

SOCIOECONOMIC IMPACT ANALYSIS REVIEW

30 October 2020

EXECUTIVE SUMMARY

This memo details the findings and outlines the review process employed by Resource Dimensions, retained by the Quinault Indian Nation (QIN) to conduct an independent peer review of the socioeconomic analysis, Section 5.10, and related technical appendix (Appendix P) prepared by ECONorthwest, an Oregon based economics consulting firm, in support of the U.S. Army Corps of Engineers (Corps) September 2020 National Environmental Policy Act (NEPA) Draft Environmental Impact Statement (DEIS) for the proposed Chehalis River Basin Flood Damage Reduction Project (Proposed Project). Resource Dimensions' review team includes Julie Ann Gustanski, PhD, LLM, AICP, Matthew M. Hayes, MS, and David T. Taylor, PhD.

The contextual focus of this DEIS review is on the economic and socioeconomic impacts of the Proposed Project and alternatives presented in the DEIS. Explicit attention is given to the framing and analysis of socioeconomic impacts, development of estimates surrounding costs for the alternatives analyzed, any economic or social impact analyses presented in these documents, and associated costs of potential impacts to the human and natural environment.¹

These analyses were assessed for the extent to which they contribute accurately and substantively to findings presented in the DEIS, including quantification of the resulting direct, indirect, and cumulative impacts associated with construction and operation of the proposed Flood Retention Expandable (FRE) facility, and the Flood Retention Only (FRO) and No Action alternatives.² Our approach seeks to fully consider all methodological and analytical efforts within the DEIS and as appropriate identify deficiencies, omissions, errors and flawed conclusions employing discipline standards and guidance provided by the Economic and Environmental Principles, Requirements and Guidelines for Water and Related Land Resources Implementation Studies (2015) (PR&G) first published in 1983 and subsequently updated with additional direction provided in executive orders, and agency directives.³ Section 2031b(3), PL 110-114 (WRDA 2007 § 2031, 42 USC 1962–3).

¹ The human environment is interpreted comprehensively to include the natural and physical environment and the relationship of people to that environment (40 C.F.R. § 1508.14). The effects analyzed under NEPA include ecological, aesthetic, historic, cultural, economic, social, or health (40 C.F.R. § 1508.8).

² Within the discipline of economics, and specifically in the context of economic impact analysis, the terms direct, indirect, and induced impacts are used. Interpretation should not be confused with and is not equivalent to “direct, indirect and cumulative impacts” as used in the context of analyses developed for NEPA/SEPA environmental impact statements. Relevant to Chehalis Basin and against the background of economic impacts: Direct impacts result from direct economic activity (employment, income, etc.) from area businesses and their activities; Indirect impacts result from regional economic activity (employment, income, etc.) arising from direct economic activity, and; Induced impacts are derived from economic activity resulting from the indirect impacts of basin-wide business spending and indirect household spending. This includes the interaction of all businesses (such as B2B supply chain purchases) within the Chehalis Basin and the larger region.

³ Developed by the Water Resource Council the original Principles & Guidelines (P&G) were intended to guide the formulation and evaluation studies of the major Federal water resources development agencies in accordance with Section 103 of the Water Resources Planning Act, as amended (42 U.S.C. 1962a-2). In the Water Resources Development Act of 2007 (WRDA 2007; P.L. 110-114), Congress directed an update of the P&G for the Corps use.

The socioeconomic impact analysis contained in the DEIS for the Proposed Project could provide an excellent contribution to our understanding of Chehalis Basin communities and the nature of social, economic and environmental outcomes for these communities under the different alternatives. Unfortunately, rarely, if ever, do federal agencies undertake assessments of social and economic conditions at this scale, or with this level of detail. However, the DEIS says little about the potential socioeconomic impacts stemming from the Proposed Project or alternatives. Whilst information in the DEIS and supplementary technical documents is informative, it is of little use in evaluating alternatives. Thus, we concentrate our review on those areas requiring additional work in order for the DEIS to become an effective document.

Table 1 provides an overview of the comments identified in our review, with a focus on the inclusion, analyses, and related presentation of socioeconomics. Comments are expanded upon within the 'Findings' section of this document.

WRDA 2007 required that the update address advancements in economic and analytic techniques; public safety; low-income communities; nonstructural solutions; and integrated, adaptive, and watershed approaches.

Table 1. Summary - Chehalis Basin NEPA DEIS Review Comments (Socioeconomics)

No.	Review Comment
Significance - High	
1	Overall analysis of Socioeconomic Impacts is severely deficient; results cannot be relied upon for decision making.
2	Analysis of the built environment resource area 'Socioeconomics' is insufficient to comparatively assess alternatives.
3	Economic benefit of proposed project alternatives is unclear; cost-benefits are not provided or developed; risk or uncertainty is not considered in analysis.
4	Analysis fails to employ appropriate methods to determine monetary or quantitative estimates for broad range of socioeconomic impacts.
5	Economic impacts presented are for construction only; operation and potential catastrophic failure are not developed, discussed, or assessed.
6	Costs of proposed mitigation strategies is not presented or addressed, and strategies to compensate for impacts is not demonstrated.
7	Limited scope of analysis; benefits of/damages to ecosystem services are not addressed.
8	Socioeconomic benefits associated with proposed FRE facility construction and FRO alternatives are misrepresented and impact estimates are substantially overestimated.
9	Misrepresents impact estimates for construction and operation of proposed FRE Facility and FRO alternatives; impact calculations are substantially overestimated.
10	Feasibility of mitigation required to compensate for impacts on fisheries resources and communities that rely upon these resources is not demonstrated.
11	Several significant costs are not included in projected estimates for the proposed project.
12	Socioeconomic impacts associated with changed ecosystem function are not adequately considered or quantified.
13	Socioeconomic and economic impacts that extend beyond geographical boundaries of study area are not addressed.
14	Economic, social and socioeconomic impacts associated with identified significant potential impact to the QIN's use of treaty resources are not addressed.
15	Substantial adverse cumulative impacts identified relative to the socioeconomic resource area are not adequately or appropriately quantified in the analysis.
Significance - Moderate	
16	Cumulative impacts analysis does not consider the value of ecosystem services that have diminished over time.

The following definitions were used to assign a significance level to comments presented in Table 1.

- **High:** Describes a fundamental problem that could affect the recommendation, success, or justification of the Proposed Project. Comments rated as high indicate that the Team analyzed or assessed the absence of required information, methods, models and/or analyses and determined there is a potential critical issue that must be addressed.
- **Moderate:** Affects the completeness of the report in describing the project but will not likely affect project justification or recommendation. Additionally, comments rated as medium indicate that the Team did not find information presented sufficient to analyze or assess the methods, models, or analyses.

Given the nature of significant infrastructure projects, such as the proposed dam, we find that the cumulative economic and socioeconomic impacts, and significant operational costs of the FRE facility, are substantially underestimated and inadequately analyzed within the DEIS, and the technical Socioeconomic Impact Analysis, Appendix P. The physical changes and subsequent ecosystem impacts associated with the FRE facility will be vast and fish populations in the Chehalis River will be irreparably

damaged, potentially extirpated, and potentially put the United States in non-compliance of an international treaty. Once constructed, risks to the downstream floodplain communities will increase and the public will be committed to the costs to maintain the facility indefinitely. Although the impacts to Treaty Rights and related costs associated with the Proposed Project are difficult to quantify, they are altogether missing from the DEIS. In fact, the DEIS does not specifically identify impacts to Treaty Rights or resources. And, while the DEIS does cover impacts to aquatic resources, it does not do so in the context of them being Treaty resources. The discussion of impacts to fisheries and other aquatic resources is deficient and underestimates impacts to them. Overall, the treatment given in the DEIS does not satisfy the requirements for discussing environmental consequences in EISs of 40 C.F.R § 1502.16.

While we generally agree with the DEIS findings that the construction and operation of the Proposed Project would have substantial adverse cumulative impacts to portions of the study area, including, socioeconomics, (ES.5.4 Cumulative Impacts, p. ES-12), we find that the shortcomings of the document and core analyses are such that it fails to meet the standards required for an EIS for a project of this magnitude. With regard to the socioeconomics resource area, we find that the analyses presented in the DEIS do not sufficiently support the estimation of impacts across the final array of alternatives or demonstrate justification for the proposed FRE facility. Our review identifies important areas of concern regarding the breadth and detail of socioeconomic and economic impact analysis presented, as well as the development of projected FRE facility costs and mitigation plans.

Socioeconomics: The purpose of the project is to “...reduce the duration and level of flooding. This would in turn reduce the corresponding damage within the existing 100-year floodplain in the Chehalis/Centralia area from Adna to Grand Mound... The proposed project is needed because flooding has caused major damage, substantial transportation delays, and high economic costs in the Chehalis Basin in the recent past.” (DEIS, ES.3, p. ES-3). While an attempt is made at some level of impact analysis, at least as related to temporary employment opportunities, estimating the future economic benefits and costs of flood risk management involves significant uncertainties that have not been addressed in the DEIS. The evaluation of socioeconomic impacts of the Proposed Project and alternatives presented in the DEIS on communities, businesses, recreation, habitats and species, land use, fisheries, ecosystem services, cultural and tribal resources, and Treaty Rights are also poorly and inadequately presented.

