WASHINGTON STATE DEPARTMENT OF
Natural Resources
PETER GOLDMARK - Commissioner of Public Lands

Contract No. SC 15-42

This Contract is between the State of Washington Department of Natural Resources, referred to as the DNR, and Cascade Economics, referred to as the Contractor, for the express purposes described in the following provisions of this Contract.

The purpose of this Contract is to develop sound economic information through an economic analysis that enables a deeper understanding of the elements of the ocean economy to assist the development of the Marine Spatial Plan for Washington's Pacific Coast.

SCOPE OF WORK

Overview

The work plan for this study is presented below. Much of the initial work plan involves working with the WCMAC and the science advisory committee to develop and refine the scope of the economic analysis. We have created three broadly defined approaches to economic analysis, consistent with the desired "menu of approaches." The discussion below provides the details associated with each of the approaches, including their formulation, outcomes, strengths, and weaknesses.

Task 0 – Kickoff Meeting with DNR

Our project team believes that a kickoff meeting is an important element to this study. Dr. Taylor, Ms. Baker, and Dr. Waters will meet with the DNR or other designees with technical interest and oversight responsibility for the study. Mr. Wegge will attend by conference phone. We can provide a proposed agenda prior to the kick-off meeting. The purpose of the meeting will be to:

- clarify project objectives and initial thoughts on research procedure;
- discuss the role of the project within overall MSP goals and objectives;
- identify or obtain previously assembled materials, project-related resources, completed sector analyses (if available), and lists of contact names of WCMAC and science advisory panel members; and
- discuss any proposed refinements to the approach to developing the scope of analysis.

If revisions to our approach or proposed work product are agreed upon, Dr. Taylor will provide a memorandum describing the revised plan to DNR.

Task 1 – Initial Background Research and Scoping Activities

For this task, the study team will initiate the research project by collecting available information; consult with the WCMAC, state staff, and science advisory committee; and recommend and design a scope of work. This includes the following subcomponents:

1. Perform initial background research: This entails collecting and reviewing available reports and other documents in order to develop a basic overview of the coastal economy.
2. Prepare for and conduct a half-day workshop, assumed to be held in Aberdeen, on the menu of options and elements of an economic analysis. This will include:
    a. a detailed dialogue of the goals and objectives and anticipated outcomes of an economic analysis;
    b. available tools and models that are appropriate for developing output;
    c. forms and types of output, and degree of precision in estimate and by location, within each;
    d. data needs and requirements, with an emphasis on key sectors, including commercial fishing, aquaculture, recreation and tourism, and shipping;
    e. development of data and incorporation of coastal tribal economies in the analysis; and
    f. design of an economic analysis that balances the needs of the planning process with the timeline and budget available for data development and analysis.

3. Prepare an initial scoping document with recommendations for the economic analysis. Work with state staff to refine and further articulate components where necessary.
4. Participate in follow up conference calls with members of WCMAC, as necessary, to respond to inquiries or comments on the proposed scope.
5. Prepare a summary scoping document for the record of the planned economic analysis.

The process used to develop, refine, and recommend an economic analysis involves a series of steps. Following the completion of initial background research, team members will contact knowledgeable members of the WCMAC, state staff, and science advisory committee to discuss details about data availability and gaps, data sources, and key elements of the study components. With this information on hand, the team will devise a workshop for the full committees and staff. The workshop will be organized around a presentation of the options and elements of an economic analysis, including the details of the three levels of study. Armed with an understanding of data requirements and availability, the team is better able to answer questions or respond to suggestions about changes or revisions to research work plan elements. In addition, the team can provide feedback on the strengths and weaknesses of particular features of the study at different levels.

Based on input gained from the workshop, the team will reconvene and develop a proposed scope of work. The scope of work will be reviewed by the science advisory committee, state staff, and their designees. This is likely to be enabled by targeted conference calls with committee members and/or state staff. The review will ultimately result in comments and suggestions for refinements, to which the team will prepare responses and/or revisions to the scope of work.

The team will then prepare a summary scoping document to memorialize the approach selected. This will include a rationale for its selection.

Task 2 – Conduct Economic Analysis and Prepare Draft Report

In this task, the team will conduct the economic analysis of proposals in the Marine Spatial Planning effort. The goal of this effort is to develop information that can be used to forecast anticipated changes in economic activity for the Washington coast, as well as individual locations within the coastal area. Furthermore, it will provide quantitative information on economic sectors that will benefit (increase) or lose (decrease) as a result of the proposal. The economic consequences will be demonstrated through direct, indirect, and induced impacts on total sales (by location and sector), personal income, and employment. The study team is cognizant of the data required for a properly prepared, objective economic analysis and has the experience and capability to collect, report, and qualify the reliability of the results.

The team will prepare draft reports for review by the WCMAC representatives and a core group of experts or other reviewers as identified by the state. In conjunction with, and probably about two weeks after submittal of, the draft report, the team will attend and present key findings of the economic analysis to the WCMAC.

Task 3 – Prepare Final Economic Analysis Report

The study team will review comments from the reviewers of the draft report. It is anticipated that reviewers will require up to four weeks before submitting comments to the study team. Comments

leading to revisions in the report will be incorporated as appropriate. Additionally, some comments may require further discussions with the science advisory committee and/or WCMAC.

All four members of the study team will attend and present a summary of the final economic analysis to the WCMAC.

The final report will be provided to the DNR no later than June 30, 2015.

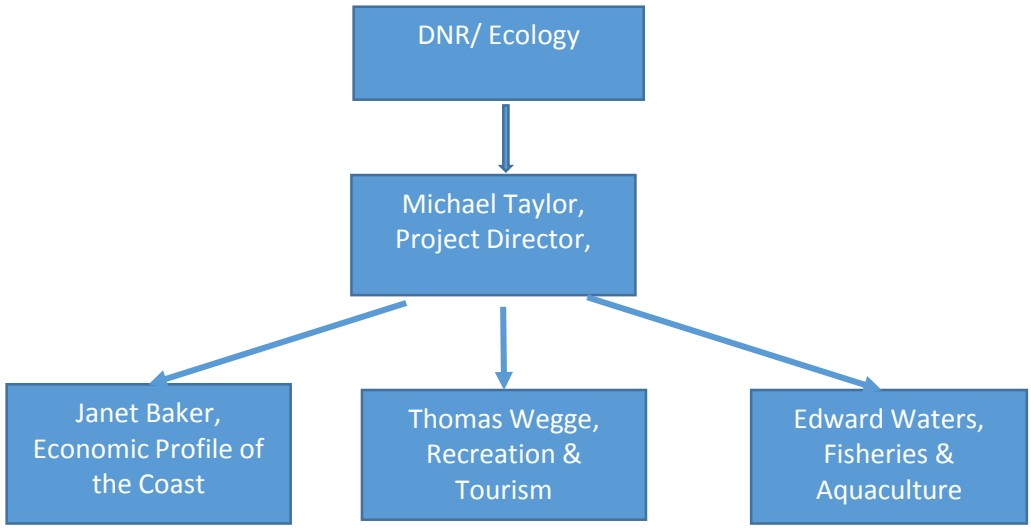
Plan to Accomplish Tasks

Description of Plan

The Organizational Chart in Figure 1 displays the anticipated coordination of efforts that will be followed in order to complete this study for the DNR. Dr. Michael Taylor will serve as the Project Director and the primary contact for the study team. He will be responsible for technical coordination among the team members and for ensuring that the DNR receives satisfactory products.

