NORTH COAST INTEGRATED REGIONAL WATER MANAGEMENT PLAN

Implementation Grant Proposal
Proposition 84, Round 2

ATTACHMENT 7:

Technical Justification of Projects

Integrated Regional Water Management Program
Applicant: Humboldt County

North Coast Integrated Regional Water Management Plan

Proposition 84, Round 2 Implementation Grant

Attachment 7. Technical Justification of Projects

Introduction

The North Coast Integrated Regional Water Management Plan (NCIRWMP) Proposition 84, Round 2 Implementation Proposal (Proposal) and its thirteen high priority projects comprise a geographically diverse and well integrated implementation program with multiple water supply, water quality, watershed health, habitat restoration and socio-economic benefits. Each project will be implemented by recognized experts in their fields after careful scientific and engineering assessments and analyses using the most recent and relevant technological applications. Listed below is each project team, the technical assessments and analyses with which the project has been developed, and an explanation of and technical justification for the physical benefits provided.

Unlike in more urban regions, built infrastructure connectivity is not required for achieving the NCIRWMP goals and objectives given the decentralized nature of the communities in the region and the regional scale connectivity of ecosystems, watersheds and habitats. The NCIRWMP PRP and TPRC determined that a series of scientifically and technically valid projects distributed throughout the region – addressing both local and statewide priorities – is the best approach for meeting the NCIRWMP objectives. While geographically separate, the NCIRWM projects in the proposal implement the highest priorities identified by natural resources agencies in the North Coast. For example, all of the projects that address salmonid restoration are acting upon recommendations by the California Department of Fish and Wildlife and/or NOAA Fisheries and are located in watersheds that the Department of Fish and Wildlife considers to be high priority for the recovery of endangered salmonids. Additionally, these projects collectively implement voluntary TMDL attainment for the region and work towards collaborative habitat enhancement specifically targeted at the California Central and North Coast Coho ESUs. NCIRWM Projects - such as the water conservation and in-stream water supply projects in the Russian, Smith, Trinity and Mad River watersheds, or the integrated salmonid restoration approach for the Klamath and Gualala rivers - have far-reaching implications for salmonid recovery in the region and

beyond. Collectively, the NCIRWMP suite of salmonid restoration projects, implement the NCIRWMP goals and objectives related to salmonid recovery. All of the thirteen priority projects that make up the Proposal, benefit and are located in disadvantaged communities; nine priority projects wholly and four partially. Two Priority Projects are focused on enhancement of land and resources for Native American Tribal communities. Three of the Priority Projects address critical drinking water supply and water quality need in disadvantaged communities, as defined by the IRWM Guidelines and can be classified as California Department of Public Health Safe Drinking Water State Revolving Fund ranking categories B or E. These projects demonstrate how physically separated projects can collectively implement the goals and objectives of the NCIRWM Plan. These projects address serious water impairments in the region – prioritized by the TPRC and PRP due to their impacts on regional public health and other beneficial uses of water – including salmonid viability. These projects will address environmental justice issues in Tribal and disadvantaged communities by allowing for enhanced economic development via recreational tourism, recreational and commercial fishing, clean drinking water and other mechanisms. Local, regional, state and national energy and climate mitigation/adaptation priorities are integrated into several projects, and the majority of projects support climate change mitigation via energy conservation/GHG emissions reduction, and/or adaptation to climate change. All of the projects that were selected for inclusion in the NCIRWM Proposal address statewide priorities and program preferences – both individually at the project site scale and collectively at the regional scale. The responsiveness of the NCIRWM Proposal to statewide priorities and program preferences is addressed in much more detail in Attachment 9 (Program Preferences) and Attachment 10 (Disadvantaged Community Assistance).

Uncertainty in delivering project benefits is related to circumstances and events out of the control of the project proponents and the RWMG, such as funding availability, drastic weather pattern changes due to global climate change, large seismic events, changes in ocean conditions that affect salmonid populations, and other natural and social catastrophic events. To the extent that the project proponents and RWMG can control project implementation, there is little uncertainty that the projects in this Proposal will deliver stated benefits. The NCIRWM Proposal and process relies on the best available science to plan and prioritize projects; the NCIRWM Phase II Plan identifies all of the relevant watershed plans, technical documents and agency guidance for the Region. Project proponents have developed substantial libraries of technical and scientific data in support of project planning and design and have been working collaboratively with scientists from agencies including DWR, CDFW, USEPA, NRCS, NCRWQCB, and NOAA Fisheries on related projects for years, if not decades. Finally, the NCIRWMP Technical Peer Review Committee (TPRC) is comprised of scientists with a long history of research, planning and implementation experience in the North Coast. This committee evaluates the degree to which projects address Program Preferences and the likelihood that they will provide the intended results. The TPRC prioritizes projects for the Policy Review Panel based on technical and scientific merit and makes suggested revisions to enhance the project's responsiveness to statewide preferences and priorities. This regional and project-specific emphasis on scientifically and technically sound planning and implementation creates certainty that the projects included in this Proposal will deliver the benefits below.

A. North Coast Rivers Watershed Management Area - North

101- Big Rock Community Services District, Stabilize Water Storage Tank

Project Team

The Big Rock CSD was formed in September 1966 to provide potable water and other services to the inhabitants of the District. Though limited by funding, the CSD effectively manages the municipal water system by networking with the Rural Community Assistance Corporation, the Redwood Water Resources Network, the Gasquet CSD, and Crescent City, and it constantly strives to remain in compliance with the myriad regulations that apply to water distribution, management, and treatment. Its custom Supervisory Control and Data Acquisition (SCADA) system, its skilled volunteer workers, anticipatory planning, networking, and immediate attention to the increasing frequency of infrastructure failures due to 42 years of system aging collectively enable the Big Rock CSD to address its growing number of issues. The CSD has implemented several grant funded emergency upgrades projects over the last several years, including installation of emergency generators at the project site and at the pumping/treatment facility. The District also recently completed an upgrade of the intake system. Cal-EMA and FEMA are collaborating partners in this project, particularly Richard Castillo, Emergency Services Coordinator with Cal-EMA. This project was included in the Del Norte County Local Hazard Mitigation Plan. For project implementation, the CSD is using GHD, an international network of engineers, architects, and environmental scientists with decades of experience on California's North Coast.

Technical Justification for Project

This project will be constructed to meet both state and industry standards to protect the tank from seismic events and include appropriate construction methods, coating, and disinfection for the tank. Standards include, 2010 California Building Code, AWWA D102 Coating Steel Water Storage Tanks, AWWA D104 Cathodic Protection for Interior of Steel Water Tanks, AWWA Standard C652-92 Disinfection of Storage Facilities, National Sanitation Foundation ANSO/NSF Additives Standard No. 61. GHD has completed several technical documents for this project that are included with the application materials (See Attachment 3, Workplan, Appendix A, Priority Project Plans, Specifications, Technical Studies and Scientific Data). The technical documents are described in the table below.

Table 7.1 – Big Rock CSD Technical and Scientific Documentation Table

Technical and Scientific Document Name	Document Description	Relevant page #
GHD. Big Rock Community Services District Water Storage Tank Stabilization Project-Benefit Cost Analysis Support, 2012	Benefit Cost Analysis software, version 4.5.5.0, was used to find a benefit cost ratio for the Big Rock CDS project.	All
GHD. Big Rock Community Services District Water Tank Stabilization Project-Supporting Information for Environmental	The Supporting Environmental Information Checklist provides information on the relevant environmental factors. Some of these items will be addressed in more	All

Checklist, 2012	detail in Environmental Documentation to come.	
GHD. Big Rock CSD Water Storage Tank Stabilization Project- Scope of Work, 2012	The Scope of Work (SOW) document describes the methodology of the project as well as specific items that are included in the scope of the project.	All
GHD. Project Location Map, 2012	Provides project location and vicinity of tank stabilization project.	N/A

Project Physical Benefits

Conditions Without the Project. Big Rock Community Services District (BRCSD), located in Del Norte County, supplies water to about 650 permanent residents of the Disadvantaged Community of Hiouchi. It also serves about 1,200 tourists who seek lodging during the summer season in Jedediah Smith Redwoods State Park and the Smith River National Park.

BRCSD's water system has a 100,000 gallon water storage tank, which was built in 1971 on a steep hillside with grades between 50 and 70 percent. Water runoff from the mountain above has eroded the tank's foundation. This has increased the likelihood the gravel fill prism under the tank would fail during a 5.5 or greater magnitude earthquake that occurred during the winter when the ground was saturated. If this should occur, it likely would cause a massive landslide that would destroy the District's water system, approximately 19 homes in Hiouchi, and portions of Highway 199. This damage could result in deaths and would disrupt water service to other customers until the system could be restored. The landslide could eventually reach the Smith River, depositing a large sediment and debris load into the river. This would create water-quality issues for downstream water users and damage salmonid habitat.

Conditions With the Project. The project would replace the system's existing water storage tank with a new tank built to modern seismic standards and anchored into bedrock. BRCSD would build it on county land immediately adjacent to the existing site, which it is in the process of acquiring. Before construction could begin, BCRSD would improve the access road to the storage tank area by grading and placing a compacted aggregate base on the road surface. It would also put in place a temporary water system utilizing an existing 50,000 gallon tank. This would maintain minimum water pressure in the system, but water supply to customers would be reduced. To address the temporary shortage, BCRSD would enact temporary water conservation measures and notify fire suppression agencies to locate alternate sources of water during construction.

Construction would involve excavating the new site to bedrock, building a retaining wall, and installing tank foundation and footings. Site drainage features and features to prevent damage to downslope properties would be installed. BRCSD would then install a new tank, piping, and valves, including a seismic shut off valve, which would prevent a broken pipe from draining the entire tank. Communications, lighting, and monitoring equipment would all be installed.

Once construction is complete, the new tank would undergo disinfection and water quality testing before BRCSD brings it back online. Once online, BRCSD would lift water conservation measures and restore fire protection services. BRCSD would dismantle the existing 100,000 gallon tank and sell the Redwood staves.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Addresses critical drinking water supply and water quality need in disadvantaged communities, as defined by the IRWM Guidelines and can be classified as California Department of Public Health Safe Drinking Water State Revolving Fund ranking category E, supporting goals of DWR, CDPH, and the California Water Plan, increasing regional environmental justice and the provision of safe drinking water for DACs.
- Through the prevention of sediment and debris deposition to the Smith River, this proposal supports water quality and salmonid habitat goals of the NCRWQCB, DFW, and NOAA fisheries as well as the NCIRWMP, protecting salmonid habitat in the region.

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-101 through 9.5-101, included at the end of this section.

- Reduced risk of catastrophic landslide into Smith River which would cause sediment and debris to impair water quality and degrade salmon habitat
- Reduced risk to 19 homes from catastrophic landslide
- Reduced risk to other infrastructure from catastrophic landslide
- Reduced risk of deaths from landslide
- Reduced risk of injury (major and minor) from landslide

Methods for estimation. The estimate of avoided death and injury was determined from a door-to-door survey of residents in homes in the path of a landslide, and assumes all would be affected with highest risk of death in homes at the front of the impact zone. Estimate of the risk and extent of damage is based on geotechnical modeling results provided in the technical justification of benefits.

Acknowledgement of New facilities, policies, and actions required. This project requires the construction of a temporary tank, a new tank foundation anchored into bedrock, and a new 100,000 gallon water storage tank, complete with piping, valves, and communications, lighting, and monitoring equipment. For greater detail, please see “Conditions With the Project,” above.

Adverse physical effects. The project may produce temporary impacts, including disturbance of the new site and adjacent properties during construction. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations.

Uncertainty. Lack of funding is the most significant obstacle to implementation of safe drinking water projects, and the major factor creating uncertainty in achieving this project's goals of improved water supply reliability and quality. Additional uncertainty arises when considering events outside of the project proponent's control, such as differences in weather patterns caused by climate change, extreme seismic events, or other catastrophic societal or natural events.

The NCIRWMP framework and process has built-in mechanisms to ensure that safe drinking water projects from disadvantaged communities are identified, planned and implemented, including outreach and technical assistance support, technical and engineering support to project proponents from disadvantaged communities, one-on-one assistance with applications, and the formation of a regional sub-group comprised of small water supply and wastewater treatment facility operators.

Table 9.1-101 – Annual Project Physical Benefits

Project Name: 101 - Big Rock Community Services District, Stabilize Water Storage Tank

Type of Benefit Claimed: Reduced risk of environmental damage

Measure of Benefit Claimed (Name of Units): Unquantifiable

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015-2064	High Risk	Very Low Risk	Reduced Risk

Comments: A landslide triggered by tank failure during wet weather or an earthquake would deposit sediment into the Smith River. This would degrade water quality with sediement and debris and damage salmon habitat.

Table 9.2-101 – Annual Project Physical Benefits

Project Name: 101 - Big Rock Community Services District, Stabilize Water Storage Tank

Type of Benefit Claimed: Structures protected from landslide

Measure of Benefit Claimed (Name of Units): Residential properties

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015-2064	0	19	19

Comments: 19 residential homes would incur property damage from a landslide. The project would reduce the risk of tank failure triggering a landslide, protecting these properties.

Table 9.3-101 – Annual Project Physical Benefits			
Project Name: 101 - Big Rock Community Services District, Stabilize Water Storage Tank			
Type of Benefit Claimed: Other infrastructure protected from landslide			
Measure of Benefit Claimed (Name of Units): Types of infrastructure protected			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015-2064	0	Campground Highway 199	Campground Highway 199
Comments: A campground and Highway 199 would be damaged or destroyed from a landslide. The project would reduce the risk of tank failure triggering a landslide, protecting this infrastructure and property.			

Table 9.4-101 – Annual Project Physical Benefits			
Project Name: 101 - Big Rock Community Services District, Stabilize Water Storage Tank			
Type of Benefit Claimed: Reduced deaths from landslide			
Measure of Benefit Claimed (Name of Units): Number of deaths if landslide occurs			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015-2064	31	0	-31
Comments: Homes in the path of the landslide would result in deaths of occupants in a landslide triggered by a 6.0-magnitude earthquake. This benefit represents the number of deaths that would be avoided over the project lifespan by reducing the risk of landslide. Staff conducted a survey to determine there are 62 people living within the 19 homes in the impact area. Assumes all people would be home at the time of the event.			

Table 9.5-101 – Annual Project Physical Benefits			
Project Name: 101 - Big Rock Community Services District, Stabilize Water Storage Tank			
Type of Benefit Claimed: Reduced injury from landslide			
Measure of Benefit Claimed (Name of Units): Number of injuries if landslide occurs (major and minor)			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015-2064	31	0	-31
Comments: Homes in the path of the landslide would result in injury of occupants in a landslide triggered by a 6.0-magnitude earthquake. This benefit represents the number of injuries that would be avoided over the project lifespan by reducing the risk of landslide. Major injuries = 19, minor injuries = 12. Staff conducted a survey to determine there are 62 people living within the 19 homes in the impact area. Assumes all people would be home at the time of the event.			

B. North Coast Rivers Watershed Management Area - North

320 – Mendocino County Resource Conservation District, Working Landscapes Riparian Enhancement Project

Project Team

The Mendocino County Resource Conservation District (MCRCD) is a non-regulatory, local agency supporting voluntary stewardship of natural resources on wild and working landscapes since 1945. MCRCD assists landowners in sediment reduction projects, streambank protection, invasive species removal, riparian design, re-planting with native plants, and permitting assistance. Since 2000, MCRCD has removed three miles of river front invasive vegetation and replanted with natives and protected over 2,000 feet of streambank to prevent excessive erosion in addition to other sediment reduction, restoration, and erosion control efforts. The RCD has successfully implemented at least thirteen similar projects in its district from TMDL implementation to habitat enhancement, including the 319(h) Garcia Headwaters TMDL Implementation Project, the DFG Mill Creek Coho Habitat Enhancement Project, the DFG Red Hill Gulch Adaptive Management Project, and the DFG Upper Russian River Exotic Invasive Removal Project. Collaborating partners include the Natural Resources Conservation Service, which is providing technical assistance and cost-share, Caltrans, which is providing matching funds, The Department of Conservation, which is providing funding for staff time, and the Department of Fish and Wildlife, which is providing permitting assistance. Five private landowners are also collaborating by providing in-kind contributions and allowing the work to be performed on their land, in part due to the trust relationships built between MCRCD and local landowners over the past six decades and in part due to MCRCD's reputation for excellence in project implementation.

Technical Justification for Project

The critical state of riparian plant communities in California has provided the impetus for several *Arundo* removal programs to address the influence of giant reed on water supply, fire danger, and impacts to native riparian habitat and the species which depend upon it. The proposed tasks of riparian restoration, invasive plant removal, channel restoration and stream bank stabilization have been analyzed in several texts and manuals (*Table 7.2, Mendocino County Resources Conservation District Technical and Scientific Documentation Table*). Discussion of *Arundo* impacts and prescriptions are contained in the Russian River Integrated Coastal Watershed Management Plan (MCRCD 2012); the Russian River Basin Fisheries Restoration Plan (CDFW 2002); the North Coast Integrated Regional Water Management Plan (North Coast Regional Partnership 2007); and the Russian River Biological Opinion (SCWA). For the Denmark Creek Project, technical justification is supported by the Navarro Watershed Restoration Plan (Entrix, 1998). The Plan states, "It is important to maintain and improve spawning and rearing habitat in the Anderson Creek basin to prevent fragmentation and potential loss of steelhead habitat (p. 5-7)." The NOAA/NMFS SWR, Dec. 2012 Map of core and phase areas for intrinsic potential for coho and steelhead in the Navarro watershed, shows Denmark Creek with a mix of high/medium potential habitat for steelhead, and some medium potential habitat for CCC coho. The fish passage barrier the project will be addressing is shown as a partial barrier on this map.

MCRCD implements best management practices following Chapter 11, Riparian Restoration in the California Salmonid Stream Habitat Restoration Manual (2010) and NRCS Field Office Technical Guide Standards.

Table 7.2, Mendocino County Resource Conservation District Technical and Scientific Documentation Table

Technical and Scientific Document Name	**Document Description**	**Relevant page #**
Russian River Coastal Integrated Coastal Watershed Management Plan, MCRCD 2012 http://mcrcd.org/publications/	The RRICWMP is a watershed-specific, planning document specific to the Russian River and contextualized within the North Coast Integrated Regional Water Management Plan framework. The plan was developed by conducting research and analyzing current and historic scientific, socioeconomic, and policy data, and enlisting stakeholders and watershed experts to identify key management issues.	84-86
Russian River Basin Fisheries Restoration Plan, CDFG 2002 http://www.northcoastirwmp.net/docs.php?oid=1000008649&ogid=1000002244	The goals of the restoration plan includes identifying and prioritizing high priority factors that may restore functionality to watershed systems or lifecycle patterns specifically for anadromous salmonids/	125-126
Russian River Biological Opinion, SCWA http://www.scwa.ca.gov/rrifr/	This Biological Opinion was developed pursuant to Section 7(a)(2) of the Federal Endangered Species Act (ESA). The SCWA and its partners have proposed to implement ongoing practices and operations related to flood control, water diversion and storage, regulation of flows in the Russian River and Dry Creek, estuary management, hydroelectric power generation, channel maintenance, and fish hatchery production. These actions likely affect Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*), CCC coho salmon (*O. kisutch*), and California Coastal (CC) Chinook salmon (*O. tshawytscha*),	138
Navarro Watershed Restoration Plan Pages included	A comprehensive watershed plan developed by the State Coastal Conservancy, State Water Resources Control Board, the Mendocino County Water Agency, and the Anderson Valley Land Trust—in 1998. The Plan, conducted by Entrix, included input from stakeholders and identified restoration goals, recommended land management practices, and prioritized sub basins for treatments. The Plan is the basis for the TMDL Technical Support Documents, and provides guidance and a scientific basis for restoration activities.	5-4 - 5-7, 6-11,6-12, 8-1
California Salmonid Stream Habitat Restoration Manual – Part XI, Riparian Habitat Restoration and Part VII – Project	This manual describes many methods and techniques used by habitat restoration specialists. The methods and techniques described here represent a starting point for	Please see descripti

Implementation, Volume 4, 2010	project design and implementation. Specific sections used when developing project site-specific restoration plans include: Restoration of Native Riparian Habitats Chapter XI, Natural Regeneration and Exclusionary Fencing XI-13, Erosion Control XI-14, Riparian Revegetion XI-16, Non-native Invasive Plant Species XI-6, Brush Checkdams VII-90, Willow Wall Revetment VII-78, Revegetation with Willow Sprigs VII-76, Native Material Revetment VII-75, Tree Revetment VII-73, Stream Bank Stabilization VII-63,Brush Mattress VII-79.	on
Team *Arundo* del Norte *Arundo* Eradication PlanningPacket (http://teamarundo.org/eradproject/planning_packet.html)	A web page with forms and reference documents available to enable development of a site-specific *Arundo* Revegetation and Restoration Plan	Entire web page
Denmark Creek Fish Barrier Removal and Riparian Enhancement Project, Phase II, MCRCD, 2012.	Provides Riparian Restoration Component of project, with specifics about revegetating the site and plant species used.	Entire
NRCS Field Office Technical Guide Standards, (http://efotg.sc.egov.usda.gov/efotg_locator.aspx)	These practices define the specifications to be used for riparian restoration and bank stabilization	390, 391, 395, 490, 578, 580, 612
Community-level consequences of invasion: impacts **of exotic clonal plants on riparian vegetation,** J. Hall Cushman and Karen A. Gaffney, January 2010. Biological Invasions	Peer reviewed publication evaluating the impacts of Arundo donax on Russian River riparian ecosystems, and outlining effective methods for control and habitat restoration.	Entire

Project Physical Benefits

Conditions Without the Project. Riparian ecosystems are some of the most threatened and impaired landscapes on the North Coast. Mendocino County's working landscapes are a mosaic of agriculture, forestry, fishing, and aggregate production. Approximately 50 percent of the riparian vegetation in the Russian and Navarro Rivers has been lost since 1942. This has led to degraded habitat for threatened and endangered salmon populations. Consequently, local and regional watershed plans identify riparian restoration as a primary strategy to improve water quality and ecological health.

In 2012, staff from the MCRCD performed an in-channel mapping exercise of *Arundo*, a highly invasive, noxious perennial grass, from Tomki Road on the West Fork Russian River downstream on the mainstem Russian River to the confluence of Dooley Creek. Over the distance of approximately 30 miles, the crew

identified over 60 stands of *Arundo*. Managers have identified the *Arundo* invasion as one of the most serious threats to the remaining habitat in the Russian River, as it directly impacts threatened Chinook salmon, endangered Coho salmon, and steelhead habitat. In addition to degrading salmon habitat, *Arundo* increases fuel loads and contributes to wildfire risk. It also has the potential to exacerbate flooding and contribute to downstream flood damage.

In Denmark Creek, work has been underway to restore the stream channel. A failing culvert sits just upstream of this newly restored habitat, cutting off access to 0.4 miles of additional spawning and rearing grounds for steelhead trout. The culvert is on an abandoned segment of Highway 128. Water flows through and under the pipe, further eroding the stream channel. Project proponents expect that within the next 20 years it is nearly certain that the culvert will fail and deliver fill to the channel, damaging downstream structures and restored habitat.

Conditions With the Project. MCRCD is proposing two riparian demonstration projects on working landscapes in the Upper Russian and Navarro Rivers watersheds. These include: (1) Upper Russian River *Arundo* removal and riparian enhancement on agricultural land; and (2) Phase 2 of Denmark Creek Riparian Restoration.

In the first part of the project, MCRCD would work with agricultural operators with large patches of *Arundo* on the right bank of the Russian River to remove the giant reed. MCRCD would also follow-up with the landowners with a restoration program of native plantings over a three-year period, particularly in areas where bank erosion is a concern. MCRCD will use willow sprigging or willow mattresses on bank slopes and native species on upland areas. Monitoring and maintenance—which includes checking for re-invasion, controlling new infestations, and ensuring that revegetation maintains a sustainable survival rate—will occur for three years. This process would remove 24,240 square feet (0.5 acres) of *Arundo*.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Regional salmonid habitat enhancement and restoration in by implementing DFW, NOAA, and NCRWQCB recommendations for improved habitat and water quality
- Improvement of regional water quality in a 303(d) listed watercourse, contributing towards attainment of the sediment TMDL for the Navarro River
- Implementation of NCIRWMP objectives related to conservation and enhancement of native salmonid populations, support of TMDLs, the North Coast Watershed Management Initiative, and NonPoint Source Program Plan, and addressing environmental justice issues for the DACs of Boonville, Philo, Talmage, Ukiah, Hopland Band of Pomo Indians, and Hintl Tribe

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-320 through 9.5-320, included at the end of this section.

- Culvert replacements, reducing failure and risk to downstream habitat and water quality and barrier to fish
- Reduced number of miles of road to maintain
- Reduced sediment deposition
- Restored riparian habitat
- New spawning and rearing habitat

Methods for estimation. Methods for estimation included field studies, mapping, and engineering designs (Table 7.2). The mechanisms by which the project actions would produce these physical benefits are supported by studies conducted in the region that document current and historic conditions that adversely affect habitat and water quality and management strategies to enhance beneficial uses.

