

APPENDIX A

STATEMENT OF WORK

Project Background: Puget Sound Marine Mussel Monitoring for the RSMP

Blue mussels (*Mytilus* spp.) and other sessile, filter-feeding bivalves have been used to monitor contaminant conditions in nearshore biota worldwide. In the past, mussel data from the National Oceanic and Atmospheric Administration's national Mussel Watch program, which collected mussels in the Puget Sound from 1986 to 2012, have been useful to broadly characterize ambient contaminant conditions in Puget Sound's nearshore biota. Based on recommendations from the Stormwater Work Group, Washington State's Regional Stormwater Monitoring Program (RSMP) includes a component to monitor the status and trends of contaminants in mussels in the marine nearshore of Puget Sound in 2015/16. This status and trends monitoring follows a probabilistic sample design such that data gathered can be summarized across the Puget Sound ecoregion. Forty (40) marine nearshore sites that are adjacent to Puget Sound's Urban Growth Areas (UGAs) have been selected for inclusion in the first round of mussel monitoring. This monitoring will occur in the winter of 2015/16 and will be implemented by the Washington Department of Fish and Wildlife's (WDFW) Puget Sound Ecosystem Monitoring Program (PSEMP) team, which will evaluate and report on the contamination in mussels taken from the 40 selected sites. Contaminants to be assessed include polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyl (PCBs), polybrominated diphenyl ethers (PBDEs), a range of chlorinated pesticides and metals.

The objectives of this project are to:

- Evaluate the range of chemical contamination in UGA shoreline biota, using blue mussels (*Mytilus* spp.) as the primary indicator organism, from 40 sites.
- Measure the magnitude of contamination in mussels from the 40 sites and compare to known biotic effects.
- Provide recommendations for future status and trends monitoring with mussels to answer questions about stormwater management.

The purpose of this Statement Of Work (SOW) is to define and describe the RSMP activities and products that will be delivered to the Washington State Department of Ecology (Ecology) by the Washington Department of Fish and Wildlife (WDFW) from the initiation of this contract through June 30, 2017. This SOW describes the work to be completed for each task, the deliverables to be submitted upon completion of each task, and the total estimated cost and schedule per task.

Tasks and Deliverables

Task 1 – Quality Assurance Project Plan - QAPP

WDFW will develop a QAPP based on existing knowledge, protocols and procedures. The QAPP will guide mussel monitoring by WDFW staff and citizen science volunteers directly for the RSMP, with specific sections as needed to guide mussel monitoring by Pierce County, the sole Option 2 permittee who will conduct similar monitoring in their jurisdiction. The QAPP will incorporate findings from a recent WDFW survey and include procedures for site confirmation, field and laboratory activities, and analytical procedures. Elements of this QAPP will be similar to those in a document already produced by the WDFW-PSEMP team entitled, "Quality Assurance Project Plan: Mussel Watch Pilot Expansion Project".

Deliverable 1.1. Draft QAPP.

- Target Completion Date: May 15, 2015

- Percent of Estimated Cost: 80%

Deliverable 1.2. Final QAPP for RSMP mussel monitoring.

- Target Completion Date: June 15, 2015
- Percent of Estimate Cost: 20%

Task 1 Estimated Cost: \$20,544

Task 2 – Recruit and Organize Volunteers

WDFW will contact regional groups (e.g. marine resource committees (MRCs), tribes, non-governmental organizations (NGOs), marine science centers, etc.) that have worked with WDFW in the past in an attempt to recruit them to assist with the 2015/16 RSMP mussel monitoring survey. WDFW will offer reimbursements to volunteers for costs associated with participation in the RSMP survey (e.g. ferry tickets, parking fees, gas mileage, etc.). Volunteers will visit potential nearshore monitoring sites to verify their safety and feasibility for use in the RSMP (see Task 3) and will assist with mussel preparation in advance of deployment (see Task 6). WDFW anticipates there will be enough volunteers to deploy and retrieve mussel cages at approximately 90% of the confirmed RSMP mussel sites (see Tasks 7 and 8). WDFW will maintain contact with the volunteer groups throughout the study period to answer questions, verify their commitment to participate, provide feedback, register them in the WDFW volunteer tracking system, and manage efforts at every step of the 2015/16 RSMP mussel survey. WDFW will maintain volunteer forms on file.

Deliverable 2.1. List of volunteer groups that plan to participate in mussel monitoring and the sites for which each group will be responsible.

- Target Completion Date: July 31, 2015
- Percent of Estimated Cost: 90%

Deliverable 2.2. Account of reimbursements made to WDFW volunteers for mussel monitoring.

