
PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Yakima Phase 2 [Fish] Screen Fabrication

BPA project number: 9105700
Contract renewal date (mm/yyyy): 2/1999 **Multiple actions?**

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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NPPC Program Measure Number(s) which this project addresses
7.11B.1

FWS/NMFS Biological Opinion Number(s) which this project addresses
NA

Other planning document references

This project is a component of the Yakama Nation's anadromous fish restoration plan for the Yakima Basin; YIN was an original co-sponsor of the NPPC Program Measure this project addresses and has supported the project from its inception in 1990 and initial funding in FY1992.

Short description

YSS fabricates and installs fish screens and all miscellaneous metalwork for Yakima Basin Phase II screen projects. New fish screens prevent mortality and/or injury of juvenile anadromous and resident fish in gravity irrigation diversions.

Target species

spring and fall chinook, steelhead, coho, bull trout, rainbow trout, whitefish

Section 2. Sorting and evaluation

Subbasin

Yakima

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
<input checked="" type="checkbox"/> Anadromous fish <input type="checkbox"/> Resident fish <input type="checkbox"/> Wildlife	<input checked="" type="checkbox"/> Multi-year (milestone-based evaluation) <input type="checkbox"/> Watershed project evaluation	<input type="checkbox"/> Watershed councils/model watersheds <input type="checkbox"/> Information dissemination <input type="checkbox"/> Operation & maintenance <input checked="" type="checkbox"/> New construction <input type="checkbox"/> Research & monitoring <input type="checkbox"/> Implementation & management <input type="checkbox"/> Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9107500	Yakima Phase II Screens - Construction (USBR)	mandatory linkage with screen facility civil works construction
9200900	Yakima Screens - Phase II - O&M (WDFW, YSS)	operation & preventive maintenance of completed screens
9503300	O&M of Yakima Fish Protection, Mitigation & Enhancement Facilities (USBR)	screen & fish passage O&M and preventative maintenance
8506200	Evaluate the Effectiveness of Fish Screens (Battelle, PNNL)	post-construction and periodic biological/hydraulic evaluation of completed Phase II screens

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1998	Screen fabrication/installation completed for: Old Union Canal and Younger Ditch irrigation diversions; shop fabrication of Johncox, Fogarty screens for 1999 install	Yes--replacement of old, obsolete screens that are non-compliant with CBFWA's FSOC regional fish screening criteria
1997	Screen facilities fabricated/installed: Bull, Ellensburg Mill, Clark, Lindsey, Union Gap, Upper WIP (install)	" " "
1996	Facilities fabricated/installed: Fruitvale, Naches-Selah, Emerick, Stevens, Anderson, Tennant, Sinclair-Cobb, Gnavaugh, Peterson	" " "
1995	Facilities fabricated/installed: Toppenish Pump, Upper WIP fabrication	" " "

1994	Facilities fabricated/installed: Bachelor-Hatton, Congdon, Kelly-Lowry	"	"	"
1993	Facilities fabricated/installed: Gleed, Holmes, Lower WIP, New Cascade, Snipes-Allen, Taylor,	"	"	"
1992	Facilities fabricated/installed: Naches-Cowiche, Kiona	"	"	"

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Fabricate/Installaton of Phase 2, Group 8 fish screens and miscellaneous metalwork	a	Shop fabrication of screens and metalwork for sites designated by Yakima Basin Passage TWG
		b	Install screens, structural and miscellaneous metalwork in civil works structure
		c	Field testing, adjustment during initial operation of screen facility

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	2/2000	2/2001	Group 8 Phase II diversions upgraded to comply with regional fish screening criteria	X	100.00%
				Total	100.00%

Schedule constraints

Delays in screen civil works construction caused by diversion water rights uncertainty (on-going court adjudication) or property acquisition delays (easements, rights-of-way, fee title) may affect the Yakima Screen Shop fabrication schedule.