Acknowledgement of New facilities, policies, and actions required. This project would not require new facilities or policies. Actions required include the removal of invasive *Arundo donax* along the Russian River and the removal of a failing culvert in Denmark Creek. Additional actions include regrading stream banks and planting native riparian plants. For a complete discussion of actions required, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary impacts, including disturbance of site during on the ground restoration and implementation activities. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations and would result in enhanced habitat in the 3-5 year timeframe.

Uncertainty. Any uncertainty in benefits from this project arises from uncontrollable factors such as ocean conditions that may adversely affect salmonid populations and drastic changes in weather patterns caused by global climate change. In the absence of such natural or societal events beyond project proponent control, there is a strong degree of certainty that this project will deliver the claimed benefits. Much research has been conducted around *Arundo donax* adverse effects and removal options and the Mendocino RCD has proven experience with successful removal techniques (see Project Team, above). Additionally, The NCIRWMP project prioritization and vetting process ensures that prioritized projects are technically sound. For further discussion of how the NCIRWMP prioritization process avoids uncertainty, please see the introductory section to this attachment.

Table 9.1-320 – Annual Project Physical Benefits			
Project Name: 320 - Mendocino County Resource Conservation District, Working Landscapes Riparian Enhancement Project			
Type of Benefit Claimed: Avoided Culvert Failure			
Measure of Benefit Claimed (Name of Units): Number of culverts			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015 - 2033	1.0	0	(1.0)
Comments:			

Table 9.2-320 – Annual Project Physical Benefits			
Project Name: 320 - Mendocino County Resource Conservation District, Working Landscapes Riparian Enhancement Project			
Type of Benefit Claimed: Reduced Road Maintenace			
Measure of Benefit Claimed (Name of Units): Road to maintain			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012			0
2013			0
2014			0
2015			0
2016			0
2017	Road maintenance	0	No road maintenance
Comments:			

Table 9.3-320 – Annual Project Physical Benefits			
Project Name: 320 - Mendocino County Resource Conservation District, Working Landscapes Riparian Enhancement Project			
Type of Benefit Claimed: Reduced Sediment Deposits			
Measure of Benefit Claimed (Name of Units): Tons of sediment deposition per year			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	358.6	358.6	0.00
2013	358.6	358.6	0.00
2014	358.6	358.6	0.00
2015-2034	358.6	0	(358.6)
Comments:			

Table 9.4-320 – Annual Project Physical Benefits			
Project Name: 320 - Mendocino County Resource Conservation District, Working Landscapes Riparian Enhancement Project			
Type of Benefit Claimed: Enhanced Riparian Habitat			
Measure of Benefit Claimed (Name of Units): Acres of riaprain habitat			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016-2065	0	0.8	0.8
Comments:			

Table 9.5-320 – Annual Project Physical Benefits			
Project Name: 320 - Mendocino County Resource Conservation District, Working Landscapes Riparian Enhancement Project			
Type of Benefit Claimed: New spawning and rearing habitat for salmonids			
Measure of Benefit Claimed (Name of Units): Miles of instream habitat			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016-2065	0	0.4	0.4
Comments:			

522 – Gualala River Watershed Council, Sediment Reduction Program: Lower Rockpile Creek Planning Watershed

Project Team

The Gualala River Watershed Council (GRWC) was formed in 1996 by a coalition of stakeholders who were responding to the Clean Water Act § 303 (d) listing of the Gualala River. The GRWC is governed by the Gualala River Watershed, Inc. a 501 c (3) non-profit and a voluntary Board of Directors comprising nine members who represent landowners, the community at large and community organizations. Agencies such as NMFS, NCRWQCB, DFW, and others use the highly accessible GRWC program data and GIS database. Regional watershed organizations emulate a wide variety of GRWC programs to implement restoration projects. The GRWC provides personnel training on their Cal EPA approved QAPP to other resource management organizations. GRWC is an NGO serving as third party coordinator for implementation of an NPS sediment reduction program consistent with the mandatory five key elements of NPS programs. The cooperating landowner, Gualala Redwoods, Inc., has an established road maintenance program that focuses on Best Management Practices. The list of other collaborating partners is substantial and provided in its entirety below:

GRWC SEDIMENT SOLUTIONS FUNDING PARTNERS
Gualala Redwoods, Inc., Henry Alden, (707) 884-4226, halden@deltapac.com

GRWC SEDIMENT SOLUTIONS PROGRAM PARTNERS
Pacific Watersheds and Associates, Danny Hagans, (707) 839-5130, pwa@northcoast.com
OEI, Matt O'Connor, (707) 431-2810, matto@oe-i.com
Golden State Land Conservancy, Marc Deprey, (707) 827-3840, marcdeprey@comcast.net
Redwood Coast Land Conservancy, Laurie Mueller, (707) 785-9533, rclc@rc-lc.org
Sonoma Land Trust, Amy Chestnut, (707) 526-6930, amy@sonomalandtrust.org
Conservation Corps North Bay, Gary Miltimore, (707)303-3069, gmiltimore@concervationcorpsnorthbay.org
The Sea Ranch Water Company, Randy Burke, (707) 785-2411, rburke@tsra.org
Hartford Family Winery, Walt Chavoor, (707) 292-3468, walt.chavoor@hartforwines.com
Mendocino Redwoods Company, Russ Shively, (707) 962-2812, russshively@mendoco.com
Soper-Wheeler, William Morrison, (707) 964-4815, bmorrison@soperwheeler.com

AGENCY PARTNERS
CalFire Forest Improvement Program, Jill Buttler (707)576-2935 Jill.Butler@fire.ca.gov
California Department of Fish & Game, Derek Acomb (707) 744-8713 dacomb@dfg.ca.gov
California Department of Fish & Game, Doug Albin (707) 964-7683 dalbin@dfg.ca.gov
NOAA NMFS, Joe Pecharich, (707) 575-6095, joe.pecharich@noaa.gov
North Coast Regional Control Board, Elmer Dudik, (707) 576-2806, DudiE@rb1.swrcb.ca.gov
North Coast Regional Water Quality Control Board, Jim Burke, (707) 576-2289, jburke@waterboards.ca.gov
North Coast Regional Water Quality Control Board, Jonathan Warmerdam, (707) 576-2468
NRCS EQIP Program, (707) 468-9223 or (707) 794-1242
State Geological Survey, Wayne Haydon, (707) 576-2162, Wayne.Haydon@conservation.ca.gov
U S Geological Survey, WRD, Mike Webster, (707) 468-4042, mwebster@usgs.gov

NON GOVERNMENTAL ORGANIZATION PARTNERS IN RESTORATION IMPLEMENTATION AND COOPERATIVE MONITORING AND EDUCATION OUTREACH

Gualala River Steelhead Project, Roger Dingman (707) 884-3454, rdingman@mcn.org
Kashia Band of Pomo Tribal Government, Nina Hapner, (707) 591-0580, nina@stewartspoint.org
Mendocino County RCD, Patty Madigan, (707) 462-3664, pmad@mcn.org
North Gualala Water Company, (707) 884-3579
Redwood Coast Land Conservancy, Linda Bell, (707) 785-9533, rclc@rc-lc.org
The Conservation Fund, Scott Kelly, (707) 962-0712, skelly@conservationfund.org
The Nature Conservancy, (415) 281-9659, jcarah@tnc.org

Technical Justification for Project

All work for this project will be conducted in accordance with protocols developed by William Weaver, PhD. and Danny Hagans of Pacific Watersheds and Associates as outlined in the Handbook for Forest and Ranch Roads and the California Department of Fish and Wildlife California Salmonid Stream Habitat Restoration Manual, CDF&W. In addition, for quality assurance Pacific Watershed & Associates - specifically Danny Hagans - will be hired as a consultant and will oversee and approve all road related treatments for this sediment source implementation.

The Gualala River is listed by the USEPA Clean Water Act §303(d) as an impaired water body due to declines in diadromous salmonids from excessive sedimentation and high water temperatures. The watershed lies within the Central California Coast Coho Salmon Evolutionary Significant Unit (ESU), which is listed as endangered under the Endangered Species Act (NMFS 2005). Many studies have been conducted on the Gualala River Watershed documenting the adverse conditions limiting salmonid populations. Three priority management strategies are consistently recommend**ed** to enhance beneficial uses and improve watershed health; 1) reduce upslope NPS sediment inputs through road upgrades, repairs and decommissioning, 2) increase instream habitat diversity through sediment reduction and Large Woody Debris placement, 3) continue and expand the EPA approved GRWC monitoring program to increase understanding of watershed processes and evaluate resource management strategies.

Three notable assessment plans have been completed for the watershed and are the basis for the Gualala River Watershed Council's adaptive Gualala River Management and Enhancement Plan. First, A Technical Support Document (TSD) for the Total Maximum Daily Load for the Gualala was completed by the North Coast Regional Water Quality Control Board (NCRWQCB) in 2003. The TSD states that road related erosion accounted for 58% of the total estimated watershed erosion rate and 85% of the human-caused (controllable) portion of the estimated erosion rate. Second, the Gualala River Watershed Assessment Report (Klamt, et al., 2003) was conducted by a multi-agency task force, the North coast Watershed Assessment Program (NCWAP) now known as the Coastal Watershed Planning and Assessment Program (CWPAP). The report states that pool depth and shelter are major limiting factors to salmonids throughout the watershed and the top restoration priority for all subbasins is to increase in-stream habitat complexity. Key recommendations to achieve this goal are "Continue efforts such as road assessments, storm proofing, improvements, and decommissioning throughout the watershed to reduce sediment delivery to the Gualala River and its tributaries." Third, the Gualala Estuary and Lower River Enhancement Plan (ECORP Consulting, Inc. et al., 2005) was a result of a

partnership with Gualala River Watershed Council and the Sotoyome Resource Conservation District, funded by the California State Coastal Conservancy. In the estuary study, the factors limiting Coho populations in the watershed were attributed to "degraded habitat conditions in the upstream portions of the watershed" and a key recommendation is to "repair and retire logging roads and treat upslope sediment sources."

The proposed project integrates these priority recommendations. Planning watersheds have been prioritized and project watersheds have been selected for high road density, road proximity to streams, high watershed disturbance index, and the quality of instream habitat. Project performance will be verified through the GRWC Cooperative Monitoring Program. Monitoring protocols have been approved by the SWRCB/CALEPA and are contained in the GRWC Quality Assurance Project Plan for Monitoring Sediment Reduction (GRWC 2008). In-stream habitat will be evaluated through the GRWC Monitoring Program. Reaches established within the project area will be re-surveyed to evaluate improvements in channel morphology. Additional assessments will include a continuation of the snorkel surveys to estimate salmonid population trends. Gualala Redwoods, Inc., the landowner has an established road maintenance program that focuses on Best Management Practices and after completion of the project on-site monitoring will continue for erosion will be conducted by GRWC in conjunction with the landowner.

Technical and scientific documents used to develop this project are listed in the table below.

Table 7.3, Gualala River Watershed Council Technical and Scientific Documentation Table

Technical and Scientific Document Name	**Document Description**	**Relevant page #**
Gualala River Watershed Council. Lower Rockpile Creek Planning Watershed Road Assessment Database Report, 2012	Site specific treatment report and map of proposed work. GRWC-LowRock-Report.pdf	All
Gualala River Watershed Council. GRWC Quality Assurance Project Plan for Monitoring Sediment Reduction, 2008.	Project effectiveness monitoring quality assurance plan. http://grwc.info/Assets/Reports/grwc-qapp-ver-3-1.pdf	All
North Coast Regional Control Board, et al. Gualala River Synthesis Report, 2003.	Multi-agency assessment of the Gualala River Watershed. http://grwc.info/Assets/Reports/cdfg-ncwap-summary.pdf	21-24
Ecorp Consulting, Gualala River Estuary Study, 2005	Fisheries assessment of the Gualala River Estuary. http://grwc.info/Assets/Reports/Gualala-River-Estuary-Report-05.pdf	127-128
North Coast Regional Control Board, Gualala River Technical Support Document for	TMDL Technical Support Document, evaluating sediment source inputs into the Gualala River	All

Sediment (TSD), 2000	Watershed http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/gualala_river	
Hagans and Weaver. Handbook for Forest and Ranch Roads, 1994	Technical road restoration manual http://www.krisweb.com/biblio/gen_mcrcd_weaveretal_1994_handbook.pdf	All
California Department of Fish and Game. California Salmonid Stream Habitat Restoration Manual Volume II, Part X Upslope Assessment and Restoration Practices, January 2004.	Describes several components of watershed restoration including sediment production and delivery, upslope erosion assessment, analysis and reporting of assessment data, implementing restoration work, quality control, documentation of projects, and project monitoring. http://www.dfg.ca.gov/fish/resources/habitatmanual.asp	All
North Coast Regional Water Quality Control Board. Water Quality Control Plan for the North Coast Region, State of California, February 1993	Document describes protection of beneficial uses, and wastewater discharge guidelines http://www.swrcb.ca.gov/northcoast/water_issues/programs/basin_plan	All

Project Physical Benefits

Conditions Without the Project. USEPA Clean Water Act §303(d) lists the Gualala River as an impaired water body due to excessive sedimentation and high water temperature, which has resulted in declines in salmonid populations. In 2003 the Gualala River Technical Support Document estimated that the Gualala River watershed's present erosion rate was 1,220 t/mi^2/yr, with a background erosion rate of 380 t/mi^2/yr. Newer sediment source assessments conducted at the scale of planning watersheds in the Gualala are consistent with the TSD finding . The Gualala River TSD finds that road-related erosion accounted for 58 percent of the total estimated watershed erosion rate and 85 percent of the anthropogenic portion of the estimated erosion rate.

In the 1990s a local coalition of restoration organizations, environmental groups, stakeholders, and state and federal agencies formed the Gualala River Watershed Council (GRWC) in response to the Clean Water Act §303(d) listing. Its board includes nine members who represent landowners, the community at large, and community organizations.

Both the Gualala TMDL and the GRWC have the mutual goals of lowering sediment load to 25 percent above the background erosion level (475 t/mi^2/year). The Gualala River Reduction Program, established by stakeholders in the watershed, is a cooperative effort to implement basin-wide sediment reduction strategies in a coordinated way that prioritizes projects to most effectively attain the TMDL limits.

Conditions With the Project. The project would partner Gualala River Watershed Council with landowners to treat sediment sources on high and medium priority road networks that will prevent sediment from entering the watercourses in the Lower Rockpile basin, a highly erosive area with excessively high in-stream sediment deposits in the Gualala River Watershed.

By following industry standards, roads can be 95 percent hydrologically disconnected from streams, reducing delivery of sediment from road sources by as much as 95 percent and potentially decreasing the human-caused erosion by 80 percent.

With the project, the GRWC would replace 16 aging culverts, all of which would likely fail in the next ten years, with new culverts with a design life to meet current standards of 100 years. In addition, with the project, GRWC would restore 11 miles of road and decommission 1 mile of road.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Regional salmonid habitat enhancement and restoration by implementing recommendations of DFW and/or NOAA in a high priority watershed in the California Central Coast Coho ESU
- Regional water quality improvement by implementing sediment reduction and contributing to voluntary TMDL attainment in a watercourse 303(d) listed for sediment
- Continuation with a third phase of funding through the IRWMP process to implement targeted NPS sediment reduction strategies for the Gualala River watershed
- Implementing NCIRWMP objectives relating to salmonid population conservation and enhancement, support of TMDL implementation and Non-Point Source Program Plan, and addressing environmental justice issues in the partially disadvantaged community and partially Severely Disadvantaged Community of Gualala

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-522 through 9.4-522, included at the end of this section.

- Reduced sediment deposition to sensitive aquatic ecosystems
- Culvert replacements, reducing failure and risk to downstream habitat and water quality
- Reduced number of miles of road to maintain
- Restored riparian habitat

Methods for estimation. Methods for estimation of project benefits include field studies, monitoring results, engineering and hydrogeological designs, instream assessments, and mapping. The mechanisms by which project implementation will produce these benefits is supported by years of monitoring and assessments conducted in the Gualala River watershed (see Table 7.3). These studies document current

and historic conditions that adversely affect habitat and water quality and provide management strategies and recommendations to enhance beneficial uses and restore salmonid habitat.

Acknowledgement of New facilities, policies, and actions required. This project would not require new facilities or policies. Actions required include the treatment of 85 sediment source sites on 12.3 miles of road, the decommissioning of one mile of road, and the stormproofing of 11 miles of road. For a complete discussion of actions required, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary impacts, including disturbance of site during on the ground restoration and implementation activities. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations.

Uncertainty. Uncertainty in benefits from this project arises from uncontrollable factors such as ocean conditions that may adversely affect salmonid populations, drastic changes in weather patterns caused by global climate change, or large seismic events. In the absence of uncontrollable social or natural events, there is strong certainty that this project will provide the claimed benefits. Agencies such as DFW have conducted thorough watershed assessments (Table 7.3) and GRWC has established a SWRCB approved QAPP monitoring program in support of project planning, design and implementation. The GRWC has proven experience implementing projects in the watershed (see Project Team, above). Additionally, the NCIRWMP project prioritization and vetting process ensures that prioritized projects are technically sound. For further discussion of how the NCIRWMP prioritization process avoids uncertainty, please see the introductory section to this attachment.

Table 9.1-522 – Annual Project Physical Benefits

Project Name: 522 - Gualala River Watershed Council, Sediment Reduction Program: Lower Rockpile Creek Planning Watershed

Type of Benefit Claimed: Reduced Sediment Deposition

Measure of Benefit Claimed (Name of Units): Tons of sediment

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	1,464	1,464	0
2013	1,464	1,464	0
2014	1,464	1,464	0
2015-2024	1,464	0	(1,464)

Comments:

Table 9.2-522 – Annual Project Physical Benefits			
Project Name: 522 - Gualala River Watershed Council, Sediment Reduction Program: Lower Rockpile Creek Planning Watershed			
Type of Benefit Claimed: Avoided Avoided Emergency Repairs (Culvert Failure)			
Measure of Benefit Claimed (Name of Units): Replaced failing culverts			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	16	16
Comments:			

Table 9.3-522 – Annual Project Physical Benefits			
Project Name: 522 - Gualala River Watershed Council, Sediment Reduction Program: Lower Rockpile Creek Planning Watershed			
Type of Benefit Claimed: Reduced Road Maintenance			
Measure of Benefit Claimed (Name of Units): Miles of road to maintain			
Additional Information About this Measure: There is a per mile benefit as well as a project-wide benefit associated with this project			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	12	12	0
2013	12	12	0
2014	12	12	0
2015	12	12	0
2016-2040	12	0	(12)
Comments:			

Table 9.4-522 – Annual Project Physical Benefits			
Project Name: 522 - Gualala River Watershed Council, Sediment Reduction Program: Lower Rockpile Creek Planning Watershed			
Type of Benefit Claimed: Enhanced Riparian Habitat			
Measure of Benefit Claimed (Name of Units): Functional Acres of Riparian Habitat			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	95	95	0
2013	95	95	0
2014	95	95	0
2015	95	101	7
2016	95	108	14
2017	95	115	20
2018	95	122	27
2019	95	128	34
2020	95	135	41
2021	95	142	47
2022	95	149	54
2023	95	155	61
2024	95	162	68
2025	95	169	74
2026	95	176	81
2027	95	182	88
2028-2064	95	189	95
Comments: Assumes existing landscape has 50 percent ecological functionality, which increases to 100 percent in 15 years as restoration matures. Actual acres restored equals 189.			

C. Klamath Watershed Management Area

421 – Siskiyou County, Septage Pond Closure

Project Team

The Siskiyou County Department of Public Health and Community Development Department will manage the project. Staff from this department has extensive experience overseeing clean-up and remedial action projects associated with leaking underground storage tanks and other unauthorized releases. They have closed three similar sites over the past fifteen years and are familiar with the site and the public health risks associated with raw sewage. SHN Consulting Engineers & Geologists has been retained to implement the project. SHN Consulting Engineers & Geologists, Inc. was established in 1979 to provide science-based engineering, environmental, geoscience, planning, and surveying services throughout Northern California. They have worked on numerous environmental remediation sites including Rio Dell Brownfields, Indian Islands Tuluwat Village EPA Brownfields Site Remediation, and Town of Scotia NPDES Compliance.

Technical Justification for Project

For the past two decades, the County has been actively engaged in developing a comprehensive septage waste management plan. While the County's efforts have largely focused on developing a long-term solution to its disposal needs, it has remained acutely aware of the need to close outdated receiving facilities. Within the past three years, the County's priority has shifted to closing the one remaining facility that constitutes this project. The facility consists of an unlined pond which has been in service for close to forty years and is currently at or beyond its capacity. Since the pond is unlined it is believed the infiltration from the ponds has direct contact with shallow sub-surface water. Further, this sub-surface flows westward approximately 900 feet to the Oregon Slough. This drainage feeds into the Shasta River, which is in turn a tributary to the Klamath River. Both the Shasta and Klamath Rivers are 303(d) listed streams affected by organic enrichment and low dissolved oxygen. While there are a number of factors affecting these impaired water bodies, closure of the septage receiving facility will eliminate a known potential generator of point source pollution capable of contributing high nitrate and dissolved oxygen content waste through sub-surface and surface water transport.

SHN was hired to prepare a feasibility study that identified closure requirements and costs. With direct technical assistance provided by NCRWQCB staff, the County developed a closure plan based on the 2011 Feasibility Study, which was approved by the NCRWQCB on November 30, 2012. The table below provides supporting technical documentation for this project.

Table 7.4, Siskiyou County Technical and Scientific Documentation Table

Technical and Scientific Document Name	Document Description	Relevant page #
Miguel Villicana, North Coast Regional Water Quality Board October 7, 2003.	Regional Board Urges County to Address Septage Waste Management Practices, Miguel Villicana, October 7,	All

	2003.	
Roy O'Connor, North Coast Regional Water Quality Board, October 30, 2008.	Regional Board Strongly Recommends Closure of Pond, Roy O'Connor, October 30, 2008.	All
Klamath Riverkeeper, Notice of Intent to Seek a Preemptory Writ of Mandate Ordering Siskiyou County to Immediately Comply with the Porter Cologne Act, October 13, 2009	Notice of Intent to Seek a Preemptory Writ of Mandate Ordering Siskiyou County to Immediately Comply with the Porter Cologne Act, Klamath Riverkeeper, October 13, 2009	All
Terry Barber, Letter: Board of Supervisors, January 5, 2010.	Board of Supervisors Discussion Regarding Comprehensive Management of Septage, Terry Barber, January 5, 2010.	All
Roy O'Connor, North Coast Regional Water Quality Board, February 2010.	Regional Board Continues to Discourage Use of Facility, Roy O'Connor, February 2010.	All
SHN Consulting Engineers & Geologists, Feasibility Study, Siskiyou Septage Disposal, February 2011.	Feasibility Study, Siskiyou Septage Disposal, SHN Consulting Engineers & Geologists, Commissioned 2010, Finalized February 2011.	i-iii;1-3;30-31
Terry Barber, Regional Board/County Meeting File Notes, December 1, 2011.	Regional Board/County Meeting File Notes, Terry Barber, December 1, 2011.	All
Terry Barber, Memo-Board of Supervisors, January 3, 2012.	Board of Supervisors Memo with Summary and Timeline, Terry Barber, January 3, 2012	All
Bill Navarre, Montague Septage Pond Closure Plan Cost Estimate, November 2012.	Cost estimate to close and remediate septage pond project site.	All

Project Physical Benefits

Conditions Without the Project. There is an unpermitted septage receiving facility on Siskiyou County Airport property in the Shasta and Klamath River watersheds. Permitted septage haulers discharge an estimated 750,000 gallons per year of raw sewage into the unlined pond that has exceeded its design life. Much of this waste is from port-a-potties and septic tank emptiers. The septage haulers do not pay fees associated with waste disposal. The site is located approximately 900’ east of Oregon Slough, a tributary to Shasta River, which is a tributary to the Klamath River. Both Shasta and Klamath rivers are 303(d) listed streams affected by organic enrichment and low dissolved oxygen.

Siskiyou is under a long-standing North Coast Regional Water Quality Control Board directive to close the facility. Siskiyou County’s Board of Supervisors committed to closing the site by November 1, 2013. The County has closed three other unpermitted septage ponds, but lacks adequate resources to close

this remaining site. In October 2009, the Klamath Riverkeeper notified the County and North Coast Regional Water Quality Control Board of its intent to file a preemptory writ of mandate regarding use of the unpermitted facility (Klamath Riverkeeper 2009).

Without funding, the County would likely be unable to close the receiving pond and would continue to operate it until the Water Board threatened to or issued a cease and desist order or Riverkeeper filed a lawsuit, likely at least three months. If these conditions materialized, the County would pay legal fees and penalties from the County's General Fund.

Conditions With the Project. The project would excavate and dry septage and impacted soil on an impermeable surface located on adjacent County-owned airport property and then apply the dried material on adjacent County-owned agricultural land. If the dried waste does not meet the criteria for land application, the County will haul it to a lined landfill for disposal. The County intends to dispose of as much waste as possible with available funding and phase the remaining disposal as additional funds become available.