The scale and scope of socioeconomic, economic, and environmental issues surrounding flood reduction in the Chehalis Basin are complex, and the analyses involve many uncertainties which must be more fully addressed in the DEIS. Overall, the socioeconomic impacts analysis is severely deficient and the results, as presented, are so acutely lacking that they cannot be relied upon for decision making. Additionally, there is a total absence of essential cost-benefit analysis (CBA), cost-effective analysis, or other analyses that enable an understanding of the economic impacts of alternatives presented on Chehalis Basin communities. While there are passing references suggesting costs, economic implications and social or socioeconomic impacts, the underlying supporting data, information, and assessment is absent.

The DEIS is deficient in the following ways: 1) fails to clearly present and systematically assess the direct, indirect and cumulative socioeconomic impacts and related social and economic impacts using consistent quantitative and qualitative frameworks essential to the comparison of impacts across viable alternatives; 2) fails to appropriately include major project costs and to conduct an essential CBA of the alternatives presented; 3) substantially overestimates impacts in terms of jobs, labor income and

economic activity supported by the FRE and FRO alternatives ; 4) does not provide substantive cost and schedule analyses for each alternative, including costs and timeline to mitigate expected impacts; 5) does not provide the public or decision makers with accurate, easily understood, and transparent findings on which to assess the range and extent of impacts to the natural and human environment of the Chehalis Basin associated with the Proposed Project or other viable alternatives.

INTRODUCTION

An expandable flood retention facility has been proposed as an alternative to accomplish flood damage reduction on the Chehalis River, Washington. Several alternative concepts were considered, but the Flood Retention Expandable (FRE) facility has been advanced for environmental review under NEPA based on the application of screening criteria to address the stated purpose and need. The purpose of the facility is to store water in the upper watershed to alleviate flood damage to developed areas of the lower floodplain near the towns of Centralia and Chehalis.

Our review assesses the DEIS, relevant discipline reports, and technical documents with explicit focus on connected socioeconomic and economic elements throughout. Specifically, we address the soundness of DEIS assumptions, methods, analyses, and calculations and identify the need for additional data or analyses to aid decision makers in making informed decisions regarding the Proposed Project or implementation of alternatives and recommendations.

Core areas of review include: 1) accuracy, completeness and technical soundness of assumptions, methods and analyses related to socioeconomic and economic impact analysis conducted for the proposed FRE facility and alternatives; 2) systematic evaluation of the socioeconomic impacts associated with the proposed FRE facility and alternatives; 3) project cost estimates for the proposed FRE facility and alternatives, and; 4) scope and range of analysis pertaining to impacts on the human and natural environment associated with the Proposed Project.

As appropriate, we identify additional requirements, data or analyses essential to ensuring the final EIS documents meet the standards required for an EIS environmental review and that will provide decision makers with sufficient information on which to make determinations concerning the proposed FRE facility. The following questions were considered in assessing the DEIS and supporting appendices:

1. Are the analyses of the human environment, including socioeconomic and natural resources, in the project area sufficient to support the estimation of impacts for the alternatives presented?
2. Are appropriate methods used to assess the socioeconomic impacts of the proposed actions?
3. Are all alternatives: presented consistently, developed, and analyzed using appropriate cost development methods, cost-benefit, and impact analyses to assure comparability of the Proposed Project against the FRE and No Action alternatives.
4. Are the reviewed DEIS sections and supporting technical analyses internally logical, complete, and consistent?
5. Are the assumptions that underlie the study analyses sufficient to develop the impact models used to evaluate existing and future impacts with/without Proposed Project conditions and those of alternatives?
6. Does the DEIS accurately identify and quantify direct, indirect, and cumulative socioeconomic impacts associated with the Proposed Project?
7. Does the DEIS adequately address impacts/effects of alternatives on the Quinault Indian Nation's (QIN) use of treaty resources?
8. Does the DEIS address mitigation measures for potential damage to treaty resources?

FINDINGS

The construction and operation of a dam is a major infrastructure project with enormous costs and a substantial regional impact footprint that extends across the human and natural environment. The DEIS states that, “The Corps has determined the proposed project may have significant individual and/or cumulative impacts to the human environment. Therefore, the Corps has completed this EIS in accordance with NEPA. Preparation of this Draft EIS and the future Final EIS will support: the Corps’ permit decision.” 83 FR 49075 (Sept. 28, 2018). The DEIS identifies several impacts that have economic consequences, which should be examined to give decision makers an accurate understanding of the potential impacts of each alternative on local economies. 40 C.F.R. § 1502.16 (b) states that “*Economic or social effects by themselves do not require preparation of an environmental impact statement. However, when the agency determines that economic or social and natural or physical environmental effects are interrelated, the environmental impact statement shall discuss and give appropriate consideration to these effects on the human environments.*”

This independent review draws the following major findings regarding the DEIS.

MAJOR DEFICIENCIES

Independent review has identified several important deficiencies of high significance. Specific limitations and deficiencies that affect the validity of the DEIS are:

1. Overall analysis of socioeconomic impacts is severely deficient; results cannot be relied upon for decision making.

Under NEPA, an agency – in this case the Corps – is required to evaluate the socioeconomic impacts of the suite of alternatives it identifies, including both direct and indirect effects and their significance, see 40 C.F.R. §§ 1502.8, 1502.16. “Indirect effects” include those effects “*what are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.*” 40 C.F.R. § 1508.8. The DEIS wholly fails to analyze these effects properly. While generally acknowledging that the impacts from the Proposed Project would “*contribute to substantial adverse cumulative impacts to some portions of the study area for the following resource areas*”, including among others, socioeconomics and cultural resources (DEIS, ES-12). The DEIS improperly downplays and obfuscates the varying socioeconomic impacts of the alternatives across Chehalis Basin communities, commercial and subsistence fishers, and cultural resources.

NEPA requires both the direct and indirect impacts of a proposed action to be analyzed, but these impacts are not adequately disclosed in the DEIS. 40 C.F.R. §§ 1502.16, 1508.9. NEPA’s hard look requirement includes all foreseeable environmental consequences, including those to the human environment, see *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989). Providing lists of potentially affected communities with general demographic information does not constitute a “hard look” absent a justification as to why more definitive information could not be provided. See *Blue Mountains Biodiversity Project v. Blackwood*, 161 F.3d 1208, 1213 (9th Cir. 1998).

Community impacts associated with the FRE and FRO alternatives relative to the No Action alternative are impossible to understand from the information presented in the DEIS. Appendix P. Socioeconomic Impact Analysis provides about ten pages of general data, but that information is not used to describe the impacts of each alternative, which is the objective of the analysis under NEPA. For example, the tables presented and corresponding text do not readily allow the reader to understand which communities or job/employment sectors (e.g. commercial fishers, recreation, amenity-oriented businesses) are likely to be most affected by the Proposed Project, or the alternatives, directly or indirectly. The DEIS does not provide information on the at-risk classes, although such information is ascertainable. This fundamental information must be clearly described for each alternative to allow the reader to understand the relative impacts of each alternative, including No Action. Without it, the public and decision makers cannot take into account, for example, the importance of fishery resources on tribal and non-tribal fishing communities, by use of social and economic data that are based upon the best scientific information available, as required by 50 C.F.R. § 600.345(a).

Throughout the socioeconomic impact analysis section of the DEIS and Appendix P, the only elements provided some level of qualification through discussion and quantification are jobs (generically) and timber revenue.

The socioeconomic impact analysis, which is based entirely on incomplete information and flawed methods are likewise incomplete and inaccurate. Consequently, the net result of the omissions and deficiencies in the DEIS render the document incomplete and inadequate.

The cursory recitation of socioeconomic data and lack of detailed examination of direct, indirect and cumulative socioeconomic impacts that the Proposed Project, and alternatives, may have on potentially affected communities violates multiple sections of 40 C.F.R, 50 C.F.R. and multiple legal precedents.

To address the extreme shortcomings of the socioeconomic impact analysis and provide decision makers with clear and comparative information on the range of impacts the Proposed Project and the alternatives present across the study region, the DEIS should:

- Establish consistent direct, indirect impacts to be compared across the alternatives
- Develop costs, benefits and differences between the proposed project and alternatives in a clear and consistent manner
- Describe impacts granularly such that a reader can understand the impacts at various locations throughout the study area
- Where data is lacking, insufficient for analysis or generally of poor quality, state as much and the information needed to make a detailed comparison amongst alternatives as outlined in 40 C.F.R.

2. Analysis of the built environment resource area 'Socioeconomics' is insufficient to comparatively assess alternatives.

The DEIS provides inconsistent information and level of analysis for each alternative. Requirements for the contents of an EIS are addressed at 40 C.F.R § 1502.14, specifically, providing that the DEIS should “*present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public,*” and advises that agencies shall “(a) *Rigorously explore and objectively evaluate all reasonable alternatives*”.

