BEFORE THE HEARING EXAMINER
FOR THURSTON COUNTY

In the Matter of the Appeal of: Patrick Townsend, Kathryn Townsend, and Anneke Jensen of the May 3, 2016 Mitigated Determination of Non-Significance in the request of ChangMook Sohn for Substantial Shoreline Development Permit for an Intertidal Geoduck Aquaculture Operation	Appeal No. 16-106159 VE Case No. 2014108800 FIRST DECLARATION OF MARLENE MEADERS

I, Marlene Meaders, declare as follows:

1. I am over the age of 18 years and make this declaration based upon my personal knowledge.

2. I have a Master's of Fisheries Biology from Humboldt State University, in Arcata, California, and I specialize in marine and freshwater ecology. I am a certified senior author for biological assessments, and have written numerous consultations for the Endangered Species Act, Marine Mammal Protection Act, and Magnuson-Stevens Fishery Conservation and Management Act. I have worked or studied intertidal systems for over 10 years, and have participated in permitting efforts for over 15 years.

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3. I am currently a Senior Marine Biologist with Confluence Environmental Company.

4. Attached to my declaration as Exhibit A is a copy of my current curriculum vitae.

5. I have expert knowledge of geoduck aquaculture operations, generally, and am familiar with the applicant Pacific Northwest Aquaculture, LLC/Changmook Sohn's ("Applicant's") proposed geoduck farm ("Farm") specifically. I have reviewed the Farm's application materials and have acted as the lead author for reports to Thurston County in response to public comments submitted regarding the proposed Farm, including a report dated November 20, 2015 ("Confluence Report"). The Confluence Report (minus Appendix A thereto) is attached as Exhibit A to the First Declaration of Philip Bloch.

6. I have reviewed the Appellants' Response to Motion for Dismissal and Summary Judgment ("Response"), including Exhibit E thereto.

7. Exhibit E to Appellants' Response attempts to identify the number of days that geoduck gear would be visible between Memorial Day and Labor Day in 2007. Exhibit E states that the information shown in the document was generated from dairiki.org, which uses predicted tides.

8. While Exhibit E identifies the days in which aquaculture gear would be visible when present during this limited time period, it does not identify how many hours out of those days that gear would be visible. In addition, Exhibit E does not calculate how

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frequently gear would be visible during an entire year or over the course of a geoduck cultivation cycle.

9. The Confluence Report provides specific calculations of the amount of time that geoduck gear would be visible for the proposed Farm, both with respect to the percentage of daylight hours during a year in which the gear is present as well as over the Farm's entire culture cycle. The data used in the Confluence Report was 6-minute verified tide data from January 2014 to December 2014 generated from the National Oceanic and Atmospheric Administration (NOAA). The results of the analysis were presented in a bar chart with month on the x-axis and daylight hours on the y-axis during the year, and showing the number of hours that geoduck gear was exposed during daylight hours compared to the number of daylight hours that gear was inundated. The Confluence Report documents that tubes and nets for the Farm would be visible for approximately 5% of the culture cycle and 13% of the year when gear is present. Confluence Report, pp. 15-16.

10. The data and analysis in the Confluence Report uses more current information (2014) than Exhibit E (2007) and is, hence, more accurate for purposes of evaluating the Farm's anticipated aesthetic impacts.

11. If the same analysis is performed using the data from Exhibit E of Appellants' Response, using NOAA data to calculate the number of hours in each day that gear would be exposed, the result would be materially the same as was presented in the Confluence Report. Using Appellants' data, based on 2007 verified tide data from

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Tacoma, Washington (Station ID 9446484), tubes and nets would be visible for approximately 5% of total daylight hours during the culture cycle and 16% of any year in which the gear is present. While use of Appellants data results in a slight increase for the year in which gear is present (16% compared to 13%), the result for the entire culture cycle remains constant. This is because gear is present for a relatively short period of time in the overall culture cycle.

12. Based on the foregoing, the data provided by Appellants in Exhibit E to their Response does not materially conflict with the Confluence Report. Rather, it provides an artificially limited scope of the potential effects to aesthetics by failing to consider the number of daylight hours that the gear would be visible, limiting the analysis to only part of the year, and failing to account for entire culture cycle.