With the project, the permitted haulers who currently discharge waste into the receiving pond would likely transport waste out of the County to a permitted facility approximately 115 miles south in Anderson, CA.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Improving regional environmental justice through removal of a potential source of sub-surface and surface water contamination in an entirely Disadvantaged Community and partially severely Disadvantaged Community
- Improving regional environmental justice by protecting the economic vitality of Siskiyou County, which faces fines into hundreds of thousands of dollars if the project is not implemented and a Cease and Desist Order is issued
- Implementing the goals and objectives of the NCIRWM Plan related to environmental justice and the protection and enhancement of water quality

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-421 and 9.2-421, included at the end of this section.

- Reduced risk of surface water contamination

- Dry septage available for agricultural use

Methods for estimation. The physical effects of the project arise from removing a potential source of contamination. No studies have been completed to determine with certainty that septage is currently seeping into sub-surface or surface water, or measure the amount of pollutants its closure would reduce in soil and surface water resources. However, the underlying geology and the limited environmental

regulations in effect when the facility was constructed make it highly likely that it is a source of contamination. The estimation of benefits arises from the Septage Waste Feasibility Study and RWQCB-approved closure plan.

Acknowledgement of New facilities, policies, and actions required. This project does not require new facilities or policies. Actions required include the excavation and disposal of impacted soil either on County-owned agricultural land or in a lined landfill and the filling in and regrading of the septage waste pond. For a complete discussion of actions required, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary impacts as the septage facility is drained and septage waste is removed and dried. The waste will be tested before any land application occurs, and if it exceeds regulatory limits, it will be disposed in a certified landfill facility. Other potential adverse physical effects would arise if companies currently discharging port-a-potty and septic tank waste in the facility decide to dump waste in another location with similar or worse pollution controls.

Uncertainty. Lack of funding is the most significant obstacle to implementation of safe drinking water projects, and the major factor creating uncertainty in achieving this project's goals of improved water supply reliability and quality. Additional uncertainty arises when considering events outside of the project proponent's control, such as differences in weather patterns caused by climate change, extreme seismic events, or other catastrophic societal or natural events. This project has a high degree of certainty in achieving the stated benefits in part due to the NCIRWMP framework and process, which has built-in mechanisms to ensure that waste treatment projects from disadvantaged communities are identified, planned and implemented, including outreach and technical assistance support, educational workshops, a website to disseminate large amounts of complex information to a diverse and dispersed regional population, technical and engineering support to project proponents from disadvantaged communities, one-on-one assistance with applications, and the formation of a regional sub-group comprised of small water supply and wastewater treatment facility operators.

Table 9.1-421 – Groundwater contamination

Project Name: 421 - Siskiyou County, Septage Pond Closure

Type of Benefit Claimed: Reduced risk of groundwater contamination and contaminants reaching surface water

Measure of Benefit Claimed (Name of Units): Groundwater/surface water contamination

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	Potentially contaminated water	Potentially contaminated water	
2013	Potentially contaminated water	Potentially contaminated water	
2014	Potentially contaminated water		Reduced risk of contamination.

Comments: Possible contaminants include bacteria and nutrients, which could lead to increased dissolved oxygen.
Data are unavailable to know with certainty that septage pond is currently contributing contaminants to waterways.

Table 9.2-421 – Dry Septage for Agricultural Use			
Project Name: 421 - Siskiyou County, Septage Pond Closure			
Type of Benefit Claimed: Dry septage for land application			
Measure of Benefit Claimed (Name of Units): N/A			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	-	-	
2013	-	-	
2014	-	Dry septage available for land application	Dry septage available for land application
Comments: Tests will confirm if septage excavated for the pond would be available for agricultural application, potentially offsetting other sources of fertilizer.			

739 – Karuk Tribe, Lower Mid-Klamath (Red Cap / Perch Creek) Habitat Protection-Road Decommissioning Implementation Project

Project Team

The objective of the Karuk Tribe's Watershed Restoration Division is to protect the habitat of anadromous fish by decreasing sedimentation caused by the road networks within watersheds of critical concern. The Tribe accomplishes this by conducting site-specific geomorphic mapping, surveying, prescription design and preparation of work order specifications for implementation of identified project areas. Implementation includes proven road decommissioning methods to remove and/or stabilize unstable logging haul road-stream crossings and to reestablish the natural hillslope drainage pattern along the road. The objective of a decommissioning project is to decrease the sedimentation caused by a road by removing the potential sediment. Decommissioning of roads begin with roads that have the highest density of high hazard sites and that pose the greatest hazard to watershed processes, water quality, and aquatic habitats. The Karuk Tribe's Watershed Restoration Program has successfully completed decommissioning projects in the Mid-Klamath watershed since 1999. It has received the 2005 Bingham Memorial Award from the Klamath Basin Task Force, affirming a broad consensus regarding the importance of road decommissioning within the basin and the abilities of the Karuk Tribe's Watershed Restoration Program to successful implement these projects. Six Rivers National Forest, the property owner, is the collaborator on this project, in part due to the Karuk Tribe's Watershed Restoration Program's reputation for successful project implementation.

Technical Justification for Project

Both the Perch and Red Cap Creek watershed are of critical concern, Red Cap is a Key and Tier One watershed as determined by the Northwest Forest Plan due to its important role in the recovery of at-risk fish stocks within the Klamath Basin. The Klamath River watershed temperature TMDL addresses the heat loads that arise from seven sources, one of which is the effects of excess (anthropogenic) sediment loads. The action plan calls for decreasing excess sediment loads from anthropogenic sources (roads) to reduce heat loads. In the Implementation Plan of the Klamath TMDL (Section 6.6.5.2), roads are directly discussed; "Without proper maintenance, roads have a higher probability of failing and contributing sediment that can alter stream temperatures. Regional Water Board staff supports and encourages reduction in road densities through road decommissioning. Reducing road density has the added benefit of increasing infiltration, which can add base flow to Klamath River tributaries".

Roads are a recognized primary contributor of NPS sediment pollution into stream courses. The origin of the sediment has two generic causes, landslide derived sediment and surface erosion. Landslide mechanisms within this watershed are primarily debris flows and torrents. Surface erosion takes the form of rills, gullies, and dry ravel.

Geomorphic effects of forest roads range from chronic and long-term contributions of fine sediment into streams to catastrophic effects associated with mass failures of road fill material during large storms. The interactions of roads and land surfaces are often complex. For example, in an uphill part of the hillslope, roads may trigger mass failures, while roads downslope may trap material derived from

these failures. Roads and road building may alter channel morphology directly, or may modify channel lengths and extend the drainage network into previously unchannelized portions of the hillslope.

The culverts and ditches originally constructed on these roads continually fail due to significant rainfall events (mean annual precipitation: 97 inches) and unstable soils. The high rates of sediment generated by winter storms trigger accelerated gully erosion on the hillslopes below the road and result in costly and frequent road maintenance to keep the inadequate drainage structures functioning properly.

Sedimentation and aggradation of stream channels result from the failure of the road prisms, road stream crossings, and debris flow surface erosion. Stream habitat impacts resulting from this sedimentation include; water quality, streambed morphology quality and function, creation of migration barriers, and reduction of instream and riparian cover. These combined impacts increase turbidity and water temperature, thus reducing the significance of these watersheds as a cold-water contributor to the Klamath River

In the summer of 2002 funding was provided by the California Department of Fish and Game Fishery Restoration Grants Program to develop a plan to reduce the delivery of sediment from logging roads to streams within the Camp Creek watershed (Road Assessment and Restoration Planning in the Camp Creek Watershed of the Klamath River Basin February 2004). The areas with the highest erosion potential were found at stream crossings. While no similar report has been prepared for Red Cap or Perch Creek one can deduce the road network has the same effect.

The most common problem at stream crossings was the potential for stream diversions (debris flows and torrents). Since most stream crossings will eventually fail, it is imperative to eliminate diversion potential at all existing crossings as a principal component of any erosion prevention plan within the watershed. This is best accomplished by decommissioning roads where the risk to resources (water quality, aquatic habitat), outweigh the usefulness of access to a given area. The road system also suffers from a severe lack of maintenance funds.

The prescribed treatments will include site-specific plans that will be implemented to meet the objectives of sediment source reduction and habitat protection with maximum efficiency. This project will implement proven decommissioning methods to remove and stabilize unstable fill at road/stream crossings, swales and springs, and reestablish the natural hillslope drainage pattern along the entire road using heavy equipment and hand labor.

Post-project erosion and sediment control measures and revegetation will include the sowing of native grass seed and fertilizer by hand and using a 750 gallon hydroseeder when feasible, followed by the spreading of onsite native mulch material (brush, trees) where suitable material exist. If suitable mulch material is not onsite, certified weed-free rice straw will be utilized. Willow cuttings/stakes maybe used in post-excavated stream crossings, swales, and seeps. In addition, each excavated live stream crossing will be rock armored to minimize post project adjustments. The use of native mulch material eliminates the likelihood of introducing non-native invasive weed species that can be found in straw mulch. Documents used to develop this project are listed in the table below.

Table 7.5, Karuk Tribe Technical and Scientific Documentation Table		
Technical and Scientific Document Name	**Document Description**	**Relevant page #**
Carolyn Cook/ USFS, Forest Hydrologist, Orleans Transportation and Road Restoration Project Hydrology and Water Quality Report, 2007	Prepared as a specialist report in conjunction with the Orleans Environmental Assessment Orleans Transportation and Road Restoration Project (USFS 2007)	1-21
Kier and Associates/ The Klamath Basin Fisheries Task Force, Long Range Plan for the Klamath River Basin Conservation Area Fishery Restoration Program 1991	Prepared in accordance to Public Law 99-552, the "Klamath Act," was adopted by the Congress on October 27, 1986 for the Federal-State cooperative Klamath River Basin Conservation Area Restoration Program for the rebuilding of the river's fish resources.	44,45,49, 50,135,1 46
Karuk Tribe Non-Point Source Assessment and Management Plan 1999	Prepared by the Karuk Department of Natural Resources which describes Non-Point Source Sediment sources and prioritize watersheds for restoration	all
Coho Salmon Recovery Team/CDFG, Recovery Strategy for California Coho Salmon , 2004	Prepared for the California Fish and Game Commission as a guide for the process of recovering coho salmon on the north and central coasts of California.	73,74,18 4,202,20 5,280,38 2
USFS ID Team/USDA Environmental Assessment Orleans Transportation and Road Restoration Project, 2007	An environmental assessment will address the issues, alternatives, and effects of implementing the management options for the transportation system outlined in the Orleans Road Assessment Protocol.	2,21
USFS ID Team/USFS, Orleans Roads Analysis and Off-Highway Vehicle Strategy, 2006	Orleans RAP and OHV Strategy analysis evaluates the remaining road system within the Orleans Ranger District (e.g. Level 1, 2, and non-system roads) for management options.	all

Project Physical Benefits

Conditions Without the Project. Thirty miles of road within the Mid-Klamath Watershed near the town of Orleans, California are a source of anthropogenic sediment discharge in Red Cap and Pearch Creek, 303(d) listed water bodies in the Klamath River Basin. The Red Cap Creek drainage does not meet fines or embeddedness values for the National Marine Fisheries Service Matrix of Factors and Indicators, or

reference streams. These road networks are the primary threat to future and current function of salmonid refugia, spawning, overall water quality, wildlife, and cultural beneficial uses in these waterbodies.

The road and culverts were designed and constructed using a 20-year flood standard and do not meet the current design standard (100-years). Carolyn Cook, a Hydrologist with Six Rivers National Forest, has predicted these culverts will fail during a 10-15 year storm event, which include events with 6 to 8 inches of precipitation within a 24 hour period. The culverts also present a future erosion risk from failure, potentially delivering 98,700 to 5,800,000 cubic yards of sediment to the watershed during one of these events.

Conditions With the Project. The Karuk Tribe determined the proposed road removal within the project area is a high priority. The project would decommission 30 miles of road, removing unstable fill at stream crossings, swales, springs, seeps, and reestablish the natural hillslope drainage pattern along the intervening road reaches.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Regional salmonid habitat restoration and enhancement implementation recommended by DFW and/or NOAA Fisheries in a prioritized watershed
- Close collaboration with the Yurok Tribe (Project 140, below) via the Klamath River Coho Ecology Project; both Tribes' NCIRWMP projects will provide substantial benefits to SONCC Coho and other native salmonids
- Contribution towards voluntary attainment of TMDL for sediment in a 303(d) listed watershed
- Enhancement of land and resources for a Native American Tribal community which is also recognized as a Severely Disadvantaged Community
- Contributes towards regional environmental justice goals in the California Water Plan and NCIRWMP by providing a mechanism for inclusion of Tribal issues and employment of Tribal members
- Implements NCIRWMP objectives of conservation/enhancement of native salmonid populations, support of TMDL implementation and the Non-Point Source Program Plan and addressing environmental justice issues

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-739 through 9.5-739, included at the end of this section.

- Culvert replacements, reducing failure and risk to downstream habitat and water quality
- Reduced sediment deposition
- Reduced number of miles of road to maintain

- Restored riparian habitat
- Enhanced instream habitat for salmonids

Methods for estimation. Methods for estimation include field studies, site-specific plans, assessments, and analyses of roads and watershed condition in the Klamath Basin. Where appropriate, the Karuk Tribe has worked with other organizations to assess the risk from structures and roads on federal land. The mechanisms by which the project actions will produce these benefits are supported by regional studies and past experience. These studies document current conditions that adversely affect habitat and water quality and detail specific management strategies to decommission roads and enhance water quality and salmonid habitat (Table 7.5).

Acknowledgement of New facilities, policies, and actions required. This project does not require new facilities or policies. Actions required include removal of unstable stream crossing and perched fill material and re-establishment of natural hydrologic patterns through the use of heavy equipment and hand labor. Post-project erosion control measures include revegetation with native grasses and plants and installation of willow cuttings. For a complete discussion of actions required, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary impacts, including disturbance of site during on the ground restoration and implementation activities. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations.

Uncertainty. Uncertainty in benefits from this project arises from uncontrollable factors such as ocean conditions that may adversely affect salmonid populations, drastic changes in weather patterns caused by global climate change, or large seismic events. In the absence of a social or natural catastrophic event, there is a high degree of certainty that this project will deliver the stated benefits. Much research has been conducted around road decommissioning and the Karuk Tribe has proven experience with both decommissioning and restoration implementation activities in the Klamath River watershed (See Project Team above). For further discussion of how the suite of projects in this Proposal avoids uncertainty, please see the introductory section to this attachment.

Table 9.1-739 – Annual Project Physical Benefits

Project Name: 739 - Karuk Tribe, Lower Mid-Klamath (Red Cap /Perch Creek) Habitat Protection-Road Decommissioning

Type of Benefit Claimed: Avoided Culvert Failures

Measure of Benefit Claimed (Name of Units): Number of replaced culverts

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	8	8

Comments:

Table 9.2-739 – Annual Project Physical Benefits			
Project Name: 739 - Karuk Tribe, Lower Mid-Klamath (Red Cap /Perch Creek) Habitat Protection-Road Decommissioning			
Type of Benefit Claimed: Reduced Sediment Deposits			
Measure of Benefit Claimed (Name of Units): Tons of sediment deposition per year			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2012	22,981	22,981	0
2013	22,981	22,981	0
2014	22,981	22,981	0
2015	22,981	22,981	0
2016-2027	22,981	0	(22,981)
Comments: Reduced sediment deposits are the result fo reduced culvert failure probabilities.			

Table 9.3-739 – Annual Project Physical Benefits			
Project Name: 739 - Karuk Tribe, Lower Mid-Klamath (Red Cap /Perch Creek) Habitat Protection-Road Decommissioning			
Type of Benefit Claimed: Reduced Road Maintenance			
Measure of Benefit Claimed (Name of Units): Miles of road requiring maintenance			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	30	30	0
2013	30	30	0
2014	30	30	0
2015	30	30	0
2016-2065	30	0	(30)
Comments:			

Table 9.4-739 – Annual Project Physical Benefits			
Project Name: 739 - Karuk Tribe, Lower Mid-Klamath (Red Cap /Perch Creek) Habitat Protection-Road Decommissioning			
Type of Benefit Claimed: Enhanced Riparian Habitat			
Measure of Benefit Claimed (Name of Units): Acres of functional riparian habitat			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	1	1	0
2013	1	1	0
2014	1	1	0
2015	1	1	0
2016	1.00	1.07	0.07
2017	1.00	1.13	0.13
2018	1.00	1.20	0.20
2019	1.00	1.27	0.27
2020	1.00	1.33	0.33
2021	1.00	1.40	0.40
2022	1.00	1.47	0.47
2023	1.00	1.53	0.53
2024	1.00	1.60	0.60
2025	1.00	1.67	0.67
2026	1.00	1.73	0.73
2027	1.00	1.80	0.80
2028	1.00	1.87	0.87
2029	1.00	1.93	0.93
2030-2065	1	2	1
Comments: Restored acres of riparian habitat taken time to grow and reach their full benefit. This time is assumed to be 15 years, which begins with the completion of the project.			

Table 9.5-739 – Annual Project Physical Benefits			
Project Name: 739 - Karuk Tribe, Lower Mid-Klamath (Red Cap /Perch Creek) Habitat Protection-Road Decommissioning			
Type of Benefit Claimed: Enhanced Instream Habitat			
Measure of Benefit Claimed (Name of Units): Miles of instream habitat			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016-2065	0	14	14
Comments:			

740 – Yurok Tribe, Restoration of Lower Klamath River Habitats

Project Team

The Yurok Tribe is governed by an elected Council. Sarah Beesley, Yurok Tribal Fisheries Program (YTFP) – Lower Klamath Division, will serve as the project lead and will be responsible for managing all aspects of the project. Fiori GeoSciences, a California licensed geological firm with extensive experience restoring North Coast watersheds, will help lead project planning and implementation tasks. The YTFP has been implementing watershed restoration projects in the Lower Klamath subbasin since the late 1990s. Recent projects include the construction of five off-channel wetlands to increase the amount of productive juvenile rearing habitat for native salmonid populations, building complex fish habitat structures in Lower Klamath tributaries to improve spawning and rearing conditions for native salmonids, and planting riparian habitats with native trees to help promote increased forest resiliency and to facilitate future wood recruitment to aquatic habitats. All projects are designed in a manner that promotes the natural geomorphic processes necessary to form and maintain complex, productive aquatic habitats for Tribal Trust fish and wildlife. YTFP approaches are recognized throughout California as innovative, process-based, and effective.

Technical Justification for Project

The primary restoration tool proposed for this project is installing CWJs on a reach-scale within Hunter Creek and Terwer Creek. Constructed Wood Jams (CWJs) proposed for this project are a variation of Engineered Log Jams (ELJs) described by Abbe et al. (2003a, 2003b); and will mimic naturally occurring features such as bar apex jams (large-scale CWJ), deflector jams, and bar roughness jams. The use of CWJs and ELJs to recover habitat complexity and protect streambanks and riparian forests within river systems is widely applied in Washington and Oregon. A driving principle in ELJ technology is that habitat restoration is more likely to be effective and sustainable if done in a manner that mimics natural geomorphic processes (Abbe et al. 2003b). Wood accumulations (i.e. jams) in dynamic fluvial habitats can act as stable foundations and protective elements capable of facilitating forest development and providing long-term forest refugia (Abbe et al. 2003a, 2003b). Rehabilitating resilient streamside forests in the Lower Klamath is a critical measure for providing long-term benefits for native fish and wildlife. Resilient riparian forests help increase channel stability, provide long-term recruitment of wood to fluvial habitats, and help drive food webs.

Positive responses by salmonids to wood jams, especially by juveniles, are well documented in the Pacific Northwest (Cederholm et al. 1997; Pess et al. 2011). Wood jams create low-velocity microhabitats with complex overhead and instream cover for fish. Salmonids use these areas as velocity refugia to conserve energy and as predator protection elements and they have been shown to increase juvenile salmonid density and reduce competition for rearing habitat by providing visual isolation of conspecifics. Improving conditions for juvenile salmonids can help increase survival and growth and thus result in increased numbers of returning adults. CWJs and resilient streamside forests also promote improved salmonid spawning conditions (i.e. increased cover elements, velocity refuge, and sorting and retention of high quality spawning gravels).

This project was designed to provide long-term, sustainable benefits including protection and enhancement of riparian soils and forests to help maintain high quality, cold water habitats for native salmonids in the face of climate change. Planting streamside trees and increasing riparian forest resiliency will sequester significant quantities of carbon, while CWJs will facilitate increased flood retention and groundwater recharge, and help meter sediment delivery and reduce pool and thermal refugia filling events. A similar approach implemented by Mr. Fiori and YTFP in lower Terwer Creek has proven effective in increasing channel stability and mainstem, off-channel, and floodplain habitat complexity (Beesley and Fiori 2012; YTFP 2010).

Project standards (construction standards, safety protocols, data collection and sharing standards) are described in detail in the Yurok Restoration Design Plan, and Yurok Monitoring and Data Sharing Plan. References used to develop this project are provided in the table below.

Table 7.6, Yurok Tribe Technical and Scientific Documentation Table

Technical and Scientific Document Name	**Document Description**	**Relevant page #**
R.A. Fiori (CA Licensed Geologist/Fiori GeoSciences) and S. Beesley (Yurok Tribal Fisheries Program). Yurok Restoration Design Plan. February 2013.	Document provides the project narrative and design plan for the proposed project.	All
S. Beesley and M. Hiner. Yurok Monitoring and Data Sharing Plan. February 2013.	Document describes data collection, storage, and sharing methods for the monitoring components proposed for this project.	All
California Department of Fish and Game. Recovery Strategy for California Coho Salmon. 2004. Recovery task list is available on-line at http://nrm.dfg.ca.gov/coho/coho_tasks.aspx	Document describes the status of California coho populations, limiting factors, and sets species recovery priorities for the evolutionary significant unit (ESU).	High Priority Recovery Tasks: KR-KG-16 KR-KG-17 KR-KG-23 KR-KG-23
National Oceanic and Atmospheric Administration. Recovery Plan for the Evolutionarily Significant Unit of Southern Oregon/Northern California Coast Coho Salmon. 2012. Public Draft Version: January 2012. http://www.swr.noaa.gov/recovery/soncc_draft/SONCC_Coho_DRAFT_Recovery_Plan_January_2012.htm	Document describes the status of SONCC coho populations, limiting factors, and sets species recovery priorities for the evolutionary significant unit (ESU).	Volume II Chapter 18 Recovery Tasks: SONCC-LKR.2.1.1 SONCC-LKR.2.2.4

Abbe, T.B., A.P. Brooks, and D.R. Montgomery. 2003a. Wood in River Rehabilitation and Management. *In* S. Gregory, K. Boyer, & A. Grunell (*eds*) The Ecology and Management of Wood in World Rivers. AFS Symposium 37: Bethesda, Maryland; 367-389.	Describes the functional roles and beneficial processes created by wood jams and the principles and benefits of engineered log jam technology for river restoration.	All
Abbe, T.B., G.R. Pess, D.R. Montgomery and K. Fetherston. 2003b. Integrating Engineered Log Jam Technology into Reach-Scale River Restoration. *In* D.R. Montgomery, S. Bolton, D.B. Booth, L. Wall (*eds*) Restoration of Puget Sound Rivers. University of Washington Press: Seattle, Washington; 443-482. http://Rocky2.ess.washington.edu/grg/publications/pdfs/Abbe.pdf	Describes the functional roles and beneficial processes created by wood jams and the principles and benefits of engineered log jam technology for river restoration.	All
S. Beesley (Yurok Tribal Fisheries Program) and R.A. Fiori (CA Licensed Geologist/Fiori GeoSciences). Lower Terwer Creek Riparian Revegetation Project. 2012.	Describes similar project implemented in the Terwer Creek Valley by Mr. Fiori and YTFP.	All
Cederholm, C.J., R.E. Bilby, P.A. Bisson, T.W. Bumstead, B.R. Fransen, W.J. Scarlet and J.W. Ward. 1997. Response of Juvenile Coho Salmon and Steelhead to Placement of Large Woody Debris in a Coastal Washington Stream. North American Journal of Fisheries Management. Vol. 17: 947-963.	Describes an assessment of juvenile salmonid response to addition of wood in a small coastal stream in Washington. Found that winter coho populations increased significantly in reaches with complex wood structures.	Pages 947-963
Pess, G.R., M.C. Liermann, M.L. McHenry, R.J. Peters, and T.R. Bennett. 2011. Juvenile Salmon Response to the Placement of Engineered Log Jams (ELJs) in the Elwha River, Washington State, USA. River Research and Applications. John Wiley & Sons, Ltd. wileyonlinelibrary.com	Describes an assessment of juvenile salmonid use of engineered log jams (ELJs) in the Elwha River, Washington. Results indicated that ELJs were successful at restoring salmonid habitats.	All
Yurok Tribal Fisheries Program. Lower Terwer Creek Streambank and Riparian Restoration - U.S. Fish and Wildlife Service – Tribal Landowner Incentive Program Project. 2010.	Describes similar project implemented in the Terwer Creek Valley by Mr. Fiori and YTFP.	All

Project Physical Benefits

Conditions Without the Project. The Yurok Tribe harvests anadromous fish from the Klamath River and consider the Lower Klamath River habitats "salmon strongholds." Though anthropogenic activities over

the past century have resulted in declines of these populations, the area supports natal (Lower Klamath populations) and non-natal (Mid & Upper Klamath, Trinity populations).