Further, the analysis devoted to each alternative in the DEIS should be substantially similar to that given to the Proposed Project. 40 C.F.R § 1502.14(b) requires agencies to “*devote substantial treatment to each alternative considered in detail including the proposed action...*” While this regulation does not prescribe an amount of information to be supplied, but rather, specifies a level of treatment, which in turn will require varying amounts of information, to allow a reviewer to assess and compare alternatives for themselves.

To ensure comparative evaluation per 40 C.F.R. § 1502.14(a) economic benefits from reduced future flooding can be consistently measured in terms of:

- Residential benefits (population and households)
- Business benefits (economic valued added that is “at risk” in the floodplain)
- Property valuation benefits (measures of assessed values)

The DEIS must have sufficient detail to inform the Corps about the impacts, including economic impacts, that can be reasonably anticipated if the Proposed Project is approved. And, as further discussed in comments #3, 5 and 13, the DEIS must provide reasonable alternatives so the Corps can evaluate whether there are other options available that would meet the stated objectives of the project. Is there an alternative, for instance, that provides 90% of the benefit but only 50% of the harm? That comparative analysis cannot be undertaken if the DEIS is too general and fails to clearly identify the magnitude and character of the impacts and the difference in impacts among the alternatives.

Failure of the DEIS to present consistent information and analysis required to provide comparable results for the evaluation of the Proposed Project, or any alternative, results in an insufficient framework for decision making. By extension, there is no clear understanding of the potential economic benefits provided by Alternatives.

To address these issues, and ensure the DEIS is prepared in such a way as to “rigorously explore and objectively evaluate all reasonable alternatives,” by decision makers, the DEIS should:

- Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.
- Include reasonable alternatives not within the jurisdiction of the lead agency.
- Make a substantial, objective effort to assess and present information on economic impacts and socioeconomic consequences relevant to the actions considered in a format that allows for straightforward comparative evaluation.
- Present concise summaries of socioeconomic effects to help decisionmakers and public readily compare impacts and likely outcomes in the form of comparative analysis table.

3. Economic benefit of the proposed FRE project is unclear; cost-benefits are not provided or developed; risk or uncertainty is not considered in analysis.

The proposed FRE project is not fully developed as an alternative in the DEIS (3.4.1). Assessment of the net benefits of the proposed FRE facility is dependent on a variety of factors, the most basic of which relies upon identifying all associated costs and benefits; monetizing those that can reliably be monetized. Such assessment should incorporate information regarding uncertainties; uncertainty in the costs and benefits should be calculated and reported, together with the distributional consequences (who gains and who loses). While the Proposed Project provides potential benefits at least 100 years into the future, the DEIS neither addresses the cost-benefits of the Proposed Project, or uncertainties, the level of mitigation needed, and the

costs related to that mitigation. **The lack of such analysis in the DEIS presents an egregious flaw that does not follow NEPA requirements stating that an EIS will, “Rigorously explore and objectively evaluate all reasonable alternatives...”.**

Similarly, the DEIS for the Proposed Project does not explore the effects of risk, which would be applied to the benefit estimates if they existed. Risk is defined in terms of expected probability and frequency of the hazard occurring, the people and property exposed, and the potential consequences. To estimate future damages (and the benefits of avoiding them), the probabilities of future events must be considered. The probabilities of future events profoundly affect whether a Proposed Project is cost effective. This same procedure should also be applied to future mitigation and monitoring costs, which also involve current and future uncertainties. For instance, habitat needed for mitigation cannot be estimated as point estimates with certainty, rather must reflect the uncertain and constantly changing costs associated with mitigation efforts.

As both costs and benefits for the Proposed Project involve risk, they each involve probability distributions; given that there are a range of probabilities involved with the potential risk, the costs and benefits inherently have a distribution. The full range of associated costs and benefits are not developed, quantified, or analyzed using CBA for the proposed FRE facility or potentially viable alternatives and risk outcomes are not presented in the DEIS. Thus, the estimated economic benefits of the proposed FRE project cannot be quantified.

Failure to fully develop the associated costs and benefits for the Proposed Project and potential alternatives is a significant deficiency of the DEIS. **Additionally, uncertainty analysis must be incorporated for a full understanding of the Proposed Project’s economic benefits.** See discussion at 5, 6, 8, 9 and 10 below. The DEIS does not include a clear presentation of the uncertainties associated with the scale and complexity of the proposed FRE facility, or potential alternatives. A comprehensive examination of uncertainty is critical to understanding and accurately comparing alternatives (Apel et al., 2004).

To address deficiencies outlined here, the DEIS should:

- Conduct a CBA and report cost-benefit ranges that correspond to the uncertainties for the project using either models that directly incorporate uncertainty, or ex-post risk analysis of point estimates.
- Local economic benefits from reduced future flooding can be consistently measured in terms of residential benefits (population and households); business benefits (economic value added at risk in the floodplain); and property values.
- Document sources of uncertainty for benefits for the Proposed Project at present and into the future (50 years forward).
- Document uncertainties related to mitigation costs. These arise from both the quantity of mitigation habitat that is needed, and the variation in future expected costs of that mitigation.
- Explain the robustness of final decisions regarding project implementation to uncertainties. Discuss the range or extent to which the basic assumptions and

information supporting the economic analyses can vary without affecting the ultimate conclusions and recommendations of the study.

4. Methodology used is inadequate to assess range of socioeconomic impacts for alternatives.

All major infrastructure projects, such as the proposed FRE facility, have both positive and negative impacts, to the environment, economies, and socioeconomics of the region they are in. The DEIS specifically states that among the reasons for preparation of the DEIS, “... *the Corps determined the proposed project may have significant individual and/or cumulative impacts to the human environment.*” In so doing, it is incumbent upon the agency to prepare the DEIS in accordance with NEPA, as amended 40 C.F.R. §§ 1500-1508; 33 C.F.R. 325.

NEPA requires agencies to “*ensure the professional integrity, including scientific integrity, of the discussions an analysis in environmental impact statements*” and to “*identify any methodologies used*” and the “*scientific and other sources relied upon for conclusions.*” 40 C.F.R. § 1502.24. The current socioeconomic analysis must be revised without reliance on unsupported assumptions.

Little has been done in the DEIS to quantify the fiscal and social impacts tied to the Proposed Project, or the alternatives. In most cases there are subjective statements on expected impacts, such as “low”, “Low to medium direct”, or “beneficial impact.” The only places where any quantification occurs in terms of hard numbers reasonably known such as population, employment, spending, and taxes. And, interestingly, more detail is given to timber and agricultural production than any other sector within the Socioeconomic Impact Analysis, Appendix P., despite recent studies that have thoroughly examined the regional economic contributions of commercial and recreational fisheries, e.g., Resource Dimensions (2015a, b).

While the issue, with respect to the Chehalis Basin, could not possibly be that of unavailable information, at the very least, the DEIS must make it clear that information required to conduct appropriate analyses to evaluate the extent of “*reasonably foreseeable significant adverse effects on the human environment*” is lacking. 40 C.F.R. § 1502.22.

Analyses commensurate with the magnitude of the Proposed Project are critical to providing the public and decision makers with sufficient information to have a grasp on the scope of the potential impacts. There is sufficient readily available information to conduct analyses that will provide a range of expected and quantified projections.

The lack of use or acknowledgement of the wealth of information on a variety of socioeconomic factors in the region is in direct violation of the intent of 40 C.F.R. § 1502.24. Additionally, the requirement of NEPA to ensure agencies uphold “scientific integrity” must be met with the use of available data to make quantitative assessments where possible instead of qualitative assessments that support a certain outcome.

To overcome the deficiencies of the socioeconomic impact analysis across the alternatives, the DEIS must:

- Develop and use the best available data to assess impacts for the Proposed Project and all alternatives. If said data is not used the reason must uphold “scientific integrity”.
- Compare impacts across the alternatives; more granularity and information is needed aside from “Low”, “Low-Medium”, etc. Define impacts in such a way that alternatives are comparable.
- Identify all methodologies used to assess socioeconomic impacts.

5. Economic impacts presented are for construction and operation only; impacts of potential catastrophic failure is not developed, discussed, or assessed.

Economic and social impact analysis is particularly important for the DEIS as the Proposed Project would have significant impacts on the regional and local economies and social structure within the study area because the hydrological effects are predicted to occur across more than 75 miles of the Chehalis River and across its 100-year floodplain. (DEIS, Appendix I).

The DEIS has totally ignored the vast economic and social implications of the Proposed Project and has even further ignored addressing the potential range of related benefits associated with the Local Actions alternative, as well as the restorative approach. **Significantly, the human dimension has not been appropriately considered – a fatal error of the DEIS.** While there are many dimensions to evaluating infrastructure projects as the proposed facility Proposed Project, the human dimension is a critically important consideration.

Economics

The limited economic impact analysis conducted for the DEIS is fatally flawed. Inconsistencies in application of analysis, inappropriate use of models, omissions, errors and other deficiencies surrounding the limited assessment of economic impacts, lead to unsupported inferences and interpretations of impacts that are difficult to reasonably judge, and impossible to compare for the proposed FRE facility and other reasonable alternatives. The comparison of results across alternatives relies on the use of a consistent approach. Standard practice includes the reporting of financial returns in the evaluation of costs and benefits of each alternative. Returns to investments for flood risk reduction strategies may be reported in a variety of ways (e.g., NPV, cost-benefit ratios, avoided costs, IRR).

