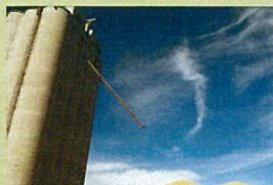
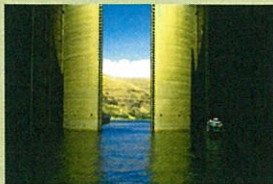


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# THE SNAKE RIVER DAMS: ANALYSIS OF COST CLAIMS



A REVIEW OF:  
The Costs of Keeping the Four Lower Snake River Dams:  
A Reevaluation of the Lower Snake River Feasibility Report  
Jim Waddell and Linwood Laughy, 2015

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## EXECUTIVE SUMMARY

In January 2015 *The Costs of Keeping the Four Lower Snake River Dams: A Reevaluation of the Lower Snake River Feasibility Report* was prepared by Jim Waddell and Linwood Laughy. The report findings were based on a 2014 analysis by Mr. Waddell of the 2002 *Lower Snake River Juvenile Salmon Mitigation Feasibility Report* (LSRFR) prepared by the Walla Walla District of the U.S. Army Corps of Engineers. The report prepared by Mr. Waddell presents findings and conclusions of his reevaluation of six specific cost categories as presented in the 2002 LSRFR.

In addition, the Waddell report includes costs associated with decommissioning the four Lower Snake River Dams at the end of their useful life. The Waddell report concludes that the Walla Walla District underestimated the cost of keeping the four Lower Snake River Dams in place by \$160.7 million on an average annual basis.

However, the Waddell report produces no creditable finding that can be used to compare against the results produced in the LSRFR, due to serious deviations from proper evaluation procedures as provided in the Corps' *Principles and Guidelines*. Specific areas of concern over Waddell's reevaluation of the six specific cost categories from the LSRFR include:

- Improper use of financial/budget data as a measurement of national economic development (NED) economic costs
- Extensive application of arbitrary inflation factors to overstate economic costs
- Fabrication of an economic cost stream without any basis or supporting documentation
- Establishing dubious decommission costs without documentation, and which do not pass any test of reasonableness

Accordingly, the Waddell report should not be relied upon by decision makers, the press, or members of the public who are interested in the accurate costs associated with maintaining the authorized project purposes of the four Lower Snake River dams.

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## BACKGROUND INFORMATION

### Principles and Guidelines

It is important to have a general understanding of the Corps' evaluation procedures to understand the merits, or lack thereof, of any effort to compare one set of results against another. This is particularly true as it relates to the treatment of financial data and inflation.

The framework for conducting benefit and cost evaluations of water resource projects with the Corps of Engineers can be found in *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*, as published in March 1983. These "Principles and Guidelines" ensure proper and consistent planning throughout the Corps, as well as for other major Federal water resources agencies. The effective application of these evaluation procedures is critical in order to develop reliable, consistent, creditable, and defensible results from which major decisions on water resource development projects can be made.

Economic and environmental evaluation procedures were incorporated into the *Principles and Guidelines* to provide water resources agencies the best current analytical techniques available. These principles are intended to ensure proper and consistent planning by Federal agencies in the formulation and evaluation of water and related land resources implementation studies. Agencies required to follow the *Principles and Guidelines* for the purpose of water resources planning include:

- Corps of Engineers (Civil Works)
- Bureau of Reclamation
- Tennessee Valley Authority
- Soil Conservation Service

### National Economic Development

The Federal objective of water and related land resources project planning is to contribute to national economic development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Contributions to NED are determined based on increases in the net value of the national output of goods and services, expressed in monetary units.

NED analysis is concerned only with economic efficiency at the national level. The general value of goods and services is measured based on the willingness of users to pay for each change of output associated with a proposed alternative. However, it is not usually possible to obtain actual willingness to pay values, and as such alternative or proxy measures are used. These measures include actual or simulated market price, change in net income, cost of the most likely alternative, and administratively established values.

## Prices

In accordance with NED evaluation procedures, the prices of goods and services used for evaluation should reflect the real exchange values expected to prevail over the period of analysis. For this purpose, relative price relationships of outputs and inputs prevailing during, or immediately preceding, the period of planning generally represent the real price relationships expected over the life of the plan.<sup>1</sup> That is, prices of goods and services are expected to maintain relative to one another over time. For example, if all prices rise by 10 percent over a given time period there is no change in any relative prices, and if nominal income and wealth also go up by 10 percent, leaving real income and real wealth unchanged, then all prices and income remain constant relative to one another. Although construction price increases over time may be important from a long-term financing perspective, the inclusion of inflation factors is of no consequence in NED analysis since there is no change in relative price relationships.<sup>2</sup>

Corps policy has allowed for projecting changes in the real price of petroleum products at times in the past, when prices well exceeded changes in relative prices. In addition, for agricultural planning, normalized prices prepared by the Department of Agriculture are used.