In the Lower Klamath River Sub-basin, anthropogenic activities occurring since the mid-1850s have resulted in substantial declines to Klamath fish runs and drastically degraded associated habitats. Fish runs in the Hunter Creek and Terwer Creek watersheds have steadily improving as a result of improved forest practices and ongoing upslope and instream restoration. However, past agricultural practices and intense timber harvest and road-building activities have simplified these watersheds. Historic agricultural and logging practices that included stream clearing activities also resulted in significant losses of floodplain and forest habitats, fluvial wood accumulations, and wood recruitment to tributary and riverine systems. This severe loss of habitat complexity and channel structure resulting from the loss of instream wood and old growth forests is a primary limitation to the survival of native fish of the Lower Klamath, especially salmonids. Large floods occurring over the last 150 years have exacerbated degraded watershed conditions by increasing rates of riparian loss, channel widening, and valley aggradation.

Conditions With the Project. The project would restore spawning and rearing habitat for native salmonids (Chinook, Coho, steelhead, coastal cutthroat) on 2 miles in each two priority Lower Klamath tributaries: Terwer Creek and Hunter creek (four miles total). Project activities will include: feasible restoration designs, building constructed wood jams, implementing complimentary bioengineering techniques (willow baffles), and planting riparian habitats with native conifers.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Regional and Klamath River watershed enhancement and protection of native salmonid populations, especially the SONCC Coho ESU, implementing recommended actions of DFW and/or NOAA Fisheries in a high priority watershed
- Close collaboration with the Karuk Tribe (Project 139, above) via the Klamath River Coho Ecology Project; both Tribes' NCIRWMP projects will provide substantial benefits to SONCC Coho and other native salmonids
- Contributes toward regional efforts supporting voluntary attainment of TMDL for sedimentation in a 303(d) listed watercourse
- Contributes toward regional environmental justice by enhancing land and resources for a Native American Tribal community that is recognized as Severely Disadvantaged
- Contributes toward regional environmental justice by providing a mechanism for employment and education of Tribal members, meeting objectives for Tribal inclusion in water management planning in the California Water Plan as well as the NCIRWMP's objective related to environmental justice
- Contributes toward NCIRWMP objectives to conserve/enhance native salmonid populations, and support implementation of TMDLs and the Non-Point Source Program Plan

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-740 through 9.6-740, included at the end of this section.

- Increased salmonid populations (Coho, Steelhead, and Chinook)
- Reduced sediment deposition
- Restored riparian habitat
- New wetland habitat
- Carbon sequestration
- Increased winter base flows

Methods for estimation. Methods for estimation include agency and Tribal assessments, field studies, and site specific plans (Table 7.6). The mechanisms by which project actions would produce these physical benefits are well documented in literature relating to salmonids, riparian habitat restoration, and fluvial geomorphology in the region and throughout the Pacific Northwest. These studies document current and historic conditions that adversely affect instream habitat and salmonid populations and recommend implementation projects and management strategies to enhance salmonid fisheries, restore habitat and enhance water quality.

Acknowledgement of New facilities, policies, and actions required. This project does not require new facilities or policies. Actions required include enhancement of 40 acres of riparian forest and restoration of 2 miles of instream habitat in two priority Lower Klamath River tributaries. Restoration activities will provide quality employment and training opportunities to Yurok Tribal members. For a complete discussion of actions required, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary impacts, including disturbance of site during on the ground restoration and implementation activities. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations.

Uncertainty. Uncertainty in benefits from this project arises from uncontrollable factors such as ocean conditions that may adversely affect salmonid populations, drastic changes in weather patterns caused by global climate change, or large seismic events. In the absence of social or natural catastrophes, this project is highly certain to produce the stated benefits. The Yurok Tribe has decades of experience implementing similar projects in the Klamath River watershed successfully (see Project Team, above) and has developed a substantial library of technical and scientific data in support of project planning and design. Additionally, it has extensive experience working collaboratively with agency and other scientists from organizations including Green Diamond Resource Company, Fiori GeoSciences, USFWS, and US Bureau of Reclamation on related projects. For further discussion of how this NCIRWMP suite of projects avoids uncertainty, please see the introductory section to this attachment.

Table 9.1-740 – Annual Project Physical Benefits

Project Name: 740 - Yurok Tribe, Restoration of Lower Klamath River Habitats

Type of Benefit Claimed: Increase in Salmon Populations

Measure of Benefit Claimed (Name of Units): Number of additional fish

Additional Information About this Measure:_____

(a)	(b)	(c-1)	(c-2)	(d)
	Physical Benefits			
Year	Without Project	With Project - Coho & Steelhead	With Project - Chinook	Change Resulting from Project (c) – (b)
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0
2016	0	0	0	0
2017	0	35	0	35
2018	0	35	0	35
2019	0	35	0	35
2020	0	35	0	35
2021	0	35	0	35
2022	0	35	0	35
2023	0	35	0	35
2024	0	35	0	35
2025	0	35	0	35
2026-2066	0	35	150	185

Comments:

Table 9.2-740 – Annual Project Physical Benefits

Project Name: 740 - Yurok Tribe, Restoration of Lower Klamath River Habitats

Type of Benefit Claimed: Reduced Sediment Deposits

Measure of Benefit Claimed (Name of Units): Tons of sediment deposited per year

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	297	297	0
2013	297	297	0
2014	297	297	0
2015	297	297	0
2016	297	297	0
2017-2066	297	0	(297)

Comments:

Table 9.3-740 – Annual Project Physical Benefits			
Project Name: 740 - Yurok Tribe, Restoration of Lower Klamath River Habitats			
Type of Benefit Claimed: Enhanced Riparian Habitat			
Measure of Benefit Claimed (Name of Units): Acres of Functional Riparian Habitat			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	5	5	0
2013	5	5	0
2014	5	5	0
2015	5	5	0
2016	5	5	0
2017	5	8.21	3.21
2018	5	11.43	6.43
2019	5	14.64	9.64
2020	5	17.86	12.86
2021	5	21.07	16.07
2022	5	24.29	19.29
2023	5	27.50	22.50
2024	5	30.71	25.71
2025	5	33.93	28.93
2026	5	37.14	32.14
2027	5	40.36	35.36
2028	5	43.57	38.57
2029	5	46.79	41.79
2030-2066	5	50	45
Comments: Assumes existing landscape has 10 percent ecological functionality, which increases to 100 percent in 15 years as restoration matures. Actual acres restored equals 50.			

Table 9.4-740 – Annual Project Physical Benefits			
Project Name: 740 - Yurok Tribe, Restoration of Lower Klamath River Habitats			
Type of Benefit Claimed: Enhanced Wetland Habitat			
Measure of Benefit Claimed (Name of Units): Acres of Functional Wetland Habitat			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	0	0.14	0.14
2018	0	0.29	0.29
2019	0	0.43	0.43
2020	0	0.57	0.57
2021	0	0.71	0.71
2022	0	0.86	0.86
2023	0	1.00	1.00
2024	0	1.14	1.14
2025	0	1.29	1.29
2026	0	1.43	1.43
2027	0	1.57	1.57
2028	0	1.71	1.71
2029	0	1.86	1.86
2030-2066	0	2	2
Comments: Assumes restoration increases wetland function from near 0 to 100 percent in 15 years as vegetation matures.			

Table 9.5-740 – Annual Project Physical Benefits

Project Name: 740 - Yurok Tribe, Restoration of Lower Klamath River Habitats

Type of Benefit Claimed: Carbon Sequestration

Measure of Benefit Claimed (Name of Units): Metric tons of carbon dioxide equivalent sequestered

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0.00	0.00
2013	0	0.00	0.00
2014	0	0.00	0.00
2015	0	0.00	0.00
2016	0	0.00	0.00
2017	0	40.18	40.18
2018	0	40.28	40.28
2019	0	40.37	40.37
2020	0	40.46	40.46
2021	0	40.57	40.57
2022	0	40.68	40.68
2023	0	40.81	40.81
2024	0	40.94	40.94
2025	0	41.06	41.06
2026	0	41.21	41.21
2027	0	41.36	41.36
2028	0	41.50	41.50
2029	0	41.67	41.67
2030	0	41.82	41.82
2031	0	41.98	41.98
2032	0	42.17	42.17
2033	0	42.33	42.33
2034	0	42.51	42.51
2035	0	42.70	42.70
2036	0	42.88	42.88
2037	0	43.06	43.06
2038	0	43.27	43.27
2039	0	43.47	43.47
2040	0	43.67	43.67
2041	0	43.87	43.87
2042	0	44.07	44.07
2043	0	44.29	44.29
2044	0	44.51	44.51
2045	0	44.73	44.73
2046	0	44.95	44.95
2047	0	45.17	45.17
2048	0	45.41	45.41
2049	0	45.63	45.63
2050	0	45.87	45.87
2051	0	46.11	46.11
2052	0	46.37	46.37
2053	0	46.61	46.61
2054	0	46.84	46.84
2055	0	47.10	47.10
2056	0	47.36	47.36
2057	0	47.62	47.62
2058	0	47.87	47.87
2059	0	48.13	48.13
2060	0	48.40	48.40
2061	0	48.66	48.66
2062	0	48.94	48.94
2063	0	49.21	49.21
2064	0	49.49	49.49
2065	0	49.76	49.76
2066	0	50.06	50.06

Comments:

Table 9.6-740 – Annual Project Physical Benefits			
Project Name: 740 - Yurok Tribe, Restoration of Lower Klamath River Habitats			
Type of Benefit Claimed: Increased winter base flows			
Measure of Benefit Claimed (Name of Units): Cubic Feet Per Second			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017-2066	0	2	2
Comments:			

D. Trinity River Watershed Management Area

635 – Salyer Mutual Water Company, Distribution System and Hydrants

Project Team

Salyer Mutual Water Company is a non-profit beneficial, tax-exempt mutual formed in February 2012 to provide water service to the community of Salyer when the privately owned system was going to be abandoned last year. A five-member board was elected by the shareholders in October to manage the business of the mutual. Trinity Valley Consulting Engineers (TVCE), which is under contract to perform the surface water treatment system design through CDPH's funding stream, will also lead this NCIRWMP project. Previous projects completed by this firm include the design of Weitchpec's water tank, tank pad, utility interconnect, and testing and monitoring infrastructure, and the design, specifications, inspections, and quality assurance testing for the Hodgson Tank Replacement for the Willow Creek CSD. TVCE has had extensive experience working with small local water districts, including Willow Creek CSD, Hoopa Valley PUD, and Trinity Village Water Company. The treasurer of the Salyer Mutual Board is also a board member of the Salyer Community Services District, Fire Chief of the Salyer Volunteer Fire Department, and retired from Cal Fire. He will review the design for adequate fire flows and fire hydrant selection and locations. The California Department of Public Health Drinking Water Division and California Rural Water Association have provided grant writing assistance and support this project's implementation. The Rural Communities Assistance Corporation will provide technical assistance and the Redwood Water Resources Network will continue to provide networking and technical resources.

Technical Justification for Project

The majority of the current potable water distribution system consists of 2" Bluebell piping, most commonly used for sewer pipes. Because Bluebell piping is made with unplasticized polyvinyl chloride (uPVC), this pipe is very rigid, thin-walled, and has less flexibility than conventional PVC piping (with plasticizing polymers) that is commonly used for drinking water supply.

The majority of the current distribution system was installed in the 1960's and 1970's in inadequately bedded trenches. Some of the lines run across private properties. Portions of the alignments are not maintained, and areas thick with vegetation are not cleared, allowing plant roots to damage already weakened pipe. Additionally, poor bedding and inadequate cover make pipes prone to breakage under traffic loads. Because of the brittleness of the old Bluebell piping, it splits easily when attempting a repair, creating greater repair costs and lower success rates.

Because of the age of the system, the rigid uPVC piping material used, and the poor trenching and bedding practices employed during the original construction, the water system is constantly addressing water main leaks and breaks.

All upgrades to the system will be performed under the direction of a California certified professional engineer according to the California Code of Regulations, Title 22, Chapter 16, California Waterworks Standards and CCR, Title 19, Division 1, Section 507 Appendix CC and BB. The project will be designed and implemented in accordance with the documents listed in the table below.

Table 7.7, Salyer Mutual Water Company Technical and Scientific Documentation Table		
Technical and Scientific Document Name	**Document Description**	**Relevant page #**
Mey Bunte/California Department of Public Health Staff Engineer Drinking Water Field Operations Branch February 27, 2013	Details past and present support from CDPH for upgrade of Salyer Mutual Water Company infrastructure	2 pages
Salyer Mutual Water Company/ Map of Distribution System and System Components February 27, 2013	Map shows current distribution line, isolation valves, and meters in the service area. Map also shows parts of the system that have been repaired/replaced in the last year Jan. 2012 to Feb. 2013.	2 pages
Salyer Mutual Water Company/Map of Service Area September 2012	Legal map of service area	1 page
Mohsen Kazemzadeh/Project Manager CPUC Water Utilities Regulated by the CPUC with Critical Water Quality Water Supply, Infrastructure or Financial Problems October 23, 2006	River View Acres, previous owners of Salyer Mutual water system, placement (3rd place) on the California Public Utilities Commission's (CPUC) list of Critical Water Quality systems.	7 pages
Heidi Carpenter/River View Acres Water Co. June 29, 2011	Letter from daughter of previous owner indicating desire to abandon the water system	1 pages
Tony Wiedemann/California Department of Public Health Klamath District Engineer Drinking Water Field Operations Branch	Letter inviting customers of the River View Acres Water Company to a community meeting to discuss future options for water service.	1 page
Dale D. Newkirk, P.E. Engineering Report for Planning Study and Scope of Work done for River View Acres Water Co. February 28, 2011	Engineering report submitted to CDPH by River View Acres Water Co. for planning for groundwater test drilling wells and a surface water treatment plant; part of the 12/7/10 planning application to CDPH for Fall State Fiscal Year 2010-2011 Safe Drinking Water State Revolving Fund (SDWSRF)	17 pages
Kim Wihelm P.E. Chief/ Technical Programs Branch Division of Drinking Water and Environmental Management Bypass letter for SDWSRF	Letter detailing the areas of concerns that necessitated the California Department of Public Health to bypass the River View Acres application for SDWSRF.	2 pages

Project Physical Benefits

Conditions Without the Project. The Salyer Mutual Water Company (SMWC), located in the City of Salyer, California, draws water from a river gallery in the Trinity River with 18 feet of cover. Salyer is part of the Trinity River Hydrographic Unit, Burnt Ranch subunit watershed.

Since 1998, the California Department of Public Health has maintained a standing boil order advisory for water users in the Salyer Mutual Water Company (SMWC) service area because the unfiltered source water does not meet Safe Drinking Water Act requirements. The SMWC took over the operation of the previously privately owned water company in 2012 after regulatory violations and deferred maintenance resulted in leaks, low water pressure, lack of proper chlorination and unsafe water for some customers. Willow Creek Community Services District has loaned SMWC equipment for water supply repairs and on occasion provides expertise for addressing water-supply issues.

SMWC has two storage tanks; each holds 10,000 gallons. SMWC serves 110 residents, which represent 59 active connections. About one fourth of these are summer homes. Residents level to the tanks experience low pressure. Power outages and frequent leaks lead to frequent water outages and require extreme water conservation to avoid shortages, including purchases of bottled water and bulk water deliveries. The system is insufficient for fire protection; Salyer is considered at high risk from wildland fires.

SMWC does not have any fire hydrants, only 7 flushing standpipes that are not compatible with Salyer VFD's equipment. Also the sediment in the unfiltered system would cause damage to the fire engine's pump. The American Water Works Association (AWWA) standard for fire hydrants is every 500 feet.

Conditions With the Project. The project would build a new storage tank(s) and a dedicated water line to storage tank(s) and new water mains throughout; install a master meter at pump house and meters at customer's homes; and install fire hydrants for fire protection. The project would eliminate the short-term and long-term water outages.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Addresses critical drinking water supply and water quality need in disadvantaged communities, as defined by the IRWM Guidelines and can be classified as California Department of Public Health Safe Drinking Water State Revolving Fund ranking category E, supporting goals of DWR, CDPH, and the California Water Plan, increasing regional environmental justice and the provision of safe drinking water for DACs
- Salyer is a Severely DAC, and this project thus meets the NCIRWMP Objective involving environmental justice and protecting and enhancing drinking water supply

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-635 through 9.7-635, included at the end of this section.

- Reduced bottled water purchases
- Reduced bulk water purchases
- Reduced energy use
- Reduced carbon emissions
- Increased instream flows for environmental purposes
- Reduced fire risk rating (ISO rating)
- Reduced number of unauthorized connections

Methods for estimation. Methods for estimation include CPUC documents, engineering reports, and CDPH communications. Staff and consulting engineering reports provide detailed documentation of the water system's current deficiencies and proposed remediation based on state and federal water standards and industry best practices (Table 7.7).

Acknowledgement of New facilities, policies, and actions required. This project requires new facilities including a distribution system that will deliver water from a water tank constructed through a CDPH grant project, and fire hydrants to provide adequate fire protection in a fire prone area. . For a complete discussion of facilities and actions required, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary impacts, including disturbance of site and possible temporary effects related to water supply for customers during construction. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations.

Uncertainty. Lack of funding is the most significant obstacle to implementation of safe drinking water projects, and the major factor creating uncertainty in achieving this project's goals of improved water supply reliability and quality. Additional uncertainty arises when considering events outside of the project proponent's control, such as differences in weather patterns caused by climate change, extreme seismic events, or other catastrophic societal or natural events.

The NCIRWMP framework and process has built-in mechanisms to ensure that safe drinking water projects from disadvantaged communities are identified, planned and implemented, including outreach and technical assistance support, technical and engineering support to project proponents from disadvantaged communities, one-on-one assistance with applications, and the formation of a regional sub-group comprised of small water supply and wastewater treatment facility operators. For further discussion of how this NCIRWMP suite of projects avoids uncertainty, please see the introductory section to this attachment.

Table 9.1-635 – Annual Project Physical Benefits			
Project Name: 635 - Salyer Mutual Water Company, Distribution System and Hydrants			
Type of Benefit Claimed: Reduced Bottled Water Purchases			
Measure of Benefit Claimed (Name of Units): Gallons of Drinking Water Purchased per year			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	550	550	0
2013	550	550	0
2014	550	550	0
2015	550	550	0
2016-2055	550	0	(550)
Comments:			

Table 9.2-635 – Annual Project Physical Benefits			
Project Name: 635 - Salyer Mutual Water Company, Distribution System and Hydrants			
Type of Benefit Claimed: Bulk Water Purchases			
Measure of Benefit Claimed (Name of Units): Gallons of Bulk Water Purchased			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	11,800	11,800	0
2013	11,800	11,800	0
2014	11,800	11,800	0
2015	11,800	11,800	0
2016-2055	11,800	0	(11,800)
Comments:			

Table 9.3-635 – Annual Project Physical Benefits			
Project Name: 635 - Salyer Mutual Water Company, Distribution System and Hydrants			
Type of Benefit Claimed: Reduced Energy Use			
Measure of Benefit Claimed (Name of Units): Kilowatt Hours per year			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	1,600	1,600	0
2013	1,600	1,600	0
2014	1,600	1,600	0
2015	1,600	1,600	0
2016-2055	1,600	0	(1,600)
Comments:			

Table 9.4-635 – Annual Project Physical Benefits			
Project Name: 635 - Salyer Mutual Water Company, Distribution System and Hydrants			
Type of Benefit Claimed: Carbon Emissions			
Measure of Benefit Claimed (Name of Units): Metric Tons of Carbon Dioxide Equivalent Emitted			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	5.04	5.04	0
2013	5.04	5.04	0
2014	5.04	5.04	0
2015	5.04	5.04	0
2016-2055	5.04	0	(5.04)
Comments:			

Table 9.5-635 – Annual Project Physical Benefits			
Project Name: 635 - Salyer Mutual Water Company, Distribution System and Hydrants			
Type of Benefit Claimed: Increased instream flows			
Measure of Benefit Claimed (Name of Units): Acre-feet of water			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016-2055	0	8	8
Comments:			

Table 9.6-635 – Annual Project Physical Benefits			
Project Name: 635 - Salyer Mutual Water Company, Distribution System and Hydrants			
Type of Benefit Claimed: Reduced fire risk rating			
Measure of Benefit Claimed (Name of Units): ISO rating			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	10	10	0
2013	10	10	0
2014	10	10	0
2015	10	10	0
2016-2055	10	7	Reduced fire insurance risk rating (ISO rating)
Comments:			

Table 9.7-635 – Annual Project Physical Benefits			
Project Name: 635 - Salyer Mutual Water Company, Distribution System and Hydrants			
Type of Benefit Claimed: Reduced number of unauthorized connections			
Measure of Benefit Claimed (Name of Units): Number of unauthorized connections			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	2	2	0
2013	2	2	0
2014	2	2	0
2015	2	2	0
2016-2055	2	0	(2)
Comments:			

636 – Trinity County Resource Conservation District, West Weaver Creek – Channel and Floodplain Rehabilitation

Project Team

Trinity County Resource Conservation District (TCRCD) is a legal subdivision of state government responsible for conservation and education projects within its boundaries. It encompasses 2.1 million acres in rural Northern California and has as its Mission Statement "to assist people in protecting, managing, conserving, and restoring the natural resources of Trinity County through information, education, technical assistance, and project implementation programs. In the past year, TCRCD has implemented a floodplain rehabilitation project for Indian Creek, a tributary of the Trinity River. Like the proposed project, the Indian Creek project site is significantly impacted by past mining activities, resulting in an aggraded alluvial reach with sparse riparian vegetation. The project's goal was to reduce fine sediment by establishing riparian vegetation and floodplain connectivity; a secondary channel was cut to relieve sheer stress to existing riparian vegetation and roughness elements (willow baffles) were installed to establish floodplain vegetation and sequester fine sediment. ESA PWA, a private consultant well known for high quality restoration and geomorphological work in Northern California, has been contracted to provide design, environmental compliance documents, permitting documents, and construction support and construction monitoring for the proposed project. The USFS Shasta-Trinity National Forest Trinity River Management Unit, the property owner, is another collaborator on this project, in part due to TCRCD's reputation for successful project implementation. USFS Redwood Sciences Lab will be conducting pre- and post-project monitoring and modeling.

Technical Justification for Project

Rivers are comprised of their contributing tributaries and upstream watersheds. These tributaries contribute more than water—they provide important contributions of sediment, organic material, and also serve as habitat for resident and anadromous aquatic species. For the Trinity River downstream of Lewiston Dam, these tributaries are perhaps even more important than in other basins given the exclusion of anadromous habitat in the river's watershed upstream of the dams. Ironically, while many of these important tributaries provide habitat for key anadromous aquatic species, they may also contribute fine sediment to the Trinity River. The Trinity River Restoration Program (TRRP) includes the Watershed Restoration Program and Watershed Coordinator Program to assess, plan and implement tributary watershed restoration actions for an improved anadromous fish population in the Trinity River.

West Weaver Creek, a tributary to the Trinity River, is one of the many headwater watersheds critical to supporting existing and future anadromous fish populations in the Trinity basin. The resident and anadromous fish species that have been observed in West Weaver Creek include Coho (*Oncorhynchus kisutch*), Steelhead (*Oncorhynchus mykiss*), Brown Trout (*Salmo trutta*), Speckled Dace (*Rhinichthys osculus*), Threespine Stickleback (*Gasterosteus aculeatus*), and Klamath Smallscale Sucker (*Catostomus rimiculus*). Additionally, though there has been no recent sampling of Pacific Lamprey (*Entrosphenus tridentatus*) in West Weaver Creek, the species is present in the mainstem of Weaver Creek. The high water quality (and low temperatures) of the West Weaver Creek headwater watershed upstream of developed areas is particularly ideal for supporting coho and steelhead. Climate change is expected to

drive temperatures in Northern California higher, making cold headwater watersheds such as West Weaver Creek increasingly vital to supporting threatened fish populations, including anadromous species such as coho salmon.

As a result of hydraulic mining and fire, portions of West Weaver Creek are in poor condition. However, these degraded reaches have been assessed and found to exhibit strong potential for improved spawning and rearing conditions, improved fine sediment storage, and reduced fine sediment yield, given appropriate rehabilitation efforts. This proposal focuses on the 1,000 feet of West Weaver Creek immediately upstream of the confluence with Grub Gulch. Extensive hydraulic mining in the surrounding area has adversely influenced the channel and its floodplain, with the hillslope and valley morphology of the creek significantly altered in many areas. Much of the finer grained mine-waste material has already been washed downstream and out of this part of the watershed. However, the residual coarse hydraulic mine debris (cobble- to boulder-sized substrate) has confined portions of the channel in the project reach to a form that is not beneficial to salmonid spawning and rearing and is also poorly configured for supporting the physical processes that sort and store fine sediment. Further, this coarse sediment size is too large for the creek to recruit and mobilize for downstream transport, creating a downstream reach with limited available coarse sediment. Coupled with the channel morphology, the stream in the lower portion of the reach transports the majority of the sediment coming from upstream through the reach to downstream reaches. In some locations the channel has scoured down to the weakly–resistant Weaverville Formation (a Tertiary-age conglomerate bedrock). Current continuous erosion of this soft conglomerate bedrock yields fine sediment to downstream reaches. This bedrock reach harbors little alluvial substrate, making it a challenge for anadromous fish to spawn, providing poor rearing habitat, and at some flows precluding upstream fish passage. Also, it produces a steady source of fine sediment to the Trinity River, which is detrimental to anadromous fish in the mainstem.

