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**General Information**

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<b>Project Title</b>	Restoration-based Water Quality Enhancement Strategy for Satsop/Wynoochee
<b>Project Short Description</b>	<p>This project will create a Restoration Strategy targeting water quality enhancement in the Satsop/Wynoochee Rivers. It will result in 1) analytical tools to identify and prioritize stream reaches where restoration-based approaches are predicted to improve water quality, and 2) specific prescriptions of reach-scale, in-stream restoration techniques that will enhance temperature, sediment, and DO conditions. One reach-scale pilot project will be implemented to demonstrate Strategy effectiveness.</p>
<b>Project Long Description</b>	<p>Water quality conditions of the Satsop and Wynoochee river systems are degraded from past and current land use practices. These Chehalis River tributaries have been impacted by the removal of in-stream large wood and harvest of the source of future large wood inputs throughout their stream networks. This has resulted in decreased sediment retention capability, leading to stream incision and floodplain disconnection. Downstream effects include higher sediment inputs, decreased flows during groundwater dominated low flow periods (leading to higher water temperatures and lower DO), a flashier river system with more erosive power, and a decrease in fish habitat quality/quantity (Stock et al, 2005; Tague et al, 2008a; Dixon et al, 2016; Watson et al, 2016).</p> <p>Currently in these two basins there are five category 2 temperature listings, four category 2 DO listings, four category 5 temperature listings, and four category 5 DO listings. A TMDL was developed for large portions of these two basins for temperature and sediment for the Green Diamond Natural Resource Company holdings. Numerous plans for the entire Chehalis Basin have been developed to address degrading water/habitat quality, but few have developed detailed methods to address these in an integrated manner, despite the clear linkages between habitat quality and water quality.</p> <p>To address the system-wide issues described above that negatively impact temperature, sediment, and DO, we propose to (1) develop a Water Quality Enhancement Strategy utilizing stream restoration actions to improve water quality in the Wynoochee/Satsop River watersheds, (2) use the Restoration Strategy to identify, prioritize, and implement a pilot project to improve water quality, (3) monitor the effectiveness of the pilot project in retaining sediment and improving temperature/DO conditions through alluvial water storage, and 4) share the Restoration Strategy with relevant restoration practitioners and forest landowners.</p>

General Information

Recent pilot projects and studies have shown how in-stream restoration actions that reintroduce flow resistance to a stream can improve water quality by retaining sediment, increasing groundwater storage, decreasing temperature and augmenting streamflow during the low flow season (Loheide and Gorelick, 2006; Tague et al, 2008b; Dickerson-Lange et al, 2017). In one such study, up to a 3 °C decrease in stream temperature was documented downstream from restoration actions where groundwater inputs to the stream were enhanced (Loheide and Gorelick, 2006). However, the appropriateness and effectiveness vary with reach characteristics such as stream gradient, drainage area, channel morphology, and valley width. We will analyze these characteristics for each stream reach of the Satsop/Wynoochee tributary network to identify reaches most likely for these approaches to succeed. Using the analysis we will create reach appropriate in-stream restoration/water quality enhancement prescriptions. We'll concurrently work with landowners, such as Green Diamond, to define restoration prescriptions that would be feasible to implement on their properties.

We'll use our analysis to select a pilot project reach for design, implementation, and monitoring. Our design will target water quality improvements through increased retention of sediment and restoring hydrologic connectivity to the floodplain and shallow groundwater (to improve temperature/DO). Monitoring will assess effectiveness in order to inform future implementations. The Restoration Strategy will be developed to be a valuable resource for restoration practitioners and forest landowners looking to implement cost-effective, site-specific, multi-benefit stream restoration projects in the Satsop/Wynoochee and will provide a prioritization framework for future projects. With some adaptation of the analytical tools we created during this project, this type of strategy can be developed for other watersheds with similar water quality issues.

<b>Total Cost</b>	\$278,000	<b>Total Eligible Cost</b> \$278,000
<b>Effective Date</b>	7/1/2019	<b>Expiration Date</b> 6/30/2022
<b>Project Category</b>	<ul style="list-style-type: none"> <li>✓ Nonpoint Source Activity</li> <li>On-Site Sewage System</li> <li>Stormwater Activity0</li> <li>Stormwater Facility</li> <li>Wastewater Facility</li> </ul>	

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**General Information**

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**Will Environmental Monitoring Data be collected?**

Yes

**Ecology Program**

Water Quality

**Overall Goal**

Our goal is to develop a restoration-based strategy for water quality enhancement in the Satsop/Wynoochee River tributary watersheds. We aim to complete an analysis of how factors such as stream gradient, channel morphology, and others contribute to water quality impairments in these rivers. Once these are identified, we will develop a suite of restorative actions appropriate for respective stream reaches.

Our restoration prescriptions will be designed to address impairments such as high temperature, low DO, and excessive sediment. Once the strategy is complete, we will use it to identify a pilot project for construction and effectiveness monitoring. Our goal is to galvanize the full implementation of the strategy by restoration practitioners and landowners. Towards this end, the strategy will be designed to be a roadmap for feasible, effective, and multi-benefit watershed restoration. We hope this strategy will be an example for restoration in basins throughout western Washington.

**WATER QUALITY COMBINED FINANCIAL ASSISTANCE**

Organization: Grays Harbor Conservation District

WQC-2020-GrHaCD-00074

**Project Characterization**

**Project Themes**

Select a primary and secondary theme that best describes the work to be achieved during this project.

- Primary Theme: Nonpoint Source Pollution
- Secondary Theme(s): Riparian/Wetland Restoration
- TMDL Support
- Monitoring and/or Maintenance
- Education & Outreach

**Project Website**

If your project has a website, please enter the web address below. After entering a website and saving, another blank row will appear. Up to three websites may be provided.

Website Title/Name	Web Address
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Recipient Contacts

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**Project Manager**

Anthony Waldrop

*Contact Information*

Anthony Waldrop  
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Specialist  
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**Authorized Signatory**

Mike Nordin

*Contact Information*

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**Billing Contact**

MELISSA GONZALES

*Contact Information*

MELISSA GONZALES  
Financial Administrator  
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**Recipient Contacts**

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(360) 249-8532

ghcd.melissag@gmail.com

**Other recipient signatures on printed agreement**

**Name**

**Title**

WATER QUALITY COMBINED FINANCIAL ASSISTANCE

Funding Request- Nonpoint Project

**Total Eligible Cost:** \$278,000

**Grant Request**

\* **Will your match be cash-only?**

Yes  No

**Grant Request:** \$208,500

**Match Required:** \$69,500

IMPORTANT NOTICE. Grants for nonpoint projects require a 25% match. Projects with cash-only match are eligible for up to \$500,000 in grant. Projects with a mix of funds for match are eligible for up to \$250,000 in grant. Cash match includes any eligible project costs paid for directly by the recipient that are not reimbursed by the Ecology grant or another third party. Donations that become the long-term property of the recipient are considered cash match. Loan money provided through the CWSRF is also considered cash match. In-kind contributions are considered non-cash match. More information on match requirements can be found in the Water Quality Combined Financial Assistance Guidelines which are available for download on the Application Menu.

**Loan Request**

\* **Are you requesting or will you accept loan funds for part or all of the eligible project costs or to meet your match requirement?**

Yes  No

**What is the loan amount you are requesting or willing to accept?**

**What loan term do you prefer?** 5 years 20 years 30 Years

IMPORTANT NOTICE. Ecology may provide special loan funding for nonpoint projects in the following case: (1)

Funding Request- Nonpoint Project

projects that meet the criteria for "green project reserve" may receive up to 25% forgivable loan. Ecology will determine eligibility for special funding when developing funding packages.

**Other Funds**

\*

**Do you have any secured funds committed to this project?**       Yes  No

If Yes, complete the Secured Funds Table, and include any secured matching funds if known.