- Target Completion Date: March 1, 2016
- Percent of Estimated Cost: 10%

Task 2 Estimated Cost: \$18,829

Task 3 – Site Confirmations and Permissions

Marine sampling sites for the RSMP come from the Puget Sound Shoreline Master Sample Site list. WDFW staff and volunteers (see Task 2), will evaluate and confirm the suitability of potential RSMP monitoring sites in numerical order (from lowest to highest in the ORDER column of the list) until 45 sites are accepted for the 2015/16 RSMP mussel monitoring survey. Evaluation of a candidate site will be based largely on a field visit to the site during daylight low tides, in the spring or summer of 2015. Sites will be evaluated on their accessibility and safety, whether the property owner and/or tenants give permission to access to the site, and the suitability of the intertidal substrate for anchoring/securing a mussel cage. If a site is determined to be unacceptable WDFW will then evaluate the next qualifying site and continue evaluating sites, moving numerically through the list, until 45 sites are confirmed for the 2015/16 monitoring survey. Locations of final 45 sites will be submitted to Ecology's EIM database.

Deliverable 3.1. Map of confirmed 2015/16 RSMP mussel monitoring sites.

Deliverable 3.2. List of names and coordinates for confirmed and rejected mussel monitoring sites.

Deliverable 3.3. Spreadsheet of “Location Data” submitted to EIM.

- Target Completion Date: August 31, 2015

Task 3 Estimated Cost: \$14,678

Task 4 – Obtain Permits and Memorandum of Understanding (MOU)

WDFW will obtain a Hydraulic Project Approval (HPA) and a Shellfish Transfer Permit for the RSMP mussel monitoring. WDFW will attempt to obtain a MOU with the Washington Department of Natural Resources to access State-Owned Aquatic Lands for all RSMP mussel monitoring activities.

Deliverable 4. PDF of all permits and MOUs necessary to gain access to and place a mussel cage on confirmed RSMP mussel monitoring sites.

- Target Completion Date: September 30, 2015

Task 4 Estimated Cost: \$4,432

Task 5 – Equipment and Supplies Procurement and Assembly

WDFW will procure all the equipment for mussel deployment (e.g. mussel cages, anchors, fastening devices, etc.) and supplies for the laboratory processing (e.g. solvents, scalpels, weighing pans, gloves, etc.) necessary to complete mussel monitoring at 40 RSMP sites. WDFW will obtain mussels (*Mytilus* spp.) from a local shellfish aquaculture facility in the Puget Sound to be transplanted for the monitoring. WDFW will assemble and distribute all the equipment and supplies necessary for the deployment and retrieval phases of the monitoring.

Deliverable 5. List of equipment/supplies ordered and procured by WDFW in support of the 2015/16 RSMP mussel monitoring survey.

- Target Completion Date: September 30, 2015

Task 5 Estimated Cost: \$24,099

Task 6 – Preparation of Mussels

WDFW and volunteers will measure and sort enough mussels to accommodate 64 mussels per cage at the 40 RSMP monitoring sites, and for six baseline (i.e. starting condition) samples. Mussels used for the 2015/16 RSMP mussel monitoring will be measured and selected to fall within a uniform size range, and they will be placed into aquaculture bags in groups in preparation for deployment. Bagged mussels will rest for a brief period, likely at the aquaculture source, before they are deployed to cages at the monitoring sites.

Deliverable 6. Email confirmation that all mussels necessary for deployment are prepared and resting.

- Target Completion Date: October 31, 2015

Task 6 Estimated Cost: \$12,394

Task 7 – Deployment of Cages

WDFW staff and volunteers will deploy bagged mussels (see Task 6) in anti-predator, wire mesh cages to the 40 confirmed (see Task 3) RSMP mussel monitoring sites during evening low tides following the approved QAPP. Mussel cages will be anchored into the substrate and/or secured to fixed objects in the intertidal environment at each site at approximately zero to -1.5 feet mean lower low water (MLLW). As part of this effort WDFW staff will spend several evenings at the aquaculture facility handing out bagged mussels, cages, and deployment kits to all volunteers participating in the RSMP mussel monitoring. In addition, environmental data specific to each RSMP mussel monitoring site will be recorded at the time of deployment on a Deployment Datasheet and photos of each deployed cage and its surroundings will be collected.

Deliverable 7. PDF of completed Deployment Datasheets from all RSMP mussel monitoring sites.

- Target Completion Date: December 31, 2015

Task 7 Estimated Cost: \$9,689

Task 8 – Retrieval of Cages

During a series of evening low tides in 2016, approximately 90 days after deployment, WDFW staff and volunteers will revisit the 40 RSMP mussel monitoring sites and retrieve all remaining mussel cages. Mussel cages and all anchoring devices will be removed from the substrate so that nothing is left behind at any of the sites. All bags of mussels will be removed from each cage and placed in coolers on ice overnight, then delivered the following day to the WDFW Marine Resources Lab in Olympia, WA. As part of this effort PSEMP staff will send out retrieval kits in advance to all the participating volunteers and will make several trips to collection points across the north and central Puget Sound to facilitate delivery from volunteers. In addition, environmental data specific to each RSMP mussel monitoring site will be recorded at the time of retrieval on a Retrieval Datasheet and photos of each retrieved cage and its surroundings will be collected.

