

## PART I - ADMINISTRATIVE

### Section 1. General administrative information

|  |                                |
|--|--------------------------------|
| <b>Title of project</b><br>Yakima Phase II Screens - Construction  |                                |
| <b>BPA project number</b>  | 9107500                        |
| <b>Contract renewal date (mm/yyyy)</b>   | 12/1998                        |
| <b>Multiple actions? (indicate Yes or No)</b>  | Yes                            |
| <b>Business name of agency, institution or organization requesting funding</b><br>U.S. Bureau of Reclamation   |                                |
| <b>Business acronym (if appropriate)</b>   | USBOR                          |
| <b>Proposal contact person or principal investigator:</b>  |                                |
| <b>Name</b>  | R. Dennis Hudson               |
| <b>Mailing address</b>   | 1150 N. Curtis Rd. - Suite 100 |
| <b>City, ST Zip</b>  | Boise ID 83706-1234            |
| <b>Phone</b>   | (208) 378-5250                 |
| <b>Fax</b>   | (208) 378-5171                 |
| <b>Email address</b>   | rhudson@pn.usbr.gov            |
| <b>NPPC Program Measure Number(s) which this project addresses</b><br>Measure 7.11B.1 of the 1994 Fish and Wildlife Program as amended in 1995.  |                                |
| <b>FWS/NMFS Biological Opinion Number(s) which this project addresses</b>  |                                |
| <b>Other planning document references</b>  |                                |
| <b>Short description</b><br>Install new fish screens at all significant diversions in the Yakima River Basin to keep juvenile salmon and steelhead from being diverted and lost in canals during outmigration. Improve adult upstream passage at selected sites. |                                |
| <b>Target species</b><br>salmon, steelhead   |                                |

### Section 2. Sorting and evaluation

|  |
|--|
| <b>Subbasin</b><br>Lower Mid-Columbia/Yakima |
|--|

#### **Evaluation Process Sort**

| <b>CBFWA caucus</b>  | <b>CBFWA eval. process</b>     | <b>ISRP project type</b> |
|----------------------|--------------------------------|--------------------------|
| X one or more caucus | If your project fits either of | X one or more categories |

|   |                 |   |                                     |
|---|-----------------|---|-------------------------------------|
|   |                 | these processes, X one or both            |                                     |
| X | Anadromous fish | X Multi-year (milestone-based evaluation) | Watershed councils/model watersheds |
|   | Resident Fish   | Watershed project eval.                   | Information dissemination           |
|   | Wildlife        |   | Operation & maintenance             |
|   |                 |   | X New construction                  |
|   |                 |   | Research & monitoring               |
|   |                 |   | Implementation & mgmt               |
|   |                 |   | 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  |
|-----------|--|---|
| 9105700   | Yakima Phase II Screen Fabrication                                 | Provides fabrication and installation of screens and other mechanical and metalwork items at Phase II screen sites. |
| 9200900   | Yakima Screens - Phase II - O&M                                    | Provides on-going operation and maintenance activities at completed screens.  |
| 9503300   | O&M of Yakima Fish Protection, Mitigation & Enhancement Facilities | Provides on-going operation and maintenance activities at completed screens.  |
| 8506200   | Passage Improvement Evaluation (PNNL)                              | Provides biological and hydraulic evaluation of selected Phase II screens.  |

### Section 4. Objectives, tasks and schedules

#### ***Past accomplishments***

| Year | Accomplishment                       | Met biological objectives? |
|------|--------------------------------------|----------------------------|
| 1990 | Planning Report completed            |                            |
| 1992 | First construction contracts awarded |                            |

|      |                                       |  |
|------|---------------------------------------|--|
| 1995 | 14 screen sites completed (1992-1995) |  |
| 1998 | 11 screen sites completed (1996-1998) |  |

**Objectives and tasks**

| Obj 1,2,3 | Objective   | Task a,b,c | Task   |
|-----------|---|------------|--|
| 1         | Provide screens at all Phase II diversion sites that will meet current agency criteria for effective fish protection and passage. | a          | Develop schedules and budgets and coordinate project implementation                  |
|           |   | b          | Develop conceptual plans and obtain consensus of all interested parties at each site |
|           |   | c          | Prepare designs and specifications   |
|           |   | d          | Award construction contracts and supervise and administer construction.              |

