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## PART I - ADMINISTRATIVE

### Section 1. General administrative information

**Title of project**

Juvenile Anadromous Fish Prototype-Scale Evaluation Facility

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**BPA project number:** 20060

**Contract renewal date (mm/yyyy):**

**Multiple actions?**

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

Northwest Hydraulic Consultants, Inc.

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**Business acronym (if appropriate)**

NHC

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**Proposal contact person or principal investigator:**

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

NWPPC Columbia River Basin Fish and Wildlife Program Fiscal Year 1999 Annual Implementation Work Plan, Item number 14, "Earmark budget for innovative work"

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

Conservation Number 6 - " NMFS Bi-Op 1995"

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**Other planning document references**

National Marine Fisheries Service Biological Opinion "Reinitiation of Consultation on 1994-1998 Operation of the Federal Columbia River Power System and Juvenile Transportation Program in 1995 and Future Years." (2 March 1995)

"Risk Management: Improved Strategy for Development of Biological Criteria to Support Design of Large Scale Fish Passage Improvements" (December 1996) U.S. Army Corps of Engineers, Portland and Walla Walla Districts

"Preliminary Assessment of Hanford Sites for a Fish Passage Research Laboratory" (1996) Battelle Pacific Northwest Laboratory

"Pre-Proposal for Hydraulic and Biological Fish-Passage Research Facility" (199?) Washington State University

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**Short description**

Behavioral and physiological prototype-scale juvenile fish behavior and injury test facility capable of simulating surface and submerged outlet passage routes at prototype scale hydraulic head.

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**Target species**

All juvenile migrant salmonids

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## Section 2. Sorting and evaluation

Subbasin

Mainstem

### ***Evaluation Process Sort***

<b>CBFWA caucus</b>	<b>Special evaluation process</b>	<b>ISRP project type</b>
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 type="checkbox"/> New construction <input checked="" 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.

<b>Project #</b>	<b>Project title/description</b>

### ***Other dependent or critically-related projects***

<b>Project #</b>	<b>Project title/description</b>	<b>Nature of relationship</b>

## Section 4. Objectives, tasks and schedules

### ***Past accomplishments***

<b>Year</b>	<b>Accomplishment</b>	<b>Met biological objectives?</b>

**Objectives and tasks**

<b>Obj 1,2,3</b>	<b>Objective</b>	<b>Task a,b,c</b>	<b>Task</b>
1	Determine regional biological evaluation requirements, regional research needs, preferred site location	a	Consult with agencies to develop regional perspective of biological research needs
		b	Develop general capability requirements for regional research facility
		c	Develop design criteria for research facility
		d	Select preferred site for primary research facility
2	Develop preliminary design for regional research facility	a	Prepare preliminary conceptual designs and reconnaissance level cost estimates for research facility at preferred location
		b	Regional agency review and comment on preliminary facility design and cost estimate
3	Develop feasibility level design and cost estimate for research facility	a	Prepare feasibility-level facility design and construction cost estimate based on regionally coordinated agency needs

**Objective schedules and costs**

<b>Obj #</b>	<b>Start date mm/yyyy</b>	<b>End date mm/yyyy</b>	<b>Measureable biological objective(s)</b>	<b>Milestone</b>	<b>FY2000 Cost %</b>
1	10/1999	12/1999	Determine regional research objectives, scope facility design criteria	X	11.00%
2	1/2000	3/2000	Prepare preliminary design for facility	X	25.00%
3	3/2000	9/2000	Prepare feasibility-level design for facility	X	64.00%
				<b>Total</b>	100.00%

**Schedule constraints**

Must complete scoping of regional research needs and coordinate facility design criteria within the first quarter of FY2000 (Oct - Dec 1999), in order to provide at least 200 days for preliminary and feasibility-level design work.