## Drawdown Regional Economic Work Group

While Mr. Waddell's efforts to conduct a reevaluation of specific costs items from the LSRFR are commendable, his approach is inaccurate. The reevaluation cannot be accomplished through utilization of overly simplified approaches, particularly when considering the highly complex nature of the Lower Snake River system. By comparison, the Corps of Engineers' economic analysis in the LSRFR was conducted in an open and collaborative manner. Stakeholders throughout the region were invited to participate in the process. In this effort to reach a regional consensus and pool resources more efficiently, the Corps established the Drawdown Regional Economic Workgroup (DREW). This group included roughly 50 economists, social scientists, and other professionals interested in developing a more consensus-based analysis of the social and economic impacts associated with potential dam removal. Members of DREW included:

- U.S. Army Corps of Engineers
- Bonneville Power Administration
- Bureau of Reclamation
- National Marine Fisheries Service
- Northwest Power Planning Council
- Columbia River Inter-Tribal Fish Commission
- Other interested groups

DREW held public meetings on a regular basis, providing status reports, responding to questions, and seeking public input into the process. Work products of DREW were extensively reviewed

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<sup>1</sup> Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, March 1983, para 1.4.10.

<sup>2</sup> NED Procedures Manual – Overview Manual for Conducting NED Analysis. IWR Report 91-R-11, dated October 1991, p. 25.

by a broad and diverse group of interested parties. In addition, a full technical review was conducted by the Independent Economic Analysis Board (IEAB) of the Northwest Power Planning Council.

The overall analysis was not perfect for sure, but it provided a very reasonable approximation of possible benefits and costs associated with breaching the four Lower Snake River Dams in accordance with the Corps' *Principles and Guidelines*.

## SPECIFIC REVIEW COMMENTS

It is very obvious that the Waddell report did not utilize proper NED evaluation procedures as contained in the *Principles and Guidelines*. As a result of this, the findings and conclusions of his report are without merit and not valid for comparative purposes against the economic analysis contained in the LSRFR. Specific issues and concerns with each of the six categories presented in the Waddell report are as follows:

### **Category 1 - Improving Fish Passage (System Improvement Costs)**

The primary cost data for making adjustments to system improvement costs in the Waddell report comes from the Walla Walla District's Civil Works Activities Report. In the District's report for fiscal year 2004, it states that the "fully-funded" project cost for the system improvements under the Columbia River Fish Mitigation Program is \$682.7 million (pg 30-5). In the Waddell report, this \$682.7 million cost is then manipulated (as presented in Appendix A of his reevaluation) to develop a 17 percent cost differential between this fully funded cost, and system improvement costs contained in the LSRFR. This 17 percent factor is then applied to each year of the Corps' major system improvement cost data for FY 01 through FY 10 (as presented in the LSRFR) for the purpose of developing updated major system improvement costs.

However, the serious problem is that a "fully funded" cost is a financial cost primarily used for budget planning, and not an NED cost. It includes an estimate of inflation using appropriate Civil Works Construction Cost Index System factors that is applied to the total project cost through mid-point of construction.<sup>3</sup> The use of financial data in this manner is inconsistent with proper evaluation procedures under *Principles and Guidelines* as previously discussed.

In addition, the Waddell report applies a three percent inflation factor, compounded annually, to estimate future costs for system improvements throughout the period of analysis. The *Principles and Guidelines* clearly states that the general level of prices for outputs and inputs prevailing during and immediately preceding the planning period is to be used for the entire period of analysis. Thus, general price levels of benefits and costs are effectively assumed to remain constant. As previously stated, although it is recognized that costs increase over time due to inflation, these increases may be of critical importance in financing the project but are of no consequence in NED analysis.

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<sup>3</sup> U.S. Army Corps of Engineers Memorandum titled: Corps of Engineers Civil Works Definitions and Applicability, dated August 2011.

Comparing the results of the Waddell report in this category against those contained in the LSRFR is not practicable.

## **Category 2 - Operation and Maintenance Costs, including minor repairs to the four dams and O&M costs for system improvements**

Again the catalyst for differences in the Waddell report from the LSRFR report is principally the inclusion of an arbitrary inflation rate of three percent. Such application is inconsistent with NED evaluation procedures under the *Principles and Guidelines*, and not applicable in any comparisons of costs between the Waddell report and the economic analysis contained in the LSRFR.

