quantified survival and guidance rates approaching 100% (range: 90-99%), provided that an adequate operation and maintenance program is implemented following construction. This on-going project=s (9200900) objective is to assure that BPA=s capital investment in fish screens is realized by performing operations that assure optimum fish protection and long facility life through a rigorous preventative maintenance program.

**Section 7. Project description**

- a. Technical and/or scientific background.

Survival and fish bypass effectiveness at Yakima Basin fish screens constructed in the 1930's, 40's, 50's, 60's and even as recently as the 1970's, are inadequate to assure that gravity water diversions are not depressing anadromous salmonid egg-to-smolt survival rates. Survival and bypass guidance at Pacific Corps. Wapatox Canal hydropower/irrigation diversion on the Naches R. were quantified by Eddy (1988). This pre-Phase 2 facility (500 cfs, circa 1936) was studied in 1986 and 1987 and shown to guide less than 10 percent (0-7%) of marked, acclimated, hatchery-reared chinook fry (<60 mm FL) safely back to the river. Fingerling (60-90 mm) and yearling smolt size chinook (>90 mm) experienced incrementally better

guidance that was clearly size related; 40-60 percent for fingerlings and 70-75 percent for yearlings. Low survival/guidance for small fish was attributed to canal entrainment caused by over-sized screen mesh openings and screen impingement caused by high approach velocity at the screen face, perpendicular screen orientation relative to canal flow, and poor hydraulic conditions at the fish bypass entrances. This electric-drive, drum screen facility, with an average approach velocity of 1.0 feet/sec (range: 0.8 -1.4 feet/sec) and 1/4" screen mesh openings, was designed primarily to protect larger, yearling size fish. These obsolete design criteria are representative of most pre-Phase 2 fish screens in the Yakima Basin and throughout WA. Some paddlewheel-driven drum screens were designed based on a 1.5 feet/sec approach velocity, thought to be necessary to provide adequate power to turn the paddlewheel, with total disregard for the biological needs of the fish.

At about the same time, the Wash. Dept. of Fisheries (WDF) , Dept. of Wildlife and Centralia City Light Dept. contracted with the Univ. of Wash., Fisheries Research Institute to perform laboratory swimming stamina tests of several salmon species including steelhead and resident rainbow trout (Smith and Carpenter, 1987). The research revealed that a design screen approach velocity of 0.4 feet/sec was necessary to protect emergent fry of the weakest species (steelhead, rainbow trout, pink & chum salmon) at low spring- time water temperatures (3-4° C.). WDF adopted the 0.4 feet/sec approach velocity criteria in 1988. Oregon Dept. of Fish and Wildlife and NMFS concurred with the findings and also adopted this conservative criteria.

In 1992, WDF conducted research on salmon fry entrainment through various types and sizes of screen material (Bates and Fuller, 1992). The results showed that that mesh openings greater than 0.125 inches allowed entrainment of salmon emergent fry. A similar study performed by Beecher and Engman (1995) testing steelhead and resident rainbow trout fry determined that a 3/32 inch (0.094) criteria was necessary to prevent entrainment. This conclusion was supported by an evaluation of the Dryden Canal fish screen (Wenatchee R.) in 1994 by the Pacific Northwest National Laboratory (Mueller et al. 1995). Although the Dryden screen was designed using the 0.4 feet/sec approach velocity criteria, it was constructed in 1993 using the applicable 0.125 inch mesh opening criteria. PNNL determined that 6 percent of wild summer chinook fry were entrained and in excess of 40 percent of rainbow trout were entrained.

Together these studies represent the scientific basis for the current regional fish screening criteria adopted in 1995 by NMFS and the WA, OR and ID fish screening programs (the principal regulatory agencies on the Columbia Basin Fish & Wildlife Authority=s Fish Screening Oversight Comm.). Post-construction evaluations conducted under Proj# 8506200 by PNNL confirm that Yakima Phase 2 fish screens constructed to the current criteria and properly operated and maintained, protect fry from injury/mortality and achieve bypass guidance rates in the 90-99 percent range. Fish screen facilities with this high level of protection performance minimize