**Secured Funds Table**  
**Source\***

Source*	Type*	Amount Committed*
State/Federal agency: Grays Harbor Conservation District Forester	In-kind	\$3,000.00
State/Federal agency:		
State/Federal agency:		
Interlocal contributions:		
Interlocal contributions:		
Local agency:		
In-kind contributions:		
Other		

**WATER QUALITY COMBINED FINANCIAL ASSISTANCE**

Organization: Grays Harbor Conservation District

WQC-2020-GrHaCD-00074

**Scope of Work - Task 1 Project Admin: 1**

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**Task Number** 1

**Task Title** Project Administration/Management **Task Cost** \$10,000.00

**Task Description**

A. The RECIPIENT shall carry out all work necessary to meet ECOLOGY grant or loan administration requirements. Responsibilities include, but are not limited to: maintenance of project records; submittal of requests for reimbursement and corresponding backup documentation; progress reports; and a recipient closeout report (including photos).

B. The RECIPIENT shall maintain documentation demonstrating compliance with applicable procurement, contracting, and interlocal agreement requirements; application for, receipt of, and compliance with all required permits, licenses, easements, or property rights necessary for the project; and submittal of required performance items.

C. The RECIPIENT shall manage the project. Efforts include, but are not limited to: conducting, coordinating, and scheduling project activities and assuring quality control. Every effort will be made to maintain effective communication with the RECIPIENT's designees; ECOLOGY; all affected local, state, or federal jurisdictions; and any interested individuals or groups. The RECIPIENT shall carry out this project in accordance with any completion dates outlined in this agreement.

**Task Goal Statement** Properly managed and fully documented project that meets ECOLOGY's grant or loan administrative requirements.

**Task Expected Outcomes**

- \* Timely and complete submittal of requests for reimbursement, quarterly progress reports, and RECIPIENT closeout report.
- \* Properly maintained project documentation

**Recipient Task Coordinator** Anthony Waldrop

**Deliverables**

<b>Deliverable #</b>	<b>Description</b>	<b>Due Date</b>	<b>Received?</b>	<b>EIM Study ID</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Location Address</b>
1.1	Quarterly Progress						

Scope of Work - Task 1 Project Admin: 1

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- 1.2 Reports  
Recipient Closeout  
Report
- 1.3 Project Outcome  
Summary Report

Scope of Work - Additional Tasks: 2 - Spatial Analysis and Background Data Synthesis

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Task Number	2		
Task Title	Spatial Analysis and Background Data Synthesis	Task Cost	\$54,500.00*
Task Description	<p>GHCD staff will work with a technical consultant and additional project stakeholders (landowners) to form a Technical Team that will initiate the studies described in this grant. The following tasks describe the work to be completed by the Technical Team at the direction of the GHCD staff.</p> <p>Task 2.1 Hire Design Consultant</p> <p>GHCD staff will use a competitive bid process to seek consulting services from a design consultant with experience in stream restoration science, prioritization, design and construction, in particular for alluvial water storage projects.</p> <p>Task 2.2 Best Available Science Review</p> <p>GHCD and the design consultant will form a Technical Team that will initiate a thorough review of best available science related to water quality effects from stream restoration projects, and existing data for the Wynoochee and Satsop watersheds.</p> <p>This review work will include:</p> <ol style="list-style-type: none"> <li>1. Synthesis and reporting on published scientific literature related to the link between stream restoration actions and water quality benefits associated with sediment, water temperature, and dissolved oxygen.</li> <li>2. Review and reporting of findings from recent, unpublished alluvial water storage pilot projects in the western United States.</li> <li>3. Further investigate specific water quality impairments within the Wynoochee and Satsop River subbasins and their sources.</li> <li>4. Compilation of relevant spatial data sources including digital elevation models, hydrography, vegetation data, geological mapping, and infrastructure.</li> </ol> <p>Task 2.3 Spatial Analysis of Water Quality Enhancement Potential</p> <p>This effort is the first attempt to apply both the science behind alluvial water storage (Task 2.2) and the new spatial analysis tool in western Washington watersheds.</p> <p>The Technical Team will refine and apply a GIS-based spatial analysis approach to assess and prioritize</p>		

**Scope of Work - Additional Tasks: 2 - Spatial Analysis and Background Data Synthesis**

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water quality enhancement potential within the Wynoochee and Satsop River basins. The beta version of this tool was developed by the consultant firm Natural Systems Design as a pilot model in 2018 to assess water storage potential within the Wenatchee River basin. The model uses GIS tools implemented in a model-builder analysis framework to compute stream gradient, delineate valley bottom and compute reach-average valley width, and estimate channel incision. Primary model inputs are a digital elevation model, a stream network (e.g., NHDplus v2), and floodplain sediment types. This analysis then allows the computation of water storage potential at a reach-scale, which then contributes to prioritization of stream reaches. In locations where restoration actions have high potential to increase water storage, there are correlated benefits to water quality from storing sediment in the re-aggradation of stream channels, and from increasing the sub-surface residence time of water, which cools surface water inputs and shifts the timing of flows to later in the dry season.

**Task 2.4 Field Reconnaissance**

Following the completion of Task 2.2, the Technical Team will select priority sites to conduct field reconnaissance and ground truthing. Sites will be identified through the modeling effort and based on knowledge of landowner willingness and access. This will include an evaluation of channel incision to verify model assumptions, an examination of onsite woody materials that may be used for construction, and a check of site access as it would relate to potential construction methods.

**Task Goal Statement**

The goal of this task is to create a solid scientific foundation for the analysis, identification, and selection of reach scale project sites. This foundation is critical for the creation of a scientifically sound and implementable water quality enhancement restoration strategy.

**Task Expected Outcomes**

These efforts will be drafted in a memorandum that documents the following for both the Wynoochee and Satsop subbasins: 1) Best available science review 2) Inventory of existing data 3) Model methods, assumptions, and output 4) Results of the field reconnaissance.

**Recipient Task Coordinator**

Anthony Waldrop

**Deliverables**

Deliverable #	Description	Due Date	Received?	EIM Study ID	EIM System Link	Latitude	Longitude	Location
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Scope of Work - Additional Tasks: 2 - Spatial Analysis and Background Data Synthesis

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		(ECY Use Only)	Address
2.1	The hiring of an experienced design consultant		
2.2	A memorandum that documents the best available science review, the inventory of existing data, the model methods, assumptions, and output, and field reconnaissance results.		

Scope of Work - Additional Tasks: 3 - Water Quality Enhancement Restoration Strategy

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Task Number	3		
Task Title	Water Quality Enhancement Restoration Strategy	Task Cost	\$66,000.00*

Task Description

Task 3.1: Development of the Restoration Actions

The Technical Team will create a report that will include a set of restoration actions specific to the Wynoochee and Satsop subbasins. The restoration actions will include but are not limited to the following: engineered log jams, beaver dam analogs, small woody reservoirs, and stage 0 restoration. "Cut sheets" will be developed for each of the types with typical plan, profile, and cross-section drawings. This evaluation will also include proposed construction sequencing, and material types.

Task 3.2. Evaluation of Reach-Scale Restoration

The Technical Team will evaluate the restoration actions in Task 3.1 to prescribe the appropriate approach to specific stream reaches as identified and prioritized in Task 2. The applicability of these typical actions will be evaluated against geomorphic characteristics such as stream order, stream power, channel incision, channel width, channel slope, and valley width, and against feasibility criteria such as construction method, access, and materials needed. The prescriptions will also include the preferred number of structures and spacing which will serve as a guideline for future design efforts. This will create a prescription that matches the most appropriate restoration action to the reach/site conditions.

Task 3.3. Project Prioritization

The results of Task 3.2 will be combined with the results from the Task 2 prioritization to create a priority list of projects within each subbasin. The prioritization will include criteria such as water quality enhancement potential, landowner willingness, design complexity, construction complexity, and cost. This evaluation will result in the identification of one priority pilot project for construction and will provide clear approaches to scope future design and construction costs.

Task 3.4. Restoration Strategy Documentation

A draft Restoration Strategy will be prepared for review by stakeholders. The Technical Team will facilitate

**Scope of Work - Additional Tasks: 3 - Water Quality Enhancement Restoration Strategy**

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a field reconnaissance with interested stakeholders to demonstrate the use and applicability of the draft strategy. Following review and comment we will prepare a final report.

