Project Assessment and Evaluation Plan
Load Reduction

for the

Waddle Ranch/Northstar Watershed Improvement Program

I. PROJECT SUMMARY

A. Funding Program

This Supplemental Environmental Project (SEP) is being funded through a settlement reached between the Lahontan Regional Water Quality Control Board and Northstar Mountain Properties, LLC related to an Administrative Civil Liability (ACL Order No. R6T-2009-0012).

B. Project Description

The Waddle Ranch/Northstar Watershed Improvement Program Supplemental Environmental Project (hereinafter referred to as the SEP project) is designed to enhance and improve watershed conditions within the Waddle Ranch property and to improve forest conditions in the West Martis Creek area, located in and near the Martis Valley, eastern Placer County, California. Further, this project is intended to serve as a model for other watershed activities in the region. Beyond the water quality and biological benefits produced by this SEP project, the project is designed to fill two significant knowledge gaps in watershed restoration and management. In an effort to close these gaps, the two following work products will be produced: 1) Watershed Evaluation, Treatment and Monitoring Handbook (Work Item #5), and 2) Forest Vegetation Treatment/Water Quality Protection Handbook (Work Item #6). The first handbook will provide land managers, land trust staff, watershed councils, agency staff and others with a direct, accessible and cost effective method of evaluating, repairing and monitoring watersheds and sub-watersheds for water quality related improvements. The second handbook will consist of a set of science-based guiding principles for different forest vegetation treatments that incorporate water quality protection and an adaptive management process for ensuring water quality is integrated with fuels treatment program development.

C. Problem Statement

i. Identify or characterize baseline data

No baseline water quality monitoring data exists for East Martis Creek (Waddle Ranch project area). Some baseline water quality monitoring has been collected in West Martis Creek downstream of the Northstar project area.

ii. Identify pollution source categories

Research in the central Sierra has shown that fine sediment loading is particularly associated with disturbed bare soil areas such as unpaved

roads and areas impacted by logging and forest vegetation treatments, such as landings and skid trails. There is a high concentration of these types of sediment source areas within the Waddle Ranch project area. Unstable stream channels and eroding stream banks may also be contributing to fine sediment loading in the project area.

iii. *Identify and describe current restoration activities; BMPs; load reduction activities; prevention activities*
No restoration, BMP implementation or other types of load reduction activities have been implemented at Waddle Ranch. Currently, forest vegetation treatments are underway on the Waddle Ranch property. These activities are focused on reducing the potential for catastrophic wildfire on the property. The potential impacts of these types of activities on soil, vegetation and water quality are unknown but are being assessed as part of this project.

iv. *Describe the manner in which the proposed best management practices or management measures will be implemented*
Restoration treatments will be implemented in critical sediment source areas that are being identified and prioritized through an erosion-focused watershed assessment of the Waddle Ranch property. Most treatments will be focused on eroding unpaved roads that intersect or drain to East Martis Creek and pose a direct and immediate threat to water quality. Some restoration treatments will also be implemented at landings and other areas impacted by forest management activities. Several levels of treatment will be tested, ranging from low-intensity surface treatments to full-scale soil and vegetation restoration treatments. Treatments will be implemented by a restoration contractor (Integrated Environmental Restoration Services) working closely with the SEP Steering Committee.

v. *Summarize how the effectiveness of the proposed practices or measures in preventing or reducing pollution will be determined*

Three types of baseline (pre-treatment) and performance (post-treatment) monitoring will be conducted as part of this project:

1. <u>Simulated rainfall and runoff monitoring</u> – simulators are used to induce either rainfall or runoff (depending on site conditions). By simulating hydrologic events, we will directly measure runoff and infiltration rates and sediment yields before and after restoration treatment implementation at each of the project locations.
2. <u>Soil and vegetation monitoring</u> – this package of monitoring measurements includes upland erosion parameters such as surface cover, vegetation species composition, soil moisture, soil density, soil physical characterization, soil nutrient content, and photo monitoring. Soil and vegetation monitoring will be conducted before and after restoration treatment implementation at each of the project locations Soil and vegetation measurements are a critical complement to the rainfall and runoff simulations described above, as they provide valuable information about the ecological sustainability of plant-soil

systems, their ability to resist erosive forces and their resilience following disturbance.