Social Impact

The DEIS reflects a lack of substantive social or socioeconomic impact analysis that could be used to inform the public and decision-makers in any meaningful way on the effects of the Proposed Project or viable alternatives. The DEIS correctly finds that construction and operation of the Proposed Project would have unavoidable adverse direct, indirect and cumulative impacts on aquatic and terrestrial resources and habitat, recreation, water quality, local economies, and more. Yet, the DEIS does not address the significant and interrelated social, cultural, and economic dimensions of such impacts. From the permanent loss of important river resources that provide various recreation and tourism related opportunities (e.g. fishing, kayaking, etc.)

that support the region’s economy, to effects on important subsistence species and sites that will directly and permanently affect traditional and cultural uses and resources. And, despite acknowledging the range of impacts, the DEIS provides nothing to either identify appropriate mitigation strategies and related costs, or acknowledging the costs that may be associated with the National Historic Preservation Act (NHPA) Section 106 review process (DEIS Appendix P).

The analysis given to the assessment of the socioeconomic and/or social impacts of the Proposed Project within the DEIS is fatally flawed.

Thus, the DEIS fails to address or employ widely accepted professional standards to ensure a thorough, objective and transparent evaluation of the Proposed Project, and any alternatives.

Overall, the DEIS does not provide decision makers with an accurate understanding of the potential impacts of the Proposed Project or any alternative. The lack of appropriate detail and analysis across resource area discipline reports and appendices for socioeconomics and Environmental Justice suggests a lack of concern as to whether or not people who live in and rely upon the Basin’s natural resources are better off as a result of the Proposed Project – or how local and regional economies are likely to be impacted by the Proposed Project.

Given the magnitude of the Proposed Project, the Corps abused its discretion in electing not to conduct any meaningful analysis surrounding the economic and social impacts attributable to the Proposed Project.

Socioeconomic and sociocultural impacts associated with the Proposed Project and alternatives should be fully assessed and disclosed in the DEIS, including, but not limited to, the following:

- Evaluation of potential changes to the region's economy as a result of dam construction and operation (e.g., changes to sectors as commercial and tribal commercial fishery, recreational fishery, recreation, and tourism, etc.).
- Assessment of impacts associated with economic changes to families, communities, and cultures, including potential changes to those aspects of the area's economy that are currently subsistence-based.
- Evaluation of replacement costs from reduced subsistence harvest of traditional foods if access or availability are impacted by the Proposed Project.

6. Costs of proposed mitigation strategies is not presented or addressed, and strategies to compensate for impacts is not demonstrated.

In the general failure of the DEIS to reasonably address mitigation for various resources (e.g. wetlands, streams, aquatic, terrestrial and riparian habitat, fish and wildlife species and habitat, surface water quality, recreation) it similarly does not acknowledge or include future costs associated with mitigation strategies presented. Each type of mitigation strategy also has risks for achieving successful mitigation, which should be addressed within cost estimates.

Compensatory measures are presented to increase the feasibility of an alternative. The absence of cost information for mitigation presented contributes significantly to the underestimation of

projected costs by obfuscating or simply not including major costs (e.g. monitoring and management, land and easement acquisitions).⁴ For example, wetland mitigation for an estimated minimum of 24 acres will be subject to a management plan that will include maintenance, annual and long-term monitoring for established success criteria, and adaptive management, none of which are mentioned in the DEIS. The EPA estimates that the typical Section 404 enforcement monitoring period ranges between five and ten years.⁵ Developing, updating and enforcing management plans and conducting required monitoring will require a substantial investment over time. Other requirements may continue for the life of the Proposed Project. Yet, as with its general approach to addressing mitigation, the DEIS does not provide cost estimates for any of the mitigation measure likely required for the Proposed Project. Thus, making it impossible to either assess whether potential mitigation strategies for the Proposed Project, or any other alternatives, are prohibitively expensive or otherwise not economically “feasible” or “practicable.” As a result, it is not possible to assess whether or not a particular alternative could be deemed to be impracticable under the Clean Water Act. The DEIS does not provide an economic feasibility study or any other type of economic assessment for the Proposed Project or for other alternatives.

The failure to include estimated mitigation costs also complicates comparability across alternatives and offers decision makers no information on which to meaningfully assess whether mitigation measures proposed in the practicability determination.

Overall, the DEIS does not sufficiently address costs and effects on the range of mitigation measures identified.⁶ ***Mitigation as presented in the draft DEIS fails to meet the requirement of 40 C.F.R. § 1502.16(c), generally as well as specific to impacts on treaty reserved rights.***

7. Limited scope of economic analysis; benefits of and damages to ecosystem services are not addressed.

The DEIS discloses that virtually all resource areas (e.g., water quality and quantity, geology, aquatic and terrestrial species and habitats, recreation, cultural resources, etc.), *would* experience substantial adverse cumulative effects as a result of the Proposed Project. Yet, the

⁴ The regulatory definition of the word "significantly" at 40 CFR § 1508.27 – as in "major federal action significantly affecting the quality of the human environment" – includes as measures of impact intensity: (2) The degree to which the proposed action affects public health or safety. (4) The degree to which the effects on the quality of the human environment are likely to be highly controversial. (5) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks. (6) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration. (8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources. (9) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973. (10) Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

⁵U.S. Environmental Protection Agency. "Section 404 of the Clean Water Act." 33 U.S.C § 1251.

⁶ The definition of "effects" at 40 § CFR 1508.8 – as in "effects on the quality of the human environment" – includes changes in the human environment that are "aesthetic, historic, cultural, economic, (or) social."

DEIS fails to assess the considerable economic consequences of these impacts. Further, despite noting that a recent study specifically addressing the value of Chehalis Basin ecosystem services had been conducted (Section 5.10.2.6 Ecosystem Services, p. 229) no effort is given to presentation of the economic value and contributions to the local and regional economy. Apparently, because “...the economic value of ecosystem services can be difficult to measure.”

“Difficult to predict and quantify” or “measure” is not a reasonable excuse in an environmental impact statement to ignore or dismiss impacts. Impacts, including economic impacts, can be described and evaluated in whatever terms or metrics are available rather than ignoring or trivializing them because they are not easily predicted, measured, or quantified.

The value of the flood-dependent system can be characterized in terms of ecosystem services such as water supply, flood control, pollination (Costanza et al. 1997). Throughout the DEIS, ecosystem services are not seriously considered. Further, across the DEIS and its technical appendices, the economic value or contributions of ecosystem services are never, explicitly, mentioned though they are clearly part of many of the resource areas that are examined.

The DEIS assigns no value to the ecosystem services (e.g., natural hazards mitigation) provided by floodplain connection to the, based on the argument that the system has been significantly changed over time. However, the ecological value of the remaining connection to the Chehalis River is high. As described in CEQ (1997), the loss of this last remaining connection is an example where additional impacts, no matter how small, will have a disproportionate cumulative effect by exceeding the threshold where floodplain connection ecosystem functioning is eliminated. Closing the last connection would have a significant cumulative impact on the flood-dependent system. While it is not required that a project compensate for historical impacts, it is incumbent on the project not to contribute the incremental impact that may cause the project to exceed this overall threshold.

Economic research conducted by several agencies, including the U.S. Department of Agriculture, U.S. Forest Service, and the U.S. Army Corps of Engineers, have demonstrated the economic importance of ecosystem services and landscape amenities to local economic vitality (Wainger, L. and D. Ervin, 2017; Deal et al. 2017; Smith et al. 2011; Reed et al. 2013). This research has also warned of the negative consequences on local economic vitality and wellbeing associated with development that damages or degrades important habitat, ecosystem services, and landscape amenities. This knowledge developed, over the last several decades, not only by these agencies but broadly by many economists, should serve as part of the foundation for any socioeconomic impact analysis written by the Corps.

If the economic analysis of the Proposed Project took into account ecosystem services and amenity-supported economic development and eliminated the bias in the DEIS socioeconomic analysis, a starkly different picture of the economic impacts of the proposed FRE facility on Chehalis Basin communities would be clear: It is highly likely that the “beneficial” economic impacts of the Proposed Project will be completely offset by the negative impacts on the economic benefits of ecosystem services to the local economy and amenity supported in-migration. For that reason, it is also highly likely that the Proposed Project would, overall, damage the economic vitality and well-being of the Chehalis Basin.

Related to the limited scope of analysis, the DEIS does not include an evaluation of the ecosystem services that will be directly or indirectly affected by the Proposed Project. Rather, a short qualitative passing paragraph is offered at (DEIS, Socioeconomics, 5.10.2.6) and a similar treatment is given within Appendix P, at 2.6 Ecosystem Services, pp. 10-11. Additionally, no economic value has been apportioned to compensate for the loss of these services. For instance, the DEIS states there will be economic benefits to employment, income and tax revenues with the FRO with detailed figures presented; however, there is no corresponding estimate of the loss in ecosystem services although recent estimates of ecosystem services in the region are as high as 15 billion dollars (Resource Dimensions 2020). Further, the indirect impact of the Proposed Project on downstream ecosystem services, such as flood mitigation or water quality improvement, is also not included in the DEIS.