**Task Goal Statement**

The goal of Task 3 is to use the results of Task 2 to develop a Water Quality Enhancement Restoration Strategy for both the Wynoochee and Satsop River subbasins. The strategy will be a comprehensive resource for forest landowners and restoration practitioners as to the suitability of stream reaches for this type of water quality enhancement approach. Based off of our analysis, we will create reach scale prescriptions for in-stream restoration that will allow the prioritization of locations for treatment. It will provide a starting point for restoration design that focuses on retaining sediment and increasing in-situ water storage for downstream water quality (sediment, temperature, DO) benefits. The development of the strategy will provide the Technical Team with the information to proceed to the design of the pilot project in Task 4.

**Task Expected Outcomes**

This task will create a Draft and Final Wynoochee and Satsop Water Quality Enhancement Restoration Strategy which describes: In-stream wood restoration techniques (typical engineered designs), prescriptions for channel type and stream order for each reach of the sub-basins respective tributary networks, simple design schematics, implementation guidelines, estimated water quality benefits if reach scale prescriptions are implemented, identification of one reach scale priority pilot project that is cost effective for water quality enhancement

This report will include the background data and spatial model output from Task 2 as an appendix.

**Recipient Task Coordinator**

Anthony Waldrop

**Deliverables**

Deliverable #	Description	Due Date	Received? (ECY Use Only)	EIM Study ID	EIM System Link	Latitude	Longitude	Location Address
3.1	Draft Wynoochee and Satsop Water							

Scope of Work - Additional Tasks: 3 - Water Quality Enhancement Restoration Strategy

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3.2 Quality  
Enhancement  
Restoration  
Strategy  
Final Wynoochee  
and Satsop Water  
Quality  
Enhancement  
Restoration  
Strategy

Scope of Work - Additional Tasks: 4 - Pilot Project Design

Task Number	4		
Task Title	Pilot Project Design	Task Cost	\$43,500.00*

Task Description      Task 4.1 Field Assessment

Design will begin with a field-based site assessment that will be completed to quantify local conditions, design details, and construction approach. This assessment will include Technical Team staff along with the local landowner over 2 days. A willing landowner will be identified through outreach efforts as described in Task 5. The following surveys will be completed:

- 1) Channel and floodplain cross-section survey using RTK survey equipment.
- 2) Identification and survey of specific treatment sites. This will be based on existing conditions related to water storage potential and other conditions
- 3) Identification of existing large wood and slash material that could be used to construct in-stream wood structures.

Task 4.2 Design Documents

The Technical Team, led by a design engineer, will use the reach scale prescriptions from the Restoration Strategy and the results from the field effort to compile a list of feasible treatment types, such as channel-spanning wood structures, and their construction methods, to achieve the geomorphic changes that will result in the estimated water quality improvements. The Technical Team will follow the RCO Manual 18 design procedure which prescribes the following steps:

- 1) Preparation of Conceptual Designs
- 2) Preparation of Preliminary Designs: 1-D HEC-RAS model to assess stream power and water storage potential; draft Basis of Design Report; draft construction cost estimate. These designs will be used by GHCD to obtain project permits.
- 3) Preparation of Draft Final and Final Designs and Specifications: Final Basis of Design Report; final construction cost estimate; final bid documents

One project site is expected to include multiple wood structure types for construction by hand-tools and machine, using both onsite materials and imported materials as appropriate. The treatments will be reviewed with the landowner and adjusted as needed as part of the Conceptual Designs development.

**Scope of Work - Additional Tasks: 4 - Pilot Project Design**

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The design engineer will prepare a 1-D HECRAS hydraulic model representing the project site to help inform structure architecture and stability, spacing, and potential effectiveness. The model will use cross section data collected in Task 4.1 for the surface construction. The results of this modeling will be presented in the Design Report.

Comments from review of the proposed concepts will be incorporated into the Preliminary Plans for project permitting. The preliminary plans will include the following: cover sheet with project location map, proposed locations and typicals for in-channel wood structures, access and staging plan.

A construction cost estimate and a design report will also be prepared to support the Preliminary Plans. The design report will include the following: summary of field observations and field data collected, methods and results for estimating water quality enhancement potential and locating and prioritizing treatment locations, results from the 1-D hydraulic model of existing and proposed conditions, design intent and construction methods of each of the proposed structure/treatment types.

Final design will include project specifications and bid documents to support advertising and award of project construction.

**Task 4.3**

GHCD will conduct environmental and cultural review of the pilot project using documents created during Tasks 4.1 and 4.2. All permitting and cultural resource documents will be completed before project implementation.

**Task Goal Statement**

Using the guidance from the Strategy (Task 3), one reach in the Wynoochee or Satsop will be selected for pilot project design and construction. The site will be selected based on priority level to improve water quality and feasibility with regards to the overall budgeted funds for design and construction work. This task will result in the design and engineering required to provide contract and construction documents to the GHCD. Permitting and cultural resource documents will be completed during this task.

**Task Expected Outcomes**

This task will produce the following design and contracting documents following RCO Manual 18 design procedures:

Scope of Work - Additional Tasks: 4 - Pilot Project Design

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Conceptual Designs.

Preliminary Designs.

- o These designs will be used by GHCD to obtain project permits.
- o 1-D HEC-RAS model to assess stream power and water storage potential.
- o Draft Basis of Design Report.
- o Draft construction cost estimate.

Draft Final and Final Designs and Specifications.

- o Final Basis of Design Report.
- o Final construction cost estimate.

Final bid documents.

Approved permitting and cultural resource documents

Recipient Task Coordinator      Anthony Waldrop

Deliverables

Deliverable #	Description	Due Date	Received? (ECY Use Only)	EIM Study ID	EIM System Link	Latitude	Longitude	Location Address
4.1	Conceptual Designs							
4.2	Preliminary Designs							
4.3	Draft Final Designs							
4.4	Final Designs							
4.5	Final Bid Documents							
4.6	Approved							

permitting and  
cultural resource  
documents

WATER QUALITY COMBINED FINANCIAL ASSISTANCE

Scope of Work - Additional Tasks: 5 - Landowner and Restoration Practitioner Outreach

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Task Number 5

Task Title Landowner and Restoration Practitioner Outreach Task Cost \$18,000.00\*

Task Description This task includes all forest landowner outreach during Strategy development, pilot project design/construction, monitoring, and site visits. Preliminary dialogue about this project proposal has begun with Green Diamond Natural Resources Company (GDNRC). GDNRC has signed a memorandum of understanding that they will participate in strategy development if grant funds are awarded. Under this task, the Technical Team will continue dialogue with GDNRC to help guide the development of the restoration strategy, so that it can be feasibly applied to Wynoochee/Satsop tributaries present on their forestlands.

Outreach will also occur to other significant forest landowners in the Satsop/Wynoochee watersheds, most notably Weyerhaeuser. Similar to dialogue with GDNRC, outreach to Weyerhaeuser will guide the development of the strategy.

In addition to outreach to industrial landowners, GHCD will work with our District forester to conduct outreach to small forest landowners in the Satsop/Wynoochee watersheds.

Outreach to landowners will result in recommendations that will be incorporated into the restoration strategy. These conversations will be important towards identifying an appropriate site for pilot project implementation and for hosting landowner site visits when the pilot project is complete.

The results of Restoration Strategy development and the pilot project will be shared with restoration practitioners, such as with the Chehalis Lead Entity and the Chehalis Basin Strategy Aquatic Species Restoration Program. This task component addresses our goal of galvanizing the full implementation of the strategy.

Task Goal Statement The goal of forest landowner outreach is to inform the development of our Water Quality Restoration Strategy so as to make it widely applicable, feasible according to existing management regimes, and cost-effective. Furthermore, the process of dialoguing with landowners will lead to the location of a pilot project implementation site, as well as the identification of future willing landowners. Educational opportunities will be present as our project team discusses the importance of in-stream wood as it pertains

Scope of Work - Additional Tasks: 5 - Landowner and Restoration Practitioner Outreach

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to water quality with landowners. The conversations generated around the development of the strategy will create landowner investment in strategy success and generate momentum towards watershed-wide in-stream wood restoration for water quality improvement.