**Completion date**

September 30, 2000

**Section 5. Budget**

**FY99 project budget (BPA obligated):**

**FY2000 budget by line item**

<b>Item</b>	<b>Note</b>	<b>% of total</b>	<b>FY2000</b>
Personnel	NHC only. (Staff costs for NWPPC, COE, NMFS, ODFW, WDFW, IDFG, CRITC	% 15	19,000

	assumed carried within-agency)		
Fringe benefits	(Included in Personnel item above)	%0	
Supplies, materials, non-expendable property	Supplies and material costs are minimal for this phase.	%2	3,000
Operations & maintenance		%0	
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	(Capital improvements / lands acquisition support assumed carried by the Corps of Engineers')	%0	
NEPA costs		%0	
Construction-related support		%0	
PIT tags	# of tags:	%0	
Travel	Assume travel for two individuals to a total of four meetings in Portland, and two in Walla Walla.	%2	2,200
Indirect costs	(Included in Personnel item above)	%0	
Subcontractor	INCA Engineers	%67	86,000
Subcontractor	BioAnalysts	%14	17,500
Subcontractor		%0	
Other		%0	
<b>TOTAL BPA FY2000 BUDGET REQUEST</b>			<b>\$127,700</b>

**Cost sharing**

Organization	Item or service provided	% total project cost (incl. BPA)	Amount (\$)
NMFS	Staff support	%0	
COE-Portland	Staff support	%0	
COE-Walla Walla	Staff support	%0	
WDFW	Staff support	%0	
ODFW	Staff support	%0	
IDFG	Staff support	%0	
CRITC	Staff support	%0	
<b>Total project cost (including BPA portion)</b>			<b>\$127,700</b>

**Outyear costs**

	FY2001	FY02	FY03	FY04
<b>Total budget</b>				

**Section 6. References**

Watershed?	Reference
<input type="checkbox"/>	"Risk Management: Improved Strategy for Development of Biological Criteria to Support Design of Large Scale Fish Passage Improvements," US Army Corps of Engineers, Portland and Walla Walla Districts, December 1996.
<input type="checkbox"/>	"Preliminary Assessment of Hanford Sites for a Fish Passage Research Laboratory," Battelle Pacific Northwest Laboratory, January 1995.
<input type="checkbox"/>	"Pre-Proposal for Hydraulic and Biological Fish-Passage Research Facility," Washington State University, August 1996.
<input type="checkbox"/>	"Fixed-Location Hydroacoustic Evaluation of Fish Passage at Lower Granite Dam in Spring

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## **PART II - NARRATIVE**

### **Section 7. Abstract**

This proposal is intended to forward the scoping of criteria for development of a regional research facility for the evaluation of juvenile fish behavior, fish passage survival, and physical injury. Several proposals for similar facilities have been developed over the last decade or so. However, this proposal is the first to support prototype-scale testing of fish behavioral response and to evaluate physical injury mechanisms with regard to large hydraulic structures. The goal of the work proposed in this submittal is to develop regional criteria for a single research facility to evaluate juvenile fish behavior, to evaluate prototype test equipment and procedures (such as PIT tag sensing equipment and other individual fish monitoring equipment), and to study the physical injury processes relevant to fish passage through large dams. In addition, a preferred location for this facility will be selected, with at least several other alternative sites, based on the needs of regional system managers. Following development of criteria, a reconnaissance level scoping for the design of this facility will be accomplished. Preliminary construction cost estimates for the facility will be developed, based on the range of desired experimental needs the regional managers select during the scoping phase. This proposal strongly supports one of the primary recommendations of the 1994 Columbia Basin Fish and Wildlife Program and 1995 NMFS Biological Opinion, that for database accumulation on the physical processes of juvenile salmonid migration mortality and measurement of the success of survival improvement measures. Prototype testing programs and future prototype data collection efforts will be evaluated cost effectively through the use of this facility prior to implementation.

### **Section 8. Project description**

#### **a. Technical and/or scientific background**

The current process by which new juvenile fish passage technology is evaluated has relied on scale model investigation of fish passage devices in the hydraulic laboratory and then prototype implementation of the design without first evaluating potential success or failure based on fish behavioral response. This process results in significant expenditures without reasonable assurance that the technology will be successful. In addition, prototype tests are conducted with potentially threatened fish, and the risk to the resource overall is quite high if failure of the technology should occur. A regional facility to evaluate fish passage technologies will provide relatively 'safe' assessment of fish behavior and physical injury by testing only with fish from non-threatened stocks, and under controlled conditions. Experimental data collected from such a facility would be invaluable in hastening the application of successful fish passage technologies at lower development cost than the current process. For example, recent surface collection tests at Lower Granite Dam have shown that the prototype surface collector has performed significantly less successfully than expected, primarily because the behavioral response of fish approaching the collector was not known prior to installation of the facility. A surface collector of the design used at Lower Granite Dam ("Fixed Location Hydroacoustic Evaluation of Fish Passage at Lower Granite Dam in Spring 1998," Walla Walla District, COE, November 1998) could have been evaluated at prototype scale in a regional facility such as that proposed in this request prior to prototype implementation. Poor performance would have been evident in the test collector, and full scale implementation in the prototype could have been delayed until effective modifications could be made to the design to improve its capture success.