- Dr. Waters will lead the scoping for the analysis of commercial and tribal fisheries, and will be assisted by Mr. Wegge on recreational fishing, and by Dr. Taylor with respect to the processing component.
- Dr. Waters will lead the scoping of the aquaculture sector modeling.
- Ms. Baker will lead the scoping of the profile and trends of the Washington coast
- Dr. Taylor will lead the scoping of the tribal economic profile.
- Mr. Wegge will lead the scoping for the recreation and tourism sectors. Ms. Baker and Dr. Taylor will provide assistance.

Figure 1: Project Organizational Chart



Project Management

The project team consists of Dr. Michael L. Taylor, Dr. Edward Waters, and Ms. Janet Baker of Cascade Economics LLC, and Mr. Thomas Wegge of TCW Economics. Dr. Taylor will serve as the Project Director and the primary contact for the study team. He will be responsible for technical coordination among the team members and for ensuring that the DNR receives satisfactory products.

Dr. Taylor will lead the "Tribal Economy" research, and will also serve in a support role on commercial fishing and recreation and tourism. By serving in this capacity, he can ensure consistency in the format, level of detail, and flow of the reporting. Within the study team, each member has a specific role and provides a unique perspective.

- Dr. Waters will lead the research of the commercial (tribal and non-tribal) fishing sector and the aquaculture sector.
- Ms. Baker will lead the research of the economic profile of the Washington coast. She will also provide a support role on the recreation and tourism research.
- Mr. Wegge will lead the research on recreation and tourism, and will provide support on recreational fishing.

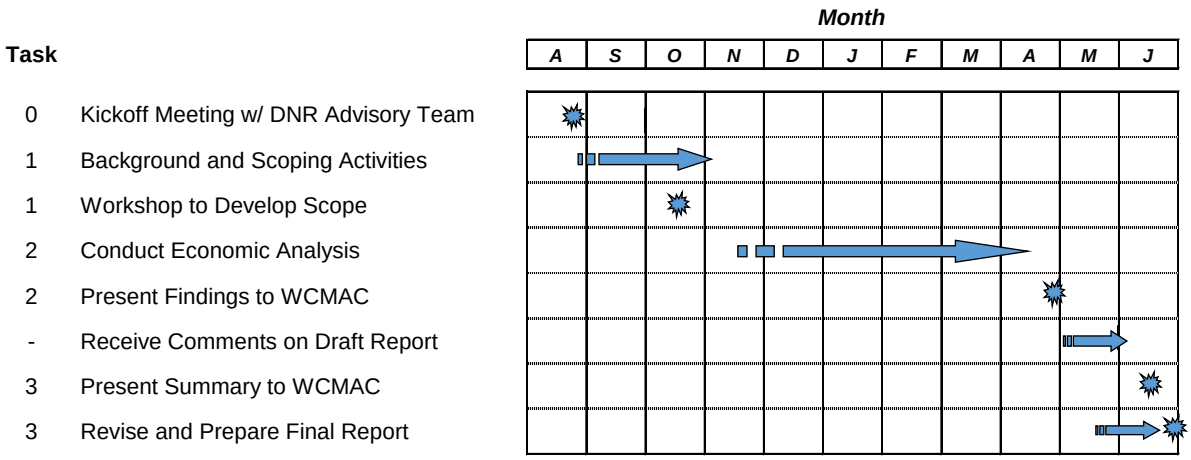
Proposed Schedule

The timeline that is anticipated for this project has an ultimate deadline for a final report by June 30, 2015, approximately ten months after the contract. The timeline is displayed in Figure 2. Interim deliverables are shown in the timeline, and the final deliverable remains the same as in the RFP.

Figure 2

Design and Implementation of an Economic Analysis to Support Marine Spatial Planning in Washington

Proposed Timeline



Deliverables and Timeline

The deliverables as listed in the RFP will be adhered to in this project. They include:

- Task 1 – Workshop to present scoping elements and refine proposed scope of work
- Task 1 – Summary of scoping activities, including process used to recommend and select an approach (by November 1, 2014)
- Task 2 – Draft economic analysis (by April 15, 2015)
- Task 2 – Attend and present findings at WCMAC meeting (approximately May 1, 2015)
- Task 3 – Prepare and deliver final report (by June 30, 2015)
- Task 3 – Present final report at WCMAC meeting (approximately June 15, 2015)
- Detailed summary of progress reports (monthly, with invoice)

Menu of Approaches for Economic Analysis: A Comparison Summary

The components that make up an economic analysis will vary by the identified needs of the study, proposals being investigated, required precision of output, sectors or groups of particular interest or emphasis, locations being examined, data availability and delivery, timeline, and budget available. Because so many elements must be balanced in order to frame an appropriate economic analysis, we have developed a summary comparison of three bundled packages, as shown in Table 1. The three packages represent different levels of investment in studies, each yielding a different set of output estimates that vary in precision and reliability.

Summary information about particular components as they relate to each study level is shown across the rows in Table 1. The categories of components are oriented to addressing points raised by the Technical Committee in Exhibit D of the RFP, plus some additional components that our team believes are useful or necessary in this economic analysis. Details on a number of these components are outlined in subsections following Table 1, along with a summary of advantages and disadvantages of the respective approaches.

In the course of the scoping process, it is possible – even appropriate – to select component elements from different levels of study, depending upon the WCMAC's focus or emphasis, in order to devise a targeted scope of work.