The goal of restoration practitioner outreach is to further galvanize the full implementation of the strategy. We will share the strategy as a roadmap for feasible, effective, and multi-benefit watershed restoration, and present the pilot project as a demonstration of effectiveness.

Task Expected Outcomes

Representatives from Green Diamond Natural Resources Company and Weyerhaeuser will be involved in strategy development through at least three Technical Team meetings.

At least 5 small forest landowners in the Satsop/Wynoochee watersheds will offer input during Restoration Strategy development.

Continued dialogue with landowners will result in the identification of 1 pilot project implementation site.

Representatives from GDNRC and Weyerhaeuser, and at least 5 small forest landowners from the Satsop/Wynoochee watersheds will participate in a site visit to the completed pilot project implementation site.

Presentation of the Restoration Strategy and pilot project results to the Chehalis Basin Lead Entity and ASRP Steering Committee both during and after the project.

Recipient Task Coordinator

Anthony Waldrop

Deliverables

Deliverable #	Description	Due Date	Received? (ECY Use Only)	EIM Study ID	EIM System Link	Latitude	Longitude	Location Address
5.1	Attendance of GDNRC and							

Scope of Work - Additional Tasks: 5 - Landowner and Restoration Practitioner Outreach

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- 5.2 Weyerhauser staff at 3 Technical Team meetings during strategy development
- 5.3 Engagement with 5 small forest landowners during strategy development
- 5.4 One site visit conducted to pilot project for forest landowners
- 5.4 Presentation of project results to the Lead Entity and ASRP during and after project implementation

WATER QUALITY COMBINED FINANCIAL ASSISTANCE

Scope of Work - Additional Tasks: 6 - Construction of One Pilot Project

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Task Number	6		
Task Title	Construction of One Pilot Project	Task Cost	\$68,000.00*
Task Description	Task 6.1 Pilot Project Construction  GHCD will be the Contracting Officer during all construction phases. The District will competitively advertise for construction contracting using documents created during Task 4. GHCD will hire the selected contractor and lead the implementation of the project. All administration of construction costs will be handled by District staff.  Task 6.2 Onsite Construction Support and Lessons Learned Documents  This task assumes the construction of 1 project site in the Wynoochee or Satsop River subbasins. We have found through previous pilot projects that special attention to structure architecture and porosity plays a significant factor in project success. The Technical Team will work with the design engineer to provide construction inspection services. This includes input during pre-construction meetings, staffing during construction (1 staff over 2 weeks of time), and for a post-construction walk-through.		
Task Goal Statement	The goal of this task is to support, coordinate, and facilitate the construction of one reach scale alluvial water storage pilot project for water quality enhancement in either the Wynoochee or Satsop River subbasins. This effort is intended to build upon the relationships with landowners built during Task 5 to provide a “lessons learned” project that will help guide future efforts to implement the Restoration Strategy produced in Task 3.		
Task Expected Outcomes	This task will produce the following outcomes: <ul style="list-style-type: none"><li>· A single water quality enhancement pilot project will be constructed.</li><li>· GHCD and design engineer will provide onsite construction support and will provide daily observation reports.</li><li>· A lessons learned document to inform the implementation of future projects as identified in the Restoration Strategy. This document is essential for supporting outreach conducted to forest landowners and restoration practitioners.</li></ul>		

WATER QUALITY COMBINED FINANCIAL ASSISTANCE

Organization: Grays Harbor Conservation District

WQC-2020-GrHaCD-00074

Scope of Work - Additional Tasks: 6 - Construction of One Pilot Project

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Recipient Task Coordinator      Anthony Waldrop

Deliverables

Deliverable #	Description	Due Date	Received? (ECY Use Only)	EIM Study ID	EIM System Link	Latitude	Longitude	Location Address
6.1	One constructed reach scale water quality enhancement pilot project							
6.2	A pilot project lessons learned document that will be shareable with project stakeholders							

**WATER QUALITY COMBINED FINANCIAL ASSISTANCE**

Organization: Grays Harbor Conservation District

WQC-2020-GrHaCD-00074

**Scope of Work - Additional Tasks: 7 - Monitoring Plan Development and Implementation**

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Task Number	7		
Task Title	Monitoring Plan Development and Implementation	Task Cost	\$18,000.00*

**Task Description**

The development and initial implementation of a monitoring plan will include qualitative assessment of treatment function and stability, and quantitative assessment of sediment and water quality enhancement. The function and stability of the treatment actions will be assessed via field observations and time-lapse cameras, with a focus on slowing flow velocities, raising water surface elevation, and initiating sediment deposition upstream of restoration actions. The quantitative assessment will include pre- and post-project channel bed elevation, water temperature, dissolved oxygen, and ground water elevation.

**Task Goal Statement**

The goal of this task is to prepare a comprehensive long-term monitoring plan to evaluate project effectiveness. This data will add to the scientific literature surrounding alluvial water storage potential, especially as it relates to water quality, and will be the first to evaluate the effectiveness of this type of project in western Washington. The monitoring data will also be used in adaptive management efforts to improve treatment function, and to contribute to future refinements of restoration techniques.

**Task Expected Outcomes**

This task will produce the following outcomes:

- Technical memorandum (2-3 pages) documenting monitoring plan, including map of monitoring locations and description of types of data to be collected and methods used to collect data.
- Pre- and post-implementation monitoring according to the monitoring plan
- Technical memorandum (2-3 pages) documenting findings from pre- and post-implementation monitoring, including quantitative and qualitative data.

**Recipient Task Coordinator**      Anthony Waldrop

**Deliverables**

Deliverable #	Description	Due Date	Received? (ECY Use Only)	EIM Study ID	EIM System Link	Latitude	Longitude	Location Address
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Scope of Work - Additional Tasks: 7 - Monitoring Plan Development and Implementation

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- 7.1 One Technical Memorandum that documents the monitoring plan
- 7.2 Collected monitoring data according to the monitoring plan
- 7.3 One Technical Memorandum documenting the findings from pre- and post-implementation monitoring

**WATER QUALITY COMBINED FINANCIAL ASSISTANCE**

Organization: Grays Harbor Conservation District

WQC-2020-GrHaCD-00074

**Scope of Work Summary**

<b>Task Title</b>	<b>Task Cost</b>
Project Administration/Management	\$10,000.00
Spatial Analysis and Background Data Synthesis	\$54,500.00
Water Quality Enhancement Restoration Strategy	\$66,000.00
Pilot Project Design	\$43,500.00
Landowner and Restoration Practitioner Outreach	\$18,000.00
Construction of One Pilot Project	\$68,000.00
Monitoring Plan Development and Implementation	\$18,000.00
<b>Total</b>	<b>\$278,000.00</b>

**Total Eligible Costs**

(from the General Information Form)  
\$278,000.00

WATER QUALITY COMBINED FINANCIAL ASSISTANCE

Organization: Grays Harbor Conservation District

WQC-2020-GrHaCD-00074

Subcategory

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**\*Are you applying to refinance debt for a wastewater facility project that has been completed (i.e., standard refinance)?** Yes ✓ No

**\*Do you want your project to be considered for GPR subsidy under the CWSRF program? (NOTE: Projects are only eligible if they meet EPA's GPR criteria, and applicants accept a CWSRF loan.)** Yes ✓ No

**\*Is this a wastewater facility project that includes Construction tasks for which you are seeking funding and is the population of the community that will pay for the project less than 25,000 and do you want to be considered for Financial Hardship subsidy?** Yes ✓ No

## Task Costs and Budget

**Describe the process used to estimate the cost of the project. If your process included reviewing similar projects, describe how this review affected your estimate.**

The costs associated with the technical work described in Tasks 2 – 7 were prepared through consultation with Natural Systems Design (NSD). Natural Systems Design is based in the Pacific Northwest and specializes in restoration of rivers, shorelines, and wetlands. NSD is currently working on restoration projects in both the Wynoochee and Satsop River basins and is leading the development of alluvial water storage science in the Pacific Northwest. Costs are estimated based on similar analyses and projects completed in the Pacific Northwest within the past 5 years, and are based on predicted staff labor. Construction costs are estimated to be below \$50,000 based on recently completed alluvial water storage pilot projects using hand tools and onsite equipment.