I certify under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

EXECUTED at Seattle, Washington this 26 day of August, 2016.

Marlene Meaders, Declarant

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Exhibit A

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CONFLUENCE
ENVIRONMENTAL COMPANY

MARLENE MEADERS

Senior Marine Biologist

Marlene has specialized in marine and freshwater biology since 2000. She manages and implements a variety of fisheries projects, with a focus on shellfish aquaculture. Marlene is a certified senior author for biological assessments, and has written numerous consultations for the Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), and Magnuson-Stevens Fishery Conservation and Management Act (MSA). She has coordinated with federal, state, and local agencies to complete environmental permitting of marine projects under Sections 404 and 401 and the Shoreline Management Act. Marlene regularly works with both models and field data to produce technical studies that aid in the consultation process. She has conducted over 20 baseline surveys that directly relate to geoduck aquaculture, and is well versed at understanding the direct impacts/benefits that an operation or project might have on the environment.

Representative Projects

Pacific Northwest Aquaculture, LLC/ChangMook Sohn Site Visit and Consultation Dana Passage, Thurston County, WA. *Project Manager.* Conducted two site visits to identify baseline information associated with a proposed geoduck farm in Dana Passage, adjacent to Zangle Cove. One of the site visits was to review the property with the Washington State Department of Ecology and Thurston County biologists and land planners. The information developed during the site visits was included in response to comments documents submitted to Thurston County. The response documents addressed concerns from the public related to the proposed geoduck aquaculture operation.

Technical Assistance and Consultation Related to Recent Modeling Events. *Technical Lead.* After the release of the Ferriss et al. (2015) article in ICES Journal of Marine Science that used the EcoPath with EcoSim (EwE) model to discern potential ramifications of increasing geoduck aquaculture in central Puget Sound, Confluence was asked to do a review and consultation with the authors. Confluence provided an understanding of the model results, which were then discussed with the authors during a January 19, 2016, meeting. The result of the conference was to fully understand the results, make sure that our interpretation of the results was not in conflict with the author's interpretation, and how this model compared with a similar effort performed in south Puget Sound (Preikshot et al. 2015). Continued efforts will be made to engage the researchers in order to guide future research opportunities.

Technical Report for the Updated Pierce County Shoreline Master Program (SMP), Pierce County, WA. *Project Manager.* Developed a

EDUCATION

M.S., Fisheries Biology, Humboldt State University, Arcata, CA, 2008
B.S., Biological Oceanography, University of Washington, Seattle, 2000

CERTIFICATIONS

Open Water Diver, PADI, 2014
Qualified Senior Writer for Biological Assessment, WSDOT, March 2013

EXPERTISE

Marine and Freshwater Biology
Shellfish Ecology
ESA Consultation
Environmental Permitting
Habitat Surveys

ADDITIONAL TRAINING

HAZWOPER, Argus Pacific, 2012
Construction Safety Training System (CSTS), Alberta Construction Safety Association, 2012
H_2S Alive, Enform, 2012

AFFILIATIONS

American Fisheries Society, Member, Since 2001
American Society of Parasitologists, Member, 2009

technical report that addressed language from the Pierce County SMP that conflicted with existing scientific literature and the Ecology (2016) Handbook. The goal was to provide a best available science review of the literature pertaining to shellfish aquaculture to facilitate revisions to the SMP by the Washington State Department of Ecology during their review. The technical report included a review of existing shellfish aquaculture in Pierce County, submerged aquatic vegetation buffers, prohibitions on shellfish aquaculture, best management practices associated with forage fish habitat identification and training, use of predator protection gear, and the literature provided by other public commenters.

Technical Report for the Bainbridge Island Limited Amendment to the Shoreline Master Program (SMP), Kitsap County, WA. *Project Manager.* Developed a technical report that addressed language from the Bainbridge Island Limited Amendment to the SMP that conflicted with existing scientific literature a. The goal was to provide a best available science review of the literature pertaining to shellfish aquaculture to submit to the City of Bainbridge Island. The technical report included a review of the literature associated with submerged aquatic vegetation buffers, positive and negative ecological functions associated with shellfish aquaculture, use of predator protection gear, and shoreline characterization reports for Bainbridge Island. The information is intended to facilitate revisions to the limited amendment.