**Objective schedules and costs**

| Obj # | Start date mm/yyyy | End date mm/yyyy | Measureable biological objective(s) | Milestone    | FY2000 Cost % |
|-------|--------------------|------------------|-------------------------------------|--------------|---------------|
| 1     | 10/1992            | 05/2001          |                                     |              | 100           |
|       |                    |                  |                                     |              |               |
|       |                    |                  |                                     |              |               |
|       |                    |                  |                                     |              |               |
|       |                    |                  |                                     | <b>Total</b> | 100           |

|   |
|---|
| <p><b>Schedule constraints</b></p> <p>Canal system consolidation proposals have not been implemented and have delayed construction at some sites while the irrigation districts proceed through the study process. If these proposals are not implemented by January 1999 we must proceed to screen existing diversions or risk loss of funding and incomplete project objectives. Water rights uncertainties also have delayed construction at some sites. If the water rights issues are not resolved by Jan 1999, we intend to proceed with screen sizing based on historical diversions. Difficulties in securing rights-of-way continue to delay construction at some sites.</p> |
| <p><b>Completion date</b></p> <p>2001</p>   |

**Section 5. Budget**

|   |                    |
|---|--------------------|
| <b>FY99 project budget (BPA obligated):</b> | <b>\$1,500,000</b> |
|---|--------------------|

**FY2000 budget by line item**

| Item  | Note   | % of total | FY2000 (\$) |
|---|--|------------|-------------|
| Personnel   | Direct labor for construction supervision, contract administration, design, and project coordination | 15.0       | 150,000     |
| Fringe benefits   |  | 5.0        | 50,000      |
| Supplies, materials, non-expendable property                              |  | 0.5        | 5,000       |
| Operations & maintenance  |  |            |             |
| Capital acquisitions or improvements (e.g. land, buildings, major equip.) |  |            |             |
| NEPA costs  |  |            |             |
| Construction-related support  | Construction contracts and related contingencies   | 65.0       | 650,000     |
| PIT tags  | # of tags:   |            |             |
| Travel  |  | 3.5        | 35,000      |
| Indirect costs  |  | 9.5        | 95,000      |
| Subcontractor   |  |            |             |
| Other   |  | 1.5        | 15,000      |
| <b>TOTAL BPA REQUESTED BUDGET</b>   |  |            | 1,000,000   |

**Cost sharing**

| Organization                                      | Item or service provided | % total project cost (incl. BPA) | Amount (\$) |
|---|--------------------------|----------------------------------|-------------|
|   |                          |                                  |             |
|   |                          |                                  |             |
|   |                          |                                  |             |
|   |                          |                                  |             |
| <b>Total project cost (including BPA portion)</b> |                          |                                  |             |

**Outyear costs**

|                     | FY2001      | FY02      | FY03 | FY04 |
|---------------------|-------------|-----------|------|------|
| <b>Total budget</b> | \$1,000,000 | \$500,000 |      |      |

**Section 6. References**

| Watershed? | Reference  |
|------------|--|
|            | 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 and Wildlife Report, Olympia, Washington.                                  |
|  | Eddy, B.R. 1988. Wapatox Canal Fish Screen Facility Passage Effectiveness Evaluation: 1986-87. Pacific Power and Light Company 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.                       |

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## **PART II - NARRATIVE**

### **Section 7. Abstract**

All Phase II diversion sites will be screened to meet current agency design criteria for effective fish protection and fish passage by the year 2001. The target objectives of adequate juvenile fish passage are designed to meet three criteria which will: (1) reduce delay to a degree approaching zero; (2) reduce the possibility of injury to a degree approaching zero; and (3) allow fish to pass with little additional expenditure of energy. Selected Phase II screens have been (and others will be) monitored and evaluated using live fish to determine effectiveness of the new screens.

This program directly relates to measure 7.11B.1 of the 1994 Columbia Basin Fish and Wildlife Program as amended in 1995.

### **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, are inadequate to assure that gravity water diversions are not depressing anadromous salmonid egg-to-smolt survival rates. Survival and bypass guidelines at Pacific Corps. Wapatox Canal hydropower/irrigation diversion on the Naches River 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 Washington. 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 Washington Department of Fisheries (WDF), Department of Wildlife and Centralia City Light Department contracted with the University of Washington, 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, and chum salmon) at low spring-time water temperatures (3-4o C). WDF adopted the 0.4 feet/sec approach velocity criteria in 1988. Oregon Department 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 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 Washington, Oregon, and Idaho fish screening programs (the principal regulatory agencies on the Columbia Basin Fish and Wildlife Authority's Fish Screening Oversight Committee). Evaluations conducted under Project #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. Rationale and significance to Regional Programs**

The NPPC and BPA have made substantial investments in Yakima Basin anadromous fish recovery. These investments are considered "off-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 Project #9200900 and Project #9503300, are complementary “infrastructure” investments intended to safeguard and enhance the other FWP anadromous fish recovery investments in the basin.