The costs associated with project management and landowner outreach are based on Grays Harbor Conservation District estimates using actual compensation rates for each individual that will be involved in the project or it's administration. The costs are estimated based on a three-year project timeline. Costs include estimated direct administrative costs for supplies, occupancy, etc. and estimated travel costs.

**Describe the process used to determine that this project is the lowest cost solution to the problem.**

*If the proposed project is not the lowest cost, describe the other benefits or considerations such as feasibility, community acceptance, or coordination with other projects that influenced the decision making process.*

Sediment, water temperature, and low flow-related water quality impairments issues are related to and moderated by instream habitat complexity. Thus, a congruent systemic approach is likely to be the lowest-cost and most sustainable solution. Even without accounting for the additional habitat benefits, a side-by-side comparison of proposed water storage infrastructure to a multi-benefit restoration approach in the Wenatchee basin indicated that the cost of the restoration approach ranged from 1/8 to 1/2 the cost per acre-foot as a traditional built approach. The Water Quality Enhancement Restoration Strategy will provide a spatial framework with an associated toolbox of approaches for multi-benefit in-stream restoration projects that are appropriate to site conditions. Rather than address only water quality, these projects will restore natural stream functions that improve water quality by retaining sediment, storing water, and augmenting streamflow during the dry season. These same functions improve aquatic habitat by creating pools, providing cover, and engaging side channels. These functions also increase soil water availability and therefore increase the resilience of riparian forests to drought, insects, and fire.

**Upload a detailed budget for the project and any supporting documentation, including engineers estimates, cost analysis, etc.****Attachment Description**

Budget

**Attachment**

\_Upload/98326\_906585-EcologyWaterQualityGrant2020BudgetSheet1.pdf

**WATER QUALITY COMBINED FINANCIAL ASSISTANCE**

Organization: Grays Harbor Conservation District

WQC-2020-GrHaCD-00074

**Project Information**

**Project Length in months:**

35

*(The difference between the effective date and the expiration date on the General Information Page)*

**Project Start Date**

7/1/2019

*(The date the actual work will start, or if interim refinance, the date the work started)*

**Please identify all 12 digit HUCs in which the project work will be done.**

<b>HUC</b>	<b>Percentage</b>
171001040205	10%
171001040204	10%
171001040203	10%
171001040202	10%
171001040107	10%
171001040106	10%
171001040101	10%
171001040103	10%
171001040105	10%
171001040104	10%

**WATER QUALITY COMBINED FINANCIAL ASSISTANCE**

Organization: Grays Harbor Conservation District

WQC-2020-GrHaCD-00074

**Water Body and Water Quality Needs Addressed**

**Check all type(s) of water bodies that this project targets: \***

- Freshwater rivers
- Freshwater lakes
- Freshwater wetlands
- Ground water
- Direct marine water
- Saltwater estuary
- Other (**specify**):

**Check all the resource protection and regulatory requirements that this project addresses: \***

- Endangered or threatened salmonids
- Other Endangered Species Act protected species (**specify**):
- Protection of shellfish habitat
- National Pollutant Discharge Elimination System (NPDES) permit requirements
- State Waste Discharge Permit
- Other (**specify**):

**Check all the water quality parameters that this project targets: \***

- Dissolved oxygen
- Sediment
- Nitrogen
- Fecal coliform
- Phosphorus
- Temperature
- pH
- Other (**specify**):

**Identify the water bodies, any impairments (Category 4A, 4B, and 5 waters), and listing parameters that your project will address.**

**Water Body Name**

Satsop River W.F.  
Wynoochee River  
Satsop River M.F.  
Satsop River  
Black Creek

**Are you addressing a TMDL?**  Yes  No

**TMDL Name**

**WATER QUALITY COMBINED FINANCIAL ASSISTANCE**

Organization: Grays Harbor Conservation District

WQC-2020-GrHaCD-00074

**Water Body and Water Quality Needs Addressed**

Simpson Timberlands Temperature TMDL

**WATER QUALITY COMBINED FINANCIAL ASSISTANCE**

Organization: Grays Harbor Conservation District

WQC-2020-GrHaCD-00074

**Nonpoint Source Activity Project Information**

**Check all the type(s) of project that apply:**

Agricultural best management practices (BMP)

Other BMPs (**specify**):

- ✓ Site specific planning for BMP implementation
- Groundwater/aquifer/wellhead protection and/or planning
- Lake restoration planning and/or implementation
- ✓ Public outreach and education
- ✓ Riparian/wetland restoration
- ✓ TMDL support
- ✓ Water Quality monitoring

Other (**specify**):

**Is the project planning, implementation or a combination of both? \***

Planning    Implementation    ✓ Planning/Implementation

**Implementation Action**

**Reference the plan(s) that describe this action, including page numbers and where a copy can be obtained**

In-Stream Restoration Pilot Project    The project site/actions will be identified during Restoration Strategy development , the first phase of this project.

Project Team

Fill out the following table to describe your Project Team, including staff, contractors, and partner agencies:

Team Member Name/and or Title	Key Responsibilities	Qualifications/ Experience	Estimated Total Hours Devoted to the Project	Who will take over the person's responsibilities if they are unable to work on the project?
Anthony Waldrop	Anthony will be project manager and the lead on outreach for the project. He will schedule, coordinate, and facilitate meetings with forest landowners and design consultants during Strategy development. He will be the main landowner point of contact for the project in case any issues come up during Strategy development or pilot project design/implementation. He will also give presentations about the Strategy and pilot project implementation to habitat restoration entities in the region.	Anthony has a Masters degree in Conservation Biology and Sustainable Development. He has extensive experience in landowner outreach and project management in Grays Harbor County for river restoration projects. For the Lower Satsop Planning Project, he leads outreach to floodplain landowners to incorporate their interests into a multi-jurisdictional planning process. For the Chehalis Basin Strategy, Anthony leads restoration outreach efforts with floodplain landowners in the Satsop/Wynoochee.	480.00	Brandon Carman
Brandon Carman	Brandon will assist with landowner outreach and lead restoration design in collaboration with experienced design consultants. He will lead	Brandon has a bachelor's degree in Fishery Resources and works as the District's Fish Habitat Restoration Biologist. He has implemented multiple	320.00	Anthony Waldrop

WATER QUALITY COMBINED FINANCIAL ASSISTANCE

Project Team

	data collection efforts.	fish passage restoration projects and been active in landowner outreach in the two county area within District jurisdiction (Pacific and Grays Harbor).		
Tom Kollasch	Tom will oversee the project and provide technical and administrative guidance to lead staff. He will use his expertise in restoration project and contractor management to assist lead staff.	Tom has 26 years of experience in natural resources management and restoration. He managed the Ellsworth Creek Preserve for The Nature Conservancy for 12.5 years, completing a comprehensive management plan and implementing extensive watershed restoration and research. He managed the completion of 28 miles of road decommissioning, 3500 acres of young stand thinning, 800 acres of commercial restoration harvest, three miles of instream restoration and intensive watershed monitoring efforts.	144.00	Anthony Waldrop
Dave Houk	Dave will assist with outreach to small forest landowners as he engages with them as part of his normal job duties. Dave will highlight the	Dave has an associate's degree in Forestry/Natural Resources. He has experience working for an industrial timber company and has served as the	60.00	Jim Getchman

Project Team

<p>efforts of our assessment and look for in-stream restoration opportunities on properties he visits in the Satsop/Wynoochee watersheds. Dave will also assist with identifying sources of and securing wood, slash, and other materials necessary for completion of the pilot project.</p>	<p>Grays Harbor Conservation District Stewardship Forester for 5 years. Dave has written over 100 forest management plans and was the lead author of the Chehalis River Watershed Landscape-Level Master Forest Stewardship Plan, developed for the Landscape Scale Restoration Initiative.</p>
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*To add a team member, fill out a row and SAVE. A blank row will appear. To remove a team member, clear the contents of the entire row and SAVE. One blank row is always visible.*