Completion date

2002

Section 5. Budget

FY99 project budget (BPA obligated): \$186,000

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	fabrication/installation labor costs	%30	89,370
Fringe benefits	@ 31% of labor costs	%9	27,705

Supplies, materials, non-expendable property	includes: metered/non-metered equipment charges; WA sales tax @ 7.8%	%38	110,731
Operations & maintenance	Not Applicable	%0	0
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	None in FY2000	%0	0
NEPA costs	Not Applicable	%0	0
Construction-related support	Not Applicable	%0	0
PIT tags	# of tags: 0	%0	0
Travel	vehicle mileage costs for installation/field testing	%2	6,700
Indirect costs	YSS indirect costs @ \$300/man-month	%3	9,755
Subcontractor	Not Applicable	%0	0
Other	Admin. overhead @ 20% of above subtotal	%17	48,852
TOTAL BPA FY2000 BUDGET REQUEST			\$293,113

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount (\$)
Not Applicable		%0	
		%0	
		%0	
		%0	
Total project cost (including BPA portion)			\$293,113

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	\$150,000	\$100,000	\$0	\$0

Section 6. References

Watershed?	Reference
<input type="checkbox"/>	Bates, K. and R. Fuller. 1992. Salmon fry screen mesh study. Wa. Dept. of Fisheries Rept., Olympia, Washington.
<input type="checkbox"/>	Beecher, H. and G. Engman. 1995. Screen mesh size effectiveness for excluding trout fry from water diversions. Wa. Dept. of Fish & Wildlife Rept., Olympia, Washington.
<input type="checkbox"/>	Blanton, S. L., D. A. Neitzel, and C. S. Abernethy. 1998. Washington Phase II Fish Diversion Screen Evaluations in the Yakima River Basin, 1997. Prepared for the Bonneville Power Administration by Pacific Northwest Laboratory, Richland, Washington.
<input type="checkbox"/>	Eddy, B. R. 1988. Wapatox Canal fish screen facility passage effectiveness evaluation: 1986-87. Pacific Power & Light Co. Rept., Portland, Oregon
<input type="checkbox"/>	Mueller, R. P., C. S. Abernethy, and D. A. Neitzel. 1995. A fisheries evaluation of the Dryden fish screening facility. 1994 Annual Report. DOE/BP-00029-2, Bonneville Power Administration, Portland, Oregon.
<input type="checkbox"/>	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.

PART II - NARRATIVE

Section 7. Abstract

Obsolete Yakima Basin fish screens constructed in the 1930's, 40's, 50's and 60's must be replaced or updated to comply with current, regional fish screen biological protection criteria adopted by CBFWA's Fish Screening Oversight Committee (FSOC) in 1995. The project objective is to provide 100 percent protection from mortality and/or injury for all species and life stages of anadromous and resident salmonids—including bull trout which are now listed as "Threatened" under ESA (6/98) and steelhead which are proposed for listing (3/99). Old screens in the Yakima basin, and in other Columbia R. subbasins, 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 by irrigation diversions may reduce subsequent smolt production and hampers 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%). Consequently, the state and federal fish agencies and Yakama Indian Nation propose to complete replacement or upgrade of all obsolete fish screen facilities in the Yakima Basin by the end of FY 2002.

Section 8. 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, is 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, necessary to provide adequate power to turn the paddlewheel, with total disregard for the biological needs of the fish.

At about the same time as the Wapatox Screen Evaluation Study, 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 (PNNL) (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.). On-going 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 (Blanton et al. 1998). Fish screen facilities with this high level of protection performance minimize a source of mortality that can reduce basin smolt production.

b. 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.

c. Relationships to other projects

Project accomplishments and annual expenditures are inextricably linked to progress on Proj.# 9107500, Yakima Phase 2 screen civil works construction managed by the Bureau of Reclamation (USBR). YSS tries to match the shop fabrication schedule to the USBR civil works construction schedule, delaying fabrication if necessary to prevent cost overruns that could result from civil works design changes. Cost-effective and timely completion of Phase 2 screen projects requires that both this project (9105700) and 9107500 be adequately funded and coordinated. Coordination is accomplished through the Yakima Passage Technical Work Group (TWG).