DNR Habitat Conservation Plan for Shellfish Aquaculture, Pacific Coast Shellfish Growers Association (PCSGA), Washington State. *Technical Lead.* Provided technical assistance for the Washington Department of Natural Resources (DNR) Aquatic Resources Habitat Conservation Plan (HCP) and Environmental Impact Statement. Tasks included planning and conservation of threatened, endangered, and other species of concern that can be affected by activities on state-owned aquatic lands. The main focus of this work was related to freshwater and anadromous fish. Also provided comments on the shellfish aquaculture sections of the draft HCP to DNR. Provided minor support to PCSGA as they addressed comments from DNR on the draft HCP.

Gateway Pacific Terminal NEPA/SEPA Third-Party Environmental Impact Statement (EIS), U.S. Army Corps of Engineers, Washington Department of Ecology, Whatcom County, Bellingham, WA. *Marine Technical Lead.* Conducted research for marine issues related to construction and operation of a deepwater terminal facility exporting various dry goods, including coal. Assessed potential impacts to water quality, herring migration and spawning, fish and wildlife, and nearshore benthic biota from proposed project actions such as pile driving, vessel operations, increased overwater structures, and stormwater management. Other tasks included developing agendas and preparing information for meetings with the agencies. This work was incorporated into the Marine Biology chapter of the Affected Environment section of the NEPA/SEPA combined EIS.

Pier 4 Reconfiguration Project Biological Evaluation, Port of Tacoma, Tacoma, WA. *Technical Lead.* Prepared an ordinary high water mark (OHWM) determination in the Blair Waterway (Commencement Bay) project area and adjacent mitigation site. Proposed activities include piling removal, pile driving, berth deepening, and creation of 4 acres of open-water area. The OHWM determination was approved by Ecology without revision.

Burley Lagoon Cumulative Impacts Review, Taylor Shellfish Farms, Purdy, WA. *Senior Marine Biologist.* Prepared a cumulative impacts review associated with a change in shellfish aquaculture practices in Burley Lagoon, Pierce County, WA. Burley Lagoon has cultured shellfish since the 1930s. Although neither the Shoreline Management Act nor Pierce County Shoreline Master Program requires cumulative impacts to be analyzed for activities that do not result in a significant impact to the environment, there has been an interest in providing a cumulative impacts review to understand whether a general threshold of impact is being reached within specific areas of Puget Sound associated with shellfish aquaculture. The purpose of the cumulative impacts review was to

analyze the likely ecological (e.g., water quality, sediment dynamics, fish) and social (e.g., aesthetics, recreation, noise, light) impacts of the proposed action in the context of, and in conjunction with, other uses and development over time within Burley Lagoon and the surrounding environment (i.e., project region). The review addressed the major contributing factors to environmental processes within Burley Lagoon using conceptual models informed by existing literature and data. Initial findings were also presented to the Shellfish Interagency Permitting team, which is a multi-agency team funded through the Washington Shellfish Initiative. The project is moving forward with a full Environmental Impact Statement in order to fully understand public concerns with the project and develop tools to analyze potential impacts from project actions. This will be the first EIS for a proposed geoduck farm.

Burley Lagoon Sediment Sampling, Taylor Shellfish Farms, Purdy, WA. *Project Manager*. Taylor Shellfish Farms is proposing to conduct geoduck aquaculture activities on 25.5 acres in Burley Lagoon. North of the proposed farm is a former Superfund site for polychlorinated biphenyls (PCBs) at which sediment cleanup occurred from 1984 to 1991. Sediment and biota monitoring occurred from 1986 through 1992, with supplemental sampling in 1994 and 2013. However, because geoduck clams are cultured down to a depth of about 60 centimeters and the proposed farm is located farther south in Burley Lagoon than where the majority of sampling occurred, additional verification samples were requested by Taylor Shellfish. Marlene assisted with sampling and sample processing according to a Sampling and Analysis Plan designed by Confluence. Results indicated that the sediments do not contain levels of PCBs that would be a concern to biological resources or human health. These results will be reviewed by Ecology and the Corps prior to project activities.