In 2013, FEMA introduced the first policy introducing the allowance of ecosystem service benefits into cost-benefit analysis for mitigation programs (FP108-024-01). This policy was subsequently revised and updated in 2016 and then again in 2020 (FP108-024-02). Therefore, the federal government has recognized the importance of ecosystem services and cost-benefit analyses to comparing potential projects which may be undertaken. Given that ecosystem services in this study area could be worth as much as 15 billion dollars (Resource Dimensions 2020), it is crucial to conduct a thorough and detailed cost-benefit analysis that accounts for, amongst other things, ecosystem service benefits.

The Chehalis Basin provides a variety of ecosystem services. Resource Dimensions (2020) estimate that ecosystem services in the basin provide a value of \$35,000/acre to upwards of \$250,000/acre, Table 2. Ecosystem services such as flood prevention and water treatment are an important part of the true value of Chehalis Basin natural ecosystems. With the value of many of the ecosystem services that would be altered by the proposed project, such as water regulation, water treatment, etc., in the thousands of dollars per acre category, omitting a review or study of the regions ecosystem services is a serious concern and will leave decision makers with inadequate information on which to gauge how the Proposed Project will further impact the capacity of the Basin's natural systems to support the provision services such as flood and erosion control, purification of air and water, regulation of hydrologic flows, recreation opportunities, fish and wildlife habitat, and more.

Table 2. Summary of Chehalis Basin ESVs, by Service (2019\$)

Ecosystem Services Provided	Low		High	
	Min	Max	Min	Max
Provisioning				
Food	\$794	\$2,832	\$826	\$2,969
Water Supply	\$557	\$3,983	\$614	\$4,397
Regulating				
Biological Control	\$60	\$72	\$65	\$77
Gas & Climate Regulation	\$35	\$206	\$37	\$217
Natural Hazards Mitigation	\$441	\$2,239	\$458	\$2,438
Pollination	\$2,805	\$49,520	\$2,969	\$53,313
Erosion Control	\$73	\$2,245	\$76	\$2,337
Soil Formation	\$245	\$5,847	\$269	\$6,322
Waste Treatment	\$153	\$20,436	\$165	\$22,735
Water Treatment & Quality	\$444	\$13,937	\$513	\$15,155
Water Regulation	\$4,764	\$7,148	\$5,358	\$7,946
Societal/Cultural				
Aesthetic/Amenity	\$2,175	\$61,737	\$2,273	\$65,566
Recreation/Tourism	\$22,020	\$40,696	\$23,490	\$43,539
Supporting				
Habitat and Nursery	\$192	\$7,638	\$241	\$9,296
Biodiversity/Genetic Resources	\$46	\$1,081	\$53	\$1,138
Total Annual Value (\$/acre/year)	\$34,806	\$219,617	\$37,408	\$237,446

Source: Resource Dimensions, 2020.

To address deficiencies outlined here, the DEIS should:

- Explicitly identify the nature and degree of effect of the Proposed Project on the aquatic ecosystem, including the severity or significance of those effects.
- Include ecosystem services valuation analysis and other analyses that determine and include the associated economic impacts on ecological function.
- Include the cost of protecting the existing wetlands from potential impacts from the Proposed Project and reasonable alternatives in the cost-benefit calculations.
- Include benefits in the project alternatives that could enhance Chehalis Basin ecosystems and the provision of goods and services (e.g. forest conservation/management, wetland restoration, aquatic habitat restoration, etc.).

8. Socioeconomic benefits associated with proposed FRE facility construction and FRO alternatives are misrepresented and impact estimates are substantially overestimated.

The socioeconomic impact analysis concludes that the construction of the Proposed Project would have “beneficial” impact in the form of income, employment, and tax revenue, and

“beneficial” impact to income, employment, and tax revenue, including reduced flood risk (DEIS, Appendix P, p. P-18). Due to flaws in the methods and execution of the ECONorthwest study, these “beneficial” impacts are overblown. In short, the analysis conducted

- Overestimates short-term construction period impacts due to inherent issues with the models used and the choice of the size of the study region.
- Overestimates long-term job “creation” and other impacts due to use of a model empirically proven to have no value as a predictor of economic activity occurring more than a year into the future.

Overestimation of short-term impacts due to FRE facility construction.

The impact analysis estimates of economic impacts resulting from spending on the construction of the Proposed Project suffers from fundamental problems with input-output (I/O) analysis, for which EcoNorthwest used the IMPLAN data and modeling software. I/O models are so named as their intent is to translate an exogenous change in the economy—that is, the “input,” which in this case is spending required to construct the proposed FRE facility—into “outputs,” which are spending by those firms (contractors) that would be hired to build the dam, spending by firms that those firms would hire, and so on, plus spending by the households whose labor the various firms would hire. Spending by the project proponent would be a “direct” effect. Spending by the other firms are the “indirect effects.” Spending by the households are the “induced effects.” The ratio of the sum of these three effects to the direct effect is known as the “multiplier.”

Empirical I/O models like IMPLAN are constructed using a limited set of assumptions about how spending and hiring decisions are made. Basically, the models assume that decisions are made the way they have always been made. Even though firms and people in the real world will innovate and adjust their decision-making based on the situation presented, firms and people in the I/O model will simply do what they have always done. And since innovation leans toward cost minimization, using I/O models as a proxy for practical decision-making tends to overestimate a firms’ spending, which results in overestimates (Hoffmann and Fortmann, 1996). What that means in context of the DEIS is that construction of the Proposed Project will not involve as much indirect and induced spending, or create and support as many indirect and induced jobs, in the real world as the output from ECONorthwest’s “out of the box” IMPLAN model suggests. The only way to correct for this is to develop a custom IMPLAN model, which requires advanced modeling expertise to modify the model and multi-regional analysis functions.

Although the introduction to section 3 of Appendix P mentions both a 2018 IMPLAN Washington Statewide model and an IMPLAN County model (which county is not specified) and identifies the study area as a four-county area, the first sentence in section 3.1.5 states that the analysis used IMPLAN’s 2018 Washington State model to perform the analysis. Thus, the DEIS estimates of construction impacts for the four-county area are likely substantially overestimated due to use of the State IMPLAN model, which uses the entire state as the region for the analysis. Regional economic impact depends on the degree to which direct, indirect, and induced spending occurs within the study region. The larger the region, the more likely it is that materials or services can be found from within the region, and the more likely it becomes that labor would be hired from those living within the region. In an attempt to elucidate how a “... a suitable judgment about

the geography chosen for the construction impact analysis”, was made the authors state, *“This analysis uses information about specialized requirements of the construction process...”* (Appendix P, Section 3.1.3). Yet, no information, data, or detail is provided to explain a rationale for using the Washington State IMPLAN model.

Section 5.10.3.3 of the DEIS does note that not all the construction labor will be residents of the four-county area. However, there does not appear to have been any adjustment to the induced impact estimates to account for the differences in household expenditure patterns for nonresidents working on the project. Given the rural nature and population base of the Chehalis Basin it is extremely unlikely that even a majority of materials and labor will come from within the study region. Additionally, with a significant percentage of workers coming from outside the Chehalis Basin area, substantially less of workers’ spending will occur inside the region. Regional household expenditures for workers commuting or staying in motels or campgrounds would be vastly different than the resident expenditures estimates by the IMPLAN household sectors. There is no indication in the DEIS, or the analysis conducted in Appendix P, to suggest the model was adjusted to account for non-local construction workers in the use of IMPLAN. Consequently, the estimated multiplier effects and the benefits during construction, as presented in the DEIS, are further overstated.

Another issue arises in the confusion of presentation related to “jobs” versus “workers.” In Appendix P, Table 3.2-5 indicates that peak employment would be in Year 2 (1,910). Since the source for this number is indicated to be IMPLAN it is presumably a measure of jobs. However, section 5.10.3.3 indicates that peak employment is 1,910 workers. As noted in Appendix P “jobs” are not the same as “workers.” The two numbers should not be the same. It should also be noted that construction jobs are usually supported job to job. Thus, new construction projects are keeping construction workers employed rather than genuinely creating new jobs in the economy. Given these issues, together with the inaccuracies and inadequacies in the presentation of information about potential employment supported by the Proposed Project, at a minimum the DEIS does not meet the task of informing public decisions on this important element of the socioeconomic impact analysis.

How or if any of the short-term employment impacts presented in the DEIS can be expressed in terms of a representative number of ongoing permanent jobs has not been addressed. And, no attempt is made to account for differing locations of economic activity. Just as all jobs and industries are not comparable, the money derived from economic activities is not spread evenly between communities. Where people earn money and where they spend it has direct implications for understanding such industries as agriculture, recreation and timber production. This issue is ignored in the NEPA DEIS.

Finally, the overall point of the social and economic assessment appears to be that most communities [and most of the population] are sufficiently resilient to absorb whatever alternatives are implemented. This frame of reference addresses only half of the pertinent question. The other half of the question, which is neglected in the DEIS, asks what impacts implementation of the Proposed Project alternatives might have for the overall social and economic wellbeing of Chehalis Basin communities.

Overestimates long-term impacts due to FRE facility operation.