Completed projects are periodically evaluated by fishery scientists from the Pacific Northwest National Lab (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 Aadaptive management feedback≡ used by YSS, USBR 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 April, 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 on the Yakima R. and North Fork Teanaway R. YKFP experiments and fish production will benefit from completion of pending Phase 2 screen projects by reducing injury, delay and mortality of hatchery smolts at Yakima Basin irrigation diversions.

Similar fish screen construction projects are ongoing in Oregon (Proj.# 9306600) and Idaho (Proj.# 9401500) subbasins. WDFW-YSS is also an active partner with the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) who is the project sponsor for passage and fish screening improvements in the Walla Walla R. basin (Proj.# 9601200). YSS will be performing similar screen fabrication tasks in this subbasin on behalf of CTUIR and BPA. Taken together, regional efforts to improve juvenile anadromous salmonid survival at water diversions may result in higher Columbia basin natural smolt survival and outmigration and contribute to Columbia River salmon and steelhead stock recovery.

d. Project history (for ongoing projects)

Since FY92, YSS has completed shop fabrication, delivery and field installation of fish screens, fish bypass control systems, lifting gantries and other miscellaneous metalwork or conversion/decommissioning for 34 of the 66 prioritized Yakima Basin Phase 2 water diversions approved in program measure 7.11B.1. This project is ongoing with two new facilities being fabricated and scheduled for completion prior to the 1999 irrigation season. Total YSS costs for Yakima Basin Phase 2 screen fabrication through FY99 is \$2,452,777 (after deducting BPA funds provided to YSS under this project number for fabricating Umatilla River screens and for portable drum screens for Oregon and Idaho).

e. Proposal objectives

YSS will fabricate and install USBR-designed and Passage TWG-approved fish screens, fish bypass control gates and miscellaneous metalwork for the following new Phase 2 facilities scheduled to be constructed in FY2000:

- 1) Scott Ditch (23 cfs, Naches R.)**
- 2) Powell Ditch (20 cfs, Naches R.)**
- 3) LaFortune Ditch (13 cfs, Naches R.)**
- 4) Lewis Ditch (2.6 cfs, Naches R.)**
- 5) Packwood Ditch (30 cfs, Yakima R.)**

f. Methods

Project priority and scheduling is determined by the Yakima Basin Passage TWG including input from the BPA project manager, USBR, state and federal fish agencies and Yakama Indian Nation. Water rights adjudication updates provided by the WA Dept. of Ecology play a significant role in scheduling projects because determining accurate screen design flow is critical to the biological success and cost effectiveness of each project. Once the annual work plan is developed with specific

projects selected for construction, YSS builds screens and miscellaneous metalwork using state-of-the-art metal fabrication equipment, methods and materials.

g. Facilities and equipment

WDFW's Yakima Screen Shop is a fully-equipped and staffed metal fabrication 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 operation and maintenance 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 12-1/2 ton boom truck, a back-hoe, 2 -10 yd. dump trucks, a BPA-purchased 1-1/2 ton flatbed truck, a new BPA-purchased (Proj.# 9200900) 3-1/2 ton utility truck, assorted utility trailers and other equipment necessary for field construction and installation of screens and miscellaneous metalwork.

h. Budget

The increased budget request for FY2000 (\$293K), relative to the FY1999 request (\$186K), reflects the Yakima Basin Passage TWG's intention to complete major, pending screening projects in FY2000 after a production slow down in 1999 caused by design and real estate/easement acquisition problems. The five projects listed in Sect. 8.e. are the last group of medium-to-large size Phase 2 screens left to replace from the original list of 66 projects. A full 80 percent of the budget will be used beneficially to produce a tangible, on-the-ground product; overhead accounts for only 20% of the budget (3% YSS O/H; 17% WDFW Administrative O/H).

Section 9. Key personnel

John A. Easterbrooks, WDFW Fish Screening Program Manager/Fish Biologist

3 man-weeks/yr

Duties: Yakima Basin Passage TWG coordination, planning; project oversight (shop and field) 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 diversions, primarily 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

7 man-weeks/yr

Duties: Project estimator and detailed budget preparation, project cost tracking, design review, fabrication quality control.