3. In-stream water quality and stream flow monitoring – water quality monitoring stations are established along segments of East and West Martis Creek below selected project locations at Waddle Ranch and Northstar. In-stream water quality and flow monitoring measurements will include near continuous stream flow, near continuous turbidity (Northstar only) and targeted grab sampling for total suspended sediment (TSS), nutrients (N and P) and particle size distribution (Waddle Ranch only). The purposes of in-stream monitoring are to: 1) determine whether or not the impacts of sediment source control treatments and management activities in upland areas can be detected through in-stream measurements and 2) to develop a sediment discharge curve to estimate sediment loading in East Martis Creek.

vi. Determine, to the extent feasible, "changes in flow pattern" in affected water bodies.

No stream enhancement projects have been identified at this point. Therefore, it is impossible to determine changes in flow pattern. Initial assessment of East Martis Creek on the Waddle Ranch property suggests that main stem stream enhancement may not be necessary. If stream channel improvements are recommended through the ongoing watershed assessment process, the scope, scale and location of stream channel improvements will be defined and this PAEP will be amended to include any changes in flow pattern associated with those projects.

vii. Determine economic benefits of implementing the project.

This project will quantify the cost-effectiveness (cost per unit of sediment yield reduced) of implementing a variety of restoration and sediment source control treatments, which may help to prioritize treatment efforts under the Middle Truckee TMDL.

D. Project Activities or Tasks

Work Item 1: Project Initiation and Coordination

1.1 SEP Steering Committee development and facilitation
1.2 SEP Steering Committee meetings
1.3 SEP Steering Committee coordination
1.4 Review and integration of pertinent Martis Valley projects

Work Item 2: Project Administration

2.1 Quarterly progress reports
2.2 Draft project report
2.3 Final project report
2.4 Project coordination
2.5 Direct overhead

Work Item 3: PAEP and QAPP

3.1 PAEP Document
3.1.1 Northstar-at-Tahoe PAEP & QAPP Integration
3.2 PAEP Oversight and Documentation
3.3 Monitoring Plan
3.4 QAPP Preparation

Work Item 4: Waddle Ranch Restoration

4.1 Site/watershed evaluation (EfRA)
4.2 Environmental/permitting documentation
4.3 Treatment sites identification
4.4 Permitting assistance
4.5 Treatment specifications
4.6 Pre-treatment site monitoring
4.7 Water Quality Monitoring
4.8 Road removal
4.9 Stream/wetland restoration
4.10 Forest fuels demonstration treatments
4.11 Post treatment monitoring
4.12 Site tours-education and technology transfer
4.13 Public outreach program and materials

Work Item 5: Watershed Evaluation, Treatment and Monitoring Handbook

5.1 Watershed Technical Group development, meetings
5.1.1 Watershed Technical Group review
5.2 Literature summary
5.3 Document outline
5.4 Draft document
5.5 Interim/working document
5.6 Document iteration
5.7 Final document
5.8 Document layout and printing

Work Item 6: Forest Vegetation Treatment/Water Quality Protection Handbook

6.1 Forestry Technical Group formation
6.2 Forestry Technical Group meetings
6.3 Literature summary
6.4 Develop draft Handbook/Guiding Principles
6.5 Identify treatment options
6.6 Forest Vegetation Treatment Implementation (research plots)
6.7 Develop working draft Handbook

6.8 Monitor treatments
6.9 Distribution Copy-Forest Vegetation Treatment/Water Quality Protection Handbook
6.10 Final Draft Forest Vegetation Treatment/Water Quality Protection Handbook
6.11 Printing-distribution of Forest Vegetation Treatment/Water Quality Protection Handbook

Work Item 7: Northstar Riparian and Vegetation Enhancement Project

7.1 Permitting and Notification
7.2 Pre Treatment Monitoring
7.3 Field Work (Site Preparation)
7.4 Hand Crew Work (Treatment)
7.5 Hand Crew Work (Chipping)
7.6 Hand Crew Work (Pile Burning)
7.7 Mastication
7.8 Project Inspections & Forestry Management
7.9 Post Treatment Monitoring and Reporting

E. Category of Project Activities or Tasks
All project activities correspond to the Pollutant Load Reduction category.

II. PROJECT GOALS AND DESIRED OUTCOMES

Waddle Ranch Goals

1. Develop and conduct erosion-focused watershed assessment
2. Remove, treat and/or restore unpaved roads and other disturbed areas based on watershed assessment
3. Implement drainage improvements on unpaved roads based on watershed assessment
4. Treat unstable streams and water courses based on watershed assessment
5. Develop a clear process and set of tools for cost-effective watershed assessment, improvement, measurement and management
6. Develop process and tools for understanding and addressing soil and water quality impacts of forest vegetation treatments