Dungeness Bay Biological Evaluation, Taylor Shellfish Farms, Sequim, WA. *Project Manager.* Conducted eelgrass delineation and site characterization, as well as a detailed literature review, to identify potential impacts of proposed geoduck aquaculture to tidelands of outer Dungeness Bay in Clallam County, WA. Analysis focused on the influence of direct and indirect effects from geoduck aquaculture, and the avoidance of eelgrass and kelp beds. Issues addressed included invertebrate community distribution, salmonid and forage fish utilization, migration of turbidity plumes, nutrient availability, temperature differences, and other water quality parameters. The proposed project went through initial agency consultation, including the Washington Department of Ecology, Clallam County, and the U.S. Army Corps of Engineers. Findings of the biological evaluation and field studies were presented to the Dungeness River Management Team. While the project was finding common ground on technical issues, the client decided to end the process due to geographical constraints.

SR 520 Pontoon Construction Project EIS, WSDOT, Seattle, WA. *Fisheries and Invertebrate Biologist.* As part of the Washington State Department of Transportation construction of the SR520 bridge over Lake Washington, Marlene provided fish identification and fish handling expertise during fish exclusion operations at the pontoon casting basin at the Aberdeen Log Yard site. In this role, she supported WSDOT's oversight of the construction contractor's fish removal operations, helped to train staff and volunteers on the identification of fish collected and released, and supported report efforts to WSDOT on the results of the exclusion sampling. In addition, Marlene provided invertebrate identification expertise for the biofouling aspect of the WSDOT 520 project. This portion of the work included developing a sampling strategy that reduced the risk associated with introducing aquatic invasive species (AIS) during the transportation phase of the pontoons from Grays Harbor to Lake Washington. Because many of the pontoons constructed in Aberdeen were moored for extended periods of time (up to 4 months) in marine waters, there was a potential for being a vector for the introduction of AIS, especially the invasive European green crab which has not be identified in Puget Sound. Marlene helped sample the surface of the pontoons, sorted invertebrates, identified species, and provided reports to WSDOT on the findings associated with the biofouling work.

New Farm Nearshore Surveys, Taylor Shellfish Farms, Thurston and Mason Counties, WA. *Project Biologist.* Taylor Shellfish is expanding geoduck operations in South Puget Sound. Marlene led teams to conduct baseline nearshore surveys of proposed culture areas and collected data on riparian vegetation, macroalgae, eelgrass, invertebrates, fish, sediment, and surrounding land use. Performed data analysis and summarization. Coordinated with GIS analyst to create accurate figures for reports. Prepared abbreviated BEs for submittal to the Corps. Tracked project schedule and budgets.

Point Defiance Right Timber Floating Dolphin Replacement, WSDOT, Tacoma, WA. *Technical Support.* Confluence helped permit a project to replace the Point Defiance Right Timber Floating Dolphin. As follow-up to construction activities, Confluence conducted a reconnaissance dive survey, including an underwater video survey of habitat conditions. Recorded observations included eelgrass presence/absence, macroalgae observations, macrofauna (e.g., clams, crabs, fish) observations, and presence/absence of underwater debris. A survey report was provided to WSDOT including an update of existing conditions and recommended next steps.

Anderson Island Ferry Dock Dolphin Replacement Project, Pierce County Public Works. *Technical Lead.* For this current project, Marlene provided integrated technical support for preparation of the project NEPA processes with the Endangered Species Act and other federal, state, and local regulatory compliance. She also conducted an eelgrass and macroalgae survey using underwater camera and diver support. The field report detailed existing conditions for submerged aquatic vegetation (SAV) and analyzed how the project would affect SAV. The project entailed removing eight creosote wood dolphins and installing four new double steel pile dolphins. Although the project temporarily impacted macroalgae, recolonization will be relatively rapid given adjacent source populations. No additional mitigation was recommended for SAV.