ECONorthwest also uses I/O modeling and IMPLAN to project long-term or ongoing impacts from the operation (O&M) of the dam. There main issue is that input-output analysis is inappropriately used to estimate long-term impacts, resulting in bloated estimates of jobs created or supported by the ongoing operation and maintenance of the dam. I/O modeling is not suited for long-term economic impact assessment, and it has been empirically shown to be unreliable for this purpose (Haynes et al. 2007).

Using IMPLAN, the total output from operations spending is estimated at \$949,514 annually, which is estimated to support about five jobs: one direct, jobs – three direct, one indirect and one induced. We do not doubt that the operation of the project will spur some economic activity in the form of associated jobs and income. However, given the issues with using IMPLAN for estimating ongoing O&M impacts and because the estimated level of activity is minimal and the effects overstated, we conclude that the employment and income effects are miniscule relative to the study regions' economies.

It may seem unimportant to be concerned about whether the projected five jobs are imaginary for the area of the Chehalis Basin. Though, one or two jobs can make a big difference in small rural communities of the region. It is all the more important, therefore, to avoid over-stating long-term impacts and over-promising economic benefits from the Proposed Project.

Correcting the range of issues and errors outlined here would require, at a minimum, the following actions:

- Correct IMPLAN impact analyses.
 - Revisit and revise estimates of the construction benefits using a the correctly sized study region.
 - Develop custom impact models using IMPLAN county models for counties included in the study region.
 - Modify assumptions for sourcing construction related costs (materials, services, labor).
 - Enter expenditures for each year of project construction separately to apply the appropriate industry deflators.
- Correct employment impact tables and express job-years appropriately.
- Adjust benefit estimates by considering only the direct effects (not indirect and induced effects) of O&M of the Proposed FRE facility.

9. The feasibility of mitigation required to compensate for the impacts on fisheries resources and communities that rely upon these resources is not demonstrated.

It is well known that salmon are essential to our regional identity, tribal lifeways, and the livelihoods of native and non-native fishermen.⁷ Construction of the Proposed Project would have devastating impacts on these fish, already at severe risk due to existing degraded habitat⁸ that will be exacerbated by climate change, and harm Washington’s coastal fishing economies.

The DEIS does not, and cannot, properly assess the extent to which adverse impacts on fisheries can be avoided through mitigation because it does not implicitly assess the extent and range of direct, indirect, and cumulative adverse impacts that will result from construction and operation of the Proposed Project. **Thus, the DEIS fails to meet the requirement of 40 C.F.R § 1502.14 (e), which states that in addition to presenting the environmental impacts of the proposed action and the alternatives in comparative form agencies “shall include” in the alternatives section “...appropriate mitigation measures not already included in the proposed action or alternatives.”**

Failure of the DEIS to assess the extent that fisheries would be impacted, including the economic and ecological changes which would occur under the Proposed Project, results in an inability to assess the feasibility of mitigation that would be required. The economic value of the fisheries in the Chehalis river region are not inconsequential sums of money. Gislason et al. (2017) estimated that commercial and recreational salmon fishing accounted for an annual average of more than \$1.39 billion in GDP and supported more than 26,000 jobs in the U.S. economy. Locally in the Chehalis region, Resource Dimensions (2015a, b) estimated the economic value of fisheries in the Chehalis county region to be worth more than \$55 million (\$2020 dollars), directly affecting more than \$9 million of personal income for more than 250 individuals and more than 40 indirect jobs worth more than \$2 million annually.

There are also farther reaching national and international impacts for which mitigation has not been addressed. The current DEIS does not allow these impacts to be mitigated, let alone assess the mitigation needed, due to the lack of analysis on the economic and cultural value of the fishery. These oversights in the DEIS are egregious in and of themselves but are compounded by recent history where salmon have been threatened, populations have declined rapidly in many areas and Endangered Species Act (ESA) lawsuits abounded. No Proposed Project would escape litigation without a thorough accounting of the proposed impacts to a fishery, demonstration of feasibility to actually complete mitigation and a plan for constant monitoring and adaptation to ensure mitigation was successful.

To provide vital information on which decisions regarding the Proposed Project, or any alternative can be made, mitigation measures must be identified and assessed for feasibility. The DEIS does not identify or assess mitigation measures that are “Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.” 40 C.F.R § 1508.20(c). Further,

⁷ See, e.g., Langdon Cook, Why Wild Salmon Remains King in the Pacific Northwest, NAT. GEOGRAPHIC (October 26, 2020). <https://www.nationalgeographic.com/travel/features/searching-for-wild-pacific-northwest-salmon-from-river-to-table/>.

⁸ Governor’s Chehalis Basin Work Group 2014 Recommendations Report (November 25, 2014).

the DEIS does not discuss “Minimizing impacts by limiting the degree or magnitude of the action and its implementation.” 40 C.F.R. § 1508.20(b). The DEIS does not indicate what the projected environmental benefits of mitigation measures are for significant adverse impacts, nor does it discuss their technical feasibility or their economic practicability, provides no indication as to concern about whether a mitigation measure is capable of being successfully accomplished, and does not have a study area that accounts for the expansive potential impact to resources outside the narrowly defined study area.

In addition, no mitigation of impacts to the United States obligations to the Pacific Salmon Treaty were addressed. Certainly, a firm understanding of the United States responsibilities to this international and legally binding treaty are required before proper mitigation could be determined, and the feasibility of this mitigation could be assessed. Likewise, impacts to the Treaty rights and resources and potential for mitigation of those impacts should have been assessed.

By failing to demonstrate the feasibility of mitigation to compensate for impacts to fishery resources the DEIS fails the requirement of 40 C.F.R. § 1508.20.

10. Several significant costs are not included in projected estimates for the Proposed Project.

There are numerous costs associated with the proposed FRE project. Yet, as noted in this review, the DEIS does not include CBA, which would have required a systematic development of all Proposed Project costs, as well as those associated with alternatives. The result is a scattering of cost and economic information buried within various sections of the DEIS and its many discipline and technical reports, and reliance upon previously developed cost estimates for the Proposed Project and alternatives, which have been previously documented as seriously flawed. See Quinault Indian Nation SEPA DEIS comments, May 11, 2020.

Further complicating interpretation and understanding of cost development are the inadequate detail about the extent of Proposed Project costs. For example, certain construction, land acquisition, mitigation actions, and adaptive management costs over the life of the project are at best fleetingly referenced, though largely absent.

The information referencing Proposed Project costs throughout the DEIS neither provides adequate defensible calculations of costs and/or analysis of costs, or any comparative format in which to evaluate costs, changes to local and regional economy, socioeconomic impacts, or impacts that may affect the future possibility for members of the Quinault Nation to exercise their treaty rights (economic, socioeconomic and cultural). The absence of such information provides no sound platform for decision-making with regard to the social, environmental, economic, and other public health and safety considerations related to the proposed FRE project, or other potentially viable alternatives.

Areas of significant costs not included within the development of the cost estimate for the Proposed Project are below. It should be noted that the list is not intended as inclusive.

- All Mitigation (e.g., compensatory mitigation, wetland creation, etc.) and ongoing monitoring and/or adaptive management.
- Consultation with affected tribes.
- Plan development (e.g., mitigation, adaptive management, and contingencies).
- Teardown and rebuilding costs for the Proposed Project. The projected lifespan of the Proposed Project is 100 years. At the end of the 100 years, the dam will have to be torn down or significantly rehabilitated. Excluding these costs is misleading; and will leave the next generation with a significant bill.
- Quarry development and access roads (e.g. land acquisition, quarry development and road construction). Costs for new road construction and road crossings required for quarry access should be included in project costs. (DEIS, 3.4.1.2.1; p. 28-30).
- Stream crossings - 36 new stream crossings associated with the proposed action are identified. Quarry access road construction together with the required stream crossing structures will contribute significant costs to the project. Estimates developed from current studies indicate significant cost variation, depending on the variables (e.g. stream indicated as fish habitat, slope, bridge required, etc.) and associated requirements. Given the number of crossings, required permits, engineering and road construction costs, the total costs could easily reach into the millions.
- Public Services: water supply system Pe Ell (DEIS, 4.1.3.3.4, p. 68).
- Costs for Construction equipment operation and maintenance staff and cumulative economic and social impacts were not included in development of project costs for the proposed FRE facility.
- Cost of development of Airport Levee Changes (e.g. permits as flood hazard zone, earth moving, right of way, NPDES) and ongoing monitoring and maintenance.

The following should be completed to address errors and omissions pertaining to development of Proposed Project costs estimates, as well as any alternatives presented:

- Conduct a thorough CBA and economic impact analysis. Present detail on all costs and benefits monetized and included in Proposed Project calculations. Justify reasons for not including any costs not incorporated into calculations.
- Provide economic models underlying benefits analysis, inclusive of all data used.
- Define all variables used in any empirical model and explain relevant equations that quantify relationships between them. Explain whether tests for serial correlation were conducted in the analysis and if so, what corrections were made.
- Clarify the role of crop and flood insurance assumed in the agricultural economics model and explain any assumptions about risk preferences.
- Itemize all costs (including mitigation and adaptive management) and all benefits for each year of the project, both in nominal and in present value terms.
- Discuss in text the content of all tables that provide numbers with economic relevance.