Table 1 - Economic Impact Studies Comparison Matrix

Item	Level I Study	Level II Study	Level III Study
Strengths	• Quickest implementation. • Data already exists. • Advantageous if budget is limited.	• County-level impact estimators specifically designed for the study region. • Most data already exists.	• Impacts fine-tuned for individual communities in the study region. • Most accurate representation of sectors and local economies.
Weaknesses	• "Off-the-shelf" so accuracy may suffer. • Finer-level activity and geographic detail may not be available.	• May require access to confidential business data. • Relies on existing data but some interviews required.	• May require access to confidential business data. • Data needed for fine-tuning must be collected via interviews. • Most time-consuming implementation.
Economic Profile of the Coast	• Research and provide narrative profile of economic base. Rely on existing publications. • Socioeconomic data from US census, REIS, BEA, WA Employment Security. • Incorporate information from Sector Analyses.	• Research and provide profile of economic base, coast-wide and by county. • Socioeconomic data from US census, REIS, BEA, WA Employment Security. • Incorporate information from Sector Analyses. • Research and discuss trends affecting coastal economy.	• Research and provide profile of economic base, coast-wide and by county. • Socioeconomic data from US census, REIS, BEA, WA Employment Security. • Incorporate information from Sector Analyses. • Research and discuss trends affecting coastal economy; research and forecast near-term economic conditions for major sectors.

Item	Level I Study	Level II Study	Level III Study
Economic Profile of Tribal Communities	• Research and provide socioeconomic profile of Quinault, Quileute, Hoh, Shoalwater Bay, and Makah Tribes, based on published sources.	• Research and provide socioeconomic profile of Quinault, Quileute, Hoh, Shoalwater Bay, and Makah Tribes. Use published sources, plus direct interviews with the Tribes. • Discuss economic relationship of Tribes within coastal community.	• Research and provide socioeconomic profile of Quinault, Quileute, Hoh, Shoalwater Bay, and Makah Tribes. Use published sources, plus direct interviews with the Tribes. • Discuss economic relationship of Tribes within coastal community. • Research and discuss trends affecting tribal economy; research and forecast near-term economic conditions for major sectors.
Economic Impact Analysis Measures	• Document and use published industry impact multipliers. • Quantitative direct impact estimates apply coast-wide, with qualitative discussion relating to localized impacts.	• IMPLAN model (five counties, plus region), with minor adjustments to source data. • Model and data turned over to DNR.	• IMPLAN model (five counties, plus region and state), with significant adjustments to source data. • Direct business interviews in order to make adjustments to RPCs. • Model and data turned over to DNR.
Regulatory and Policy Decision Impacts	• Work with Technical Committee, provide qualitative analysis of impacts of several “key decisions.”	• Work with Technical Committee, provide quantitative estimate of impacts of several “key decisions.”	• Work with Technical Committee, provide quantitative analysis of impacts of several “key decisions.”
Estimate Impacts of	• Provide qualitative and, if possible, quantitative estimates	• Provide quantitative estimates of impacts of up to 5 potential uses	• Provide quantitative estimates of impacts, by county and region, of

Item	Level I Study	Level II Study	Level III Study
Potential Uses	of impacts of up to 5 potential uses identified by Technical Committee	identified by Technical Committee.	up to 5 potential uses identified by Technical Committee.
Ecosystem Services	• Discuss general concepts, identify coastal sites that are providers of relatively high level of ecosystem services.	• Discuss general concepts, provide examples of valuation within the state, and identify coastal sites that are providers of relatively high level of ecosystem services.	• Discuss general concepts, provide examples of valuation within the state, and identify coastal sites that are providers of relatively high level of ecosystem services. • Identify data needs required for a site specific valuation.
Commercial Fishery Profile of the Coast	• Research and develop profile of major or significant fisheries by species, ports of landing, and processors. Include discussion of trends by major species.	• Research and develop profile of commercial fisheries by species, ports of landing, processors, market forms and markets. Include discussion of trends, including data by port.	• Research and develop profile of commercial fisheries by species, ports of landing, processors, market forms and markets. Include discussion of trends, including data by port. • Update IMPLAN models to incorporate FEAM profiles and new survey data.
Tribal Fisheries and Ports	• Provide profile of tribal fisheries and ports based on published information.	• Provide profile of tribal fisheries and ports based on published information and interviews with tribal fisheries managers.	• Provide profile of tribal fisheries and ports based on published information and interviews with tribal fisheries managers. • Include details as available related to tribal fish markets and hatchery operations.
Estimate Impacts of Potential Uses on	• Include qualitative and, if possible, quantitative impacts on commercial fisheries of proposed	• Include quantitative impacts by location on commercial fisheries of proposed uses identified	• Include quantitative impacts by location on commercial fisheries of proposed uses identified

Item	Level I Study	Level II Study	Level III Study
Fisheries	uses identified above	above	above
Profile of Commercial Aquaculture	• Develop profile of aquaculture production, processing, and markets. Incorporate sector analysis.	• Develop profile of aquaculture production, processing, and markets, including future trends. Incorporate sector analysis.	• Develop profile of aquaculture production, processing, and markets, including future trends. Incorporate sector analysis. • Update IMPLAN models to incorporate new survey data, which can be used to estimate impacts to this sector.
Estimate Impacts of Potential Uses on Aquaculture	• Include qualitative and, if possible, quantitative impacts on aquaculture of proposed uses identified above	• Include quantitative impacts by location on aquaculture of proposed uses identified above	• Include quantitative impacts by location on aquaculture of proposed uses identified above
Recreation Sector	• Research and develop profile of recreation on the coast, including activities and participation rates and trends, based on published information.	• Research and develop profile of recreation on the coast, including activities and participation rates and trends, based on published information. • Incorporate Surfrider study of recreation participation. • Research and incorporate published spending profiles by activity in order to estimate baseline and impacts	• Research and develop profile of recreation on the coast, including activities and participation rates and trends, based on published information. • Incorporate Surfrider study of recreation participation. • Research and incorporate published spending profiles by activity in order to estimate baseline and impacts

Item	Level I Study	Level II Study	Level III Study
Tourism Industry	• Research and develop profile of tourism on the coast, based on published information and incorporating information from sector analysis.	• Research and develop profile of tourism on the coast, based on published information and incorporating information from sector analysis. • Research future trends, incorporating broader regional or national research on participation.	• Research and develop profile of recreation on the coast, including activities and participation rates and trends, based on published information. • Research future trends, incorporating broader regional or national research on participation
Social Impact Analysis	• Provide social impact information based on recent community profiles by NOAA and PFMC in EISs	• Provide social impact information based on NOAA research, addressing effects by port or community if possible.	• Provide a NOAA guidelines-based "social impact analysis," as practical, by port and community of each proposed use. • Identify data requirements for a fully compliant analysis.

Economic Profile of the Washington Coast

While the MSP draft sector reports will provide good details about five important sectors on the Washington coast – shipping fishing, aquaculture, recreation and marine energy – the total economy on the coast includes more than just those five sectors. The goal of this economic profile will be to draw from those sector reports, as well as other existing documents, and add in other socioeconomic data, pulling all the information together in a cohesive fashion that will provide a broad view of the coastal economic environment as it currently exists.

The initial step in this task will be to identify and review all relevant existing as well as ongoing economic research related to the Washington coast. This review will include ongoing as well as completed MSP projects, plus research conducted outside the MSP process.