**Describe similar projects that your project team or organization has completed. Note any deviations from the original proposal in scope, budget, or schedule and briefly describe project success and lessons learned. If the project was funded by Ecology, include the Ecology grant or loan number.**

The watershed restoration program at GHCD is about 3 years old and is thus still building our implementation portfolio. Staff have also brought applicable experience to GHCD from previous employment. At GHCD, staff have implemented multiple types of projects that have built our project management skills and capacity. We've completed 6 fish passage projects with private timber companies, Counties and individual landowners including construction of a county road bridge in Pacific County. Staff members are currently designing two large tidal restoration projects, one of which will be constructed next year. We're conducting a watershed scale fish passage inventory for the Willapa Bay watershed and planning a detailed stream habitat assessment in the Middle Nemah River that will lead to similar in stream restoration actions. While not directly related to the proposed work, these projects involve similar design and project management skills. Our team is currently involved in designing multiple reach scale habitat restoration projects that will involve significant large wood components being installed in the Satsop and Wynoochee river mainstems. From previous employment, staff implemented over 2 miles of large wood placements in conjunction with forest restoration thinning harvests at Ellsworth Creek which demonstrated restoration approaches similar to those proposed in this grant. On Hurst Creek in the Clearwater River watershed staff managed the installation of engineered log jams. Our team's project management experience on large scale restoration initiatives demonstrates our ability to complete this proposed project in an efficient and effective manner.

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**Project Schedule**

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**Describe the steps you have taken to be ready to proceed immediately with the project. Provide detailed information and documentation on project elements such as status of designs, permits, interlocal agreements, landowner agreements, easements, other secured funding, staff, or agency approvals.**

*If applicable, describe the environmental review completed such as:*

- \* *National Environmental Policy Act (NEPA)*
- \* *Environmental Review Process (SERP)*
- \* *State Environmental Policy Act (SEPA)*
- \* *Cultural Resource Assessment*

Substantial project coordination has been undertaken during the development of this grant proposal in order to be ready to proceed immediately when project funds are awarded. Extensive consultation with design consultants resulted in a detailed, comprehensive, and realistic scope of work for the technical elements of our project. Their expertise at completing similar projects to the one we are proposing provided us with information about the feasibility of conducting the analysis and implementing a pilot project within the time scale of the grant funding. The selection process for the pilot project, which involves using the feasibility analysis conducted during Restoration Strategy development, will result in a project that is feasible to design and permit.

The presence of an in-house Grays Harbor Conservation District Forester, who we have already discussed this project with, provides our team with a built-in resource for forest landowner outreach. We have already begun outreach to Green Diamond Natural Resources Company, which resulted in a signed memorandum of understanding that they will participate in Master Plan development.

We have begun discussions with other potential partners who may be sources of funding for the pilot project implementation aspects of this project. Conversations with the Coast Salmon Partnership and the Chehalis Basin Lead Entity show support for our project scope. We have secured a letter of support from the lead entity.

The experience of our team at Grays Harbor Conservation District is a major contributor to our ability to proceed immediately and effectively with this project. We have years of experience at assessing stream conditions in the field, managing large scale restoration projects, securing state and federal permits, conducting landowner outreach around restoration, and contracting with skilled consultants for design work.

**Upload a Project Schedule that includes all tasks necessary to complete the project, including tasks that are not part of the funding request.**

Project Schedule

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**Attachment Description**

Project Schedule

**Attachment**

\_Upload/98245\_906603-EcologyWaterQualityGrant2020Schedule  
ProjSchdhorizlong.pdf

## Project Planning and Development

**Describe the process used by your organization to select the project for implementation. In your description please include:**

- (1) All criteria used to evaluate the value, feasibility and site suitability of the proposed project.*
- (2) Alternatives to the proposed project that were considered.*
- (3) A list of project stakeholders, their involvement in the decision-making process, and their level of support for the project.*
- (4) The plan to ensure long term project success and maintenance of the water quality benefits.*

The District works with landowners throughout Grays Harbor County to conserve natural resources. During our work with floodplain landowners in the Satsop and Wynoochee watersheds, we have been consistently alerted of water quality concerns that originate in the tributaries of these systems. Our time collaborating with stakeholders on basin-wide restoration efforts has identified restoration of Wynoochee/Satsop tributaries as critical to improving the water quality of these important rivers. Further degradation of sediment, temperature, and dissolved oxygen conditions will contribute to impaired conditions. After establishing the need for tributary restoration in the Satsop and Wynoochee watersheds, the District gathered input from consultants with expertise at landscape level river restoration. We defined the scope of our project according to key data gaps and feasibility. We identified the need to assess the suitability of various types of in-stream restoration techniques for various stream types and orders in the Satsop/Wynoochee. We decided that this type of analysis was best performed at the entire watershed level, and confirmed that this analysis could feasibly be performed on both watersheds during the grant funding period. We determined that this type of analysis would be necessary before implementing actions, which is why the project will be conducted in two phases. The first phase being Strategy development and the second phase being pilot project implementation. This phasing is important because the value, feasibility, and suitability of in-stream wood restoration according to stream reach will be determined during the first phase. It will allow for pilot project implementation and future implementation projects using our assessment to cost-effectively improve water quality.

**Considered alternatives:**

We considered an analysis of the entire Chehalis Basin, however this was considered infeasible due to the level of jurisdictional coordination and analysis that would need to occur during the lifetime of the grant funding. We determined that conducting our analysis and implementing one pilot project would provide a framework for future work in the rest of the watershed. Furthermore, we decided that lessons learned during this project will allow for more cost-effective analysis and implementation for the entirety of the basin.

We considered conducting implementation on a subset of streams in the Satsop/Wynoochee watersheds in lieu of undertaking an analysis of the entire watershed. Although this would allow for immediate on the ground impacts, we determined that a number of data gaps would limit our ability to perform the most impactful and cost-effective restoration projects. Developing an implementation strategy will allow projects to be focused on stream reaches where water quality improvements and value are maximized.

We considered only developing an in-stream restoration toolbox, as a general tool for restoration analysis in western Washington streams.

**Project Planning and Development**

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However, we decided that applying the toolbox to actual watersheds and implementing a pilot project would demonstrate the applicability and effectiveness of the techniques, which would then create momentum for this type of strategy to be applied to other streams in western Washington.

**Project stakeholders:**

Grays Harbor Conservation District - Involved in developing project scope and all proposal elements; lead on landowner outreach and project management. High level of support for the project because of the ability to improve natural resource and water quality conditions in the county.

Green Diamond Natural Resources Company - Will be involved in development/application of Restoration Strategy. Medium level of support for project due to uncertainties, however the company has a high level of support for stream restoration actions on their properties. They have signed a memorandum of understanding to participate in Restoration Strategy development.

Weyerhaeuser - Will be contacted during development/application of Restoration Strategy. Unknown level of support at this time.

Small forest landowners - Will be contacted during development/application of Restoration Strategy. Unknown level of support at this time.

Long term success for the Restoration Strategy will be achieved if private landowners and restoration entities use the strategy to implement cost-effective in-stream wood restoration projects that sustainably and systematically enhance water quality throughout the Satsop/Wynoochee watersheds. To ensure this success, we will conduct landowner and restoration group outreach both during and after Strategy development. This will result in a strategy that clearly identifies incentives for landowners and is simple to implement for restoration practitioners.

Long term success for the pilot implementation project will be achieved if the installed in-stream restoration structures function to improve water temperature and dissolved oxygen conditions and sort/retain sediment. The analysis that precedes Strategy development, which identifies suitable project sites and techniques for water quality improvement, will help to ensure success. Furthermore, the experience of the project team at working with landowners and implementing river restoration projects will contribute to implementation success. The development of a monitoring and adaptive management plan by the project team will allow for adjustments to be made during and after implementation so as to ensure structures are fully functioning and water quality benefits are maintained.