11. Socioeconomic impacts associated with changed ecosystem function are not adequately considered or quantified.

Significant degradation is measured by substantial adverse impacts on: (a) human health or welfare, including municipal water supplies, plankton, fish, shellfish, wildlife, and special aquatic sites; (b) life stages of aquatic life and other water-dependent wildlife; (c) aquatic ecosystem diversity, productivity, and stability, such as loss of fish and wildlife habitat or loss of the capacity of a wetland to assimilate nutrients, purify water or reduce wave energy; and (d) recreational, aesthetic, and economic values.

Ecosystem services are products and services provided by the environment. Any improvements or damages to the environment have impacts on the nature’s capacity to deliver ecosystem services. The DEIS outlines a series of environmental impacts, yet makes no attempt to quantify the values associated with those impacts.

The Proposed Project and alternative (FRO) have different impacts. To fully evaluate the economics of each alternative, the DEIS should look at improvements and damages (near- and long-term) to ecosystem services and their associated monetary values. Inclusion of non-market valuation is well-established in environmental decision making (e.g. Atkinson and Mourato, 2008; Brown et al., 2009; Fisher et al., 2009).

The recent ecosystem service valuation conducted for the Chehalis Basin, reveals the magnitude of the region’s ecosystem services; Study results indicate that the Basin’s natural capital provides an estimated minimum of \$1.1 to upwards of \$15.7 billion in ecosystem service benefits annually, Table 3 (Resource Dimensions 2020).

Acknowledging natural capital as a transitory economic asset, similar to roads and other infrastructure, a conservative asset value for the Basin over 100 years is between \$49.1 billion and \$206.2 billion at the lower bound and between \$53 billion and \$223.7 billion at the upper bound.

Table 3. Summary Asset Value of the Chehalis Basin

	ASSET VALUE			
	Low		High	
	2%	7%	2%	7%
Minimum	\$49,148,681,066	\$16,272,428,654	\$53,023,502,383	\$17,555,326,832
Maximum	\$622,911,396,122	\$206,237,095,910	\$675,692,683,790	\$223,712,228,898
Periods (years)	100	100	100	100
Annual Value	\$1,140,384,242	\$14,453,253,371	\$1,230,290,727	\$15,677,924,052

Source: Resource Dimensions, 2020.

The natural capital and correlated ecosystem services in the Chehalis Basin are extremely valuable – the natural capital of the region underpins the region’s economy. Any damage to the

current function of the basin’s ecosystems will result in changes to the economic contributions provided through diverse ecosystem services, as well as the basin’s asset value.

The DEIS correctly identifies a range of adverse impacts across every resource area, ranging from low to high, associated with both construction and operation of the Proposed Project (DEIS, p. ES-8 – ES-11), and alternatives, including the “...*permanent loss of 1.23 acres of wetlands, 4.8 acres of other waters, and 11.2 acres of associated buffers*”, and the degradation of aquatic and terrestrial habitat over time would have “...*high impacts to water quality, fish, wildlife, and wetlands and other waters.*” (DEIS, ES 5.3, p. ES-8).

Omission of non-market values leaves substantial economic impacts out of the decision-making process and ignores important differences between the proposed action and other viable alternatives that were not considered in the DEIS.

12. Socioeconomic impacts that extend beyond the geographical boundaries of the study area are not addressed.

The DEIS states that several species of salmon are expected to be significantly and adversely affected if the Proposed Project proceeds. Chinook and coho salmon originating in the Chehalis Basin are harvested by commercial, recreational, and subsistence fisheries within the Chehalis Basin and the Grays Harbor estuary. Additionally, these species are harvested over an extensive marine geographic area. The marine fisheries that depend on these salmon range from southern Oregon to British Columbia. In addition, there are important inter-regional linkages in the salmon industry, both within the U.S. and between the U.S. and Canada. The fishing activity in one region can have beneficial impacts on the economy of another region. Seattle and Washington State are major economic beneficiaries of important inter-regional linkages in the salmon industry, both within the U.S. and between the U.S. and Canada. In addition, any impacts to salmon in this region will lead to subsequent updates to the Pacific Salmon Commission for updating to the Pacific Salmon Treaty as decreases to stocks must be reported within that body (Pacific Salmon Treaty 2020).

Although the DEIS states that “The lack of major or greater flooding in the system would limit the migration of the river channel in the floodplain, and would change riverbed characteristics of the Chehalis River over time.” will occur (DEIS ES 5.3, page ES-9), no economic analysis or impact analysis has been conducted to understand the economic or social implications relative to any change in abundance of Chehalis Basin salmon. Furthermore, the DEIS does not provide an equitable economic analysis of fisheries as a commodity. Both ocean and in-river fisheries that depend on the health of Chehalis River salmon stocks provide millions of dollars in economic activity annually. From 2012-2015, Gislason et al. (2017) estimated that commercial and recreational salmon fishing accounted for an annual average of \$1,996 million in GDP and supported 26,700 FTE jobs in the U.S. economy. Resource Dimensions (2015a, b) estimated the economic value of fisheries in the Grays Harbor county region to be worth more than \$55 million (\$2020 dollars), directly affecting more than \$9 million of personal income for more than 250 individuals and more than 40 indirect jobs worth more than \$2 million annually.

The DEIS analysis does not include impacts to fish populations outside the Chehalis Basin. Use values occurring outside of Washington are likely substantial, given the percentage of mortality

that occurs north of the U.S./Canada border. The 2019 Pacific Salmon Commission (PSC) Joint Chinook Technical Committee’s Chinook Salmon report indicates that 90% of U.S. stocks are harvested in Alaska and Canada (PSC 2019). Fishery Use Values reported in the Appendix C Economic Study Update account for at most 10% of the Chinook Use Value (PEIS 2016). Any impact to Chehalis Basin salmonid populations will have significant implications for the entire economy of Pacific Rim fisheries.

Further, any analysis related to the economic importance of the commercial, recreational, and subsistence fisheries, must consider marine fisheries along coastal Oregon and Washington waterways. Such, analyses must be conducted to facilitate an understanding of what the potential loss of genetic diversity within the salmon population will have for the species across a wider geographic area. Impacts to international treaties, specifically the Pacific Salmon Treaty, dictates that the geographic scope for analyses on specific fishery resources must expand to any marine fishery that depends on salmon which require the Chehalis river for spawning.

By excluding adequate quantitative analysis of the economic and socioeconomic impacts associated with the Proposed Project, the DEIS fails to address the extent and range (spatial and temporal) of direct, indirect and cumulative impacts that extend both within and beyond the Basin’s boundaries.

13. Important cost-benefit and economic impact analysis have not been provided for the airport.

Related to the Centralia-Chehalis Airport, essential cost-benefit and economic impact elements have not been addressed within the DEIS. The Proposed Project includes modifications to the current levee around the Centralia-Chehalis airport. Proposed changes include increasing levee height by 4 to 7 feet along its 9,511 foot length with earthen materials or floodwalls; raising 810 feet of NW Louisiana Avenue along the southern extent of the airport; replacing utility infrastructure; widening portions of the existing levee base, and other more minor improvements. DEIS 3.4.2.1, p. 33.

There is a long history of applying CBA to the evaluation of airport investment analysis, infrastructure investment analysis, transportation and flood risk management projects. Economic analysis provides important rational information to support the decision-making process. The basic principle of CBA requires that a project results in an increase of societal welfare – that is, the benefits to society generated by the project exceed the costs. Every effect of a project can be systemically estimated and, wherever possible, given a monetary value. Additionally, CBA gives an overview of distribution effects, alternatives, and uncertainties.

Though, consistent in its approach, the DEIS does not include a CBA or any economic analysis of the airport in the context of the Proposed Project. Thus, assuring the absence of essential information required for decision makers to fully assess important dimensions of the Proposed Project. No consideration is given to the costs associated with the construction (e.g. permits, engineering, materials) required to accomplish the proposed Airport Levee Changes, or the associated ongoing maintenance costs.

Additionally, with regard to the stated purpose of protecting the airport against flood damage, there are other “reasonable” alternatives that should have been assessed, including moving the

airport 40 C.F.R § 1502.14. Completion of a CBA as part of the DEIS would have provided the public and decision makers information needed to assess the economic benefits of the airport for the region versus the costs of protecting it from flood damage.

Related to the consideration of other alternatives, the DEIS fails to consider the airport levee in combination with any alternative other than the Proposed Project. Similarly, the DEIS fails to quantify possible benefits of building flood wall or levees around key infrastructure. Instead, flood proofing is considered, though very generally and without any assessment of costs or benefits to key infrastructure. As with other building level flood-damage risk reduction and adaptation measures, the decision on the use of flood proofing techniques, alone or in combination with flood protection requires cost-benefit analysis (de Ruig, et al 2019).

Given the lack of cost-benefit analyses, economic impact analyses and the exclusion of assessing other reasonable alternatives to the proposed project, the DEIS fails to provide the public and decision makers with accurate and reliable information with which to make a decision about the Proposed Project, or any alternatives.