## **Category 3 - Turbine Rehabilitation Cost**

The LSRFR analysis of turbine rehabilitation costs assumed a 50-year life for the turbine units before replacement is required. The Waddell report is correct in its documentation that turbines have a life expectancy of 35-45 years. However, there may be some inconsistencies in the LSRFR regarding turbine life expectancy as the report also indicates the units have a 25 - 50 year life. There is also a reference in the LSRFR which indicates that at one dam the turbines would not need to be replaced for 50 years.<sup>4</sup> The LSRFR does not explain the rationale for using a 50 year life for all units, and as such included cost data for only two replacements.

The Waddell report indicates that the Corps should have included cost estimates for a third turbine rehabilitation, assuming the dams remain in place. The third rehabilitation would occur in the 70-90 year period. The inclusion or exclusion of costs to rehabilitate the turbines a third time would have a marginal impact on overall average annual costs. This marginal impact is due to the time period in which they would be expended and discounting that cost to a present value. If the Corps had rehabilitated the turbines on a 40 year cycle it would add roughly \$200k in average annual turbine rehabilitation costs. This represents a less than five percent increase from net average annual avoided turbine rehab costs presented in LSRFR, and should be considered insignificant.

Data presented in BPA's Major Project Capital Status Reports are used as a basis for developing turbine replacement costs in the Waddell report. The reports show capital outlays of \$97 million for ongoing projects, with a completion date of October 2018. As discussed in Category 1, these are financial data representing overall capital investments for project completion. The use of financial data in an NED analysis is not consistent with acceptable evaluation procedures under the *Principles and Guidelines*.

The Waddell reevaluation also compounds the problem by applying an annual inflation factor of three percent. Again this is inconsistent with acceptable Corps evaluation procedures under the *Principles and Guidelines*.

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<sup>4</sup> Lower Snake River Juvenile Salmon Migration Feasibility Report/ Environmental Impact Statement, Appendix I dated February 2002, p. I3-213.

Comparing the results of the Waddell report in this category against those contained in the LSRFR would again be inappropriate.

The Waddell report indicates costs for decommissioning the projects were added as the least-cost alternative to a third rehabilitation of turbines. This will be addressed in the Decommission Cost section of my review.

#### **Category 4 - Lower Snake River Compensation Plan Costs, and Category 5 - Power Service Costs**

Once again, the Waddell report inappropriately includes inflation factors in his cost data. A five percent annual inflation factor is applied annually to Category 4 cost items and a three percent inflation factor for Category 5 costs. Again, this is inconsistent with acceptable Corps evaluation procedures under the *Principles and Guidelines*.

#### **Category 6 - Navigation and Flow Conveyance Dredging**

Inclusive in the Corps' analysis of dam-related Operation, Maintenance Repair, Replacement, and Rehabilitation costs, are funds to maintain the federal navigation project. Such costs would be utilized for lock operation and maintenance, dredging, and other items related to navigation. Under the dam breach alternative, these costs would no longer be incurred.<sup>5</sup>

The Waddell report accurately quotes information from an appendix in the final Lower Snake River Programmatic Sediment Management Plan (PSMP) regarding 700K cubic yards per year needing to be dredged annually. However, Waddell took the quote out of context as it relates to current and future O&M dredging activities by the Corps. There is no recommendation in the PSMP that supports ongoing O&M dredging of this magnitude on an annual basis. In the Corps' Record of Decision for the PSMP the selected alternative provides a broad range of dredging, system management, and structural management measures for the Corps to use to address sediment that interferes with existing authorized project purposes. The PSMP provides only the framework, or a tool box, of measures that can be employed for effective sediment management. Implementation of any future site specific sediment management measures would require additional evaluation before a decision is made. The Walla Walla District is also using information from the PSMP to address any immediate action to address sediment accumulation that may be affecting authorized project purposes.

Past history has shown the need for maintenance dredging on a periodic basis only, and for the most part site-specific at identified problem areas. As such, there is no annual dredging requirement at this time or planned for a future time. Dredging occurred during the winter of 2005-2006. Roughly nine years then transpired, until the most recent dredging action which restored full depth to the federal navigation channel in early 2015. The amount of material removed after nine years of no dredging was just 400K cubic yards – a far cry from the 700K cubic yards per year Waddell claims is necessary.

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<sup>5</sup> Lower Snake River Juvenile Salmon Migration Feasibility Report/ Environmental Impact Statement, Appendix I dated February 2002, p. I3-213.

The O&M dredging costs presented in the Waddell report appear to ignore the recommendations of the study as well as actual activity on the river, and represent a fabricated cost stream that is not supported by facts.