In addition to the five sector reports, other MSP funded projects will be reviewed. One completed study is the MSP-funded University of Washington report, 'Working Coast: An Analysis of the Washington Pacific Coast Marine Resource-Based Economy.' While their study was limited to publicly available data at the time of the report (and other limitations identified by the authors, e.g., lack of information on non- consumptive recreation use, lack of comprehensive fishing and shellfish data, limited tribal fishing data), the direct interviews conducted as part of this study provide some useful insight into perceptions about the coastal economy as well as economic development activities deemed appropriate for the coast and those that are perceived as threatening existing or new jobs. Also along with the sector reports, the University of Washington study provides a start on the full literature review that will be conducted as a part of this proposed study.

One of the shortcomings identified in the draft recreation sector report was the lack of site-specific recreation data for the MSP study area. Another MSP project, the ongoing recreational survey by the Surfrider Foundation, should provide more detailed baseline recreation activity levels for this part of the report. The Surfrider project is collecting more site-specific data for the Washington coast recreation.

Other studies we anticipate reviewing to refine the coastal economic narrative to county level profiles are port-sponsored studies and city and county economic development plans. In addition to the studies mentioned above other data sources to be used for development of the description of the economic base include:

- U.S. Census Bureau data on housing, population by age class, employment, ethnicity for the county.
- Bureau of Economic Analysis, Regional Economic Information System (REIS) data on sector-based production and personal income.
- City, county or state level updates to the Census data or more localized estimates of demographics or other social economic statistics.
- County Business Patterns data
- Washington Department of Revenue data on tax receipts for study area businesses.

The baseline section will include the most recent, publicly available socioeconomic data that provides an overview of characteristics of the five counties.

Level II Supplement

Additional information about trends in the MSP study area will be included in Level II. Data on economic trends in key parts of the coastal economy will be developed in part from the original sector reports, the Surfrider recreation survey, and other published reports. Trends in population, age distribution, and income will come from historical data and projections by respective national and state agencies involved in collecting and analyzing these statistics.

It is anticipated published information about the coastal economy may not be sufficient to identify all trends relevant to the Marine Spatial Planning effort. For this reason the published information will be supplemented by a series of interviews with key players in different parts of the coastal economy to determine significant trends in their respective sectors and geographies. These would include, but not be limited to, interviews with port officials, representatives in the fishing and aquaculture industries, and natural resource department staff at federal, state and county agencies who are experts on trends in recreation/tourism. In addition we anticipate conducting interviews with representatives in industry sectors outside the five key sectors addressed in the previous MSP project. For example, while the wood products industry currently plays a smaller role than it did historically, it is still an important economic factor on the coast. Contact with county/city economic development staff will help us incorporate their insights into important broader trends in their respective geographies.

A proposed list of contacts will be submitted to the Council for their approval as well as additional suggestions of appropriate contacts within their specific industries and geographies.

Level III Supplement

In Level III the team would go beyond simply identifying important trends and provide some near term forecasts (five to ten years) of economic conditions on the coast. Some of this forecasting effort would be based on additional targeted interviews with key parties in the coastal economy. This will be supplemented by examination of broader trends – demographic, technological, economic, and climate change – in the State of Washington and the U.S. as a whole that are likely to affect conditions in the coastal communities, beyond what communities themselves can impact. In addition, planned capital improvements would be reviewed for projected changes in public and private infrastructure that would result in additional revenue and employment on the coast.

Economic Profile of Tribal Communities

There are five Indian reservations on the Washington coast: Quinault, Quileute, Hoh, Makah, and Shoalwater Bay. In many respects, there is considerable economic interaction among the Tribes, tribal members, and the non-Indian communities. Commerce and employment are often co-mingled, as tribal members work and shop off-Reservation, non-Indians are employed by the Tribes, and many tourists and local residents alike visit tribally owned businesses. Furthermore, many natural resources are co-managed by federal, state, and tribal entities through sovereign government agreements. Yet, there are important distinctions about tribal communities that merit developing a profile separate from the non-tribal communities of the coast.

Tribal members and the communities in which they live are connected through culture and background. Many tribal communities are organized around a structure and value system that focuses on the strength of its common culture and the benefits of community. This means that on most reservations, tribal government tends to be the largest employer, engaged in the well-being of tribal members through health, education, and governance, and support and enhancement of culture as well as economic opportunity. For the coastal tribes, this includes, for example, considerable investment in fish propagation facilities and programs.

Tribal enterprises, either owned outright or sponsored by (but separate from) the tribes, are also common. These include casinos and facilities catering to tourists, but also fish harvesters and processors. For example, the Quinault Indian Nation was just awarded an economic development grant to upgrade and expand a fish processing facility in Queets, estimated to generate an additional 30 jobs.[1] In addition to tribal enterprises, there are also independently owned businesses and self-employed tribal members.

The Level I study will entail using existing, available data and literature to prepare a socioeconomic profile of each of the five tribes on the coast. The U.S. Census provides information presented on a reservation-wide basis. Additional information is available from public sources, tribal websites, and Bureau of Indian Affairs field offices (Makah Agency, Olympic Peninsula Agency, and Taholah Agency).

Level II Supplement

The most comprehensive and complete data are available from the tribes directly. The Level II effort would entail arranging for and visiting each tribe's center of government to seek permission to obtain more detailed demographic, socioeconomic, and commerce data. This is typically through a request or possibly a presentation to the Tribal Council or Tribal Chair. Any clearance granted would permit government staff to provide data accordingly.

Level III Supplement

The Level III effort would be complementary to that of the non-tribal coastal community, and will include a forecast of broader trends that are likely to affect the tribal economy, including conditions affecting Washington and the U.S. economies.

Economic Impact Modeling Approaches and Measures

IMPLAN (http://implan.com/) will be used to construct regional economic impact models for the five counties under the Level II and Level III analytical approaches described below. County level IMPLAN data will be used to construct models under the Level II approach. Under the Level III approach, finer detail models at the postal zip code level may also be constructed, especially for Clallam and Jefferson counties, in order to more finely characterize the actual extent of economic activity in those two counties that lies within the Washington coastal region (i.e., excluding areas on Puget Sound and Hood Canal).

Level I Approach

Impact multiplier estimates will be gleaned from other extant studies of the regional economic impacts of commercial fisheries, tribal fisheries, recreational activities and shellfish aquaculture. A literature

1 http://www.eda.gov/grants/, accessed July 28, 2014.

review will identify existing studies that focus on the economic impacts of these sectors and associated activities that are most relevant and analogous to those in the study region. In many cases these studies will have derived multipliers that translate participation levels in selected activities into estimated effects on regional sales, income and employment. For example, impact models developed by the NMFS Northwest Fisheries Science Center are currently being used by NMFS and PFMC to estimate income and employment impacts of commercial fishery landings, seafood processing, and participation in ocean recreational fisheries on the West Coast. These models are calibrated to represent county-level economies and sufficiently detailed to allow estimation of economic impacts of these activities on county-level communities in the study region. Impact multipliers selected from the relevant studies will be applied to measures or estimates of current activity levels in the key sectors (e.g., landings in commercial and tribal fisheries landings, aquaculture harvests, and recreational trips) to generate estimates of the contribution or total impact[2] of the activity on the study area economies.