During 2011 and 2012, ESA PWA worked with the TCRCD to assess conditions in West Weaver Creek and identify rehabilitation opportunities. The results of this work were published as the West Weaver Assessment and Action Planning (ESA PWA, 2012). This report recommends a rehabilitation effort in the project reach to increase in-channel substrate, improve channel morphology, increase large wood, and connect the channel to its floodplain. The benefit of such a project would be increased in-channel and floodplain sediment sorting and retention, decreased sediment yield, improved passage to upstream habitat, increased spawning and rearing habitat, increased colonization surfaces for macroinvertebrates, increased substrate for lamprey ammocoetes (larvae) and increased high flow refugia. Further, the reach would provide continuity with intact habitat upstream and provide improved rearing conditions for fish emigrating from upstream habitat. ESA PWA progressed the recommendation for this reach to a 30% preliminary engineering design to complete the necessary due diligence for the proposed project, further demonstrating the benefits of this project and providing the necessary information to estimate the effort required to accomplish the rehabilitation recommendations.

The project will be implemented based on the standard specifications for construction as defined in the most current version of the Caltrans Standard Specifications. These will be supplemented with technical specifications for construction of specific restoration project elements. Each of these will include

requirements for materials testing (e.g. rock gradations) and quality control protocols (e.g. seed and plants). Documents used in project development are listed in the table below.

Table 7.8, Trinity County Resource Conservation District Technical and Scientific Documentation Table

Technical and Scientific Document Name	**Document Description**	**Relevant page #**
Environmental Protection Agency. Trinity River Sediment Total Maximum Daily Load, 2001	The Trinity River Total Maximum Daily Load (TMDL) for Sediment is being established in accordance with Section 303(d) of the Clean Water Act, because the State of California has determined that the water quality standards for the Trinity River are exceeded due to excessive sediment.	pg. 24, 25, 39, 50, 53, 61
Ebasco Environmental/United States Department of the Interior Bureau of Reclamation. West Weaver Creek Fish Habitat Assessment, 1990.	This document reports on quantifying physical aspects of existing salmon and steelhead habitat and recommending habitat enhancements where habitat deficiencies may limit salmon and steelhead production for West Weaver Creek.	entire document
United States Forest Service. Weaverville Watershed Assessment, 2004	This document reports on vegetation condition as it relates to fuel loading, water quality, aquatic habitat, wildlife habitat, and soil productivity for watersheds that are administered by the Shasta Trinity National Forest. The document provides information on the current condition in these watersheds as well as the desired condition based on the Land and Resource Management Plan (LRMP).	3,13,14, 17, 19, 22,23,24, 25, 26, 31, 51, 82
ESA PWA/Trinity County Resource Conservation District. West Weaver Creek Assessment and Action Planning, 2012	This report provides: • A general overview of the watershed's geography, land use and ownership, hydrologic and geomorphic setting. • The history of the watershed as it concerns the existing physical and ecologic conditions of the channel. • A review of initial field reconnaissance efforts and description of observations sufficient to focus more-detailed field surveys. • A review of more-detailed surveys and field observations • A summary of hydrologic and hydraulic analyses for a focused reach of creek, including fish passage at Highway 299.	entire document

	• A summary of key issues and recommendations for next steps, including provision of potential restoration design concepts.	
ESA PWA/Trinity County Resource Conservation District. West Weaver Creek Channel and Floodplain Rehabilitation - 30% Preliminary Design Plans, 2012.	Title Sheet, Existing Conditions Plan View, Proposed Conditions Plan View and Profile, Proposed Conditions Design Details	entire document

Project Physical Benefits

Conditions Without the Project. West Weaver Creek is a branch of Weaver Creek, a headwater tributary to the Trinity River. West Weaver Creek lies just west of the town of Weaverville, Trinity County, California. It has good water quality and is ideal for supporting habitat for Coho and Steelhead. West Weaver Creek has a reach 1,000 feet upstream of its confluence with Grub Gulch, adjacent to Highway 299 and mostly within the Weaverville Community Forest, which has been degraded by historic hydraulic mining and recent fires. This reach has poor salmonid habitat, and supplies fine sediment to Trinity River downstream. Currently, the project reach is incised with prominent in-channel bedrock exposure, minimal in-channel cover, little substrate to support spawning and macroinvertebrate productivity, and no high-flow refugia.

Conditions With the Project. The project would involve pool and riffle construction, spawning gravel augmentation, and riparian planting to improve instream habitat though an increase in-channel and floodplain sediment sorting and retention, decrease fine sediment yield, improve passage to upstream habitat, increase spawning and rearing habitat, increase colonization surfaces for macroinvertebrates, and increase high flow refugia. The project would reduce water temperature in Willow Creek by increasing hyporheic exchange from gravel augmentation. The Forest Service Redwood Science Lab would continue their fish population monitoring and modeling of the creek, and their post-project monitoring would document the fish population response and benefits of the project in relation to the wider region.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Regional enhancement/protection of salmonid habitat implementing recommendations of DFW and/or NOAA Fisheries in a watershed identified as high priority for the recovery of endangered salmonids
- Contributes toward voluntary attainment of TMDL for sediment in 303(d) listed Trinity River
- Incorporates local, regional, state, and federal climate adaptation strategies through restoration and enhancement of a cold headwater watershed and its floodplain, restoring a natural buffer

to high intensity precipitation events and providing a cold water source to the Trinity River in the face of expected warming weather patterns.

- Contributes toward NCIRWMP objectives including conservation/enhancement of native salmonid populations, supporting TMDL Implementation and the Non-Point Source Program Plan, and addressing environmental justice issues for the entirely Disadvantaged and partially Severely Disadvantaged Community of Weaverville

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-636 through 9.5-636, included at the end of this section.

- Increased salmonid populations
- Reduced sediment deposition
- Increased riparian habitat
- Increased groundwater recharge
- Reduced water temperature

Methods for estimation. Methods for estimation include West Weaver Creek fish habitat and watershed assessments, and watershed and rehabilitation plans (Table 7.8). During 2011 and 2012, ESA PWA worked with the Trinity County Resource Conservation District (TCRCD) to assess conditions in West Weaver Creek, identify rehabilitation opportunities, and develop preliminary design plans, which this project will implement.

Acknowledgement of New facilities, policies, and actions required. This project does not require new facilities or policies. It will require the implementation of a creek restoration design that includes pool and riffle construction, spawning gravel augmentation, construction of a secondary side channel, and riparian planting. . For a complete discussion of actions required, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary impacts, including disturbance of site during on the ground restoration and implementation activities. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations.

Uncertainty. Uncertainty in benefits from this project arises from uncontrollable factors such as ocean conditions that may adversely affect salmonid populations, drastic changes in weather patterns caused by global climate change, or large seismic events. In the absence of social or natural events beyond the control of the project proponent, there is a high degree of certainty that this project will deliver the stated benefits. The Trinity County Resource Conservation District has been working collaboratively with landowners and scientists from ESA PWA, USFS Shasta-Trinity National Forest Trinity River Management Unit, and the USFS Redwood Sciences Lab on related projects for years (see Project Team,

above), and the USFS Redwood Sciences Lab has committed to conducting extensive performance testing and monitoring pre- and post-project. The NCIRWMP project prioritization process was designed to prioritize projects that demonstrate both applicability to state and local goals and a high degree of technical soundness; this regional and project-specific emphasis on scientifically and technically sound planning and implementation creates certainty that this project will perform as stated above. For further discussion of how the NCIRWMP prioritization process avoids uncertainty, please see the introductory section to this attachment.

Table 9.1-636 – Annual Project Physical Benefits

Project Name: 636 -Trinity County Resource Conservation District, West Weaver Creek - Channel and Floodplain Rehabilitation

Type of Benefit Claimed: Increases in Salmon Population

Measure of Benefit Claimed (Name of Units): Number of fish

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	101	101
2016	0	202	202
2017	0	302	302
2018	0	403	403
2019	0	504	504
2020	0	605	605
2021	0	706	706
2022	0	806	806
2023	0	907	907
2024-2064	0	1008	1008

Comments:

Table 9.2-636 – Annual Project Physical Benefits

Project Name: 636 -Trinity County Resource Conservation District, West Weaver Creek - Channel and Floodplain Rehabilitation

Type of Benefit Claimed: Reduced Sediment Deposition

Measure of Benefit Claimed (Name of Units): Tons of sediment deposition per year

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	59	59	0
2013	59	59	0
2014	59	59	0
2015	59	0	(59)
2016-2064	59	0	(59)

Comments:

Table 9.3-636 – Annual Project Physical Benefits

Project Name: 636 -Trinity County Resource Conservation District, West Weaver Creek - Channel and Floodplain Rehabilitation

Type of Benefit Claimed: Enhanced Riparian Habitat

Measure of Benefit Claimed (Name of Units): Acres of Riparian Habitat

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0.13	0.13
2016	0	0.27	0.27
2017	0	0.40	0.40
2018	0	0.53	0.53
2019	0	0.67	0.67
2020	0	0.80	0.80
2021	0	0.93	0.93
2022	0	1.07	1.07
2023	0	1.20	1.20
2024	0	1.33	1.33
2025	0	1.47	1.47
2026	0	1.60	1.60
2027	0	1.73	1.73
2028	0	1.87	1.87
2029-2064	0	2	2

Comments: Assumes existing landscape has 0 percent ecological functionality, which increases to 100 percent in 15 years as restoration matures. Actual acres restored equals 2.

Table 9.4-636 – Annual Project Physical Benefits

Project Name: Trinity County RCD West Weaver Creek Project

Type of Benefit Claimed: Increased groundwater recharge

Measure of Benefit Claimed (Name of Units): Acre-feet of groundwater

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012			
2013			
2014			
2015 - 2064		Increased groundwater recharge	Increased groundwater recharge

Comments:

Table 9.5-636 – Annual Project Physical Benefits

Project Name: Trinity County RCD West Weaver Creek Project

Type of Benefit Claimed: Decreased water temperature

Measure of Benefit Claimed (Name of Units): Degrees Fahrenheit

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012			
2013			
2014			
2015 - 2064	0	(0.02)	(0.02)

Comments:

E. Humboldt Bay Watershed Management Area

206 – Humboldt Bay Municipal Water District, Ranney Collectors 1 & 1A Lateral Replacement

Project Team

The Humboldt Bay Municipal Water District (District) was formed in 1956 to provide water to the cities and communities in the greater Humboldt Bay area. It has as its Mission to 1) Reliably deliver high quality drinking water at a reasonable cost, 2) Reliably deliver untreated water to wholesale industrial customers at a reasonable cost, and 3) Protect the long-term water supply and water quality interests of the District in the Mad River watershed. The District is the wholesale water agency that provides water to 2/3rds of Humboldt County's population, including the Cities of Eureka, Arcata and Blue Lake, as well as the Special Service Districts of McKinleyville CSD, Humboldt CSD, Fieldbrook/Glendale CSD, and Manila CSD. It completed a similar Ranney Collector 3 project in October 2012. The project was a success and has resulted in an approximate 50% increase in individual Collector yield and a decrease of approximately 10% in energy use. The Cities of Arcata, Eureka, and Blue Lake, McKinleyville CSD, Humboldt CSD, Manila CSD, and Fieldbrook-Glendale CSD are all collaborators on the project through contribution of matching funds for project planning, design, permitting and construction.

Technical Justification for Project

The District operates R.W. Matthews Dam at Ruth Lake, which impounds a portion of the water in the upper end of the Mad River Watershed during the winter, then releases the flow down the Mad River during the remainder of the year. The flow recharges the aquifer below the Mad River, and the District collects the filtered flow through 4 Ranney type collectors, located just east of Arcata at their Essex facility. The collectors consist of 13-foot diameter concrete caissons, which are sunk to a depth of approximately 80 feet below the ground surface. Steel laterals are then projected out from the caisson into the surrounding aquifer. The laterals are 12-inch diameter screens, and the original lateral screens are carbon steel, punched well screens. The lateral lengths vary from 30 to 80-feet in length. The laterals collect the water and direct it back into the central caisson, where it is pumped to the District's treatment and distribution facilities. Collectively, the collectors are capable of pumping 20 MGD and have been a source of high quality drinking water to the area for over 50-years. The collectors are the heart of the District's potable water system and must be rehabilitated so they remain operational for another 40 or 50 years. The District has experienced a reasonable and useful life from the collectors and with good planning and maintenance should be able to operate the collectors for an extended time into the future. Installation of new laterals will be required to provide added operational life to the system. Over the years the Collectors have been maintained and upgraded; however, investigations have shown that the existing laterals are approaching the end of their useful service life and need to be replaced. The District has conducted a systematic approach to the assessment and planning for the refurbishing of the Ranney Collector Wells. Recent work/Reports related to the collector assessment and rehabilitation includes:

- 1996 – Inspection Report for Collector 1, Aqua Video Engineering
- 2002 – Video Inspection and Pump Test of Pump Station 2, Reynolds, Inc.
- 2003 – Ranney Collector Rehabilitation Feasibility Report, Winzler & Kelly
- 2005 – Pump Station 2 Cleaning and Rehabilitation, Maintenance Report, Collector Well Pumping Station No.2, Collector Wells International, Inc.
- 2006 – Humboldt Bay Municipal Water District Groundwater Study, Winzler & Kelly
- 2006 - Pump Station 2 Evaluation Final Report, Winzler & Kelly
- 2006 – Inspection Report Collector Wells 1, 1A, 3, 4, Collector Wells International, Inc.
- 2008 – HBMWD Ranney Collector Final Evaluation Report, Winzler & Kelly
- 2012 – HBMWD Ranney Collector 3 Lateral Installation Final Report, GHD and Reynolds, Inc.
- 2013 – Report for Collectors 1&1A, Dive Survey, Topographic Survey and Initial Assessment for New Lateral Installation, GHD

The 1996 Aqua Video Engineering Report found the concrete structures of Collector 1 to be in generally good condition, but found the laterals and valves to be “heavily encrusted with corrosion products and nodules”. If this project is not implemented, the existing laterals will eventually fail, ether by collapsing or by becoming completely encrusted with corrosion products.

As presented in the 2006 Inspection Report by Collector Wells International, the video inspection of the laterals showed that the interiors of the lateral screens are generally coated with black and reddish-colored bacterial and/or mineral deposits. These deposits appear to be 1/2-inch to more than 1-inch thick. In portions of the laterals the deposits are thick enough so that the screen slot openings are not visible. The diver was able to advance the camera to the end of all of the laterals except the fourth lateral from the right of the ladder in the lower tier (designated as A4 in the tables). This lateral was partially blocked by what appeared to be sand and gravel at about 55 feet from the caisson wall. The report went on to recommend rehabilitation of the laterals.

In 2004, the District obtained a grant from the State Department of Water Resources, Local Groundwater Assistance Grant program to develop a groundwater model of the Essex reach of the Mad River to help the District in the management of the groundwater basin and to assist in the development of recommendations on where to install additional laterals in the existing collectors to allow for their rehabilitation. The 2006 & 2008 Winzler & Kelly Reports built off this grant, and focused on the water system in the region of the four active Ranney Collectors (Collectors 1 through 4). The activities of the 2006 study consisted of: collecting existing data (from construction plans, well logs, operational data, and previous studies), collecting new data (from the installation of four new monitoring wells and seismic refraction study), compiling the collected data into a site conceptual model, construction of a three dimensional computational model, numeric and parameter model calibration, and model application. The site conceptual model was used to construct the computational model. The computational model estimated the water flow and head by solving the flow equations using MODFLOW-SURFACT, a MODFLOW based finite difference model. The model was then applied to seven operational pumping regimes. The 2008 Winzler & Kelly Groundwater Study: 1) updated and refined the previously developed groundwater model with additional data near Collectors 3 and 4 not included in the original groundwater modeling efforts; 2) completed a final evaluation to determine the potential yields from Collectors 3 and 4; and 3) provided a recommendation to the District regarding which

Collector the District should start the lateral replacement program at, under the broader Ranney Rehabilitation program being developed in the CIP. The 2008 Study recommended that the District begin working on a phased replacement of all of the laterals in all of the collector wells and recommended they begin at Collector 3.

The District prepared plans and specifications, obtained bids and has successfully completed the construction work on the installation of 6 new laterals at Collector 3 in 2011. The Collector 3 project was a large success and 690-lineal feet of new laterals were installed in Collector 3. The new lateral installation improved the production from Collector 3 from approximately 6 MGD to over 10 MGD. It also decreased the draw-down in this collector by over 50% and increased the specific capacity of this collector by over 50%. Ultimately it also replaced the existing lateral screens with new laterals that should extend the life of this collector by 50 years or more.

This project focuses on the 2nd phase of the District's Collector Rehabilitation Capital Improvement Plan and consists of installing new laterals in Collectors 1&1A to replace the existing laterals in these collectors. This project will consist of projecting 4 to 6 new stainless steel laterals out from the existing caisson. Cores will be cut through the sides of the existing caissons, and new laterals will be projected out horizontally into the surrounding aquifer. The work will be performed from within the existing caisson and will therefore have minimal to no impact to the surrounding environment. The new laterals will be spiral wound, stainless steel well screens, with a much larger ratio of open space per foot of screen than the existing lateral screen. This will reduce the flow velocities in the subsurface, thereby reducing the associated turbidity of the water. There is currently 756-ft of well screen in the existing laterals, and a minimum of 660-feet of new screen will be installed. This will more than replace the capacity of the existing screen and, given the greater capacity and lower flow velocities, drawdown in the collectors will likely be reduced by several feet. This will reduce the energy required to pump the water from the caisson to the treatment and distribution system, thereby reducing energy consumption and greenhouse gas emissions. The impacts on the drawdown, specific capacity and energy savings will be evaluated by conducting pre- and post-construction testing. Drawdown in the caisson and surrounding monitoring wells will be measured prior to the installation of the new laterals, and after the installation of the new laterals to determine the impacts. SCADA data will also be collected after the construction to determine pumping rates, drawdown, and turbidity levels.

This project will conform to all applicable American Water Works Association (AWWA), American National Standard Institute (ANSI), National Sanitation Foundation (NSF), California Department of Public Health (CDPH) and California and Federal Occupational Safety and Health Administration's (OSHA) standards. The table below contains the documents which provide detailed technical justification for the development of this project.

Table 7.9, Humboldt Bay Municipal Water District Technical and Scientific Documentation Table		
Technical and Scientific Document Name	**Document Description**	**Relevant page #**
Environmental Protection Agency. Trinity River Sediment Total Maximum Daily Load, 2001	The Trinity River Total Maximum Daily Load (TMDL) for Sediment is being established in accordance with Section 303(d) of the Clean Water Act, because the State of California has determined that the water quality standards for the Trinity River are exceeded due to excessive sediment.	pg. 24, 25, 39, 50, 53, 61
Ebasco Environmental/United States Department of the Interior Bureau of Reclamation. West Weaver Creek Fish Habitat Assessment, 1990.	This document reports on quantifying physical aspects of existing salmon and steelhead habitat and recommending habitat enhancements where habitat deficiencies may limit salmon and steelhead production for West Weaver Creek.	entire document
United States Forest Service. Weaverville Watershed Assessment, 2004	This document reports on vegetation condition as it relates to fuel loading, water quality, aquatic habitat, wildlife habitat, and soil productivity for watersheds that are administered by the Shasta Trinity National Forest. The document provides information on the current condition in these watersheds as well as the desired condition based on the Land and Resource Management Plan (LRMP).	3,13,14,17,19, 22,23,24,25, 26,31,51,82
ESA PWA/Trinity County Resource Conservation District. West Weaver Creek Assessment and Action Planning, 2012	This report provides: • A general overview of the watershed's geography, land use and ownership, hydrologic and geomorphic setting. • The history of the watershed as it concerns the existing physical and ecologic conditions of the channel. • A review of initial field reconnaissance efforts and description of observations sufficient to focus more-detailed field surveys. • A review of more-detailed surveys and field observations • A summary of hydrologic and hydraulic analyses for a focused reach of creek, including fish passage at Highway 299. • A summary of key issues and recommendations for next steps, including provision of potential restoration design concepts.	entire document
ESA PWA/Trinity County Resource Conservation	Title Sheet, Existing Conditions Plan View, Proposed Conditions Plan View and Profile, Proposed Conditions Design Details	entire document

District. West Weaver Creek Channel and Floodplain Rehabilitation - 30% Preliminary Design Plans, 2012.		

Project Physical Benefits

Conditions Without the Project. Humboldt Bay Municipal Water District (HBMWD) provides wholesale treated water to municipal customers through 7 water agencies that provide water to about 87,000 people (about 60 percent of Humboldt County's population).

HBMWD's collection system draws from the aquifer below the Mad River. The HBMWD recharges the aquifer through water releases in the summer and fall from seasonal flows stored in Ruth Lake, approximately 60 miles upstream of the collection system. Ruth Lake was designed to provide 75 million gallons per day (MGD), and the District maintains water rights, which support that. Releases from Ruth Lake also help support several species of salmonid on the 60-mile section of the Mad River, which is water-quality impaired for temperature, and has historically gone dry during the summer.

Installed almost 50 years ago, HBMWD's water collection system is aging, and its capacity to produce water has declined. Without the project, project proponents estimate that all of the laterals would progressively fail within the next 20 years, reducing water supply reliability for HBMWD's customers and resulting in emergency operations and maintenance costs for the HBMWD. With ongoing use of the existing system, engineering studies have shown that HBMWD's regular operation and maintenance costs associated with pumping, treatment, and overall system operation would be higher than with new collectors. Ultimately, the collectors would become unusable, requiring HBMWD to replace them at a later date, after incurring extensive costs to keep the deteriorating system running.

Without the project, water treatment costs would also increase. After it pumps, HBMWD treats the water to state and federal drinking water standards: chlorine is added, and during the winter, HBMWD processes the water at its turbidity reduction facility. As the collection system has aged, HBMWD has had to increase the flow velocity to maintain the same flow rate and volume production, which picks up more sediment and increases the turbidity of the water. Without the project, HBMWD would have to expand the turbidity reduction facility, incur increasing treatment costs, and operate it longer during the year.

If the collection system were to fail or no longer be able to provide the current rate of water consumption, it is likely that the District would reduce its releases from Ruth Lake. This could cause HBMWD to lose a portion of its water right from Ruth Lake, which would likely trigger a small decrease in the District's releases from Ruth Lake. This would result in lower flows to 60 miles of the river, which may have an adverse effect on aquatic species and recreational kayakers, rafters, and anglers during the low-flow summer months.

Conditions With the Project. With the project, HBMWD would replace all the laterals in the existing water collection system. The existing laterals consist of 12-inch diameter pipes that are punched with approximately 1-inch diameter holes. The new laterals consist of spiral wound well screens with over four times the available flow per foot than the existing screens. This higher flow area would allow more water through into the caissons at lower flow velocities, which would mobilize less sediment and reduce turbidity in the water pumped from the collectors.

Maintaining the integrity and capacity of the water collection system would allow HBMWD to avoid constructing an alternate water supply. It would also secure HBMWD's water right and allow it to continue to release the same amount of water from Ruth Lake, maintaining the flow regime in the Mad River. This is especially important during the late summer and fall months, when the releases augment low flows and benefit salmonids and recreational water users.

The project would not affect the net quantity of water extracted in the long-run.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Providing water supply reliability in part to both Disadvantaged and Severely Disadvantaged Communities (Arcata, Bayside, Bayview, Blue Lake, Cutten, Eureka, Fieldbrook, Freshwater, Humboldt Hill, Manila, Myrtletown, and Somoa) by replacing failing water supply infrastructure
- Collectively with the other projects in this Proposal that serve DACs and Severely Disadvantaged Communities it contributes towards NCIRWMP objectives of protection and enhancement of drinking water quality, ensuring an adequate water supply while minimizing environmental impacts, and attainment of environmental justice goals.

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-206 through 9.4-206, included at the end of this section.

- Reduced water treatment chemicals used
- Reduced gallons of water pumped
- Reduced carbon emissions
- Maintained streamflow on Mad River

Methods for estimation. Methods for estimation include inspection reports, tests, feasibility reports, and studies going back over ten years. Staff and consulting engineering reports conducted from 1996 to 2013 provide detailed documentation of the deficiencies in the collector; please see the Technical Justification section, above, for a detailed description of the reports and their findings. This project represents the second phase of a multi-phased Collector Rehabilitation Capital Improvement Plan to

replace aging collectors throughout the system. The first phase successfully replaced collectors and resulted in similar benefits as those described above.

Acknowledgement of New facilities, policies, and actions required. New facilities and actions required by this project include the installation of new laterals in Collectors 1 and 1 A in HBMWD's water supply infrastructure. New valves for existing laterals will be purchased prior to the contract date in order to increase readiness for project implementation. For a complete discussion of new facilities and actions required, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary disturbance impacts and possible temporary effects related to water supply for customers during construction. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations.