Waddle Ranch Desired Outcomes

1. Use assessment to characterize watershed conditions and prioritize targeted restoration projects
2. Reduce sediment delivery from unpaved roads and other disturbed areas
3. Increase on-site infiltration and reduce sediment delivery from unpaved roads
4. Reduce sediment delivery from water courses (intermittent and year round)
5. Increased capacity of landowners and regulators to achieve measurable sediment source reductions through cost-effective watershed restoration

6. Increased capacity of landowners and regulators to minimize and/or mitigate impacts of forest vegetation treatments on soil and water quality

Northstar Goals

1. Reduce timber stand density and increase vegetative diversity
2. Minimize impacts of forest vegetation treatments on soil function
3. Minimize impacts of forest vegetation treatments on surface water quality

Northstar Desired Outcomes

1. Reduce risk of wildfire
2. Reduce white fir encroachment
3. Increase and improve riparian habitat
4. Increased understanding of impacts of forest vegetation treatments on soil function
5. Minimize and/or mitigate soil compaction and displacement of soil and/or mulch
6. Increased understanding of impacts of forest vegetation treatments on water quality
7. Protection of water quality in West Martis Creek

PROJECT PERFORMANCE MEASURES TABLE

Goals and Performance Indicators for Load Reduction

Waddle Ranch/Northstar Watershed Improvement Program

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
Waddle Ranch Watershed Improvement Program					
1. Develop and conduct erosion-focused watershed assessment	1. Use assessment to characterize watershed conditions and prioritize targeted restoration projects	1. Map of erosion source areas/hot spots 2. Map of road system 3. Map of drainages by class 4. Prioritized list of restoration projects (i.e. restoration plan) 5. Erosion-focused watershed assessment methodology in Watershed Evaluation, Treatment, and Monitoring Handbook	1. Percentage of property assessed 2. Number of potential projects identified	1. GIS buffered line method 2. Simple counting	1. 100% of property assessed 2. At least 20 projects identified
2. Remove, treat and/or restore unpaved roads and other disturbed areas based on watershed assessment	1. Reduce sediment delivery from unpaved roads and other disturbed areas	1. Completed removal, treatment and/or restoration projects in disturbed areas 2. Annual summary of water quality monitoring results	1. Area (square feet) of completed removal, treatment and/or restoration projects 2. Percent reduction in sediment yield from removal, treatment and/or restoration project areas 3. Percent reduction in total sediment and sediment concentration in East Martis Creek (if detectable)	1. Ground measurements of removal, treatment and/or restoration project areas 2. Simulated rainfall and runoff [1] 3. Regular and event-based water quality grab sampling (lab analysis for TSS, N, P, particle size)	1. Implementation of 100,000 square feet of removal, treatment and/or restoration projects 2. Implementation of top 10% of prioritized project list 3. 75% reduction in sediment yield from removal, treatment and/or restoration projects in disturbed areas 4. Determination of ability of targeted water quality monitoring to detect changes in in-stream sediment loading
3. Implement drainage improvements on unpaved roads based on watershed assessment	1. Increase on-site infiltration and reduce sediment delivery from unpaved roads	1. Completed drainage improvements on unpaved roads	1. Percentage of targeted drainage improvement projects on prioritized list implemented 2. Percent increase in infiltration rate in drainage improvement areas 3. Percent reduction in drainage-related rilling	1. Tracking of completed drainage improvements in annual reports 2. Simulated rainfall and runoff [1] 3. Visual erosion assessment	1. Implementation of top 10% of targeted drainage improvement projects on prioritized list 2. 50% increase in infiltration rate in drainage improvement areas 3. 90% reduction in drainage-related rilling

[1] Grismer ME, Hogan MP. 2004. Evaluation of revegetation/mulch erosion control using simulated rainfall in the Lake Tahoe Basin: 1. Method assessment. Land Deg & Dev 13:573–88