Deliverable 8. PDF of completed Retrieval Datasheets from all RSMP mussel monitoring sites.

- Target Completion Date: March 31, 2016

Task 8 Estimated Cost: \$9,689

Task 9 – Processing of Mussels

WDFW staff will process retrieved mussels at the Marine Resources Lab in Olympia, WA. Laboratory mussel processing will include, 1) an assessment of mortality in each mussel cage, 2) determination of condition index for a subset of mussels, and 3) compositing of a subset of the mussels (i.e. soft tissue only) for chemical analysis.

Deliverable 9. PDFs of datasheets with biological metrics for all mussels processed for RSMP mussel monitoring.

- Target Completion Date: April 30, 2016

Task 9 Estimated Cost: \$18,823

Task 10 – Chemical Analysis and Sample Tracking

Upon completion of mussel processing, WDFW staff will deliver mussel composite samples for chemical analyses to the contracted analytical laboratories. WDFW staff will track the progress of these composite samples. Chemical contaminants to be analyzed will include polychlorinated biphenyls (PCBs), polybrominated diphenylethers (PBDEs), polycyclic aromatic hydrocarbons (PAHs), a range of organochlorine pesticides including dichlorodiphenyltrichloroethane compounds (DDTs), and a suite of metals including mercury, lead, arsenic, copper, cadmium. Tissue lipid content, percent solids, and select stable isotopes (δ^{15} nitrogen and δ^{13} carbon) may also be measured or estimated.

Deliverable 10. Copies of invoices received by WDFW from each analytical laboratory for chemical analysis of RSMP mussel samples.

- Target Completion Date: August 31, 2016

Task 10 Estimated Cost: \$76,668

Task 11 – Data Quality Assurance and Quality Control (QA/QC) check

WDFW staff will evaluate quality assurance metrics and track quality control measures to ensure high quality data is received from the analytical laboratories. Error checking and data validation procedures will be performed on all chemistry data received from the labs.

Deliverable 11. Spreadsheet of QA/QC checked chemistry data.

- Target Completion Date: October 31, 2016

Task 11 Estimated Cost: \$9,465

Task 12 – Data Digitization and Entry into Ecology’s Environmental Information Management (EIM) Database

WDFW staff will ensure all data collected during the deployment and retrieval phases and all biological data from mussel processing are digitized and error-checked. In addition, WDFW staff will submit all relevant sample, biological, and chemistry data from the 2015/16 RSMP mussel monitoring survey to Ecology’s EIM database.

Deliverable 12. Word document describing the RSMP mussel monitoring study, and spreadsheets of sample, measurement, and results data submitted to EIM.

- Target Completion Date: December 31, 2016

Task 12 Estimated Cost: \$5,814

Task 13 – Data Analysis and Report Outline

WDFW staff will analyze chemical and biological data from the 2015/16 RSMP mussel monitoring survey to determine the extent and magnitude of chemical contamination of mussels in UGAs of the Puget Sound. Summary statistics and maps will be produced for individual or groups of chemicals, depending on the analyte. WDFW staff will produce an outline of the planned report based on the analysis described above. In addition, WDFW staff will provide a progress report, in the form of an oral presentation, to the Stormwater Work Group (SWG) in the summer of 2016.

Deliverable 13.1. Progress report (oral presentation) to SWG.

- Target Completion Date: June 30, 2016
- Percent of Estimated Cost: 10%

Deliverable 13.2. Outline of WDFW agency report on 2015/16 RSMP mussel monitoring survey.

- Target Completion Date: January 31, 2017
- Percent of Estimated Cost: 90%

Task 13 Estimated Cost: \$23,361

Task 14 – Report and Review

WDFW staff will provide a summary report on the chemical, biological and geographic data from the 2015/16 RSMP mussel monitoring survey. This report will include an assessment of the extent and magnitude of chemical contamination of mussels in UGAs of the Puget Sound, tables and graphs with summary statistics, maps of contaminant distributions, and recommendations for refining future rounds of RSMP monitoring. In addition, RSMP mussel monitoring results will be compared with results from WDFWs “Toxic Contaminants in Puget Sound’s Nearshore Biota: A Large-Scale Synoptic Survey Using Transplanted Mussels (*Mytilus trossulus*)” project, where appropriate. The format will be a WDFW agency report.

Deliverable 14.1. Draft WDFW agency report on 2015/16 RSMP mussel monitoring survey for review by Ecology and/or RSMP staff.

- Target Completion Date: March 31, 2017
- Percent of Estimated Cost: 80%

Deliverable 14.2. Final WDFW agency report on 2015/16 RSMP mussel monitoring survey.

- Target Completion Date: June 30, 2017
- Percent of Estimated Cost: 20%

Task 14 Estimated Cost: \$20,544

TOTAL PROJECT COST = \$269,030