Level II Approach

All impact multipliers used in the economic analysis under this approach will be derived directly from economic models specifically constructed from recent economic data and calibrated to represent economies in the study region. IMPLAN data for the Washington coastal counties will be purchased and individual IMPLAN county-level models of Pacific, Grays Harbor, Jefferson, Clallam and Wahkiakum counties will be constructed using IMPLAN software. Some basic verification of the data in the county models will be done by checking industry employment and/or payroll totals underlying the IMPLAN models with county-level employment and payroll estimates from sources such as the U.S. Census Bureau County Business Patterns, U.S. Bureau of Labor Statistics, U.S. Bureau of Economic Analysis, and Washington State Employment Security Department. Spending levels associated with current or projected activity levels in the key sectors will be estimated and distributed among receiving industries according to expenditure profiles (percentage distributions) adapted from other relevant economic impact studies. The resulting expenditure distributions for each activity will be applied to the corresponding regional economic models to generate estimates of the economic contribution or total impact of the activity on the economies of the study areas.

Level III Approach

As in the Level II Approach, all impact multipliers under the Level III Approach will be derived from custom-built economic impact models. However under the Level III Approach, additional time and effort will be committed to validating and calibrating data in the basic models so as to more accurately reflect actual economic conditions in the study area economies. Enhanced data on local supply, demand and purchasing patterns will be gathered from interviews with key industry informants in the study area communities. For example, participants in the key industry sectors will be interviewed to identify the locations of their input suppliers and places of residence of their workforce. These factors are the key considerations in determining the magnitude of local economic multiplier effects. Information from these contacts and interviews will be used to adjust underlying industry purchasing patterns in the economic models; especially the regional purchase coefficients applied to industry purchases of goods,

2 Total impacts are the sum of all combined direct, indirect and induced economic effects attributable to a given activity. Total impact divided by the direct impact amount is called the economic multiplier effect.

services and labor inputs. This process will improve the depth and accuracy of economic impact estimates.

The steps proposed to interview and update economic impact multiplier calculators are an important but often overlooked enhancement to broad regional planning studies. Few economists have such experience but *our team is currently involved in a study for NOAA to do just that*: we are conducting interviews with seafood processors and local businesses in Southwest Alaska for the purposes of revising and improving regional economic models.

In addition to these expenditure questions, industry participants will be asked for any information they may have on the place of residence of those participating in local recreational activities, including fishing. Of key interest is what proportions of recreational participants are local residents, in which case expenditures on recreational activities may be substituting for other spending in the local economy, versus what share are visitors from outside the region, in which case spending is more like "new" money entering the local economy. Another important information collection effort will entail querying processors and distributors of aquaculture products and seafood caught in commercial and tribal fisheries for information regarding the end markets for their products. For example, knowing what proportions of seafood sales are directly exported as opposed to flowing to secondary processors and/or consumer markets located locally or in neighboring regions will affect the magnitude and distribution of local multiplier effects generated by the activity.

Non-Tribal Commercial Fishing

Fishing is an important and historical component of the Coastal Washington economy. Landings and processing of commercial fishery species supply markets in the U.S., Canada and overseas and provide income and employment in harvesting, processing and support industry sectors in the region. Important commercial fisheries operating on the Washington coast include those for groundfish (including sablefish and Pacific whiting), Dungeness crab, Pacific sardines, pink shrimp, albacore tuna, Pacific salmon (mostly Chinook and coho), Pacific halibut and shellfish such as razor clams. Published data sources such as PacFIN (for shore-based fisheries) and Norpac (for at-sea Pacific whiting) provide some idea of the scale of landings and exvessel revenue in these fisheries, but publicly available data may underestimate activity for certain species and ports due to confidentiality constraints which limit the ability to disclose business information for fisheries aggregations with fewer than three participants.

Table 2 shows landings and revenue by coastal county in 2013 for key commercial fisheries management groups. Coastal region ports where the majority of commercial fisheries landings are made include Ilwaco and Wilapa Bay ports in Pacific County, Westport in Grays Harbor County, and La Push and Neah Bay in Clallam County. Note that landings and revenues associated with these counties and ports may be underreported due confidentiality constraints. For example, very substantial landings of pink shrimp, Pacific whiting and Pacific sardines that occur in Grays Harbor (Westport) and Pacific (Ilwaco) counties do not appear in the "Groundfish" totals in Table 1 due to confidentiality issues. Note that Table 2 excludes landings of Dungeness crab and salmon (from Pacific Ocean and Columbia River fisheries) in the ports of Cathlamet and Skamokawa in Wahkiakum County. The table shows that the Washington Coast commercial fisheries shown generated at least $89.5 million in non-confidential exvessel revenue

in 2013. This contributed jobs and income to local communities and also provided opportunities for suppliers and support businesses residing in those ports and elsewhere.

Table 2. Landings and exvessel revenues for Washington Coast commercial fisheries in 2013.

County	Management Group	Round weight (mts)	Exvessel Revenue ($,000)	# of vessels	# of processors
Clallam	Crab	270.4	1,857.5		
	Groundfish	1,055.8	2,561.4		
	Highly Migratory	33.0	90.1		
	Other	441.7	1,594.7		
	Salmon	558.3	4,192.6		
	Shrimp	20.2	340.6		
Clallam Total		2,379.4	10,636.9	538	54
Jefferson	CRAB	209.5	1,714.5		
Jefferson Total		209.5	1,714.5	293	19
Grays Harbor	Crab	4,990.0	30,805.8		
	Groundfish	284.1	928.9		
	Highly Migratory	5,198.5	14,703.6		
	Other	31.9	222.6		
	Salmon	230.8	2,176.7		
	Shrimp	21.0	101.3		
Grays Harbor Total		10,756.3	48,939.0	366	51
Pacific	Crab	2,774.8	16,497.7		
	Groundfish	593.8	1,584.7		
	Highly Migratory	2,418.7	8,874.2		
	Other	18.6	162.3		
	Salmon	219.9	1,132.2		
Pacific Total		6,025.8	28,251.2	325	44
Grand Total		19,371.0	89,541.5		

Source: PacFIN "rcty_woc" report for 2013 extracted 1/31/2014 (accessed 02/21/2014).