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
4. Treat unstable streams and water courses based on watershed assessment	1. Reduce sediment delivery from water courses (intermittent and year round)	1. Completed stream and water course restoration projects 2. Annual summary of water quality monitoring results	1. Percentage of stream restoration projects on prioritized list implemented 2. Percent reduction in total sediment and sediment concentration in East Martis Creek (if detectable)	1. Tracking of completed stream restoration projects in annual reports 2. Regular and event-based water quality grab sampling (lab analysis for TSS, N, P, particle size)	1. Implementation of top 10% of stream restoration projects on prioritized list 2. Determination of ability of targeted water quality monitoring to detect changes in in-stream sediment loading
5. Develop a clear process and set of tools for cost-effective watershed assessment, improvement, measurement and management	1. Increased capacity of landowners and regulators to achieve measurable sediment source reductions through cost-effective watershed restoration	1. Development of project Watershed Technical Group 2. Completed Watershed Evaluation, Treatment, and Monitoring Handbook 3. Completed public trainings/workshops	1. Number of Watershed Technical Group meetings 2. Number of workshop attendees 3. Number of implementers interested in using Handbook	1. Watershed Technical Group meeting notes 2. Workshop attendance records 3. Email survey of workshop attendees	1. Eight Watershed Technical Group meetings 2. Combined total of 40 attendees at trainings/workshops 3. Ten implementers indicate interest in using the Handbook as a guide for watershed project planning and implementation or other restoration efforts
6. Develop process and tools for understanding and addressing soil and water quality impacts of forest vegetation treatments	1. Increased capacity of landowners and regulators to minimize and/or mitigate impacts of forest vegetation treatments on soil and water quality	1. Development of project Forestry Technical Group 2. Completed Forest Vegetation Treatment/Water Quality Protection Handbook	1. Number of Forestry Technical Group meetings 2. Number of forest vegetation treatment projects in Tahoe-Truckee region using Handbook and contributing monitoring data to toolkit development	1. Forestry Technical Group meeting notes 2. Inclusion of case studies in Handbook from cooperating Tahoe-Truckee forest vegetation treatment projects	1. Eight Forestry Technical Group meetings 2. Eight case studies in Handbook from cooperating Tahoe-Truckee forest vegetation treatment projects
Northstar Riparian Enhancement Project					
1. Reduce timber stand density and increase vegetative diversity	1. Reduce risk of wildfire 2. Reduce white fir encroachment 3. Increase and improve riparian habitat	1. Completed forest vegetation treatments	1. Reduction in stand density by demonstrating a change in basal area. 2. Change to more "fire tolerant" forest condition 3. Reduced white fir encroachment 4. Re-establishment of Quaking Aspen as dominant tree species in riparian areas	1. Forest inventory using fixed radius plot 2. Use Behave Fire Fuel Model to evaluate fire tolerance before and after treatment 3. Forest inventory using fixed radius plot 4. Visual assessment prior to treatment and following treatment (permanent plots and photographic documentation)	1. Target basal area range of 90-150 square feet for mixed conifer stand and 75-120 square feet for pine dominant stand. 2. Fuel model demonstrates a more "Fire Tolerant" condition following treatment 3. Target range of 60-70 percent pine stand and 30-40 percent true fir stand 4. Quaking Aspen re-established as dominant tree species in riparian areas

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
2. Minimize impacts of forest vegetation treatments on soil function	1. Increased understanding of impacts of forest vegetation treatments on soil function 2. Minimize and/or mitigate soil compaction and displacement of soil and/or mulch	1. Annual summary of soil monitoring results 2. Documentation of mitigation treatments (if necessary)	1. Percent change in penetrometer depth to refusal (index of soil density) 2. Cubic feet of soil displaced 3. Percent change in mulch cover	1. Cone penetrometer monitoring [2] 2. Direct measurement of soil displacement 3. Cover point monitoring [3]	1. Penetrometer depth to refusal within 80% of pre-treatment conditions 2. No soil displacement 3. Mulch cover no less than 90% of pre-treatment conditions
3. Minimize impacts of forest vegetation treatments on surface water quality	1. Increased understanding of impacts of forest vegetation treatments on water quality 2. Protection of water quality in West Martis Creek	1. Annual summary of water quality monitoring results 2. Documentation of any post-treatment erosion issues and mitigation treatments implemented	1. Percent change in TSS 2. Percent change in turbidity 3. Percent of identified post-treatment erosion issues mitigated	1. Regular grab sampling for TSS below project 2. Near-continuous turbidity monitoring via in-stream sensors below project 3. Visual erosion assessment	1. Determination of ability of targeted water quality monitoring to detect changes in sediment loading 2. 100% of identified post-treatment erosion issues mitigated

[2] Hatchett, B., M. P. Hogan and M. E. Grismer. 2006. Mechanized Mastication Effects on Soil Compaction and Runoff from Forests in the Western Lake Tahoe Basin. California Ag. 60(2):77-82.

[3] Grismer, M.E., C. Schnurrenberger, R. Arst and M.P. Hogan. 2008. Integrated Monitoring and Assessment of Soil Restoration Treatments in the Lake Tahoe Basin. Environ. Monitoring & Assessment. In-press.