Permitting for Existing and Expanded Operations for Coast Seafoods Company in Humboldt Bay, Plauché and Carr LLP, Humboldt County, CA. *Technical Lead.* Providing permitting assistance for Coast Seafoods' shellfish aquaculture operations in Humboldt Bay. Preparing a technical report using best available science that evaluates existing eelgrass conditions and potential impacts from longline operations in relation to the recent California Eelgrass Mitigation Policy. The technical report includes the development of best management practices and mitigation measures to avoid and minimize potential impacts. Coast Seafoods' operations include aquaculture of several species of shellfish and numerous culture methodologies (e.g., off-bottom culture, suspended culture, raft culture). Key environmental concerns addressed include potential impacts to eelgrass and other sensitive habitats, new longline siting, changes to circulation and sedimentation patterns, interactions with marine birds and mammals, and potential changes to ecosystem functions. Also helping to develop a monitoring plan that addresses potential mitigation for the proposed actions. The project has included numerous pre-consultation agency meetings and site visits to discuss potential impacts with various resource agencies. Agencies involved include the National Marine Fisheries Service, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, California Coastal Commission, California Department of Fish and Wildlife, California Water Board, and Humboldt Bay Harbor District. Ancillary to this project, Confluence participated in the Humboldt Bay Eelgrass Workshop with multiple stakeholders to inform understanding of agency goals for eelgrass mitigation in Humboldt Bay and to develop a Humboldt-specific regional plan for eelgrass mitigation.

Hearing Examiner and Shoreline Hearings Board Expert Witness Testimony for Proposed Geoduck Farm, Haley Beach Property Trust, Taylor Shellfish Farms, and Seattle Shellfish LLC, Pierce County, WA. *Expert Witness.* Provided testimony in front of the Pierce County Hearing Examiner and played a support role for the Shorelines Hearings Board hearing for a proposed geoduck aquaculture operation on the Key Peninsula, Case Inlet, Washington. The testimony identified the potential adverse and beneficial effects of geoduck aquaculture. Presented or developed information on the potential effects to eelgrass, water quality, sediment quality, forage

fish, benthic invertebrates, and Endangered Species Act-listed species and critical habitat, Magnuson-Stevens Fishery Act habitat, and Marine Mammal Protection Act species. The Final Decision from the Office of the Hearing Examiner stated: "The Deputy Hearing Examiner finds that all experts, whether testifying on behalf of the Coalition or Applicants were professional, forthright, sincere, conscientious and credible in their testimony. However, Appellants' witnesses, while expert in geomorphology and nearshore ecology, were overshadowed by Applicants' witnesses pertaining to specific field experience, knowledge, and expertise in geoduck aquaculture; and were thus more persuasive."

Hearing Examiner and Shoreline Hearings Board Expert Witness Testimony for Proposed Geoduck Farm, Taylor Shellfish Farms and Darrell de Tienne, Pierce and Thurston Counties, WA. *Expert Witness.* Provided testimony in front of the Thurston County Hearing Examiner, Pierce County Hearing Examiner, and Shorelines Hearings Board in support of proposed geoduck aquaculture operations in Case Inlet and Henderson Bay. The testimony identified the potential adverse and beneficial effects of geoduck aquaculture. Presented information on the potential effects to eelgrass, water quality, sediment quality, forage fish, benthic invertebrates, and Endangered Species Act-listed species and critical habitat, Magnuson-Stevens Fishery Act habitat, and Marine Mammal Protection Act species. This project is currently under appeal with the Court of Appeals.

Proposed Shellfish Aquaculture Biological Assessment, Pacific Coast Shellfish Growers Association (PCSGA), Western WA. *Project Manager.* Identified potential impacts of proposed shellfish aquaculture to tidelands of Puget Sound owned or leased by members of the PCSGA in Pierce, Mason, Thurston, and Jefferson counties. The various projects focused on the influence of direct and indirect impacts from shellfish aquaculture within Puget Sound. Some of the issues addressed included invertebrate community distribution, salmonid and forage fish utilization, migration of turbidity plumes, nutrient availability, temperature differences, and a host of other water quality parameters. Use permits obtained for these operations included: shoreline substantial development (county), shoreline conditional use (county), use authorization for state-owned aquatic lands (Washington Department of Natural Resources), Endangered Species Act consultation and approval (U.S. Fish and Wildlife Service/National Marine Fisheries Service), Section 401 water quality certification (Washington Department of Ecology), and Section 10 and 404 permits (U.S. Army Corps of Engineers).