14. Economic impacts associated with identified significant potential impact to region's fisheries are not addressed.

From an economics standpoint, analyses of the impacts and values associated with salmonids and other fisheries of the Chehalis Basin are wholly absent in the DEIS. While there has been rigorous study and evaluation of the region's fish species and aquatic habitat, the DEIS shows no level of expertise in understanding fisheries economics. One of the primary economic concerns is the lack of information within the DEIS pertaining to the economic value and impact analyses. This limitation makes assessment of the net marginal economic benefits of the Proposed Project or potential alternatives impossible.

Given the economic, recreational, subsistence and cultural importance of the region's fisheries, absence of a more robust analysis relative to the integrated economic and social impacts of the proposed FRE facility and potential alternatives is a grievous error of the DEIS. Guidelines require, for example, an evaluation of effects to recreational and commercial fisheries, which includes harvestable fish, crustaceans, shellfish, and other aquatic organisms used by man. 40 C.F.R. § 230.51.

We believe this issue can be resolved by quantifying the project-related changes in population size and estimating the economic value (or socioeconomic significance) of these population size changes.

Another prominent issue identified is that the DEIS does not explicitly identify the timeframe for effects of the Proposed Project, or any alternatives. Timing can affect the magnitude of the net present value of benefits and costs. The DEIS should clearly specify the full time period for which costs and benefits for each alternative are likely to accrue and provide an estimate of these costs and/or benefits. It is also suggested that details on the economic model and the assumptions and data sources used to calculate regional economic impacts be added to the DEIS. The net marginal economic benefits of the Proposed Project should also be calculated.

The economic contributions of commercial fishing, tribal and non-tribal, on the region’s economy cannot be understated. We summarize below from recently completed studies.

Commercial Fishing

The QIN has registered many concerns about how the proposed action could interfere with treaty fishing activities. See, QIN EIS scoping comments (2018). The DEIS documents discuss some of these impacts, but do not consider possible economic impacts. Quinault treaty fishing activities represent not only subsistence and cultural values, but an important revenue source for tribal commercial fishers. Quinault fishing activities have the following economic impacts (direct, indirect, and induced) on the Grays Harbor County economy:

- 355.5 jobs,
- \$12.3 million in personal income,
- \$28.8 million in business revenue, and
- \$9.67 million in local purchases.

Resource Dimensions (2015a) estimates that at the low end of the scale (minor disruptions in business activities), rail and vessel traffic could cost tribal members 5% of their annual income due to rail delays and 2.9% of their income from disrupted fishing activities.

Non-treaty commercial fishing and aquaculture activities in the county have additional economic impacts (direct, indirect, and induced) on Grays Harbor County’s economy:

- 1,099.6 jobs,
- \$37 million in personal income,
- \$81.5 million in business revenue,
- \$37.2 million in local purchases, and
- \$4.2 million in tax revenue

The magnitude of these business activities indicates that economic damages from fisheries disruptions could be substantial. **Additional study is warranted; analysis of the Proposed Project within the DEIS does not capture potential impacts on the local and regional economy.**

MODERATE DEFICIENCIES

Other deficiencies, that affects the completeness and validity of the DEIS relative to the socioeconomic and economic effects, were identified in our review, as framed in Table 1, are presented here:

15. The cumulative impacts analysis does not consider the value of ecosystem services that have diminished over time.

The DEIS does not assign values to, or otherwise discuss, ecosystem services (e.g., erosion control, pollination, flood control) provided by Chehalis Basin lands and appurtenant natural

systems. While functions of the basin’s ecosystems have been significantly changed over time, the ecological value of the remaining connection to the Chehalis River is high (Resource Dimensions 2020). The loss of this last remaining connection is an example where additional impacts, no matter how small, will have a disproportionate cumulative effect by exceeding the threshold where floodplain connection ecosystem functioning is eliminated.

The analysis of cumulative impacts is incomplete without a proper consideration of the effect of the Proposed Project on the diminution over time of regional ecosystem services provided by this flood-dependent ecosystem. (Costanza et al. 1997).

To address deficiencies discussed here, the DEIS should:

- Prepare analysis of cumulative effects that includes evaluation of the Proposed Project and viable alternatives in terms of ecosystem services that have diminished over time.
- Evaluate each of the alternatives (including any new alternatives) in terms of cumulative economic impacts on ecosystem services.

CONCLUSIONS

Based upon our careful assessment of the socioeconomic impact analysis and economic impact estimates presented in the DEIS, it is our conclusion:

- 1. Cost omissions identified herein for project development, real estate acquisitions, capital costs of project development and construction, operation and maintenance, cumulative economic and social impacts, and required mitigation for the life of the project, create significant inaccuracies leading to unrealistic project cost estimates.**
- 2. No economic analyses have been conducted, thus the DEIS does not meet minimal sufficiency standards required to withstand an EIS environmental review for a project of this nature and significance. Generally accepted methodologies have not been used and there is no logical presentation of information to enable comparison of the Proposed Project against other potential alternatives.**
- 3. At best, the population at risk are identified, though there is no information about economic damages they would incur during a potential dam failure are clearly to support this project. Life safety risk and the annual probability of failure were discussed, as they should have been, though economic risk was given no consideration. The impact to the public is well-documented by the inundation maps. Yet, clear loss of life and economic impacts for the proposed FRE facility or viable alternatives are not presented in the DEIS.**
- 4. The future costs associated with environmental mitigation plans are not adequately detailed. The DEIS should provide a clear explanation and presentation of the sensitivity of the estimated cost-benefit ratios, which are presented as point estimates, to the vast array of uncertainties inherent in dealing with future social, economic, climatic and environmental conditions.**
- 5. The analyses do not capture the full extent of economic and environmental impacts of the Proposed Project.**
- 6. The general and specific deficiencies, errors, omissions, and improper use of project cost development methods result in a document that only partially captures the costs of the FRE. The DEIS potentially reaches conclusions pertinent to the FRE that are not defensible by explanation and evidence presented.**
- 7. It is unclear if the costs for construction equipment operation and maintenance staff and cumulative economic and social impacts were included in development of project costs for the proposed FRE facility.**
- 8. The various omissions create incomplete information around the scale, intensity, risk/consequence of impacts and thus call into question the credibility of the DEIS analysis;**

and how these issues thus make it impossible to consider any potential for or adequacy of mitigation.

- 9. The failure of the DEIS to engage in a transparent and complete independent economic analysis of the issues, alternatives and mitigations, leaves the public or decision makers with the burden of developing additional perspectives.**
- 10. By relying on deficient analysis to support the Proposed Project, the Corps failed to comply with NEPA law and regulations.**

As outlined in this review of the DEIS and its associated appendices, major flaws exist in the DEIS as it was released to the public. To determine the best action to take, and to carefully consider alternatives as outlined and mandated by NEPA, these deficiencies must be addressed. No informed, scientifically valid conclusion can be drawn from the information presented and the DEIS could be construed as having a preferred outcome before the release of the DEIS to the public, another violation of NEPA.

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ABOUT THE INDEPENDENT REVIEW

RESOURCE DIMENSIONS

Resource Dimensions is a multidisciplinary economic and policy consulting firm specializing in integrated analyses and the development of sustainable solutions. Drawing on extensive industry knowledge, distinguished professionals, and innovative analytics, we work with communities, tribal agencies, state and federal agencies, and private and non-profit sector partners to develop lasting solutions for a variety of programs, policies and plans.

Our analyses are informed by an understanding of the local, regional and national economy as well as attitudes, beliefs and values — the human/social dimensions. Thinking innovatively as we work to solve a range of complex issues, we lead the field in the use and expansion of methodologies to assess economic and social impacts at the state, regional and local levels. Since 1985, we have completed over 950 projects across the United States and seven other countries.

REVIEW TEAM

Julie Ann Gustanski, PhD, LLM, AICP. Dr. Gustanski has more than 30 years of experience in environmental and natural resource economics, with an emphasis on the valuation of ecosystem services and conservation programs, critical habitat impact analysis, economic and non-market dimensions of treaty protected resources, and land use and environmental policy regulatory review and litigation support. As Resource Dimensions' principal since 1995, she has completed economic, socioeconomic, environmental justice, land use analyses, and peer reviews for over 60 regulatory EIS or EA documents, dozens of ecosystem service valuations, and nearly 500 economic studies centered on diverse resource management and policy issues. Her work has resulted in the conservation and restoration of over two million acres of land and appurtenant resources, tangible policy changes, and shifts in government investment strategies leading to over \$90 million in social and environmental investments.

Julie holds a BS in Legal Studies and Environmental Policy from the University of Minnesota (1995 summa cum laude); MEM, Natural Resource Economics & Environmental Policy, Duke University (1990); MPhil/MS, Urban Design & Regional Planning, University of Edinburgh (1987); LLM, Planning Law, University of Edinburgh / Duke University (1987); and PhD, Resource Economics, University of Edinburgh (1999).

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Over the past 35 years, Tex has worked broadly on the diverse economic aspects of issues such as community development; critical habitat designations; fisheries; recreation; grazing and timber production. In these efforts, he has worked extensively with communities, local government officials, tribal and federal land management agencies, state government, and industry.

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