**Attachment Description****Attachment**

Water Quality and Public Health Improvements

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**Name the water body(ies) the project will improve or protect and describe the current regulatory requirements and available planning documents for the water body. Include a description of any NPDES permitting requirements, TMDLs, or local watershed plans.**

The project will improve water quality in the Satsop/Wynoochee watersheds by creating an in-stream Restoration Water Quality Enhancement Strategy. The Forest Practices Act (FPA), with its associated riparian regulations, applies to these streams. Green Diamond Natural Resource Company (GDNRC) has adopted a Habitat Conservation Plan for its properties in these watersheds, which carries alternative riparian management regulations to the FPA. An important component of our analysis and landowner outreach will determine how the various riparian regulations relate to our in-stream wood restoration techniques, which will result in restoration prescriptions that are feasible for landowners to implement and consistent with current regulations.

Current water quality listings of stream segments in the Satsop/Wynoochee that will be included in our restoration strategy analysis are: Wynoochee River - Category 2 temperature (listing IDs 73509, 73150), Category 2 dissolved oxygen (listing IDs 77761, 77762), Category 5 dissolved oxygen (listing ID 77976); Satsop River - Category 2 temperature (listing IDs 7315, 73506, 73508), Category 2 dissolved oxygen (listing IDs 77760, 77759), Category 5 dissolved oxygen (listing ID 77974, 77973, 8038), Category 5 temperature (listing IDs 72703, 72704); Black Creek - Category 5 temperature (listing ID 7735); Unnamed Creek (Trib to Bitter Creek) - Category 5 temperature (listing ID 72719).

Simpson Timber Company (now GDNRC) developed a TMDL for their forestland properties in the Satsop/Wynoochee watersheds in 2000. The TMDL identifies high summer water temperatures as a water quality concern for fisheries resources. At the time of the TMDL development, 4 stream segments on Simpson property in these watersheds were on the 303(d) list for temperature. However, during TMDL development they decided to include all of the Wynoochee/Satsop streams that intersect their property in order to avoid future impairments. The plan prescribes effective shade targets for their streams and sets allocations for sediment loading. Our proposed project will not implement the prescriptions outlined by the Simpson TMDL. Instead, our proposal will create prescriptions and implement actions that contribute to the overall goal of the TMDL, which is to improve stream temperature conditions. Our project will not decrease sediment loading from forest management, but it will attenuate the impacts of sediment that is delivered to the stream system.

**Local Watershed Plans:**

The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy for WRIA 22 and 23: The Lead Entity strategy has identified water quality concerns for both the Satsop and the Wynoochee. The Satsop River is listed as having excess siltation and suspended solids from non-point sources. Temperature issues are declared to be associated with impaired riparian conditions (lack of trees or hardwood dominated). The Wynoochee River has poor water quality due to high water temperatures. The high water temperatures are attributed to the combination of warmer weather, dam operations, logging, and reduced stream shading. Sediment dynamics in the Wynoochee are identified as contributing to poor water quality conditions. Issues from sediment are attributed to a variety of non-point sources such as impaired riparian/stream conditions, forestry/agricultural land uses, and high road densities.

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**Water Quality and Public Health Improvements**

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Chehalis Basin Watershed Management Plan: The Chehalis Basin Partnership developed this plan in 2004. The plan recognizes the negative water quality impacts (low temperatures and low DO) that stem from low summer flows throughout the basin. The plan proposes the creation of programs to identify and address non-point sources of degradation so as to improve streams that are currently impaired and avoid future impairment listings. Such a program has not been developed to address temperature, sediment, or dissolved oxygen non-point pollution in tributary streams of the Satsop and Wynoochee.

Chehalis Basin Strategy Aquatic Species Restoration Plan (ASRP): The ASRP was created by the Chehalis Basin Strategy to address declining aquatic species populations in the basin. The initial plan identifies basin-wide water quality issues such as elevated temperatures, increased sedimentation, and low DO. The plan outlines how the degradation of aquatic/riparian habitat in the Chehalis basin has led to a loss of functions including but not limited to, sediment retention/sorting, connected floodplains, and groundwater recharge. An overarching goal of the ASRP is to restore aquatic ecosystem functions to healthy levels. This includes the restoration of floodplain habitats, riparian corridors/processes, and large wood in rivers. Behind the techniques proposed by the ASRP is a commitment to process-based restoration, which will restore the ability of aquatic habitats to sustain ecosystem function over time, and naturally improve the water quality conditions identified above.

**Describe how the project area is connected to this water body and how implementation of the project will meet regulatory requirements or support the water quality planning efforts listed above. Reference the specific requirements or recommendations that the project will address and discuss how the project will reduce or prevent the pollutants listed from entering the waterbody. All projects in the Puget Sound Region must include the elements of the Puget Sound Action Agenda that will be supported by the proposed project.**

The project area for the Restoration Strategy includes the Wynoochee and Satsop watersheds, and the pilot project reach will be chosen from within the two watersheds. Both water temperature (and related DO) impairments and excess sediment are a consequence of the loss of natural stream functions upstream, including riparian shading, sediment erosion and deposition, and interactions with side channels and groundwater. The watershed and stream channel conditions within the entire tributary network control the amount and timing of the downstream transport of streamflow, cold water, and sediment load. Thus, the individual locations for prioritizing restoration actions will be based less on whether the reach has a specific impairment and more on the position of the reach within the stream network and the potential downstream benefit for all impaired reaches. In the Satsop and Wynoochee watersheds both planning for and implementation of upstream actions to restore these natural functions will have a downstream water quality benefit. In addition, these water quality impairments are the result of distributed impacts, and therefore an overarching Restoration Strategy that targets distributed actions in the watersheds will provide a roadmap for improving downstream conditions.

The TMDL for our project area addresses two of the driving factors for water quality impairment in these basins by improving effective shade and limiting sediment loading. Our proposal will build upon the TMDL by addressing in-stream conditions that are out of the purview of the

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**Water Quality and Public Health Improvements**

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TMDL, but nonetheless are significant for enhancing water quality over the long-term through natural process re-establishment.

The plans listed above denote a general recognition that in-stream restoration can improve downstream water quality in the Satsop and Wynoochee, however they do not include detailed implementation strategies for addressing the non-point source impairments. Our proposed strategy is a natural progression of these plans in that it will provide detailed reach-scale analysis towards improving watershed conditions.

**Describe the measure and method that will be used to determine the water quality benefit and overall success of the project.**

The success of each component of the project will be evaluated independently: (1) the Restoration Strategy framework, and (2) the effectiveness of the pilot project to improve water quality.

The success of the Restoration Strategy and its associated restoration toolbox will be evaluated based on feedback from forest landowners and restoration practitioners (i.e., quality of strategy, usability of analytical toolbox) and based on the number of people/organizations to whom the Strategy is delivered via workshops, downloads, and electronic communications. We will receive some of this feedback during presentations of our project results to landowners, the Chehalis Basin Lead Entity, and the Chehalis Basin Strategy Aquatic Species Restoration Program Steering Committee. By presenting to these groups (and soliciting feedback) during the development of the Restoration Strategy, we are more likely to have a successful rollout of the final strategy.

The success of the pilot water quality restoration project will be evaluated via quantitative measures of sediment retention and hydrologic effects. Pre- and post- project topographic evaluation (e.g., manual survey or drone-based lidar) will provide estimates for change in bed elevations with the implementation of restoration actions. A positive change (i.e., bed aggradation) provides a basis for estimating the volume of sediment retained. Pre- and post-project hydrologic data (e.g., groundwater monitoring wells and/or discharge measurements, depending on the typical flows at a project reach) will be used to interpret hydrologic effects of project implementation. For example, increased groundwater elevations during the spring and early summer would suggest more in-situ water storage and therefore high potential for contributing colder, higher DO water during the low flow season, indicating water quality enhancement success.