National Park Service (NPS) Draft Environmental Impact Statement (DEIS) Technical Comments, Drakes Bay Oyster Company, Drakes Estero, CA. *Technical Author.* Reviewed and provided comments on the NPS DEIS Drakes Bay Oyster Company Special Use Permit (ID: 43390). The comments addressed 12 main topics discussed in the DEIS: eelgrass, benthic fauna, bird interactions, habitat restoration, water quality, wetlands, coastal flooding, noise, recreation, culture, socioeconomics, and environmental justice. The comments indicated that there was a general lack of scientific basis used by the NPS in developing the effects analysis of the DEIS.

Publications and Presentations

Meaders, M.D. *accepted*. Shellfish aquaculture and the environment: The wild world of literature. Presentation for the 70th Annual Shellfish Conference, Pacific Shellfish Growers Association, Lake Chelan, Washington, October 10-14, 2016.

Meaders, M.D. 2016. Beyond acres and turions: Improving metrics for eelgrass mitigation. Presentation for the NSA 108th Annual Meeting Triennial, National Shellfish Association, Las Vegas, Nevada, February 22-26, 2016.

Meaders, M.D. and K. McArthur. 2016. Eelgrass delineation methods and shellfish aquaculture: Why scale and effect are important considerations. Presentation for the NSA 108th Annual Meeting Triennial, National Shellfish Association, Las Vegas, Nevada, February 22-26, 2016.

Fisher, J.P., M.D. Meaders, and S. Luchessa. 2015. Suspended Sediment Risks and Sediment Metals Associated with Geoduck Aquaculture. Presentation for the NSA 107th Annual Meeting, National Shellfish Association, Monterey, California, March 22-26, 2015.

Meaders, M.D., C. Cziesla, R. Park, and P. Schlenger. 2014. Cumulative impacts review for Burley Lagoon aquaculture. Poster presented at the South Sound Science Symposium. Squaxin Island Tribes Events Center, October 23, 2014.

Meaders, M.D. 2014. Applying Ecosystem Services Analysis to shellfish aquaculture. Presentation for the 2014 Salish Sea Ecosystem Conference, Seattle, Washington, April 30-May 2, 2014.

Meaders, M.D., G. Reub, G. Greene, and C. Wisdom. 2013. Applying Net Ecosystem Services Analysis (NESA) applications to the shellfish industry. Presentation for the 68th Annual Shellfish Conference, Pacific Shellfish Growers Association, Sunriver, Oregon, September 30-October 4, 2013.

Bradley, T., M. Meaders, J. Fisher, and K. Patten. 2012. Noxious eelgrass control in Washington and California: Management conflicts, current policies and proposed control methods. Poster presented at the Society of Environmental Toxicology and Chemistry (SETAC) 33rd North American Annual Meeting, Long Beach, California, November 11-15, 2012.

Fogg, A., M. Henning, M. Meaders, C. Nobel, and J. Nicolette. 2012. BIMS: A database of baseline physical, chemical, and ecological conditions in the Gulf of Mexico prior to the Deepwater Horizon accident. Poster presented at the SETAC 33rd Annual Meeting, Long Beach, California, November 11-15, 2012.

Fisher, J., M. Meaders, S. Luchessa, K. Mueller, and T. Bradley. 2011. Suspended sediments, PVC use, and water quality effects related to geoduck aquaculture. Poster presented at the American Fisheries Society 141st Annual Meeting, Seattle, Washington, September 4-8, 2011.

Meaders, M.D. and G.L. Hendrickson. 2009. Chronological development of *Ceratomyxa shasta* in the polychaete host, *Manayunkia speciosa*. Journal of Parasitology. 95(6): 1397-1407