Uncertainty. Lack of funding is the most significant obstacle to implementation of safe drinking water projects, and the major factor creating uncertainty in achieving this project's goals of improved water supply reliability. Additional uncertainty arises when considering events outside of the project proponent's control, such as differences in weather patterns caused by climate change, extreme seismic events, or other catastrophic societal or natural events. In the absence of such uncontrollable events, it is highly likely that this project will deliver the benefits claimed due to the project proponent's successful experience implementing the prior lateral installation and the detailed research and planning that has preceded project implementation.

Table 9.1-206 – Annual Project Physical Benefits

Project Name: 206 - Humboldt Bay Municipal Water District, Ranney Collectors 1 & 1A Lateral Replacement

Type of Benefit Claimed: Avoided Water Treatment

Measure of Benefit Claimed (Name of Units): Gallons of alum reduced

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014-2027	0	900	900

Comments:

Table 9.2-206 – Annual Project Physical Benefits			
Project Name: 206 - Humboldt Bay Municipal Water District, Ranney Collectors 1 & 1A Lateral Replacement			
Type of Benefit Claimed: Energy Use Reduction			
Measure of Benefit Claimed (Name of Units): Millions of Gallons Pumped			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	6	6	0
2013	6	6	0
2014-2027	6	0	(6)
Comments:			

Table 9.3-206 – Annual Project Physical Benefits			
Project Name: 206 - Humboldt Bay Municipal Water District, Ranney Collectors 1 & 1A Lateral Replacement			
Type of Benefit Claimed: Reduced Carbon Dioxide Emissions			
Measure of Benefit Claimed (Name of Units): Metric tons of Carbon Dioxide Equivalent			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	25.7	25.7	0
2013	25.7	25.7	0
2014-2033	25.7	0	(25.7)
Comments:			

Table 9.4-206 – Annual Project Physical Benefits			
Project Name: 206 - Humboldt Bay Municipal Water District, Ranney Collectors 1 & 1A Lateral Replacement			
Type of Benefit Claimed: Streamflow maintained on Mad River			
Measure of Benefit Claimed (Name of Units): Miles of river with flows maintained			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014-2033	0	60	60
Comments:			

215 – Westhaven Community Services District, Water Tank

Project Team

The Westhaven CSD (WCSD) was formed in 1988 per California Government Code 61000 to assume ownership and operation of a water system constructed by the Westhaven Mutual Water Company in 1968. The WCSD provides residential water service to approximately 500 people within a portion of the larger unincorporated rural community of Westhaven / Moonstone. The District rehabilitated the project tank with a new liner and yard piping as part of a multi-phase system upgrade project in 1990 – 1994. The project included construction of surface water intake structures, construction of a slow sand filter, purchase and development of a well, upgrade of disinfection equipment and replacement of a portion of the distribution system. Contractors have not yet been retained, however, a registered engineering geologist and qualified, licensed engineering consultant will be contracted to complete final designs and implement the project.

Technical Justification for Project

The California Department of Public Health has determined that the failing roof is potentially a serious system health hazard (Wiedemann), and that it should be replaced as soon as possible.

Rains increase Dissolved Organic Carbon (DOC) concentrations (Heisig, Boyer), and by tracking the untreated water color (State, Heisig) the District hopes to determine if there is a correlation between color, rainfall, and DOC, as well as to determine the relationship between raw water DOC levels and the carcinogenic Disinfection Byproduct (DBP) concentrations in finished water. Should the District determine that DOC is a primary contributor to the formation of DBPs, it can then focus its State Revolving Funds monies to removing DOC from the raw water. Also, if the District determines there is a relationship between water color, DOC, and rainfall, it could turn off its treatment system during periods of heavy rains, thereby lowering the DBP concentrations in the distribution system.

Chlorine concentrations are a key factor in the production of DBPs (Hua, Oneby, Hong) and by reducing its initial chlorine dose from 2 mg/l to just above 1 mg/l upon completion of the new tank and water mains, the District hopes to reduce levels in the distribution system. The District cannot currently reduce chlorine levels because it is required to maintain high initial chlorine concentration to meet Health Department disinfection requirements. Reducing initial chlorine dose could reduce DBP formation (Oneby, Hua).

Time is a factor in DBP production; however, studies appear to indicate that most DBPs are produced within 72 hours of chlorination (Hua) and the District's current residence time, during winter months when DBP concentrations appear to peak, is on the order of three to five days. Therefore, the additional storage, and consequently additional chlorine contact time, is not expected to further increase DBP concentrations.

The new tank and water mains will be built to American Water Works Association standards and the new roof will be built according to California Building Standards Code and the American Water Works Association. Testing procedures will be conducted according to Standard Methods for Examination of Water and Wastewater. ASTM will be followed for Soils Compaction, ACI will be followed for concrete

standards, and at all times OSHA requirements and California Title 22 Standards will be met. The table below contains documents that provide the rationale and technical justification for this project.

Table 7.10, Westhaven Community Services District Technical and Scientific Documentation Table

Technical and Scientific Document Name	Document Description	Relevant page #
Heisig, P.M., 2009, Nutrients, dissolved organic carbon, color, and disinfection byproducts in base flow and stormflow in streams of the Croton watershed, Westchester and Putnam Counties, New York, 2000–02: U.S. Geological Survey Open-File Report 2009–1054, 105 p., online only.	A study of the DBP formation potential in a watershed that investigates possible links between dissolved organic carbon and water color. It also investigates the potential formation of DBPs from DOC in raw water.	p. 36, 44, 54-67
State Water Resources Control Board, Facts Sheet FACT SHEET 3.1.5.9 http://www.swrcb.ca.gov/water_issues/programs/swamp/docs/cwt/guidance/3159.pdf	Briefly discusses a potential relationship between Color and DOC	p. 1
Boyer Elizabeth W. Syracuse University. New York. Available online. http://www.esf.edu/hss/DOCWS/DOC%20Workshop/Boyer_DOC.pdf	A Powerpoint presentation that discusses the relationship between Color and DOC, as well as a relationship between precipitation and DOC	p. 1-4
Hua Guanghui; Reckhow, David A. DBP formation during chlorination and chloramination: Effect of reaction time, pH, dosage, and temperature. American Water Works Association, August 2008, 100:8	Investigate the relationships between reaction times and chlorine dosages.	Figures 2,3,8,9
Hong, H.C.; Liang Y.; Han, B.P; Mazumder A.; Wong, M.H. Modeling of trihalomethane (THM) formation via chlorination of the water from Dongjiang River. Science of the Total Environment, 385, 2007	Investigate the relationship between chlorine concentration and the formation of DBPs.	p. 51-52
Oneby, Micheal; Read, Andrew L.; Mahmutoglu, Serkan. Model Shed Light on TTHM Formation. Opflow. American Water Works Association, November 2009.	Present a mathematical model describing the effect of total organic carbon, time, temperature, and pH on the formation of total trihalomethanes.	Page 2 (shown as page 21)
California Department of Public Health. Notice of Violation of Maximum Contaminant Level for Haloacetic Acids, Redding Branch. August 8 2012, February 2 2012, September 13 2012, August 17 2011, March 8 2011, September 23 2010, April 14 2010.	Notice of Violation from the California Department of Public Health regarding haloacetic acid and trihalomethane concentrations in the Westahven CSDs drinking water. Seven notice have been issued to date.	

Wiedemann, Toni. California Department of Public Health. May 31, 2005, Inspection of Westhaven CSD Public Water System.	The inspection called for Westhaven CSD to replace the roof on its storage tank to repair a 'Potential system health hazard'	p. 9

Project Physical Benefits

Conditions Without the Project. The Westhaven Community Services District (WCSD) provides water to approximately 450 residential customers, which represent 210 active household connections. The system relies on a single 100,000 gallon concrete storage tank with a metal roof supported by fir (wood) trusses that are in an advanced state of rot. An annual inspection in 2005 listed the condition of the tank roof as a "system or operational defect and/or potential health hazard—costly to correct—to be included in any long-range water improvement project." To temporarily mitigate the rot problem, the district runs ventilation fans to lower the humidity.

The roof has exceeded its lifespan. The deterioration of the trusses is such that a catastrophic event such as an earthquake or heavy winds could cause the roof to collapse. Without repair, it is highly likely the roof would fail in the next 5 years.

If the roof failed it would require about six months repair the existing tank and roof. In the interim, the District would issue a boil water order and provide bottled drinking water to its 450 users. After the initial cleanup, which would require several days, the District would keep the tank in service and provide non-potable water during construction of a new tank. While the tank was out of service, the District would supply the system directly from the gravity fed slow sand filter. During peak demand, the District would augment these supplies with untreated water directly from an open reservoir. Residents would be without a potable water source for the entire duration of construction of the replacement roof—six months—and without any water source for the duration of construction of the temporary roof—about five days.

Conditions With the Project. The project would: (1) construct a new glass-lined steel 85,000 gallon storage tank adjacent to the existing concrete tank to allow the system to take the existing tank out of service and (2) replace the roof on the existing tank with a new free-span aluminum roof. The project would also construct a new ringwall foundation; install station piping connecting the new tank to the treated water effluent piping and connection to the existing outlet piping of the exiting storage tank; and install a cathodic protection system, tank floats and related controls. The new tank would operate in series with the existing tank.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Addresses critical drinking water supply and water quality need in the Severely Disadvantaged Community of Westhaven, as defined by the IRWM Guidelines and can be classified as California Department of Public Health Safe Drinking Water State Revolving Fund ranking category B

- Collectively with several other projects in this Proposal meets multiple state goals (CDPH, DWR) and NCIRWMP goals regarding protection and enhancement of drinking water supplies, ensuring adequate water supply while minimizing environmental impacts, and environmental justice

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-215 through 9.7-215, included at the end of this section.

- Reduced risk of issuing boil water notice
- Reduced risk of purchasing bottled water
- Reduced risk of water system flush
- Reduced risk of temporary water supply loss
- Reduced treatment chemicals
- Reduced energy use
- Reduced carbon emissions

Methods for estimation. Methods for estimation include water quality studies and CDPH inspection reports (Table 7.10). Staff and consulting engineering reports provide detailed documentation of the water system's current deficiencies; these will be remedied during the project preliminary design phase (see Attachment 3, Work Plan).

Acknowledgement of New facilities, policies, and actions required. This project requires the construction of a new tank to meet current seismic code and repair to a failing roof. For greater detail, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary disturbance impacts and possible temporary effects related to water supply for customers during construction. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations.

Uncertainty. Lack of funding is the most significant obstacle to implementation of safe drinking water projects, and the major factor creating uncertainty in achieving this project's goals of improved water supply reliability and quality. Additional uncertainty arises when considering events outside of the project proponent's control, such as differences in weather patterns caused by climate change, extreme seismic events, or other catastrophic societal or natural events. In the absence of uncontrollable events, there is a high likelihood that this project will provide the claimed benefits because the NCIRWMP framework and process has built-in mechanisms to ensure that safe drinking water projects from disadvantaged communities are identified, planned and implemented. These include outreach and technical assistance support, technical and engineering support to project proponents from

disadvantaged communities, one-on-one assistance with applications, and the formation of a regional sub-group comprised of small water supply and wastewater treatment facility operators. For further discussion of how the projects in this Proposal avoid uncertainty, please see the introductory section to this attachment.

Table 9.1-215 – Annual Project Physical Benefits

Project Name: 215 - Westhaven Community Services District, Water Tank

Type of Benefit Claimed: Avoided Issuance of Boil Water Notice

Measure of Benefit Claimed (Name of Units): Boil water notice issued

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012			
2013			
2014			
2015 - 2017	Boil Water Notice Issued		No boiled water notice issued

Comments:

Table 9.2-215 – Annual Project Physical Benefits

Project Name: 215 - Westhaven Community Services District, Water Tank

Type of Benefit Claimed: Avoided Bottled Water Purchases

Measure of Benefit Claimed (Name of Units): Purchase bottled water

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012			
2013			
2014			
2015 - 2017	Bottled Water Purchases		Bottled water purchases avoided

Comments:

Table 9.3-215 – Annual Project Physical Benefits

Project Name: 215 - Westhaven Community Services District, Water Tank

Type of Benefit Claimed: Avoided Cost of Flushing District and Household Water heaters

Measure of Benefit Claimed (Name of Units): Flush district and household water heaters

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012			
2013			
2014			
2015 - 2017	Flush the water system		Do not flush the water system

Comments:

Table 9.4-215 – Annual Project Physical Benefits			
Project Name: 215 - Westhaven Community Services District, Water Tank			
Type of Benefit Claimed: Temporary Loss of Water Supply			
Measure of Benefit Claimed (Name of Units): Temporary loss of water services			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012			
2013			
2014			
2015 - 2017	Temporary loss of water service		No temporary loss of water service
Comments:			

Table 9.5-215 – Annual Project Physical Benefits			
Project Name: 215 - Westhaven Community Services District, Water Tank			
Type of Benefit Claimed: Reduced Water Treatment Chemicals			
Measure of Benefit Claimed (Name of Units): Chlorine dosing			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	2 mg/l	2 mg/l	
2013	2 mg/l	2 mg/l	
2014	2 mg/l	2 mg/l	
2015	2 mg/l	2 mg/l	
2016-2066	2 mg/l	1 mg/l	(1 mg/l)
Comments:			

Table 9.6-215 – Annual Project Physical Benefits			
Project Name: 215 - Westhaven Community Services District, Water Tank			
Type of Benefit Claimed: Reduction of Energy Usage			
Measure of Benefit Claimed (Name of Units): Kilowatt hours			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	1,825	1,825	0
2013	1,825	1,825	0
2014	1,825	1,825	0
2015	1,825	1,825	0
2016	1,460	0	(1,460)
2017	1,460	0	(1,460)
Comments:			

Table 9.7-215 – Annual Project Physical Benefits			
Project Name: 215 - Westhaven Community Services District, Water Tank			
Type of Benefit Claimed: Avoided Costs from Reduced Carbon Emissions			
Measure of Benefit Claimed (Name of Units): Metrc Tons of Carbon Dioxide Equivalent			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0.8	0.8	0
2013	0.8	0.8	0
2014	0.8	0.8	0
2015	0.8	0.8	0
2016	0.6	0	(0.6)
2017	0.6	0	(0.6)
Comments:			

F. Russian River / Bodega WMA

316 – California Land Stewardship Institute, Fish Friendly Farming and Fish Friendly Ranching Environmental Certification in the Russian, Navarro, and Gualala River Watersheds

Project Team

The California Land Stewardship Institute (CLSI) is a non-profit organization dedicated to planning and implementing environmental stewardship, restoration and enhancement programs and projects including educational activities, scientific studies, promotion of beneficial stewardship practices, and resource conservation activities on private and public lands and waterways. Staff includes environmental scientists, hydrologists, and geologists. CLSI works with hundreds of landowners and managers, local districts, non-profit organizations, and a number of private consultants to design and implement environmental projects. CLSI has administered the Fish Friendly Farming / Fish Friendly Ranching (FFF/FFR) program in five counties and received over 10 grants to fund the program over the past ten years. Over 120,000 acres are currently enrolled in the program. Certifiers of the FFF/FFR program include the NCRWQCB, National Marine Fisheries Service, and Sonoma and Mendocino County Agricultural Commissioners. The NRCS provides technical support on creek, road and water facility projects related to the FFF/FFR program. The Sonoma and Mendocino County Farm Bureaus, Sonoma Winegrape Commission, and Mendocino WineGrowers, Inc., support the program and assist with program outreach.

Technical Justification for Project

The FFF and FFR programs each have two workbooks: the Beneficial Management Practices (BMPs) workbook and the Farm/Ranch Conservation Plan template. These contain the technical information supporting the FFF/FFR program, and the inventory/assessment methods for completing a Farm/Ranch Conservation Plan. For vineyard management BPs, soil erosion control measures were reviewed from a number of sources including publications on cover crops and their uses, and published papers on hydrology and hillslope processes and erosion control practices and products. Road BMPs were derived from Forest Service publications, published papers, and other sources. The creek/river corridor BMPs use published sources on fluvial geomorphology, riparian and fish ecology and hydrology combined with original research and evaluation. For the grazing program, a detailed review of published papers and agency BMPs was completed. The workbooks and templates used for individual projects are listed in the table below; a comprehensive list of references used to develop these documents is provided in the FFF/FFR workbooks (see Attachment 3, Work Plan, APPENDIX A, Priority Project Plans, Specifications, Technical Studies and Scientific Data).

Table 7.11, California Land Stewardship Institute Technical and Scientific Documentation Table		
Technical and Scientific Document Name	**Document Description**	**Relevant page #**
California Stewardship Institute, Fish Friendly Ranching: BMP Workbook, March 2013, to be provided when published March 11, 2013	Workbook of BMPs for livestock management, grazing areas, water sources, roads, creek network and photo-monitoring	all
California Stewardship Institute, Fish Friendly Ranching: Ranch Plan Template, March 2013, to be provided when published March 11, 2013	Template for completion of comprehensive plan for grazing areas, water sources, roads and creeks and photo-monitoring.	all
Laurel Marcus. Fish Friendly Farming: BMP Workbook. 1999, last updated 2012.	Workbook of BMPs for vineyards, orchards, roads, creek networks, water sources, chemical use and photo-monitoring.	all
Laurel Marcus. Fish Friendly Farming: Farm Plan Template. 1999, last updated 2012.	Template for completion of comprehensive plan for vineyards/orchards, roads, creek networks, water and soil conservation, water sources and photo-monitoring.	All
PWA. Handbook for forest and ranch roads. Prepared for the Mendocino County Resource Conservation District in cooperation with the California Dept. of Forestry and the U.S. Soil Conservation Service. Mendocino Resource Conservation District, Ukiah, California. 163 pages. 1994.	Roads need not threaten the biological productivity and water quality of streams in a watershed if they are properly located and constructed. Poor road building and maintenance practices can cause excess runoff and erosion, leading to sedimentation in downstream areas. Sedimentation can pollute water supplies, increase flooding potential, accelerate stream bank erosion and trigger landsliding. Salmonid eggs laid in stream gravels can become buried and suffocate, fish habitat can be lost, and other aquatic life may be threatened or killed.	All
North Coast Regional Water Quality Control Board (NCRWQCB). Work Plan to Control Excess Sediment. 2008.	The Staff Work Plan to Control Excess Sediment in Sediment-Impaired Watersheds (Work Plan) describes the actions and tasks staff of the North Coast Regional Water Quality Control Board (Regional Water Board) are currently taking or intend to take over the next ten years, as resources allow, to control human-caused excess sediment in the sediment-impaired water bodies of the North Coast Region. The Work Plan is a staff-level planning document that will help prioritize work associated with excess	109-115, 202-207

	sediment control. The Work Plan was developed by staff to fulfill the Regional Water Board's direction under the Total Maximum Daily Load (TMDL) Implementation Policy Statement for Sediment Impaired Receiving Waters in the North Coast Region (Resolution No. R1-2004-0087).	
California Department of Fish and Game (CDFG). Recovery Strategy for California Coho Salmon. Report to the California Fish and Game Commission. Species Recovery Strategy 2004-1. 2004.	The Biological Review Team agreed in 2004 that natural populations of coho salmon in the CCC ESU are in danger of extinction. This determination was based on the following factors: 1) substantially low abundance of coho salmon from historical levels (e.g., more than 50% of coho streams no longer have spawning runs), 2) long-term trends clearly downward, 3) degraded habitats, 4) threats to genetic integrity due to hatchery plantings, and 5) recent droughts and change in ocean productivity. It is believed a high potential for recovery is possible for CCC coho salmon because of the likelihood that freshwater impacts can be substantially controlled or reduced through habitat protection, implementation of best management practices, and focused restoration.	159, 241-242, 331-332
DFG. California Salmonid Stream Habitat Restoration Manual – 4th Edition - Part X and XI. 2010.	Part X, Upslope Erosion Inventory and Sediment Control Guidance, describes the California Department of Fish and Game (DFG) methodology for the identification of upslope and stream bank erosion, and techniques for the implementation of cost-effective erosion control treatments in salmonid watersheds.	Entirety
DFG. California Salmonid Stream Habitat Restoration Manual – 4th Edition - Part X and XI. 2010.	Large flood events may create the need for erosion control work in the riparian zone to prevent excess siltation into the stream or loss of land. Whenever possible, a vegetative method for reducing erosion such as bioengineering is preferable to a structural approach such as riprap.	14-15

Project Physical Benefits

Conditions Without the Project. California Land Stewardship implements the Fish Friendly Farming (FFF) and Fish Friendly Ranching (FFR) Environmental Certification Programs to increase the environmental values and functions on agricultural and grazing lands. The FFF program has implemented improvements on over 120,000 acres in five counties in conjunction with about 300 private owners in Sonoma, Solano, Napa and Mendocino Counties.

Grazing and irrigated agriculture in the Gualala, Russian and Navarro River watersheds generate fine sediment that erodes from pastures, cultivated land, roads and creeks. They may also generate chemical runoff from fertilizer and pesticide applications. Agricultural land uses also may contribute to higher water temperatures. Sediment, chemical runoff, and increased water temperatures reduce the quality of habitat in salmon-bearing streams.

Many of the agricultural lands in the Russian, Gualala and Navarro watersheds are owned and farmed by individuals with low incomes and limited means to implement the industry's best practices to minimize environmental damage to salmon-bearing streams. It is unlikely without the project that these operations would be able to invest in the necessary education and equipment to improve their farming and grazing practices. If future regulations require farmers and ranchers to meet more stringent requirements, they may not be able to maintain their operations at current levels, reducing employment opportunities for residents of disadvantaged communities.

Conditions With the Project. With the project, the program would provide implementation funds for an additional 20,000 acres in the Russian, Gualala, and Navarro River watersheds for both grazing land and irrigated agriculture. The program would focus on lands in disadvantaged communities.

Under the program, CLSI and the participating farmers produce and implement a detailed, comprehensive Farm Conservation Plan using the FFF/FFR template. The plan includes the following activities:

- A review of all potential sources of fine sediment generation and delivery, including grazing and farm lands, roads, creek channels, and ditch erosion.
- An inventory of the potential for chemical runoff, all water supply facilities and their effects on habitat, and other features.
- An implementation of best management practices (BMPs). Some of these include: sediment source control, road and gully repair, water conservation and water efficiency, enhancement of riparian corridors through removal of invasive species and revegetation, and widening of riparian corridors.

For each of these BMPs, the farmer contributes part of the costs of implementation, while funding from CLSI and the FFF program contributes the remaining portion. For each benefit listed below, therefore, we scale the portion of benefits from the project by the percent of costs attributable to funding under this application.

Upon completion, the National Marine Fisheries Service, the Region 1 Water Quality Control Board, and the County Agricultural Commissioner certify the site. In order to maintain the certification, the rancher/grower must be recertified every five years.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Enhancement and protection of salmonid habitat implementing actions recommended by DFW and/or NOAA Fisheries in high priority watersheds for recovery of endangered salmonids
- Voluntary TMDL implementation in watersheds 303(d) listed for sediment
- Increasing regional environmental justice by targeting landowners in the Disadvantaged and Severely Disadvantaged Communities of Boonville, Guerneville, Hopland, Philo, Talmage, and Ukiah
- Contributing toward NCIRWMP objectives including enhancement of native salmonid populations, supporting implementation of TMDLs and the Non-Point Source Program Plan, and addressing environmental justice issue

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-316 through 9.5-316, included at the end of this section.

- Increased instream flows for environmental purposes
- Reduced sediment deposition
- Increased riparian habitat
- Dirt roads assessed for applicability of BMPs
- Creeks assessed for the applicability of BMPs

Methods for estimation. Project proponents have estimated the physical effects of the project based on average values associated with prior education and technical support activities in the region. These have been documented through monitoring and post-project evaluations. The mechanisms by which the implemented BMPs would produce these physical benefits is supported by studies and assessments conducted in the region and on agricultural lands. See Attachment 3, Work Plan, APPENDIX A, Priority Project Plans, Specifications, Technical Studies and Scientific Data to review references that contain these studies.

Acknowledgement of New facilities, policies, and actions required. This project requires implementation of water quality improvements including comprehensive sediment source control, road and gully repair, water conservation and water use efficiency measure, invasive species removal, and native plant revegetation over 20,000 acres of agricultural lands in the Russian, Gualala, and Navarro River watersheds. For greater detail, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary impacts, including disturbance of site during on the ground restoration and implementation activities. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations.

Uncertainty. Uncertainty in benefits from this project arises from uncontrollable factors such as ocean conditions that may adversely affect salmonid populations, drastic changes in weather patterns caused

by global climate change, or large seismic events. In the absence of uncontrollable social or natural catastrophic events, this project is highly likely to attain the claimed benefits due to the project team's expertise and long-term experience with similar project implementation on Northern California agricultural lands. For further discussion of how this suite of projects avoids uncertainty, please see the introductory section to this attachment.