#### **b. Rationale and significance to Regional Programs**

As the managers of Columbia River fisheries, hydropower, irrigation, transportation, and recreational resources grapple with the growing, and sometimes conflicting, interests vital to the current and future use of the River, it becomes immediately apparent that the information base upon which to make management

decisions is not complete. One of the largest gaps in the knowledge base is the lack of understanding of juvenile fish behavior and the role it plays in inhibiting or encouraging passage through the dams. Another is the lack of a clear understanding of the mechanisms causing physical injury to migrating juveniles when they pass through large hydropower dams. The ability to control test conditions, recover test fish, clarify physiological response to passage routes, and assess the exact location at which injuries are received has not been available to date. This lack of prototype scale data has resulted in limited usefulness of studies conducted to date in the laboratory. Increased juvenile migration survival, therefore, requires more complete understanding of these factors. This proposed work will initiate the planning and development of a facility which will resolve these uncertainties and provide clear direction for improvement on juvenile fish passage survival. The work proposed will also develop regional criteria for laboratory evaluation methods in prototype-scale fish behavior and injury analysis, based on the combined needs of the major resource managers within the Columbia River system.

**c. Relationships to other projects**

The work proposed in this request will lead to the development of evaluation and testing facilities that can significantly reduce costs for all current and future prototype fish monitoring programs. For example, surface collection prototype testing work by the Corps of Engineers at Lower Granite Dam would benefit from data collected from an experimental facility. Supporting data could be developed from work completed at the proposed research facility for projects similar to project #9302900 “Survival Estimates for the Passage of Juvenile Salmonids through Dams and Reservoirs” in much less time than full scale prototype monitoring programs. Projects similar to #9105100 “Monitoring and Evaluation Statistical Support” would benefit from additional data collected from a regional research facility to help fill in gaps in summary data. In general, the results of monitoring studies would benefit from the evaluation tools developed with the proposed research facility by providing documentation of specific mechanisms of mortality and behavior response. In addition, by confining tests to expendable fish only, instead of potentially threatened fish, the risk that so often limits prototype study scope can be eliminated. The ability to conduct these tests perhaps outside of typical time and river flow constraints also contributes to the efficiency of data collection. The speed at which our understanding of juvenile fish migration in the Columbia River system is developed will be measurably increased with such a facility.

**d. Project history (for ongoing projects)**

This proposal is the first request for this project.

**e. Proposal objectives**

The objectives of this proposal are as follows:

1. Determine regional biological evaluation research requirements
  - Develop description of required research capability of test facility
  - Develop design criteria for regional research facility
  - Select preferred location for facility
2. Prepare preliminary design concept for facility
  - Modify design concept as required by agency review of design concept
3. Develop feasibility level design for facility

The first objective will be met by a coordinated effort between the Corps, NMFS, the state fish and wildlife agencies, and the Columbia River InterTribal Council to identify regional juvenile fish passage research requirements for any regional research facility. The proposed regional facility must meet the majority of agency research needs to be considered a viable concept. From this coordinated effort, specific design criteria will be developed for the facility, and any consideration for phased implementation based on priority needs will be identified. The second objective will be met by development of a preliminary-level design and construction cost estimates for several alternatives for the proposed regional facility. The third objective will require the coordinated review and refinement of the preliminary design concept by all stakeholder agencies. The selected design concept will consider existing and future research needs, and also will consider the potential long-term management objectives of the Columbia River system. Preferred

facility site selection will be made based on the availability of operational staff and on access convenience for resource agencies, with consideration given to the relative permanence of the facility and long-term adjustments of research needs.

**f. Methods**

The progress of the proposed work will depend on the degree and success of coordination that can be achieved with the regional agencies regarding research needs. The proposers recognize that, while complete agreement will likely be impossible to achieve, some reasonable collaboration may be realized between the competing interests of the NMFS, COE, WDFW, ODFW, IDFG, and CRITC. It should be stated that complete agreement is not necessary for successful completion of the proposed scoping effort. The primary difficulty will be found in narrowing the “wish list” of regional research needs to meet the future funding limitations of such a facility. The proposal team has individually, and in combination with each other, successfully completed a number of difficult scoping projects similar to the proposed project. The preliminary design concept alternatives will be developed based on the perceived research needs criteria gathered during agency coordination. These alternatives may span an unmanageably wide range of construction costs, or in fact they may be capable of supporting only a fraction of the regional research needs. However, reasonable design concepts can be selected which accommodate the majority interests of the regional agencies. This list will, in the interest of study brevity, be consolidated into a maximum of five different facility designs prior to submittal to the agencies for review. From this list a single preferred alternative will be selected which responds to the majority comments received during agency review. Development of designs and cost estimates will be accomplished using standard engineering methods.