## Decommission Cost

The Waddell report provides a \$20 million average annual cost for decommissioning the Lower Snake River projects at the end of their useful life. However, no details are provided to determine the validity of this amount. So, what does the \$20 million in average annual costs represent? In theory, it represents the amortization of a cost that is to be incurred at the end of the project life, year 100. When this average annual cost is capitalized at a 6.875 percent discount rate (as utilized in the LSRFR), it results in a \$290 million decommission cost - an amount to be spent at the end of the project life. Obviously some serious inflation rates must have been applied to a base number.

To illustrate the difficulty in accepting the \$20 million average annual decommissioning cost, a test of reasonableness can be performed. For example, if it costs \$1 billion at today's price level for decommissioning in year 100 (roughly the cost for the dam breach alternative in the LSRFR and a cost that would be incurred in project year 100), the present value would be about \$1.3 million using a 6.875 discount rate. The average annual cost would be roughly \$90,000. A far cry from \$20 million.

As such, more details are needed to better understand how the \$20 million was determined. Based on this test of reasonableness it would seem to indicate that the \$20 million estimate is clearly not valid, and contributes to Waddell's inflated "costs" of the dams.

## Period of Analysis

The Waddell report presents cost projections over a 100-year project life beginning in 2001. All costs are presented through the 100-year project life and discounted back to 2001 using the appropriate 6.875 percent discount rate. In addition, a second annual cost stream is presented, using 2015 as a base year. Both base years used in the Waddell report are inconsistent with the approach used in the LSRFR. The LSRFR used a 100-year period of analysis. The base year was fiscal year (FY) 1998, but the 100-year period of analysis extends from the implementation year (FY 2005) through 2104. Benefits and costs incurred during the period of analysis were discounted to the beginning of this period (FY 2005). These costs and benefits were then converted into 1998 dollars and annualized to provide an average annual value for each alternative.<sup>6</sup>

As such, any direct comparison of results from the Waddell report and the Lower Snake River Juvenile Salmon Migration Feasibility Study cannot be made with any certainty.

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<sup>6</sup> Lower Snake River Juvenile Salmon Migration Feasibility Report/ Environmental Impact Statement, Appendix I dated February 2002, p. ES-3.



## SUMMARY AND CONCLUSION

Following a review of the Waddell report, it is clearly obvious there is a lack of understanding in the application of the *Principles and Guidelines*, which provided the foundation for the economic analysis in the LSRFR. The approach utilized in the Waddell report to reevaluate six specific cost categories from the LSRFR is totally inconsistent with proper National Economic Development evaluation procedures. The inconsistencies are in the following areas.

- Use of financial/budget data as a measurement of NED economic costs
- Extensive application of arbitrary inflation factors to overstate economic costs
- Fabricating economic cost stream without any basis or supporting documentation
- Establishing dubious decommission costs without any documentation and do not pass any test of reasonableness

Finally, there is a clear inconsistency in the base year in the Waddell report when compared to the LSRFR, thereby making direct comparisons not accurate.

Overall, because of the evaluation problems indicated above, one can only conclude that the Waddell report produces no creditable findings that can be used to compare against the results produced in the LSRFR.

## BIOGRAPHY

Dennis Wagner has over 33 years of Federal service, a duration that has provided very broad and diverse experiences. It includes three years of active military service in the US Army starting in 1973, followed by two years of full-time employment with the US Army Reserves in California. He worked as an economist for the Department of Housing and Urban Development from 1978-1981.

Mr. Wagner transferred to the U.S. Army Corps of Engineers, Alaska District, in 1981. Positions held within the Corps included:

- Chief, Planning and Policy Division, Northwestern Division, Portland, OR, April 2001 – September 2006
- Division Economist /Team Leader - Plan Formulation Team, Northwestern Division, Portland, OR, February 1995 - April 2001
- Special Assistant for Policy and Long-Range Planning, Northwestern Division, Portland, OR, October 1991 - February 1995
- Chief, Planning Branch, Portland District, Portland, OR, June 1988 - October 1991
- Chief, Economics Section, Portland District, Portland, OR, December 1985 - June 1988
- Economist, Alaska District, Anchorage, AK, November 1981 – December 1985

From 1996 – 2001 Mr. Wagner served as Chairman of the Drawdown Regional Economic Work Group. As Chairman his role was to provide leadership and direction for conducting numerous economic studies by 15 sub-workgroups in support of the Lower Snake River Juvenile Salmon Mitigation Feasibility study.

Mr. Wagner retired from the Corps of Engineers in September 2006.

Dennis Wagner earned a Bachelor of Arts degree in economics from California State University, Fresno, CA in May 1978.