**a source of mortality that can reduce basin smolt production.**

**b. Proposal objectives.**

**YSS will perform biologically-oriented screen/fish bypass operations and preventative maintenance services for the following Phase 2 facilities projected to be operational in FY99 (includes site name, brief description of facility, date of first operation):**

1) **Naches-Cowiche:** 2 - 5' x 12' Electric Drums (ED); 4/92

2) **Gleed:** 4 - 6.5'(wide) x 10' Traveling Belt (TB); 4/93

3) **New Cascade:** 8 - 6.5' x 10' ED; 4/93

4) **Holmes:** 1 - 2' x 4' Portable, Paddlewheel Drum (PD); 4/93

5) **Snipes & Allen:** 2 - 4' x 12' ED; 4/93

6) **Taylor:** 2 - 2.5' x 8' ED; 10/93

7) **Congdon:** 3 - 4' x 12' ED; 4/94

8) **Kelly-Lowry:** 2 - 4' x 12' ED; 4/94

9) **Fruitvale:** vertical flat plate w/ cleaner; 4/96

10) **Naches-Selah:** vertical flat plate w/ cleaner; 4/96

11) **Emerick:** 1 - 2= x 4= Portable, PD; 5/96

12) **Stevens:** 1 - 2= x 4= PD; 6/96

13) **Anderson:** 1 - 2.5' x 4' Portable, PD; 10/96

14) **Bull:** vertical flat plate w/ cleaner; 4/97

15) **Ellensburg Mill:** vertical flat plate w/ cleaner; 4/97

16) **Clark:** 1 - 3' x 8' PD; 4/97

17) **Lindsey:** 1 - 3' x 12' ED; 4/97

18) **Union Gap:** vertical flat plate w/ cleaner; 4/97

- 19) **Old Union:** vertical flat plate w/ cleaner; 4/98
- 20) **Younger:** vertical flat plate w/ cleaner; 4/98
  
- 21) **Ballard:** 1 - 2.5' x 6' Portable, PD; 4/99
  
- 22) **Chapman-Nelson:** 1 - 2.0' x 6' Portable, PD; 4/99
  
- 23) **Musetti:** 1 - 2.5' x 6' Portable, PD; 4/99
  
- 24) **Big Creek:** 2 - 1 cfs PW, rotary wiper flat plate screens; 4/99
  
- 25) **Fogarty:** 3 - 3.0' x 10' ED; 4/99
  
- 26) **Johncox:** 2 - 3.0' x 10' ED; 4/99

**In addition, semi-annual progress reports detailing O&M activities at each site in narrative form are prepared and submitted to BPA's project technical representative (COTR). The reports summarize the number of site visits, man-hours worked and significant events or accomplishments during the previous six-month period. Progress reports 1 through 9 are available from the YSS project leader on request (#1: 5/93 - 8/93; #2: 9/93 - 12/93; #3: 1/94 - 5/94; #4: 6/94 - 12/94; #5: 1/95 - 6/95; #6: 7/95 - 12/95; #7: 1/96 - 6/96; #8: 7/96 - 12/96; #9: 1/97 - 6/97).**

**c. Rationale and significance to Regional Programs.**

**The NPPC and BPA have made substantial investments in Yakima Basin anadromous fish recovery. These investments are considered Aoff-site≡ mitigation for habitat losses elsewhere in the Columbia River and are predicated on the fact that substantial wild salmon production potential still exists because large amounts of accessible, high quality spawning and rearing habitat still exists in parts of the basin. The Yakima/Klickitat Fisheries Project (YKFP) experimental supplementation facilities are the latest major investment of the FWP. The objective of the YKFP is to supplement and enhance recovery of naturally-produced salmon and steelhead. Improved juvenile fish survival at Yakima Basin gravity water diversions is widely believed to be important in improving overall egg-to-smolt survival of critically depressed stocks of naturally-produced spring chinook, fall chinook and steelhead. This also applies to the progeny of future returning adult YKFP supplementation fish that will naturally reproduce on the spawning grounds. Completion of the Phase 2 fish screen construction program, and on-going preventative screen maintenance addressed by Proj.# 9200900, are complementary Ainfrastructure≡ investments intended to safeguard and enhance the other FWP anadromous fish recovery investments in the basin.**