Table 9.1-316 – Annual Project Physical Benefits

Project Name: 316 - California Land Stewardship Institute, Fish Friendly Farming and Fish Friendly Ranching Environmental Certification in the Russian, Navarro, and Gualala River Watersheds

Type of Benefit Claimed: Increased Instream Flows

Measure of Benefit Claimed (Name of Units): Acre-feet of water per year

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017-2026	0	307	307

Comments:

Table 9.2-316 – Annual Project Physical Benefits

Project Name: 316 - California Land Stewardship Institute, Fish Friendly Farming and Fish Friendly Ranching Environmental Certification in the Russian, Navarro, and Gualala River Watersheds

Type of Benefit Claimed: Reduced Sediment Deposition

Measure of Benefit Claimed (Name of Units): Tons of sediment deposition avoided per year

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	80,000	80,000	0
2013	80,000	80,000	0
2014	80,000	80,000	0
2015	80,000	80,000	0
2016	80,000	80,000	0
2017-2026	80,000	0	(80,000)

Comments:

Table 9.3-316 – Annual Project Physical Benefits			
Project Name: 316 - California Land Stewardship Institute, Fish Friendly Farming and Fish Friendly Ranching Environmental Certification in the Russian, Navarro, and Gualala River Watersheds Type of Benefit Claimed: Enhanced Riparian Habitat Measure of Benefit Claimed (Name of Units): Acres of functional riparian habitat Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	303	303	0
2013	303	303	0
2014	303	303	0
2015	303	303	0
2016	303	303	0
2017	303	323.2	20.2
2018	303	343.4	40.4
2019	303	363.6	60.6
2020	303	383.8	80.8
2021	303	404	101
2022	303	424.2	121.2
2023	303	444.4	141.4
2024	303	464.6	161.6
2025	303	484.8	181.8
2026	303	505	202
2027	303	525.2	222.2
2028	303	545.4	242.4
2029	303	565.6	262.6
2030	303	585.8	282.8
2031-2066	303	606	303
Comments: Assumes existing landscape has 50 percent ecological functionality, which increases to 100 percent in 15 years as restoration matures. Actual acres restored equals 606.			

Table 9.4-316 – Annual Project Physical Benefits			
Project Name: 316 - California Land Stewardship Institute, Fish Friendly Farming and Fish Friendly Ranching Environmental Certification in the Russian, Navarro, and Gualala River Watersheds Type of Benefit Claimed: Dirt Roads Assessed for Applicability of BMPs Measure of Benefit Claimed (Name of Units): Miles of road Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	24	24
2015	0	24	24
2016	0	24	24
Comments:			

Table 9.5-316 – Annual Project Physical Benefits			
Project Name: 316 - California Land Stewardship Institute, Fish Friendly Farming and Fish Friendly Ranching Environmental Certification in the Russian, Navarro, and Gualala River Watersheds Type of Benefit Claimed: Creeks Assessed for Applicability of BMPs Measure of Benefit Claimed (Name of Units): Miles of creeks Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	18	18
2015	0	18	18
2016	0	19	19
Comments:			

317 – California Land Stewardship Institute, Russian River Watershed Agricultural Water Conservation & Water Supply Reliability Program

Project Team

The California Land Stewardship Institute (CLSI) is a non-profit organization dedicated to planning and implementing environmental stewardship, restoration and enhancement programs, and projects including educational activities, scientific studies, promotion of beneficial stewardship practices, and resource conservation activities on private and public lands and waterways. CLSI has worked with the NRCS to construct over 30 agricultural water infrastructure projects in the Russian River Watershed and works with private landowners in all of its programs. The City of Ukiah, which has produced a Recycled Water Master Plan specifically for this project, is CLSI's primary collaborator. Other collaborators include the property owners, Sonoma and Mendocino County Farm Bureaus, which are Russian River Frost Protection partners, Sonoma County Water Agency, the Russian River Flood Control and Water Conservation District, and the Russian River Water Conservation Council, which are Independent Scientific Review Panel (ISRP) partners. The Mendocino and Sonoma County Natural Resource Conservation Service is a federal collaborator who is providing technical and funding support for stream pond design and construction through its Agricultural Water Enhancement Program grant.

Technical Justification for Project

Agriculture in the Mendocino and northern Sonoma areas of the Russian River is in a severe frost zone where springtime temperatures drop to 25° F. Water used to protect crops creates a potential conflict with salmon, which need instream flow for migration. Due to a lack of monitoring data to identify causes, the optimal solution is to replace direct diversions with other infrastructure that can potentially reduce the large, instantaneous drops in stream stage that occur when many farmers simultaneously divert instream flow to protect their crops from frost. The two ponds in Sonoma County would replace direct diversions from Mark West Creek and the recycled water program is a way to ensure a sustainable water supply to growers who would otherwise need to directly divert water from waterways. The ISRP will review existing scientific data sources and formulate a conceptual model of physical and ecological processes for each geomorphic region of the Russian River watershed.

During project implementation Cal OSHA, EPA, and CalEPA standards will be met. Natural Resource Conservation Service Standards and Specifications for Practices that will be used include 436 – Irrigation Reservoir, 378 – Pond Construction, 430 – Irrigation Pipeline, 533 – Pumping Plant, and 521A – Pond Liner Installation. The specific documents that will be used to guide project implementation are listed in the table below.

Table 7.12, California Land Stewardship Institute Technical and Scientific Documentation Table		
Technical and Scientific Document Name Format: Author/Agency. Title, Completion Date	**Document Description**	**Relevant page #**
City of Ukiah. Recycled Water Master Plan. Feb 2012	This master plan provides preliminary design and feasibility analysis	all
Natural Resource Conservation Service. Technical Guides Practices 436- Irrigation reservoir; 378 – Pond; 430 – Irrigation pipeline; 533 Pumping plant; 521A Pond liner	These practices define the specifications to be used for the agricultural ponds	All
Edwards, C. and Cluer, B. Data Report: Stream Flow Monitoring in Tributaries to the Russian River (Sonoma and Southern Mendocino Counties) 2010 and 2011, NOAA Fisheries Habitat Conservation Division Southwest Region. 2011.	The use of water in the Russian River basin peaks during spring when the highest demand for agricultural water is for frost protection of sensitive crops during cold weather episodes that generally occur from March to May. This time of year is when juvenile salmonids are particularly vulnerable as they emerge from gravel redds, adapt to riverine habitat and migrate to suitable summer rearing locales.	1, 13, 24-25, 39-41,

Project Physical Benefits

Conditions Without the Project. Some farmers on the Russian River and its tributaries divert water to use for frost control. These diversions primarily occur during the spring months. The Russian River and its tributaries provide habitat for federally listed salmonid species (Coho, Chinook and steelhead), and these agricultural water diversions can rapidly reduce water flows to levels that are harmful to fish populations. This is especially problematic in dry years, and climate change may increase the frequency and severity of these conditions. In 2009, the National Marine Fisheries Service proposed a moratorium on using stream diversions for frost control (NMFS 2009). The California State Water Resources Control Board developed regulations that would regulate these diversions in 2011, but they were invalidated by the California court system in 2012. It is uncertain what will happen next, but the issue has not gone away.

The City of Ukiah's wastewater treatment plant (WWTP) produces effluent that it discharges into the Russian River. The City's permit from the NCRWQCB restricts the timing and amount of effluent that it is allowed to discharge. The effluent discharge needs often exceed the limits of the permit, especially at times of the year when flows in the Russian River are low. The City has invested in a system to treat the

water to standards acceptable for agricultural use. It has developed a 20-year plan to find beneficial uses for the effluent, and frost protection programs are one of the potential uses.

Conditions With the Project. This project would construct Phase 1 of the City of Ukiah's Master Plan Recycled Water Project, including a storage pond at the treatment plant, a distribution line from the plant to the farms, a new pump station at the plant, and two storage ponds and pump systems on private land. By investing in this infrastructure, it would allow the agricultural producers to avoid diverting 180 acre-feet from the Russian River. It would also help the City avoid discharging effluent into the river during times when it would violate the terms of its wastewater discharge permit.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Contributes toward regional salmonid habitat enhancement and restoration in by implementing DFW, NOAA, and NCRWQCB, and Russian River Coho Partnership recommendations for improved habitat by collecting water when it's plentiful for use when it's scarce in order to leave water instream for environmental beneficial uses
- Provides for salmonid recovery and agricultural water supply reliability in the face of changing weather patterns brought about by global climate change, responding to recent calls by state and federal agencies for climate adaptation projects while addressing a local need for agricultural water supply during periods of critical environmental instream flow needs.
- Contributes toward NCIRWMP objectives to conserve/enhance salmonid populations, and address environmental justice issues for the partially Disadvantaged and partially Severely Disadvantaged Community of Ukiah.

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Table 9.1-317 included at the end of this section.

- Increased instream flows for environmental purposes

Methods for estimation. Methods for estimation include the preliminary design and feasibility analysis for the City of Ukiah's Recycled Water Facility and NRCS conservation practices, which are tested and approved specifically for each county.

Acknowledgement of New facilities, policies, and actions required. This project requires the construction of Phase 1 of the City of Ukiah's Master Plan Recycled Water Project, including a storage pond at the Ukiah Wastewater Treatment Plant, a distribution line from the plant to the farms, a new pump station at the plant, and two storage ponds and pump systems on private land. . For a complete discussion of new facilities and actions required, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary impacts, including disturbance of site during construction. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations.

Uncertainty. Lack of funding is the most significant obstacle to implementation of this project, and the major factor creating uncertainty in achieving its goals of improved water supply reliability and improved instream flow. Additional uncertainty arises when considering events outside of the project proponent's control, such as differences in instream water quantity associated with changes in precipitation caused by climate change, extreme seismic events, or other catastrophic societal or natural events. In the absence of social or natural catastrophes, it is highly likely that this project will deliver the stated benefits due in part to CLSI and the City of Ukiah's expertise and in part due to the NCIRWMP prioritization process, which ensures the technical feasibility of projects as well as their applicability to local needs and state and regional goals. For further discussion of how the NCIRWMP prioritization process avoids uncertainty, please see the introductory section to this attachment.

Table 9.1-317 – Annual Project Physical Benefits

Project Name: 317 - California Land Stewardship Institute, Russian River Watershed Agricultural Water Conservation & Water Supply Reliability Program

Type of Benefit Claimed: Increase in instream flows

Measure of Benefit Claimed (Name of Units): Acre-feet of water

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	250	250
2016	0	250	250
2017	0	250	250
2018	0	250	250
2019	0	250	250
2020	0	250	250
2021	0	250	250
2022	0	250	250
2023	0	250	250
2024	0	250	250
2025	0	250	250
2026	0	250	250
2027	0	250	250
2028	0	250	250
2029	0	250	250
2030	0	250	250
2031	0	250	250
2032	0	250	250
2033	0	250	250
2034	0	250	250
2035	0	250	250
2036	0	250	250
2037	0	250	250
2038	0	250	250
2039	0	250	250
2040	0	250	250
2041	0	250	250
2042	0	250	250
2043	0	250	250
2044	0	250	250

Comments:

523 – Gold Ridge Resource Conservation District, Coastal Watersheds Enhancement Project

Project Team

Established in 1941, Gold Ridge Resource Conservation District (GRRCD) has been a leader in promoting stewardship of natural resources in western Sonoma County for the past 70 years. Since its establishment, the RCD has been providing educational, technical, and funding support to landowners in the following watersheds: Salmon Creek, Estero Americano, Dutch Bill Creek, Atascadero Creek, Green Valley Creek, Laguna de Santa Rosa, Willow Creek, and other associated tributaries of the Russian River. The RCD has successfully managed numerous resource conservation programs and studies with funding from state, local, and federal agencies such as the California Coastal Conservancy, the Environmental Protection Agency, the National Fish and Wildlife Foundation, the Sonoma County Water Agency, and the Sonoma County Agricultural Preservation and Open Space District. Over the last decade, GRRCD has worked in close partnership with local, state and federal resource agency staff to characterize and assess the ecological processes and conditions of its watersheds, including developing a prioritized list of actions designed to take the aggressive steps necessary to ensure that the watersheds' ecosystems are intact, while at the same time working with the agricultural and rural residential landowners to increase water supply reliability. In 2008, GRRCD received the Collaborative Conservation Award for the Pacific Region of the National Association of Conservation Districts, which recognizes conservation districts that exemplify innovative, collaborative conservation efforts, utilize diverse funding sources, and conduct a wide range of projects to address their communities' conservation needs. The projects that GRRCD will perform for this Proposal continue and expand programs it has initiated to implement high-priority restoration projects identified in watershed planning documents, DFG's Coho Recovery Plans, and other regional planning efforts. GRRCD has successfully demonstrated the effectiveness of different applications of rainwater catchment for community water security, streamflow augmentation and drought preparedness while also addressing instream health and reducing upland sedimentation. It has also implemented riparian vegetation enhancement, installation of large wood structures, stream flow augmentation, and fine sediment delivery reduction projects. Collaborative partners include agencies providing matching funds: National Fish and Wildlife Foundation, DFW, USDA NRCS, FishAmerica Foundation, Russian River Coho Water Resources Partnership, and NOAA Restoration Center. Other collaborators and technical advisors include Western United Dairymen, Salmon Creek Watershed Council, and the Occidental Arts and Ecology Center. Private landowners are also collaborating by providing in-kind contributions and allowing the work to be performed on their land, in part due to the trust relationships built between GRRCD and local landowners over the past seven decades and in part due to GRRCD's reputation for excellence in project implementation.

Technical Justification for Project

As in the majority of salmon-bearing streams in the Central Coast ESU, the instream factors that led to the decline of coho and steelhead, and limit their recovery, are complex, cumulative, and closely tied to historic land use practices. Agriculture, timber harvest, stream clearing practices, and rural residential

development in these watersheds have simplified stream channels, caused significant sedimentation in key spawning reaches, and reduced streamflows. To address these factors and make changes to habitat conditions, both the form and physical processes of the streams must be restored. The activities in this proposal have been demonstrated to improve instream flows, ecological function and physical habitat conditions for salmonids, as well as to increase water supply security for rural residents and communities, and stem from recommendations in planning documents specific to each watershed.

This project seeks a multi-faceted approach designed to address the primary limiting factors for salmonid survival and riparian health in each of its watersheds, while assisting participating properties in adapting to uncertain climate change by reducing extractive water use and increasing water storage capacity.

Central California Coast (CCC) coho salmon (Oncorhynchus kisutch) are on the brink of extinction. Although their range once stretched inland along more than 250 miles of California's coast, only a few watersheds now support anything more than remnant populations. The decline of CCC coho salmon has been especially rapid in recent decades, resulting in their listing as endangered under both the State of California and federal Endangered Species Acts (NFWF, 2009). The near extirpation of coho in the Russian River watershed partly results from pressures associated with poor land and water use practices in the basin, including (NFWF, 2009):

- Altered hydrologic regime / low flows
- Fish passage barriers
- Riparian disturbance
- Altered sediment transport
- Channel modification
- Low population abundance

Despite the dire condition of the coho population in coastal California, there is consensus among resource experts that comprehensive and multi-faceted action can return a viable population of coho to the region. In March 2009, the National Fish and Wildlife Foundation issued its *Keystone Initiatives Business Plan* for the Russian River Watershed. The underlying hypothesis of the initiative is that water for both human and coho salmon can be secured through careful planning and water supply management. The goal of this Keystone Initiative is to return a viable, self-sustaining population of coho salmon to the Russian River watershed. This business plan describes a series of strategies for mitigating the direct threats to coho salmon populations. When implemented, the strategies should increase juvenile survivorship and contribute to a self-sustaining population of coho salmon in the Russian River watershed. Because the keystone region incorporates the freshwater (but not saltwater) portion of the coho life cycle, the Russian River Keystone Initiative will focus on increasing juvenile emergence and survivorship (NFWF, 2009).

The primary actions necessary to achieve the Initiative's goal are:

1. Changing water management practices. Currently, many farmers and homeowners divert water from streams or from wells next to streams throughout spring, summer, and fall, when streams naturally recede to low levels. To protect coho, people in the watershed must find and implement

water management solutions that include storing water when it is plentiful, in the winter rainy season, for use when water is scarce, in the summer.

2. Habitat restoration and conservation. Physical activities must be undertaken to re-structure stream channels and riparian areas where alterations have had negative impacts on habitat value. Where intact instream and riparian habitat remains, it should be conserved.

3. Population augmentation and monitoring**.** Because of the low number of coho currently in the Russian River watershed, it is necessary to augment populations through a broodstock program while carefully monitoring both the population and genetic consequences and evaluating the success of stocking efforts to identify potential causes of mortality or survival (NFWF, 2009).

- Dutch Bill Creek Watershed

The most recent Stream Inventory Report for Dutch Bill Creek (DFG, 2000) noted that the stream contained the best coho spawning habitat in the lower Russian River watershed, but that the major limiting factors were the absence of summer rearing habitat and large wood for juvenile salmonids. An earlier Stream Inventory Report (DFG, 1997) noted a lack of large wood in Dutch Bill Creek, in spite of the fact that both the riparian area and the greater watershed are dominated by coniferous forest. The 1997 survey determined that pools comprised only 26% of the total length of stream surveyed. The mean pool shelter rating was calculated at 21 (with a value of 80 being desirable) and large woody debris provided only 15% of pool shelter in the inventoried reaches. The inventory report recommended that woody cover be increased in pool and flatwater habitat units along the entire stream, and that woody debris and boulder cover/scour structures be installed to increase habitat complexity. This project seeks to address these needs through two components: The placement of large wood structures to increase habitat complexity, and a large-scale water conservation project to address the largest water diversion along the stream. A total of 27 large wood structures will be placed along a key 1.26-mile stretch of Dutch Bill Creek on the Westminster Woods Camp and Conference Center and the property downstream, The structures have been designed to increase length and depth of pools, improve gravel deposition downstream of scour areas, encourage the formation of a single-thread low-flow channel to maintain pool connectivity during the summer, and provide additional pool shelter thereby increasing juvenile salmonid survival rates.

The Westminster Woods Camp on Conference Center remains the largest known water diverter on Dutch Bill Creek. Diversion of water for its playing field irrigation during the periods of lowest flow has been shown to reduce surface flow by up to 0.3 cfs (100% of streamflow at times), imperiling juvenile fish of both species. The proposed project will eliminate this direct diversion of water from Dutch Bill Creek by 1) implementing conservation measures to minimize irrigation need, and 2) constructing water storage with sufficient capacity to store the entire remaining summer irrigation demand for Westminster Woods. Implementation of these measures, as well as a landowner agreement governing the collection, storage and use of irrigation water, will address the impacts of the largest individual water diversion on the mainstem of Dutch Bill Creek, preventing the extraction of up to 900,000 gallons of water from the stream during the critical summer/fall dry season. This large water storage component will work to both preserve streamflows during critical periods through times of

increasingly variable rainfall patterns, and assist the camp in developing a reliable, sustainable water source and long-term reduction in its water needs.

- Estero Americano Watershed

Unlike many coastal wetlands in the State, the Estero Americano is relatively undisturbed. This is due, in large measure, to the unique continuity of land ownership and land use patterns in the watershed. Small, multigenerational family-run dairies and livestock ranches are the mainstay of the local economy, and account for over 80 percent of land use in the watershed. While historical land ownership patterns have preserved large tracts of open space and critical habitat for wildlife, there is concern that erosion and agricultural run-off are impacting the natural resources and habitat values of the Estero and its tributaries (GRRCD, 2007).

The estuary of the 24,920-acre Estero Americano Watershed is an important coastal wetland for numerous plant and animal species of concern, providing rearing habitat for two federally listed fish species, the tidewater goby (*Eucyclogobus newberryi*) and the winter-run steelhead trout (*Onchorhyncus mykiss*). It provides food, shelter and nursery habitat for many marine and estuarine fish species. The mudflats, open water, and extensive marsh area of the estuary provide seasonally important foraging habitat for migratory waterfowl and shorebirds, and resident long-legged wading birds. The Estero Americano is at the heart of the Pacific Flyway and supports a very large and diverse winter and migratory bird community.

Through funding from the EPA's 319(h) Nonpoint Source Pollution funding, the Gold Ridge RCD began a workshop series in 2012 targeting landowners and land managers, designed to assist them in identifying, prioritizing, and addressing small-scale erosion sites before they become major sediment sources. This proposal is now seeking funds to continue this program, by providing funding for technical consultation, design, and assistance with implementation of erosion control efforts on sites identified by landowners. The funds requested for this component will address 3-4 sites with an estimated sediment delivery volume of approximately 100 cubic yards per site over the next ten years. More importantly, it will work to promote a more cost-effective, proactive strategy for combating sedimentation by improving the RCD's ability to assist landowners and enhancing its partnership with NRCS' EQIP program.

- Salmon Creek Watershed

The Salmon Creek Watershed, located in Western Sonoma County, is a rural, coastal watershed with strong local support for protecting the environment, sustaining local communities, and restoring salmonid populations (PCI, 2010). The Salmon Creek Estuary Study and Enhancement Plan (PCI, 2006), which is based upon a two year scientific study, lists eight high priority recommendations as well as action items for salmonid habitat improvement in the estuary and upper watershed. This project addresses four of the eight recommendations, including: (1) maintain beneficial streamflow by reducing summer withdrawals, (2) manage sediment through road assessment and improvement, (3) maintain high quality water quality, and (4) provide community education and outreach through a water conservation program (PCI, 2006).

The Watershed has a Mediterranean climate, with virtually all precipitation falling as rain during a winter wet season (typically November through April), followed by a six-month summer/fall dry season. Why is streamflow important? Juvenile coho salmon depend on adequate streamflow with relatively low water temperatures and sufficient dissolved oxygen to survive and grow through the dry season. Salmonid habitat streams like Salmon Creek typically have more than adequate streamflow during the rainy season and early summer, but following the end of spring rains, discharge drops steadily through the summer into fall. The dry season is also the period of greatest human demand for water, so diversion from streams increases during the period of lowest flow. Coho population monitoring carried out by the University of California Cooperative Extension (UCCE) has documented a correlation between reach wetted volume (strongly influenced by stream discharge) and juvenile coho survival, with data showing a dramatic decrease in juvenile survival associated with very low discharge in key coho streams in the lower Russian River watershed (UCCE, 2009).

The California Department of Fish and Wildlife has stated that Salmon Creek is a fully restorable salmonid stream (DFG, 2005). If coho recovery is to be realized in the Salmon Creek watershed, both physical and social mechanisms must be implemented so that agricultural and rural residential landowners have the incentives and means to shift their water diversions away from Salmon Creek through the dry season. The underlying premise of this program is that water for both human and coho salmon can be secured through careful planning and water supply management. This project seeks to address this issue through the design and implementation of a large-scale water storage project on one of only two dairy operations in the watershed, which currently draws an estimated 10,000 gallons/day from a source connected to mainstem Salmon Creek (estimate provided by dairy operator). This project will build on current efforts to develop a similar project on the other watershed dairy, currently in its final design phase, which includes the collection of roof rainwater in a freshwater pond to eliminate summer stream diversions by 1.3 million gallons each year. The dairy operation included in this proposal has even larger water needs, and preliminary analysis indicates an even greater capacity for diversion reduction, estimated at approximately 1.5 million gallons. As with the Westminster Woods water storage component, this proposed activity will double as a climate change adaptation strategy, allowing this family farm to persevere in a sustainable fashion through times of uncertain water supply, and allowing the RCD to further expand and promote adaptive water conservation and storage technologies.

All construction work will comply with GRRCD's Best Management Practices for Construction and DFG's California Salmonid Stream Habitat Restoration Manual. Construction partially funded through NRCS EQIP programs will comply with NRCS Conservation Practices standards. Salmonid population monitoring will be conducted in accordance with DFW's Fish Bulletin 180: California Coastal Salmonid Population Monitoring. Photo-monitoring of project construction sites will be conducted in accordance with USDA Forest Service General Technical Report PNW-GTR-526: Photo Point Monitoring Handbook: Part A-Field Procedures. Any water quality or quantity monitoring that will occur as part of this project will follow a monitoring and quality assurance protection plan and results will be entered into the California Environmental Data Exchange Network (CEDEN). Technical documents used to develop this project are listed in the table below.