**c. Relationships to other projects**

The Phase II program is facilitated by the Yakima Fish Passage Technical Work Group. This group consists of representatives from BPA, BOR, NMFS, WDFW, CBFWA, CRITFC, Yakama Indian Nation, Yakima River Basin Association of Irrigation Districts, and other state, Federal, and local agencies and interested individuals.

Project accomplishments and annual expenditures are inextricably linked to progress on Project #9105700, Yakima Phase 2 Screen Fabrication, managed by the Washington Department of Fish and Wildlife, Yakima Screen Shop (YSS). YSS tries to match the shop fabrication schedule to the Reclamation 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 II screen projects requires that both this project (9107500) and 9105700 be adequately funded and coordinated. Coordination is accomplished through the Yakima Fish Passage Technical Work Group (TWG).

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, Reclamation, and the Fish 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 (Project #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 completion of pending Phase II 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 (Project #9306600) and Idaho (Project #9401500) subbasins. 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)

Planning Report completed in FY1990. Preliminary and final design initiated in FY1990-91. First construction initiated in FY1992. As of the end of FY1998, construction of screens, consolidation of ditches, elimination of diversions or other corrective measures are complete on about 80% of the Phase II diversions. About 25 new screen structures have been built by Reclamation. About 23 sites have either been eliminated due to non-use or have been screened by the Washington Department of Fish and Wildlife using small prefabricated modular screen units. Construction is currently underway at the Johncox site. Construction at the Fogarty site has been delayed due to right-of-way problems and data collection, preliminary and final design is underway on the remaining 12 sites. Uncertainties in the consolidation process continue to delay construction of some new screens until final consolidation plans are made and funding is secured. Water rights adjudication has delayed construction at some sites because of uncertainties in selecting appropriate design flows. Difficulties in securing rights-of-way at some sites (particularly on the YIN reservation) has delayed and may continue to delay construction at some sites. We are proceeding with preliminary design work at all sites so that there will be enough lead time to prepare final designs and award contracts for construction once consolidation and water rights decisions are firmed up. Total Reclamation costs for planning, design and construction of Phase II screens through December 1998 is about \$12,500,000.

**e. Proposal objectives**

Reclamation will complete construction of the Johncox screen and will initiate construction at the Fogarty, Selah-Moxee, Moxee/Hubbard, Packwood and City of Yakima screens and Naches-Cowiche ladder mods in FY1999. Construction at some of these sites will extend into FY2000. Predesign and design work will be started on the Powell, Lewis, LaFortune, Scott, Packwood, Tjossem, and Toppenish Refuge sites in FY1999. This design work will be completed in FY2000 and construction will be initiated at most of these sites in FY2000 with completion in FY2001. It is possible that completion at one or two sites could slip into FY2002 although funding for all construction contracts should be obligated in FY2001.

**f. Methods**

Project priority and scheduling is determined by the Yakima Fish Passage Technical Work Group. The Work Group is composed of experienced biologists, engineers, facility operators, and others representing different agencies and interest groups. Preliminary designs at each site are reviewed by the Technical Work Group to ensure that all pertinent criteria are met and that the new facilities will meet the functional requirements of fish passage and protection in a cost effective manner.

**g. Facilities and equipment**

Reclamation's design and construction offices are equipped with state of the art computing,

surveying, laboratory, and drafting equipment, and vehicles. Each of the offices is staffed with experienced engineers, technicians, biologists, and office support personnel.

#### **h. Budget**

The budget figures in Section 5 are based on the assumption that the predesign work and most of the design work at all remaining Phase II sites will be completed in FY1999. About 70% of the personnel costs in FY2000 are for construction management on contracts that will be awarded towards the end of FY1999. This results in a somewhat higher indirect costs than shown in previous years to cover office space requirements for the construction office in Yakima. The construction contract costs are based on starting construction at six or seven sites in FY2000.

### **Section 9. Key personnel**

**Name:** R. Dennis Hudson, P.E.

**Title:** Program Manager, Liaison & Coordination Group, Pacific Northwest Regional Office, Boise Idaho

**FTE/hours:** 6 staff-weeks/year

**Duties:** Mr. Hudson is the chairman of the multi-agency Yakima Fish Passage Technical Workgroup. He has served in this capacity since the Phase II program was initiated in 1990. As Reclamation's Program Manager for Phase II activities, Mr. Hudson provides overall direction of planning, design, and construction activities to ensure that program accomplishment meets pre-established targets for implementation of fish passage improvements. He coordinates Phase II activities to ensure that plans are approved by the Technical Work Group and implemented by Reclamation design and construction personnel in a timely and cost effective manner that satisfies funding, environmental, permitting, rights-of-way, and other constraints.