Recreational Fishing

Recreational fishing opportunities for salmon, Pacific halibut and groundfish attract anglers from nearby urban areas in Washington and Oregon and also from across the U.S. Recreational fishing in coastal waters off Washington includes participation in seasonal fisheries for finfish species such as salmon, albacore, groundfish (lingcod and rockfish *spp*.) and Pacific halibut. The primary originating ports for Washington ocean anglers include Ilwaco and Chinook in Pacific County, Westport in Grays Harbor County, and La Push in Clallam County. A number of coastal Washington angler trips also originate from

Neah Bay and Port Angeles on the Strait of Juan de Fuca. There are also a large number of recreational trips for in-river salmon and sturgeon that originate from Columbia River ports in Pacific County (Ilwaco and Chinook) and Wahkiakum County (Cathlamet and Skamokawa).

Ocean fishing is a mix of trips taken on private and charter vessels with the distribution between them in any given port dependent on the season, local bathymetry and available target species. Table 3 shows the distribution of ocean angler trips taken in boats off the Washington Coast in 2012. Note that these numbers exclude fishing from banks, piers and jetties. The table shows more than 140,000 total boat-based angler trips were taken in 2012, the vast majority of which were targeting salmon. The charter fishing industry conducted a particularly large portion (i.e., more than half) of boat-based angler trips originating from Westport. The table also shows that fishing effort targeting bottomfish and Pacific halibut increased as you move north along the coast.

The main data used for calculating economic impacts resulting from recreational angling are the location, number and type of trips (charter or private) and average local expenditures by trip type. Some fairly standard assumptions in the literature regarding average angler expenditures can be applied using standard economic impact models to translate local angler trip counts into estimates of economic impact and/or net economic value.

In addition to finfish, recreational collection of shellfish is also a popular activity along the Washington Coast. The principal species collected is razor clam and the primary areas for clam digging are sand beaches located between the Columbia River north jetty and Quinault River mouth. Razor clam digging is closely monitored and regulated by WDFW depending on estimated clam populations, tidal conditions and domoic acid (a naturally-occurring neurotoxin) content of the clams. There is also a substantial recreational fishery for Dungeness crab in coastal estuaries including the Columbia River and Grays Harbor.

Direct data on numbers of recreational shellfish collectors and trips are not widely available; however recent study collected data and estimated economic impacts of recreational shellfishing activities on Washington beaches[3]. That study included an estimate of "tens of thousands" of recreational clammers harvesting 3.6 million pounds of razor clams on the Washington Coast in 2006 (see Table 7 and accompanying text in that report). Catching Dungeness crab is another poplar recreational activity on the coast. It is typically combined with finfish angling opportunities on recreational fishing trips.

3 Economic Analysis of the Non-Treaty Commercial and Recreational Fisheries in Washington State. TCW Economics, Sacramento CA. December 2008.

Table 3. Distribution of recreational boat angling in marine waters off the Washington coast in 2012 (number of angler trips).

Port Area / Trip Type	Charter	Private	Total
La Push-Neah Bay	**2,586**	**21,138**	**23,724**
Halibut	521	5,581	6,102
Salmon	1,388	9,032	10,420
Bottomfish	662	6,065	6,727
Highly Migratory	16	460	476
Other			
Westport	**32,991**	**28,913**	**61,904**
Halibut	2,017	610	2,627
Salmon	16,443	23,378	39,821
Bottomfish	13,474	1,854	15,328
Highly Migratory	1,057	3,071	4,128
Other			
Ilwaco-Chinook	**11,971**	**42,509**	**54,480**
Halibut	384	252	636
Salmon	7,321	36,017	43,337
Bottomfish	1,050	1,107	2,156
Highly Migratory	965	3,479	4,444
Other	2,252	1,655	3,907
Washington Coast Total	**47,548**	**92,560**	**140,108**
Halibut	2,922	6,443	9,365
Salmon	25,152	68,427	93,578
Bottomfish	15,186	9,026	24,211
Highly Migratory	2,037	7,010	9,047
Other	2,252	1,655	3,907

Source: WDFW.

Tribal Fisheries

Tribal fisheries make significant contributions to regional economic activity on the northern Washington coast. These fisheries operate on a commercial scale for several species including groundfish, Pacific halibut, Dungeness crab and Pacific salmon (mostly Chinook and coho). The preliminary exvessel value of Chinook and coho salmon landed in the treaty Indian ocean troll fishery in 2013 was $6.4 million[4]. Tribal groundfish fisheries are allocated 10% of the U.S. annual catch limit for sablefish north of 36° North latitude, and at least 17.5% of the U.S total allowable catch for Pacific whiting. The tribal sablefish and whiting fisheries generate an average of about $5-6 million ex-vessel revenue (inflation-adjusted) per year[5]. The tribes also manage substantial annual allocations of Pacific cod, lingcod and yellowtail

4 Review of 2013 Ocean Salmon Fisheries, Pacific Fishery Management Council, February 2014. http://www.pcouncil.org/wp-content/uploads/salsafe2013.pdf

5 Groundfish Harvest Specifications and Management Measures and Amendment 24: Draft Environmental Impact Statement. Evaluation of Harvest Specifications and Management Measures for the 2015-2016 Biennial Management Period. Pacific Fishery Management Council, June 2014. http://www.pcouncil.org/wp-content/uploads/F7a_Att4_15-16_GFSpexEIS_ElectricOnly_JUNE2014BB.pdf

rockfish. There is also a tribal fishery for razor clams along the central coast. Catch from Washington Coast tribal fisheries is landed at Neah Bay, La Push, Westport and other Washington Coast ports. Some catch from tribal fisheries is processed in places outside the coastal region such as Port Angeles, but some is processed locally. For example, the Quinault Pride seafood plant in Taholah processes salmon, crab, halibut, razor clams and other species caught in tribal fisheries. In addition to a shore-based fishery component, in which vessels participating in the tribal Pacific whiting fishery deliver to processors in Westport, there is also an at-sea component consisting of several tribal catcher vessels that deliver to floating processor vessels operating as motherships for this fishery.

Shellfish Aquaculture

In 2005 Washington aquaculture sales were an estimated $72 million for oysters, $17 million for Manila clams, $2.44 million for mussels, and $5.31 million for geoduck clams, for a total (meat) value of $96.9 million.[6] Although much of this production came from Hood Canal and Puget Sound, commercial aquaculture production of oysters and clams is also a significant industry on the Washington coast. Wilapa Bay, historically a major source of wild oysters, is now a major producer of farmed oysters and Manila clams. Commercial shellfish aquaculture also occurs in the Grays Harbor estuary.

Shellfish production on the Washington Coast, as elsewhere, faces significant challenges from concerns over water quality, land development, issues associated with competing uses of suitable growing areas, and controversy over the impact chemical inputs may have on other species[7].