Table 7.12, Gold Ridge Resource Conservation District Technical and Scientific Documentation Table		
Technical Document Name	**Technical Document Description**	**Relevant page #**
Gold Ridge Resource Conservation District. The Salmon Creek Watershed Assessment and Restoration Plan. 31 March 2007.	Through a cooperative effort between several agencies, the goal of this project has been to promote the implementation of needed NPS pollution controls and to assist landowners with best management practices (BMPs) that will restore water quality. The main goal of this project is to improve and protect water quality by helping landowners achieve Tier 1 voluntary compliance with current and future NPS regulations.	2, 15-16, 22-23, 32-63
California Department of Fish and Game (CDFG). Recovery Strategy for California Coho Salmon. Report to the California Fish and Game Commission. Species Recovery Strategy 2004-1. 2004.	The Biological Review Team agreed in 2004 that natural populations of coho salmon in the CCC ESU are in danger of extinction. This determination was based on the following factors: 1) substantially low abundance of coho salmon from historical levels (e.g., more than 50% of coho streams no longer have spawning runs), 2) long-term trends clearly downward, 3) degraded habitats, 4) threats to genetic integrity due to hatchery plantings, and 5) recent droughts and change in ocean productivity. It is believed a high potential for recovery is possible for CCC coho salmon because of the likelihood that freshwater impacts can be substantially controlled or reduced through habitat protection, implementation of best management practices, and focused restoration.	159, 241-242, 331-332
California Department of Fish and Game (CDFG). 2006a. California Department of Fish and Game Stream Inventory Report, Green Valley Creek. Report Revised April 14, 2006, Report Completed 2000, Assessment Completed 1994.	The October 1991 stream survey indicated there was good riparian habitat providing sufficient canopy for shading the stream, although the substrate quality had a high percent of fines, presumably due to conversion of the watershed to agriculture. A major problem noted was the unusually low summer flow, which was mostly subsurface due to high sediment.	4
California Department of Fish and Game (CDFG). 2006b. California Department of Fish and Game Stream Inventory Report, Purrington Creek. Report Revised April 14, 2006, Report Completed 2000, Assessment Completed 1994.	At the time of the survey Purrington Creek was estimated to support runs of coho salmon and steelhead, and provide good nursery habitat with year-round flow, though the small quantity of spawning gravel available appeared to be a limiting factor to fish production.	2

Edwards, C. and Cluer, B. Data Report: Stream Flow Monitoring in Tributaries to the Russian River (Sonoma and Southern Mendocino Counties) 2010 and 2011, NOAA Fisheries Habitat Conservation Division Southwest Region. 2011.	The use of water in the Russian River basin peaks during spring when the highest demand for agricultural water is for frost protection of sensitive crops during cold weather episodes that generally occur from March to May. This time of year is when juvenile salmonids are particularly vulnerable as they emerge from gravel redds, adapt to riverine habitat and migrate to suitable summer rearing locales.	1, 13, 24-25, 39-41,
National Marine Fisheries Service (NMFS). Public Recovery Plan for Central California Coast coho salmon (*Oncorhynchus kisutch)* Evolutionarily Significant Unit. Santa Rosa (CA): National Marine Fisheries Service, Southwest Region. 2010.	In the freshwater environment coho salmon require: (1) clean gravels for successful spawning and incubation; (2) adequate quantities of cool and well oxygenated water with complex deep pools for juvenile summer rearing; and (3) side channels and alcoves and/or sufficient quantities of large woody debris for over - wintering habitat. Human-made threats include habitat alterations such as water diversion, road building and maintenance, timber harvest, urbanization, flood control structures and practices and climate change.	5
Solazzi, M.F., Nickelson, T.E., Johnson, S.L., and Rodgers, J.D. Effects of increasing winter rearing habitat on abundance of salmonids in two coastal Oregon streams. Canadian Journal of Fisheries and Aquatic Sciences. 57: 906–914. 2000.	Off-channel, high flow refugia will become increasingly vital to salmonid over-winter success and survival. In addition to addressing the barrier of high flow velocities, this project would provide swampy off-channel habitat that coho juveniles have been shown to favor.	6-9
Prunuske Chatham, Inc. Towards a Healthy Wildland Watershed: Willow Creek Watershed Management Plan. March 2005.	To accomplish the vision of viable salmonid populations in Willow Creek, fish passage barriers will be removed, in-stream and riparian habitat enhancement (large woody debris, pools, riffles, food sources) will occur, and sedimentation issues will be addressed. Long-term adaptive management actions may include the CDFG brood stock program. A comprehensive, integrative, and cooperative watershed approach will be taken to address erosion and sedimentation. Evaluation of potential delivery of sediment from both the County road and legacy logging roads in the upper watershed, as well as a partial skid trail inventory, have been completed. The next step will be to identify additional erosion sites, particularly forest and grassland gullies.	21, 49-62, 69-71
Department of Fish and Game. Stream Inventory Report – Dutch Bill Creek. 2000.	In general, Reaches 3 – 7 of Dutch Bill Creek are good for salmon and steelhead habitat. Some deep, sheltered sections of the stream occur in the mid and upper reaches which may be used	20-21

	as rearing habitat. However, in the lower Reaches (1 and the lower portion of 2) pool shelter and the frequency are lacking and portions are dry, limiting successful spawning and rearing.	
DFG. California Salmonid Stream Habitat Restoration Manual – 4th Edition - Part X and XI. 2010.	*Part X, Upslope Erosion Inventory and Sediment Control Guidance*, describes the California Department of Fish and Game (DFG) methodology for the identification of upslope and stream bank erosion, and techniques for the implementation of cost-effective erosion control treatments in salmonid watersheds.	Entirety
	Large flood events may create the need for erosion control work in the riparian zone to prevent excess siltation into the stream or loss of land. Whenever possible, a vegetative method for reducing erosion such as bioengineering is preferable to a structural approach such as riprap.	14-15
NFWF. Business Plan for the Russian River Coho. 24 March 2009.	Central California Coast (CCC) coho salmon (Oncorhynchus kisutch) are on the brink of extinction. Although their range once stretched inland along more than 250 miles of California's coast, only a few watersheds now support more than remnant populations. The decline of CCC coho salmon has been especially rapid in recent decades, resulting in their listing as endangered under both the State of California and federal Endangered Species Acts. Coho salmon and steelhead trout are similarly addressed in the Highly Migratory Species Fisheries Management Plan.	4, 10-12, 27-28
Steiner Environmental Consulting. A History of the Salmonid Decline in the Russian River. Sonoma County Water Agency / California State Coastal Conservancy / Steiner Consulting, Potter Valley, California. 86 pp. 1996.	This report gathers together the best available information to provide the historical and current status of chinook salmon, coho salmon, pink salmon, and steelhead in the Russian River basin. The last 150 years of human activities have transformed the Russian River basin into a watershed heavily altered by agriculture and urban development. Flows in the main river channel are heavily regulated. The result is a river system with significantly compromised biological functions. The anthropogenic factors contributing to the decline of salmonids are discussed.	5-10, 15, 19-27, 35-40, 47-51, 79-82
University of California Cooperative Extension, Sonoma County. Qualitative Implementation and Effectiveness Monitoring of Fisheries Habitat: A Field Evaluation of Protocols. March	This body of work presents an opportunity to learn about the intended and unintended outcomes of individual restoration projects as feedback to policy decisions regarding implementation of ecological restoration programs.	7-27

2006.		
University of California Cooperative Extension, Sonoma County. Quantitative Effectiveness Monitoring of Bank Stabilization and Riparian Vegetation Resotoration: A Field Evaluation of Protocols. March 2007.	Over the past two decades, State and Federal grant programs have funded numerous projects to improve stream habitat, reduce delivery of sediment and other water quality contaminants, and provide stewardship education to public and private land managers in an effort to conserve and enhance habitat functions and maintain or recover species that are dependent upon those functions.	Entirety
University of California Cooperative Extension, Sonoma County. Sediment Delivery Inventory and Monitoring: A Method for Water Quality Management in Rangeland Watersheds. #8014. 2000.	Protecting the beneficial uses of water has become a principal goal of resource management, requiring landowners to adapt their management to comply with water quality regulations.	Entirety
Harris, R.R., C.M. Olson, S.D. Kocher, J.M. Gerstein, W. Stockard and W.E. Weaver. Procedures for Monitoring the Implementation and Effectiveness of Fisheries Habitat Restoration Projects. Center for Forestry, University of California, Berkeley. 24 pp. 2005.	The procedures outlined here recommend qualitative implementation monitoring of all restoration projects. Qualitative effectiveness monitoring would be performed on 10 percent of all projects properly implemented every year. Qualitative monitoring of projects every year constitutes a methodology for assessing practices and would provide a basis for reporting on the overall performance of the FRGP. Quantitative monitoring of individual projects, groups of projects, and smaller watersheds would provide a more rigorous basis for judging the effectiveness of fisheries habitat restoration.	8-24
Smith, R. D. Russian River Watershed Management Plan: Synthesis Report for Baseline Watershed Assessment. U.S. Army Engineer Research and Development Center - Environmental Laboratory. Vicksburg, MS. August 2008.	The Baseline Watershed Assessment task had two primary objectives. The first objective was to collect geospatial data and other information related to the physical, chemical, and biological characteristics of the Russian River watershed, and then organize it in a format that allowed it to be stored, accessed, sorted, cross-referenced, updated, analyzed, and otherwise used efficiently throughout WAMP development. The second objective of the Baseline Watershed Assessment task was to use the geospatial data and other information to evaluate, compare, and rank discrete areas in the Russian River watershed in terms of assessment criteria.	Entirety
Commins, M. L., J. C. Roth, M. H. Fawcett and D. W. Smith. *Estero* Americano and Estero de San	Aquatic habitat in the Americano Creek and Stemple Creek watersheds has been studied since February 1988, to evaluate the appropriateness and conditions for reclaimed water reuse	11-16, 28-35

Antonio Monitoring Program, 1988-1989 Results. Santa Rosa Subregional Water Reclamation System. Technical Memo E8. 1990.	for habitat enhancement. This memorandum summarizes the field monitoring data and evaluates possible effects of reclaimed water releases on aquatic organisms."	
Gold Ridge Resource Conservation District (GRRCD). The Estero Americano Watershed Management Plan. Version 1, February 2007.	The purpose of this watershed management plan is to characterize and assess the ecological processes and conditions of the Estero Americano Watershed, and to provide economically viable and agreed upon recommendations for improving water quality and the natural resource base through conservation-oriented land management practices.	9-106
Heathwaite, L., A. Sharpley and W. Gburek. A Conceptual Approach for Integrating Phosphorus and Nitrogen Management at Watershed Scales. *Journal of Environmental Quality* 29: 158-166. 2000.	Since the late 1960s, point-sources of water pollution have been reduced due to their ease of identification and treatment. As water quality problems remain and further point-source measures become less cost-effective, attention is directed toward reducing agricultural nonpoint-sources of P and N.	1-8
Madrone Associates. The Natural Resources of Esteros Americano and de San Antonio. Prepared for California Department of Fish and Game, Coastal Wetlands Series #20. 1977.	Two of California's most interesting coastal wetlands usually go unnoticed by the general public because there is no access from main roads. They lie within the rolling hills of coastal Marin and Sonoma counties and contain marine, freshwater and brackish water habitats in a setting of upland, terrestrial habitats that make them unique among coastal wetlands.	10-17, 28-48, 69-81
Prunuske Chatham, Inc. Stemple Creek/Estero de San Antonio Watershed Enhancement Plan, July 1994. Prepared for Marin County Resource Conservation District and Southern Sonoma Resource Conservation District. 1994.	The Enhancement Plan attempts to pull together the concerns identified and the resources available to address them into an integrated plan of action. The appendices contain five technical reports on the biology, vegetation, erosion and sedimentation, water resources and the hydrology of the Estero. Enhancement Recommendations: 1. Encourage the local community to take the lead in Developing and implementing enhancement projects. 2. Assist agricultural producers with practices that promote the conservation and enhancement of natural resources. 3. Reduce pollutants entering Stemple Creek and the Estero. 4. Reduce soil erosion. 5. Encourage environmentally-sound management of rangeland. 6. Conserve and enhance existing natural habitats. 7. Restore the riparian corridor. 8. Develop a long-term Monitoring program. 9. Support agriculture as the major land use in the watershed. 10. Request additional investigation by the Santa Rosa Subregional Water Reclamation System on the potential impacts of the proposed West County Alternative on agriculture	10-26, 47-70

	and natural resources.	
North Coast Regional Water Quality Control Board (NCRWQCB). Work Plan to Control Excess Sediment. 2008.	The Staff Work Plan to Control Excess Sediment in Sediment-Impaired Watersheds (Work Plan) describes the actions and tasks staff of the North Coast Regional Water Quality Control Board (Regional Water Board) are currently taking or intend to take over the next ten years, as resources allow, to control human-caused excess sediment in the sediment-impaired water bodies of the North Coast Region. The Work Plan is a staff-level planning document that will help prioritize work associated with excess sediment control. The Work Plan was developed by staff to fulfill the Regional Water Board's direction under the Total Maximum Daily Load (TMDL) Implementation Policy Statement for Sediment Impaired Receiving Waters in the North Coast Region (Resolution No. R1-2004-0087).	109-115, 202-207
University of California Cooperative Extension. Habitat conditions, stream flow, temperature, and monthly survival of juvenile coho stocked into two stream reaches in the Mill Creek watershed during the summer dry season, 2009. 2009	To evaluate the effects of changes in flow management that result from Partnership activities, the Partnership's long-term goal is to monitor juvenile coho salmon survival in treatment (flow-impaired) and reference (non-flow impaired) reaches in each of the five priority creeks sampled before and after changes in flow management. In both reference and treatment reaches, estimates of monthly survival during the dry season will be compared with measurements of flow, temperature, and habitat condition. Data will be used to document improvements in flow and survival that result from project implementation in flow impaired reaches.	6-19
Pacific Watershed Associates (PWA). 2008 Green Valley Creek Watershed Assessment and Erosion Prevention Planning Project Sonoma County, California. PWA Report No. 08073301. 2008.	The Green Valley Creek Watershed Assessment and Erosion Prevention Planning Project (GVCWA) area is located in western Sonoma County near the communities of Sebastopol, Graton, and Forestville, California. The project area encompasses 13 private landholdings in the upper and lower Green Valley Creek watersheds, and along the tributary streams of Atascadero Creek and Purrington Creek.	6-24
PWA. 2012 Annual Report, CDFG Grant #P1030426, Green Valley Creek Roads Implementation Project, Phase II – Appendix A: As-built Road Log. 2012.	Road log from Phase II of CDFG Grant #P1030426, Green Valley Creek Roads Implementation Project.	1-16
PWA. Handbook for forest and ranch roads. Prepared for the Mendocino County Resource	Roads need not threaten the biological productivity and water quality of streams in a watershed if they are properly located and constructed. Poor road building and maintenance practices	All

Conservation District in cooperation with the California Dept. of Forestry and the U.S. Soil Conservation Service. Mendocino Resource Conservation District, Ukiah, California. 163 pages. 1994.	can cause excess runoff and erosion, leading to sedimentation in downstream areas. Sedimentation can pollute water supplies, increase flooding potential, accelerate stream bank erosion and trigger landsliding. Salmonid eggs laid in stream gravels can become buried and suffocate, fish habitat can be lost, and other aquatic life may be threatened or killed.	
Weaver, W. and D. Hagans. Storm-Proofing Forest Roads. Proceedings of the International Mountain Logging and 10th Pacific Northwest Skyline Symposium, OSU Dept. of Forest Engineering and International Union of Forestry Research Organizations, Corvallis, OR. 1999.	Erosion and mass wasting associated with forest roads systems are a common and important accelerated sediment source in many mountainous watersheds.	1-14
Streamline Engineering. Dutch Bill Creek Instream Habitat Enhancement Plans. 2011.	Plans which demonstrate the placement of woody debris in Dutch Bill Creek, near Camp Meeker.	1-7
DFG. Fish Bulletin 180: California Coastal Salmonid Population Monitoring: Strategy, Design, and Methods. 2011.	This California Coastal Salmonid Monitoring Plan (CMP) has been developed to meet these monitoring needs, describing the overall strategy, design, and methods used in monitoring salmonid populations. Implementation.	9-65
Prunuske Chatham, Inc. Memo: Westminster Woods Water Savings Measures. 2012.	As part of the Westminster Woods Water Storage Project Feasibility Analysis, Prunuske Chatham, Inc. (PCI) has evaluated several options to reduce the irrigation needs of Westminster Woods. The water saving measures chosen for implementation will determine the winter storage volume required to eliminate the withdrawal of irrigation water from Dutch Bill Creek during low-flow periods.	1-5
USDA Forest Service. Photo point monitoring handbook: part A—field procedures. Gen. Tech. Rep. PNW-GTR-526. 2001.	This handbook describes quick, effective methods for documenting change in vegetation and soil through repeat photography.	1-30
Gold Ridge RCD. Salmon Creek Streamflow Restoration Monitoring: 2013-2016. 2012.	Monitoring strategy for Salmon Creek Water Conservation projects.	1-3
Gold Ridge RCD and Prunuske Chatham, Inc. Salmon Creek Integrated Coastal Watershed	This Plan takes a watershed approach to address issues of water quality and quantity, rather than looking at stream restoration	7-120

Management Plan. 2010.	on a site-by site basis.	
Gold Ridge RCD. Upper Green Valley Creek Watershed Plan: A Living Document to Facilitate the Restoration of Coho Salmon and Preservation of Sustainable Agriculture. 2010	The UGV Watershed Management Plan provides a description of existing watershed conditions, identifies data gaps, identifies and prioritizes sediment reduction and other projects for immediate implementation and provides recommendations for management practices to support agricultural and environmental sustainability.	1-206
North Coast Regional Water Quality Control Board. Water Quality Control Plan for the North Coast Region. 2011.	The need for comprehensive water quality planning is set forth in both California and federal law. California's Porter-Cologne Water Quality Control Act, which is contained in California Water Code, Division 7, Chapters 1 through 17, and the Federal Water Pollution Control Act as amended by the Clean Water Act of 1977 require water quality control plans for the waters of the State as well as public review of the plans. The basic purpose of the state's planning effort is to determine the future direction of water quality control for protection of California's waters.	1-274
PCI. Westminster Woods Water Tank Project. 2012.	Plans for the Irrigation Water Tank Storage project.	1
Dominati, E., Patterson, M., and Mackay, A. A Draft Framework for classifying and measuring Soil Natural Capital and Ecosystem Services. Ecological Economics Volume 69, Issue 9, Pages 1858 – 1868. 15 July 2010.	The ecosystem services and natural capital of soils are often not recognized and generally not well understood. This paper addresses this issue by drawing on scientific understanding of soil formation, functioning and classification systems and building on current thinking on ecosystem services to develop a framework to classify and quantify soil natural capital and ecosystem services. The framework consists of five main interconnected components: (1) soil natural capital, characterized by standard soil properties well known to soil scientists; (2) the processes behind soil natural capital formation, maintenance and degradation; (3) drivers (anthropogenic and natural) of soil processes; (4) provisioning, regulating and cultural ecosystem services; and (5) human needs fulfilled by soil ecosystem services.	1-28
Ekins P., Simon S., Deutsch L., Folke C. & De Groot R. A framework for the practical application of the concepts of critical natural capital and strong sustainability. *Ecological Economics* 44: 165-185. 2003.	This paper develops a methodology for identifying that natural capital*called critical natural capital (CNC)*the maintenance of which is essential for environmental sustainability. By consideration of the characteristics of natural capital, of the environmental functions that these characteristics enable natural capital to perform and of the importance of these functions to humans and the biosphere, it shows how sustainability standards in respect of these environmental functions may be derived. The difference between the current situation and these standards is termed the sustainability gap.	1-20

	The methodology that emerges from bringing these ideas together into a single analytical framework enables policy makers to identify the extent of current unsustainability, the principal causes of it, the elements and processes of natural capital (the CNC) which need to be maintained or restored to close the sustainability gap and the costs of so doing.	
Ecological Society of America. Ecosystem Services. 2000.	Ecosystem Services are the processes by which the environment produces resources that we often take for granted such as clean water, timber, and habitat for fisheries, and pollination of native and agricultural plants. Whether we find ourselves in the city or a rural area, the ecosystems in which humans live provide goods and services that are very familiar to us.	1-2
Gold Ridge RCD. Contractor Certification. 2013.	Contractor Certification concerning state labor standards and prevailing wages.	1

Project Physical Benefits

Conditions Without the Project. Dutch Bill Creek, a tributary of the Russian River, has historically provided high quality habitat for both Coho salmon and steelhead. The Creek supported healthy populations until the populations crashed in the 1980s and 1990s, with few fish spawning in the stream after 2000. The last remaining wild juvenile Coho were observed during the summer of 2006. Since 2006 Dutch Bill Creek has been a priority site of juvenile Coho releases through the Russian River Coho Salmon Captive Broodstock Program. In fact, Dutch Bill Creek is one of only five tributaries to the Russian River identified the Russian River Coho Salmon Keystone Initiative as critical for near-term salmonid recovery.

However, there are generally two limiting factors to salmon recovery in Dutch Bill Creek: a lack of large wood and large-scale diversions. One of these diversions is for playing field irrigation at the Westminister Woods Camp and Conference Center. This diversion decreases streamflow by up to 0.3 cfs (which can amount to 100 percent of streamflow) over a period of several hours, on a frequency that varies between two and seven times per week.

The neighboring Salmon Creek watershed, while not 303(d) listed, also suffers from considerable sedimentation, water shortages, and riparian health impacts. Dairy farms along Salmon Creek are significant water users, which draw from sources, influencing riparian flows.

Conditions With the Project. The project would implement large-scale water conservation measures and irrigation efficiency improvements on riparian properties along key reaches of Dutch Bill and Salmon Creeks. It would eliminate the Westminister Woods Camp diversion by implementing an off-channel water storage system at this site and implementing irrigation improvements and other water conservation efforts. It would construct a roof rainwater catchment system on a dairy operation along

Salmon Creek, which would allow the dairy farm to reduce summer diversions from an alluvial well connected to Salmon Creek. The project would also involve instream habitat improvements and upland sediment source management. The project would enhance key salmon spawning and rearing reaches of Dutch Bill Creek.

Finally, the project would conduct public outreach and education of IRMP priorities and project implementation with at least two public meetings and/or community events; a workshop series to assist landowners in identifying small erosion problems; and a workshop on installing roof rain water catchment systems.

Relationship with other projects in proposal. This project acts synergistically with other NCIRWMP projects in the following ways:

- Regional salmonid habitat enhancement and restoration in by implementing DFW, NOAA, Russian River Coho Partnership and NCRWQCB recommendations for improved habitat and water quality in watersheds prioritized by DFW
- Contributing towards attainment of the sediment TMDL in a 303(d) listed watercourse
- Provides for salmonid recovery and agricultural water supply reliability in the face of changing weather patterns brought about by global climate change, responding to recent calls by state and federal agencies for climate adaptation projects while addressing a local need for agricultural water supply during periods of critical environmental instream flow needs
- Contributes toward NCIRWMP objectives of native salmonid population conservation/enhancement, support for implementation of TMDLs, the NCRWQCB Watershed Management Initiative, and the Non-Point Source Program Plan, and addresses environmental justice issues as they relate to the partially Disadvantaged Communities of Monte Rio and Guerneville

For an expanded discussion of synergies and linkages between projects in the Proposal, please see the introductory text for this Attachment.

Physical benefits. The amount of each of these benefits and when they would occur are shown in Tables 9.1-523 through 9.4-523 included at the end of this section.

- Increased salmonid populations
- Increased instream flows for environmental purposes
- Reduced sediment deposition
- Increased base flows

Methods for estimation. Methods for project estimation include studies, assessments, and planning documents focused on the Dutch Bill Creek watershed and other nearby watersheds (Table 7.13). These studies document current and historic conditions that adversely affect instream habitat and water quality and recommend management strategies and implementation actions to enhance salmonid habitat and other beneficial uses.

Acknowledgement of New facilities, policies, and actions required. This project will require the construction of water storage facilities, implementation of irrigation efficiency improvements, installation of 27 large wood structures, implementation of sediment reduction projects, and the organization of two public meetings and a workshop. For a complete discussion of actions required, please see "Conditions With the Project," above.

Adverse physical effects. The project may produce temporary impacts, including disturbance of site during on the ground restoration and implementation activities. These impacts would be mitigated to the extent required by permits obtained for the work and other California regulations.

Uncertainty. The greatest sources of uncertainty for this project arise when considering events outside of the project proponent's control, such as differences in instream water quantity associated with changes in weather patterns caused by climate change, extreme seismic events, or other catastrophic societal or natural events. In the absence of such occurrences, it is highly likely that the project will provide the claimed benefits based on GRRCD's proven excellence in their field and the extensive research which has occurred during project planning. For further discussion of how this suite of projects avoids uncertainty, please see the introductory section to this attachment.

Table 9.1-523 – Annual Project Physical Benefits

Project Name: 523 - Gold Ridge Resource Conservation District, Coastal Watersheds Enhancement Project

Type of Benefit Claimed: Increased salmon populations

Measure of Benefit Claimed (Name of Units): Number of fish per year

Additional Information About this Measure:_____

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014-2063	0	196	196

Comments:

Table 9.2-523 – Annual Project Physical Benefits			
Project Name: 523 - Gold Ridge Resource Conservation District, Coastal Watersheds Enhancement Project			
Type of Benefit Claimed: Increased instream flows			
Measure of Benefit Claimed (Name of Units): Acre-feet of water per year			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015-2063	0	6.9	6.9
Comments:			

Table 9.3-523 – Annual Project Physical Benefits			
Project Name: 523 - Gold Ridge Resource Conservation District, Coastal Watersheds Enhancement Project			
Type of Benefit Claimed: Avoided Sediment Deposition			
Measure of Benefit Claimed (Name of Units): Tons of sediment deposition			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	64	64	0
2013	64	64	0
2014	64	64	0
2015-2024	64	0	(64)
Comments:			

Table 9.4-523 – Annual Project Physical Benefits			
Project Name: 523 - Gold Ridge Resource Conservation District, Coastal Watersheds Enhancement Project			
Type of Benefit Claimed: Increase in base flows			
Measure of Benefit Claimed (Name of Units): Cubic Feet per Second			
Additional Information About this Measure:_____			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015-2063	0	0.3	0.3
Comments:			