**Resume:** Mr. Hudson's career with Reclamation spans a period of about 35 years beginning in 1963, and has been focused on conceptual planning activities for multi-purpose water resource projects. He has worked on Reclamation projects throughout the Pacific Northwest Region. Some of the projects that have been implemented include the Oroville-Tonasket Unit pipe distribution system, the Second Bacon Siphon and Tunnel on the Columbia Basin Project, the Umatilla Basin Project, and fish passage improvements at numerous sites in the Yakima, Umatilla, Rogue, Salmon, and other basins in the northwest. Since 1983, Mr. Hudson's work has been mostly devoted to planning and implementation of fish passage improvements at both Reclamation and other diversions in the Region. His responsibilities have included development of conceptual plans, technical review of final designs, scheduling, budgeting, liaison, and coordination activities. Mr. Hudson received a B.S. degree in civil engineering from the Michigan College of Mining and Technology (now Michigan Technological University) in 1962. He is a registered professional engineer in the States of Washington and Idaho and is a member of ASCE.

**Name:** David W. Jennings, P.E.

**Title:** Design Program Manager, Pacific Northwest Regional Office, Boise Idaho

**FTE/hours:** 4 staff-weeks/year

**Duties:** As manager of Reclamation's Pacific Northwest Regional Office Design Group, Mr. Jennings supervises a staff of experienced engineers and technicians who create design drawings and technical specifications for civil, mechanical, and electrical engineering; architectural; and landscape architectural projects. The design staff also prepares technical studies and reports for advance planning activities. The design staff provides technical assistance to other Reclamation offices, other Federal entities, irrigation districts and Indian tribes, as required, on planning, design, and construction matters. The Regional Office design staff has designed fish passage improvements at numerous sites in the Yakima, Umatilla, Rogue, Salmon, and other basins in the northwest. Mr. Jennings assures that all designs generated or approved by the Region are in compliance with accepted engineering methods and standards.

**Resume:** Mr. Jennings' career with Reclamation spans a period of about 18 years beginning in 1980, and has been focused on civil engineering design and construction activities for multipurpose water resource projects. He has worked on Reclamation projects in many of the western United States. Prior to 1994, Mr. Jennings worked in the Lower Colorado Regional Office in Boulder City, Nevada. Mr. Jennings started with Reclamation as a civil engineer designing a wide variety of projects including canals, pumping plants, pipelines, wells, levees, roads, and buildings.

Since 1987, Mr. Jennings has worked as an engineering manager, supervising engineers and support staff who are responsible for planning and design activities. Mr. Jennings received a B.S. degree in civil engineering from Northern Arizona University in 1977. Before joining Reclamation, Mr. Jennings worked for a small engineering consulting firm in Flagstaff, Arizona. He is a registered professional engineer in the State of Nevada.

**Name:** Bernie Meskimen, P.E.

**Title:** Project Construction Engineer, Pacific Northwest Construction Office, Yakima Washington

**FTE/hours:** 4 staff-weeks/year

**Duties:** As Project Construction Engineer, Mr. Meskimen supervises a staff of engineers and technicians who have had extensive experience in the design and construction of fish screens. Mr. Meskimen's work includes dam rehabilitation, canal and pumping plant construction, fish passage facilities construction, and O&M construction.

**Resume:** Mr. Meskimen has worked for 26 years in Design and Construction with 24 of those years specifically for the Bureau of Reclamation. He holds a B.S. degree in Civil Engineering from Montana State University (1973). The first five years with Reclamation, Mr. Meskimen was a Civil Engineer in Boise and Billings Regional Office Design Branch. He served as Office

Engineer for four years with the Island Park Dam Project Office. This consisted of dam rehabilitation and construction projects in Montana, Idaho, and Nevada. Additionally, Mr. Meskimen served for two years as Assistant Construction Engineer in Bismark, N.D. on the Garrison Diversion Project. He headed design, geology, specification sections, in addition to serving as assistant to the Construction Engineer. Project work included building dams, pumping plants, and irrigation delivery systems. Since 1984, Mr. Meskimen has served as Construction Engineer for the Yakima Project. In 1990, he became the Project Construction Engineer for the Umatilla-Yakima Construction Office which is presently the Pacific Northwest Construction Office. He is a registered professional engineer in the State of Montana.

**Other Reclamation Resources:** As needed, we can call upon experienced engineering and biological staff from other offices within the Pacific Northwest Region, other Reclamation regions, and Reclamation's Technical Service Center in Denver.

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

Design standards and criteria are updated frequently to reflect lessons learned at earlier sites. We participate in the Annual Fish Screen Workshop to share information with others working on fish passage issues in the western U.S.

We also participate in joint tours and workshops with Reclamation personnel from other Regions and from Reclamation's Technical Service Center in Denver who are engaged in research, planning, design, and construction of Reclamation fish facilities.

## **Congratulations!**