**d. Project history**

Since FY93, YSS has performed preventative maintenance and major repairs on the majority of completed Phase 2 fish screen facilities. Currently, YSS is responsible for 24 sites (FY98) with two additional YSS-assigned sites going operation in FY99. Remaining sites are Bureau of Reclamation (BR) responsibility. Duties also include acting as BPA's local liaison with the diversion owner. WDFW monitors and verifies diversion owner performed "routine" maintenance eligible for BPA reimbursement and processes claims for payment (\$10,000 budget allotment in FY99).

e. **Methods.**

YSS uses current, state-of-the-art methods and materials to operate and maintain Phase 2 screens to provide optimal fish protection and long equipment service life.

f. **Facilities and equipment.**

WDFW's Yakima Screen Shop is a fully-equipped and staffed metal fabrication and fish screen repair shop with the capability to build nearly anything out of mild steel, stainless steel or aluminum. The acquisition of high-production fabrication equipment with previous BPA and state funding and the hiring of highly skilled metal fabricators has allowed the mission of the YSS to expand from primarily O&M of existing fish screens (prior to 1985) to include "production-level" fabrication of new rotating drum, traveling belt and flat plat fish screens. In addition to adequate shop space and equipment, the program has a new, state-purchased 12-1/2 ton boom truck, a back-hoe, 10 yd. dump truck, assorted trailers and other equipment necessary for a wide variety of field O&M activities. However, with the constantly expanding inventory of Phase 2 screen sites requiring O&M services, YSS has the need for a heavy duty (1-1/2 ton), 4WD service truck with a walk-in, enclosed utility bed capable of carrying all tools, equipment and materials needed to perform any type of field maintenance. Consequently, the FY99 budget request includes a one-time, \$34,000 allotment to purchase this vehicle.

g. **References.**

Bates, K. and R. Fuller. 1992. Salmon fry screen mesh study. Wa. Dept. of Fisheries report, Olympia, Washington.

Beecher, H. and G. Engman. 1995. Screen mesh size effectiveness for excluding trout fry from water diversions. Wa. Dept. of Fish & Wildlife report, Olympia, Washington.

Eddy, B.R. 1988. Wapatox Canal fish screen facility passage effectiveness evaluation: 1986-87. Pacific Power & Light Co. report, Portland, Oregon.

Mueller, R.P., C.S. Abernethy and D.A. Neitzel. 1995. A fisheries evaluation of the

Dryden fish screening facility. Annual Report 1994. DOE/BP-00029-2, Bonneville Power Administration, Portland, Oregon  
Smith, L.S. and L.T. Carpenter. 1987. Salmonid fry swimming stamina data for diversion screen criteria. Fisheries Research Institute, University of Washington, Seattle, Washington.

## **Section 8. Relationships to other projects**

Annual O&M expenditures are linked to progress in completing new Phase 2 screen facilities. Site completions depend on Proj.# 9107500, Yakima Phase 2 screen civil works construction managed by the Bureau of Reclamation (BOR) and Proj# 9105700, screen fabrication performed by YSS. Despite construction delays, new projects are being added each year which result in additional O&M responsibilities and costs.

Completed projects are periodically evaluated by fishery scientists from the Pacific Northwest Labs (PNNL) under Project# 8506200. Independent evaluation, both hydraulic and biological, by an independent third party not directly involved in screen construction or O&M, provides valuable Adaptive management feedback used by YSS, BOR and the Passage TWG to improve screen fabrication and O&M procedures with the objective of providing optimum protection of juvenile salmonids at gravity water diversions.

In 1999, the BPA-funded Yakima/Klickitat Fisheries Project (YKFP) hatchery supplementation program (Proj.# 9701300) will begin releasing experimental and control groups of spring chinook salmon smolts from acclimation/release ponds. YKFP experiments and fish production will benefit from a rigorous O&M program for completed Phase 2 screen projects by reducing injury, delay and mortality of hatchery smolts.