**Using the method described above, estimate the water quality and public health benefits that will be achieved through implementing of the proposed project.**

Water quality benefits from the implementation of this project will be relatively minimal. The strategically chosen pilot project will result in quantifiable improvements to sediment retention, water temperature, and dissolved oxygen. As mentioned in the project description, in-stream restoration actions that increased floodplain storage have resulted in a 3 °C decrease in stream temperature downstream due to enhanced groundwater inputs (Loheide and Gorelick, 2006). Preliminary findings from a reach-scale in-stream restoration project on the

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**Water Quality and Public Health Improvements**

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Mission Creek watershed in eastern Washington indicate successful retention of substantial amounts of sediment and inferred increases in groundwater storage. Topographic survey and time lapse photographs demonstrate re-aggradation of the channel bed within and upstream of the in-stream structures. For example, topographic data from one of the structures shows a decrease in channel gradient from 5% to 3% from project implementation. Assuming a porosity of 50% within the in-stream wood structure, this translates to a net retention of 200 ft<sup>3</sup> (~7 cubic yards) of sediment behind and within a single structure (note that 19 similar structures were installed in a 0.5 mile project reach). Backwater areas upstream of the structures and bank seepage downstream provide evidence that the aggradation and rise in surface water elevation upstream of the structure is also contributing to in-situ groundwater storage and downstream contribution to surface flows (which can improve temperature and DO)(results sourced from dialogue with Natural Systems Design, project engineers). We would expect to see similar water quality improvements for our pilot project, with expected differences due to climate and channel characteristics.

However, the water quality improvements from our pilot project will be localized to within and downstream of the project site. This is why our project will create a Restoration Strategy that will provide a project roadmap for the Satsop and Wynoochee that will result in substantial and long-term water quality benefits. No one reach scale project can improve water quality impairments that result from non-point watershed issues, which is why a component of our work will involve outreach to landowners and practitioners, to ensure that the strategy is implementable into the future.

Loheide SP, Gorelick SM. 2006. Quantifying Stream-Aquifer Interactions through the Analysis of Remotely Sensed Thermographic Profiles and In Situ Temperature Histories. *Environmental Science & Technology* 40 (10): 3336–3341 DOI: 10.1021/es0522074

**How long will the project provide a water quality benefit after the funding assistance ends? Who will be responsible for maintaining this benefit during its useful life?**

A completed Water Quality Restoration Strategy will provide a benefit to stakeholders in the Wynoochee and Satsop basins into the foreseeable future. Our project is designed to create a resource for landowners and restoration practitioners so that cost effective and feasible project locations for water quality enhancement can be more easily identified and implemented. By creating a bridge between general Chehalis Basin watershed plans and on the ground restoration, we expect that investment in this strategy will create a trajectory of sustained water quality benefit for these watersheds. Furthermore, we expect that our analytical process and restoration toolbox for creating the strategy will be applicable to other watersheds in Western Washington. Thus, our project will create a model for planning for and implementing cost-effective water quality enhancement projects throughout the region.

The longevity of the sediment retention benefit of the pilot project will depend on the reach that is chosen for treatment, because the amount of in-situ sediment storage and the rate at which it fills up will vary with channel morphology and local sediment loads. In sediment impaired reaches in the Puget Sound region, the sediment retention benefit of in-stream treatment for a stream with a 5% channel gradient was estimated at 50-90 years. In addition, since the treatments are designed to arrest channel incision and dissipate the erosive energy of the

**Water Quality and Public Health Improvements**

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stream, a positive feedback loop is anticipated, in which natural processes that store sediment and water locally will be restored.

Actions to restore natural functions that decrease temperature and DO are likely to provide this benefit into perpetuity. Restoration actions that are appropriate for reach characteristics will re-initiate natural processes by raising channel bed elevation, increasing water surface elevation and providing flow resistance. These effects contribute to increased exchange of water between the stream and groundwater, which decreases temperature, and therefore DO. Restoration actions initiate a “recovery trajectory” for the ecosystem, in which positive feedbacks leads to additional function through time.

**Will any measures be taken to reduce greenhouse gases as part of the project? What policies or measures has your organization put in place to reduce greenhouse gas emissions apart from this project?**

The Restoration Strategy will be developed so as to create efficient, cost-effective restoration prescriptions for reaches of the Satsop and Wynoochee. One analysis that will be a part of this project involves the question of how to implement projects with limited use of heavy machinery. Not only is heavy machinery use costly, but it also creates more greenhouse gas emissions than hand tools. Where prescriptions do include heavy machinery usage, suggested actions in the strategy will include minimizing the impact on vegetation from the staging and use of machinery.

Furthermore, the suite of in-stream restoration actions included in the strategy will all be designed to reengage floodplain habitat, which will increase the availability of water for riparian plants. This reduces water stress on plants making them more resilient to fire, drought, and insects and allowing them to grow more robustly, all contributing to enhanced carbon sequestration.

Finally, the creation of the strategy will largely involve desktop analysis and we will limit field reconnaissance to only essential data gathering visits. Data gathering will be strategically coordinated so as to make the fewest driving trips into the field, and when trips are taken, fuel efficient routes are taken. These actions will reduce vehicle emissions.

**Upload a map or maps that show an aerial view of the project area, an estimated direction of flow for the project area, potential locations for the proposed facility or activity, and how the project connects to the water body named above.**

*These maps do not need to be precise but they should help the reviewer with a general understanding of the area. If access to GIS software is not available, screen shots or snips from Google Maps with arrows and text added using a paint program may be used.*

**Attachment Description**

Vicinity Map

**Attachment**[\\_Upload/98435\\_906599-VicinityMap-Satellite\\_Image.pdf](#)

Water Quality and Public Health Improvements

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Land Use Map

\_Upload/98435\_906599\_2-LandUseMapV2.pdf

**Environmental and Cultural Review**

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## Instructions:

Please upload the appropriate documents.  
The type of project and the funding source you're applying for or have received determines the Environmental and Cultural Review documents that you must upload.

When done, click the SAVE button.

If you have a wastewater or stormwater facility project, and you are applying for or have received a loan from the CWSRF, when applicable upload the following documents.

- SEPA Checklist
- SEPA Threshold Determination
- Affidavit of Publication of SEPA Threshold Determination
- Public Meeting Documents
- SERP Coversheet
- SERP Checklist
- SERP Determination
- Other SERP/SEPA Documentation
- Ecology 05-05/106 Review Form
- EZ-1 Form (If Ecology is the lead agency, an Ecology 05/05-106 Form is required)
- Cultural Review Final Determination
- DAHP Letter of

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**Environmental and Cultural Review**

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Concurrence  
Completed  
activity/location specific  
Inadvertent Discovery  
Plan (IDP).

An IDP is not associated with consultation and is required in the event of a discovery during ground disturbance.

In addition to the above documents, if you are required to prepare a federal cross cutter report, when applicable upload the following documents.

Cross Cutter Report  
Cross Cutter Checklist  
Cross Cutter Final  
Determination

If you have a stormwater facility project, and you are applying for or have received funding via SFAP but not CWSRF, when applicable upload the following documents.

SEPA Checklist  
SEPA Threshold  
Determination  
Affidavit of Publication of  
SEPA Threshold  
Determination  
Ecology 05-05/106  
Review Form  
EZ-1 Form (If Ecology is  
the lead agency, an  
Ecology 05/05-106 Form  
is required)  
Cultural Review Final  
Determination (No  
sensitive information

Environmental and Cultural Review

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allowed)  
DAHP Letter of  
Concurrence  
Completed  
activity/location specific  
Inadvertent Discovery  
Plan (IDP).

An IDP is not associated with consultation and is required in the event of a discovery during ground disturbance.

If you have a nonpoint activity, an onsite sewage system, or a stormwater activity project, regardless of the funding source, when applicable upload the following documents.

Ecology 05-05/106  
Review Form  
EZ-1 Form (If Ecology is  
the lead agency, an  
Ecology 05/05-106 Form  
is required)  
Cultural Review Final  
Determination (No  
sensitive information  
allowed)  
DAHP Letter of  
Concurrence  
Completed  
activity/location specific  
Inadvertent Discovery  
Plan (IDP).

An IDP is not associated with consultation and is required in the event of a discovery during ground disturbance.

Upload Documents

Environmental and Cultural Review

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Description

Attachments