One recent independent study used production data and survey data collected from Washington producers to estimate economic impacts of shellfish aquaculture in Washington State[8]. Table 4 in that report listed the total area permitted by the Washington Department of Health for commercial shellfish aquaculture at over 17 thousand acres in Pacific County (Wilapa Bay), more than two thousand acres in Grays Harbor County, and over one thousand acres in Jefferson County (much of which is presumably on the Hood Canal or Puget Sound).

Fisheries Data Sources

The PacFIN fisheries database is a comprehensive repository of landings and exvessel revenue data by vessels and fish buyers operating in commercial fisheries on the Pacific coast (including Washington inland waters and the Columbia River). PacFIN also includes data for landings made to Washington state-licensed fish buyers from distant ocean areas and from commercial-scale tribal fisheries conducted on the coast and in the Columbia River. The Northwest Indian Fisheries Commission also maintains a database of landings made and in tribal fisheries. Data on Pacific whiting catch by catcher-processor vessels and deliveries to mothership floating processors participating in the at-sea Pacific whiting

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6 Booth, S. Crop Profile for Bivalve (Oysters, Manila Clams, Geoduck Clams and Mussels) Aquaculture in Washington, Willapa Bay-Gray's Harbor Oyster Growers Association, January 2010.

7 Sanford, E. An Analysis of the Commercial Pacific Oyster (Crassostrea gigas) Industry in Willapa Bay, WA: Environmental History, Threatened Species, Pesticide Use, and Economics. Master's Thesis, The Evergreen State College, April 2012.

8 Northern Economics, Inc. The Economic Impact of Shellfish Aquaculture in Washington, Oregon and California. Prepared for Pacific Shellfish Institute. April 2013.

fishery, including deliveries made in the at-sea tribal fishery, are maintained in the Norpac fishery observer database.

While direct data on the ex-processor (or "first wholesale") sales of resulting fisheries products are not generally available, these values can be estimated from landings and revenue data and anecdotal information using basic knowledge of the industry and some fairly standard assumptions about the value of inputs used in seafood processing.

Information on the quantity and value of seafood products exported from U.S. customs district is available from NMFS (http://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/applications/trade-by-specific-us-customs-district).

Washington Department of Fish and Wildlife (WDFW) maintains a database of shellfish harvest and production, however until recently, reporting was voluntary. Independently-conducted surveys suggest that official data may significantly underestimate annual shellfish aquaculture production.

Data on the estimated number of recreational angler trips by port or region, the stated target of the trips, and resulting catch by species group is generated and maintained by WDFW and is accessible from the RecFIN database.

Estimates of recreational angler trip expenditures are available from multiple sources, including regulatory impact documents produced by PFMC and NMFS for periodic groundfish and salmon fisheries management actions.

In addition to reviewing existing officially-collected data, extant literature on relevant economic activities, and reports produced by earlier phase project contractors; government regulators, industry sources and other experts will be canvassed to gather additional information and identify emerging trends. If existing official data reporting is too heavily constrained by confidentiality concerns (due to the limited numbers of participants in certain ports) then it may be necessary to obtain clearance to view confidential data, or else obtain official data that has been "anonymized". Key contacts will include government agency personnel at Washington Department of Fish and Wildlife, Washington Department of Health (shellfish aquaculture permits), experts at regional universities and Sea Grant, and representatives of industry groups such as commercial fishermen's and processors' associations, recreational fishing groups, shellfish growers' associations, and other regional industry support and advocacy groups.

Analytical Approaches for Fisheries and Aquaculture Impacts

Level I Approach

The Level I approach will largely entail collecting published data on activity levels, gleaning multiplier estimates from regional economic impact existing studies of commercial and recreational fisheries, tribal fisheries and shellfish aquaculture, and using these off-the-shelf estimators to project economic impacts of activities in these sectors. As such the scale of the Level I analysis will be largely constrained by the level of detail of available data in the existing, published analyses.

Level II Approach

All impact multipliers used in the economic analysis under the Level II approach will be derived from custom built, county-level economic models of the study region. Some basic verification of the fisheries-related jobs in the five county models will be done using government employment data. Additional detail and geographic breakouts of commercial and tribal fisheries landings data will be obtained from WDFW and PacFIN, pending confidentiality clearances being granted. Likewise additional detail on locations of recreational fishing and aquaculture harvest and processing activities will be sought from WDFW and aquaculture industry sources.

Level III Approach

As in the Level II Approach, all impact multipliers under the Level III approach will be derived from custom-built economic impact models, but with additional effort validating and calibrating key industry data in the economic models. Enhanced data on local supply, demand and purchasing patterns gathered from fishing industry informants will identify the locations of input suppliers and their workforce residence. These Information will be used to adjust the key industry data in the economic models, resulting in improve the depth and accuracy of economic impact estimates. If applicable, finer detailed economic models will also be constructed and used under this approach to further focus the analysis on individual communities of interest.

Recreation and Tourism

Historically, recreation and tourism has always been a part of the economy of coastal counties, but it has been small relative to other well-established sectors of fishing, forestry, and manufacturing. While structural shifts continue to take place leading to declines in both forestry and manufacturing, recreation and tourism remains steady or growing, and is increasing in prominence. Foreseen for some time, a Sea Grant report from a decade ago pointed to continued growth in the magnitude and, consequently, economic importance of coastal tourism.[9] Recent Bureau of Economic Analysis data on industry earnings and trends supports this finding.[10] For these reasons, we have chosen to include these sectors for special consideration in the economic analysis, even though they were not specifically identified by the Technical Committee in Exhibit D of the RFP.

Recreation and tourism are particularly important components in the coast tribal economies. Two reservations (Quinault and Shoalwater Bay) have gaming casinos and lodging.[11] The Makah recently discussed publicly their plans for enhancing tourism (through a golf course and new cabins), and the Quileute are also focusing on eco-tourism opportunities.

In general, there is not a ready source of data for measuring “recreation and tourism” related participation, businesses, employment, or earnings. Absent from the more common categorization of business and industry sectors is a profile of the recreation and tourism industry within the region. Businesses that specialize in hospitality and lodging, restaurants, tours, private museums, arts, guide

9 Hadley, Nina, 2002. Coastal Tourism in Washington, Washington Sea Grant, WASHU-G-02-007-C2.
10 Bureau of Economic Analysis (BEA), Regional Economic Data, Local Area Personal Income, Table CA25, 2009-2012 (downloaded February 2014).
11 Washington State Gambling Commission Tribal and Technical Gambling Division, “Tribal Casinos in Washington State.”

services, equipment rental, and outdoor recreation suppliers are all present and represented among the county businesses. Many local retail stores also provide goods to tourists. In addition, there are inland businesses outside of the coastal counties that serve or participate in activities on the coast.