**g. Facilities and equipment**

No facilities or equipment are required to complete the proposed work.

**h. Budget**

Bioanalysts will assume the lead role in coordinating agency responses and in developing the regional research needs document for review. Bioanalysts and Northwest Hydraulic Consultants will together share the responsibility for arrangement of meetings with individual agency staff and any summary meetings required to develop the research requirements, design criteria, facility site selection, and for distribution of review comments and revisions. This proposal assumes that much of the agency coordination will not require large meetings that must be attended by all agency staff simultaneously, rather the approach will be to individually meet with staff to develop their individual needs or opinions without forced compromise. The proposal assumes the scoping effort will require a maximum of ten meetings with individual agency staff from all stakeholder agencies following designation of staff assigned to this project by respective agency heads. In addition, the proposal assumes that developing a collaborative list of design criteria and regional research needs and facility capabilities will require about 10 days of effort for both BioAnalysts and for NHC. The preliminary and feasibility level design effort is expected to consume another five to eight days of labor for BioAnalysts and about ten days for Northwest Hydraulic’s staff. INCA Engineers will take responsibility for developing both preliminary and feasibility level design documents and construction cost estimates. INCA Engineers is expected to require about 140 days of effort to develop both preliminary and feasibility design documents to the appropriate level of detail for the finished product. Northwest Hydraulic Consultants and BioAnalysts will support INCA in the design effort by developing conceptual designs for the proposed facility.

## **Section 9. Key personnel**

Al Giorgi (Bioanalysts) will provide overall direction of agency coordination effort. Al has been recognized throughout the region as a capable fish biologist very familiar with the regional Columbia River management issues as they relate to anadromous salmonids. His previous employment with the National Marine Fisheries Service affords him the rapport with NMFS issues and staff that are critical to successful completion of the proposed scoping effort. His resume is attached.

Gary Johnson (BioAnalysts) will provide technical review and consultation regarding regional research needs compilation and design criteria selection. Gary has completed a large number of significant research projects with direct relevance to regional research objectives, including long-term juvenile monitoring work for the Lower Granite Dam surface collector facility, the Bonneville Dam Second Powerhouse surface collection study, and other juvenile behavioral studies throughout the Columbia River System.

Ed Zapel (Northwest Hydraulic Consultants) will provide hydraulic engineering design and consultation for both the scoping of the regional research facility needs and for the preliminary and feasibility level design effort. In Ed's previous employment with the Corps of Engineers, he had extensive experience with agency staff coordination and development of large dams and other hydraulic structures and fish passage facilities, requiring extended agency involvement in the design development and refinement process. Ed has recently been involved in a number of mainstem Columbia River juvenile fish migration-related design projects, including the abatement of dissolved gas generation by mainstem hydropower projects, development of surface collection alternatives at Bonneville Dam's Second Powerhouse, juvenile fish bypass facilities at The Dalles Dam, and adult fish ladder improvement for all four of Portland District's Columbia River dams. He also has been involved in physical model studies of fish passage facilities and gas abatement structural features, as well as the early development of submerged traveling screen technology for Chelan County PUD. Ed's resume is attached.

Dave Stensby (INCA Engineers) will provide overall direction of the preliminary and feasibility level design effort for the proposed research facility. Dave has extensive experience throughout the Pacific Northwest in developing designs for juvenile fish handling and evaluation facilities, large hydraulic structures, fish ladder modifications, surface collection structures, juvenile fish bypass structures, and many other juvenile and adult fish-related engineering assignments. Dave's resume is attached.

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

The coordinated development of regional research needs and research facility design considerations will be published in a technical document and distributed to the stakeholder agencies and to other interested parties throughout the region. Presentation of the scoping document and a summary of the facility design may be made at the American Fisheries Society Annual Symposium as well. Design documents will be distributed to all stakeholder agencies and other interested parties following completion of the proposed study if permitted by the Bonneville Power Administration.

**Congratulations!**