## **Section 9. Key personnel**

**John A. Easterbrooks, WDFW Fish Screening Program Manager/Fish Biologist  
2 man-weeks/yr**

**Duties: Periodic Phase 2 screen facility site visits to assess O&M procedures from a biological perspective; annual project proposal and outyear budgeting.**

**Resume: John Easterbrooks has been the manager of the WDFW Fish Screening Program since 1983. The program designs, fabricates (metalwork), constructs (civil works), modifies, inspects, operates and maintains fish passage and protection facilities at surface water diversionsXprimarily in anadromous fish areas of the Columbia Basin. Mr. Easterbrooks has expertise in the design, operation, maintenance and hydraulic/biological evaluation of all types of fish passage/protection facilities. Mr. Easterbrooks has provided project oversight for BPA-funded, YSS screen fabrication beginning in 1984 with the Yakima Phase 1 fish**

passage construction program and continuing with Yakima Phase 2 in 1992. Mr. Easterbrooks represents WDFW on the Yakima Basin Passage Technical Work Group (Passage TWG) and CBFWA=s regional Fish Screening Oversight Committee (FSOC). Both groups are charged with implementing fish passage/screening construction programs critical to restoration of Columbia River salmon and steelhead. Mr. Easterbrooks holds a B.S. degree in Wildlife Management from the Univ. of Maine (1974), and an M.S. degree in Fishery Resources from the Univ. of Idaho (1981).

**Patrick C. Schille, Construction & Maintenance Superintendent**

**8 man-weeks/yr**

**Duties:** Project estimator and detailed budget preparation, project cost tracking, field O&M personnel supervisor, periodic site visits to assess O&M procedures from a mechanical perspective.

**Resume:** Pat Schille has 10 years of combined experience as a fish screen fabricator and supervisor at the YSS. Mr. Schille was the first welder/fabricator hired specifically to work on BPA-funded screen projects in 1987 (Yakima Phase 1). Pat has 20 years of fabrication experience and 8 years in a supervisory capacity. Technical training includes: fabrication layout, advanced welding, blueprint reading, applied hydraulics, personnel management, project estimation and management, basic personal computer training (wordprocessor and spreadsheet).

**Dale Banker, Plant Mechanic**

**20 man-weeks/yr**

**Duties:** Field and shop O&M of lower Yakima R. and Naches R. Phase 2 screen facilities (17 sites).

**Resume:** Dale Banker has 18 years experience in screen maintenance and fabrication at the YSS. Dale also has two years experience in food processing plant equipment maintenance. Qualifications and/or training include: fabrication layout, welding, blueprint reading, basic electrical wiring and motor repair, heavy equipment operation (trucks, backhoes, boom trucks, etc.). Dale holds a Class A Commercial Drivers License (CDL) necessary for heavy equipment operation on the road.

**Bill Werst, Plant Mechanic**

**16 man-weeks/yr**

**Duties:** Field and shop O&M of upper Yakima R. Phase 2 screen facilities (9 sites).

**Resume:** Bill Werst has 22 years experience in construction and maintenance trades, including 9 years of fabrication and O&M experience with the YSS. Bill was a pipe fitter and quality control inspector at the Hanford Nuclear Reservation for 7 years prior to coming to the YSS. Qualifications and/or training include: fabrication layout, welding, blueprint reading, basic electrical wiring and motor repair, heavy equipment operation (trucks, backhoes, boom trucks, etc.). Bill holds a Class A Commercial Drivers License (CDL) necessary for heavy equipment operation on the road.

## **Section 10. Information/technology transfer**

**YSS is constantly looking for ways to enhance screen quality, durability and fish protection effectivenessXboth from a fabrication and long-term O&M perspective. YSS is particularly interested in improvements in: 1) rotating drum and traveling belt screen seals and drive systems, and 2) active cleaning systems for fixed plate screens. Innovations or new O&M procedures are shared with BOR, NMFS and the other state screening programs (OR, ID) by providing shop sketches and/or revised engineering drawings on request. New developments are also shared between the state screening program coordinators at AFish Screening Oversight Committee≡ (FSOC) meetings (FSOC is a standing CFWA committee). In addition, improved fish screen O&M technology and methods are shared among the Ahands-on≡ O&M personnel of the state and federal agencies and tribes at the Pacific Northwest Fish Screening Fabrication, Operation & Maintenance Workshop held annually since 1992. This workshop is co-sponsored by BPA & CFWA (FSOC) and hosted by the three state screening programs on a revolving basis.**