The Level I study will involve collecting and organizing data from traditional sources, including the Bureau of Economic Analysis and Regional Economic Information System, and from Washington Employment Security. These will provide useful trend information that can provide a foundation for forecasts and comparisons to other sectors. Reports and commissioned studies of recreation and tourism on the coast will also be important, particularly if they include detailed data on activities and participation rates. Broader level studies of tourism and recreation participation trends can be used to fill in data gaps.

Level II Supplement

It will be important to characterize activity types by recreation and tourism visitors, and the business categories that support them, in order to relate spatial needs of the activities to growth and development potential of the businesses. The ongoing Surfrider project may provide some of this information but it is likely that output from their research will need to be supplemented by expert interviews. These expert interviews would be used to develop a comprehensive list of business types that would fit wholly or partially into a "recreation and tourism" category in order to provide a mechanism for disaggregating traditional economic data sources. This will be most effective in order to merge with commonly used regional economic modelling tools.

Level III Supplement

The Level III enhancement will incorporate research into regional and national trends designed to forecast near term changes in recreation participation and tourist activities.

Regulatory and Policy Decision Impacts

The Technical Committee (in Exhibit D of the RFP) indicated some interest in having the economic analysis address the impacts of certain "key regulatory and policy decisions" on coastal communities. Fortunately, the structure of the economic analysis itself lends itself to such an examination. Without further specificity at this point, the team proposes to work with the Technical Committee to identify and evaluate several (up to five (5)) policy decisions. In the Level I analysis, available information will allow for a qualitative impacts analysis, possibly enhanced by multiplier-generated indirect and induced quantified results, depending upon the reliability of the direct impacts. The Level II analysis provides capability to estimate impacts quantitatively and by county (as appropriate). The Level III analysis will add precision to the quantitative analysis, including impacts developed on a narrower, more focused scale, again depending upon the reliability of the direct impacts estimate.

Estimate Impacts of Potential Uses

The Technical Committee has identified a number of potential scenarios to examine, and the team anticipates that more may be generated by the completion date of this project. The economic analysis tools will be set up to accommodate examination of alternative proposals and scenarios. Without additional detail on the specific scenarios, the team proposes to analyze up to five (5) scenarios or proposals (possibly more, depending upon complexity or availability of funding). In the Level I study, qualitative results will be presented, which may be enhanced by quantitative estimates based on

multipliers depending upon the details of the scenario examined. In the Level II analysis, quantitative estimates will be generated at a county and region wide basis, as appropriate for the scenario. The Level III analysis will generate quantitative results on a more focused and precise level.

Ecosystem Services

The new fiscal environment within which managed natural resources operate requires a reexamination of not only the relationship between the natural landscape and outdoor recreation, but a full understanding of its role in the economic environment of the region. Contemporary economic theory suggests that many environmental attributes can be measured and monetized. Once these environmental attributes (e.g., water quality, maintenance of vegetation cover for carbon sequestration) are connected to the human condition and assigned dollar values, they can be incorporated with more traditional ways of identifying economic impacts and benefits of open space or protected areas. This line of reasoning supports the notion that sometimes the highest economic value for a natural or cultural resource base may be to maintain it in its undisturbed condition. This contemporary thinking is referred to as "ecosystem services" and is often instructive in the context of natural and recreational resource planning.

A number of studies have attempted to estimate the value of ecosystem services in watersheds, small regions, or even particular land parcels. These studies have utilized a wide variety of site-specific physical and biological data to derive estimates. Such information is not generally available in uniform measure or degree of detail at the full scale that can be applicable to all counties.

For a Level I study, the concepts of ecosystem services will be provided on a qualitative basis of the types and forms of ecosystem services that are associated with the area, with examples drawn from individual locations on the coast. A Level II analysis will include research on valuations from representative locations, and the identification of sites in the planning area that are likely to carry relatively high ecosystem service values. A Level III analysis will also include a discussion of the data requirements associated with preparing a site-specific valuation of ecosystem services.

Social Impact Analysis

The team has familiarity with social impact analysis through NOAA's Fishery Guidelines. In fact, these guidelines were used to generate social impacts associated with the Groundfish Trawl EIS in which Drs. Waters and Taylor were analysts, and that EIS included information pertinent to the Washington coast.

A fully compliant Social Impact Analysis is very detailed and involves the collection of a considerable amount of data, mostly from personal interviews and focus groups. For the Level I economic analysis, information will be collected from recently completed analyses and presented in the report. For the Level II analysis, additional research will be conducted from past Social Impact Analyses prepared by NMFS or by the PFMC, and a synopsis of their findings will be presented. It is anticipated that there will be enough detail available to present the information on a port and community basis. For the Level III analysis, a Social Impact Analysis will be presented based *largely* on NOAA Fishery Guidelines; however, some components (e.g., minimum number of interviewees or a detailed survey of residents) may not be included. The team will work with the Technical Committee to identify specifically what will and will not be included in the analysis. In addition, the team will identify data requirements in order to develop a

fully compliant Social Impact Analysis following NOAA Fishery Guidelines. Results will be presented for each of the scenarios evaluated.

Summary of Strengths, Weaknesses and Scientific Merit of the Three Analytical Approaches

All three proposed analytical approaches are considered valid for description and impact analysis of regional economies. Which approach is preferred depends mainly on the availability of time, budget resources, and primary data (i.e., accessibility of knowledgeable informants from key industries, research institutions and relevant government agencies). The **Level I** approach relies the least on non-published data and key informants and is therefore the quickest to implement. It is sometimes referred to as the "benefits transfer" approach, where relevant data (multipliers) from similar regions or sectors are borrowed in order to provide quick and reasonably accurate estimates of economic impacts in the study area. The primary weakness of the Level I approach is that the ability to focus on specific activities and locations may suffer, depending on what data and research already exist in the literature.

The **Level II** approach is centered on building, validating and implementing custom built, county-level economic impact models using IMPLAN regional modeling software. This approach includes the standard practice in high-quality economic impact studies of cross-checking some of the key economic variables in the IMPLAN models against data from other published sources. Any large discrepancies between the data sources are investigated and resolved, if necessary. A limited number of interviews with key informants from industries and relevant agencies will be required to gather economic data. Fully implementing the Level II approach may require gaining access to certain possibly confidential business data, as in the case of commercial fisheries landings, however this approach is also flexible enough to utilize less detailed or more highly aggregated data if necessary (although detail of the resulting analysis would suffer).

The **Level III** approach includes the full Level II analysis plus additional features that focus and fine tune the analysis for specific activities and locations. Under Level III, a more extensive group of interviewees from key sectors, industries, institutions and relevant agencies will be contacted to gather more detailed economic data including the locations of business sales, purchases and hires. This approach will also likely require access to possibly confidential business data (fisheries landings). Consequently, the Level III approach requires the greatest amount of time, coordination, and budget resources to implement.