Resume: Pat Schille has 11 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 21 years of fabrication experience and 9 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).

Chuck Lenberg, Plant Mechanic Supervisor

41 man-weeks/yr

Duties: Shop foreman supervising project welder/fabricators, general repairers and laborers; review of shop fabrication drawings; materials and tool procurement; task coordination and scheduling; product quality control; field supervision during screen installation.

Resume: Chuck Lenberg is a journeyman welder/fabricator with 16 years of shop and field experience in production metal fabrication and 7 years of supervisory experience as a shop foreman including 9 years of service with the YSS. Technical training includes: fabrication layout, advanced welding, blueprint reading, automotive repair, heavy equipment operation and basic computer training (wordprocessor and spreadsheet).

Robert Haverfield, Lead Welder/Fabricator

40 man-weeks/yr

Duties: Fish screen and miscellaneous metalwork layout and fabrication; shop equipment maintenance and repair, heavy equipment operation in the field (boom truck, backhoe, dump trucks, etc.); field installation of fish screens and misc. metalwork; supervision of temporary laborer.

Resume: Bob Haverfield is a journeyman welder/fabricator with 14 years of shop and field experience in production metal fabrication and 6 years of supervisory experience as a foreman including 5 years of service with the YSS. Technical training includes: fabrication layout, advanced welding, blueprint reading, entry level management and heavy equipment operation. Bob holds a Class A Commercial Drivers License (CDL) necessary for heavy equipment operation on the road.

Scott Brons, Welder/Fabricator/Machinist; Draftsman

40 man-weeks/yr

Duties: Fish screen and miscellaneous metalwork layout and fabrication; lathe and milling machine operation; preparation of shop fabrication drawings (manual and computer-assisted); shop equipment maintenance and repair, heavy equipment operation in the field (boom truck, backhoe, dump trucks, etc.); field installation of fish screens and misc. metalwork; supervision of temporary laborer.

Resume: Scott Brons is a journeyman welder/fabricator with 11 years of shop and field experience in production metal fabrication and machining including 6 years of service at the YSS. Technical training includes: fabrication layout, advanced welding, blueprint reading, heavy equipment operation, and drafting including computer-assisted drawing using AutoCad. Scott holds a Class A Commercial Drivers License (CDL) necessary for heavy equipment operation on the road.

Joe Molano, Jr., General Repairer

40 man-weeks/yr

Duties: Assist welder/fabricators by cutting and fabricating parts and assisting with component assembly. Primary employee responsible for surface preparation and application of 2-part epoxy industrial coating to all mild steel components of screens, control gates, lifting gantries and other miscellaneous metalwork.

Section 10. Information/technology transfer

YSS is constantly looking for ways to enhance screen quality, durability and fish protection effectivenessXparticularly improvements in: 1) rotating drum and traveling belt screen seals and drive systems, and 2) active cleaning systems for fixed plate screens.

YSS R&D innovations are shared with USBR, NMFS, ODFW, IF&G and anyone requesting technical assistance or advice concerning fish screening. Shop sketches and/or detailed engineering drawings are provided on request. YSS technical information exchange capability increased

dramatically in 1998 with the combination of full AutoCAD capability and e-mail. Two-way transmission of AutoCad drawings via the Internet is now the standard for information exchange. Another recent development to foster information exchange is the addition of a fish passage/fish screening web page to the WDFW site: <http://www.wa.gov/wdfw/hab/engineer/habeng.htm> . Technical documents and AutoCad drawings of general interest to fish screening practitioners will be added to the web page in 1999.

New developments are also shared between the WA, OR, ID screening program coordinators at AFish Screening Oversight Committee (FSOC) meetings (FSOC is a standing CBFWA committee). In addition, improved fish screening technology is shared among the hands-on fabrication and 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 & CBFWA (FSOC) and hosted by the three state screening programs on a revolving basis. In 1999, FSOC is planning to extend the workshop to California to exchange ideas and information with USBR, CA F&G, NMFS and others working on Sacramento-San Joaquin Basin fish screening and salmonid recovery.

Congratulations!