Attachment 6

Monitoring, Assessment, and Performance Measures

This attachment describes the performance measures for each project contained in the proposal. For each project a discussion of the monitoring system, monitoring locations, types of analyses, and how monitoring data will be used to measure performance in meeting goals and objectives of the Tahoe Sierra IRWM plan is included. A narrative and Performance Measure Table are included for each of the projects. The Performance Measure Tables include the following items, as indicated in the Round 2 PSP:

- Project Goals
- Desired Outcomes
- Targets
- Performance Indicators
- Measurement Tools and Methods

Project 1: Markleeville Creek Restoration Project

Project Description

The Markleeville Creek Restoration Project will re-establish the natural form and function of Markleeville Creek through the site. The project will reconstruct the floodplain and realign the sewer system in order to improve geomorphic function, reduce water quality risks, enlarge and enhance natural habitats, and create a recreational resource for the community. The project is currently fully funded for and in the midst of Phase 2, Planning and Design. Phase 3 of the project, Final Design and Implementation, is intended to begin in October 2013.

This proposal will fund the initial phase of implementation, Phase 3A, which will include sewer system modifications and pre-project baseline monitoring. Sewer system modification is the critical path element to begin project implementation and ensure compliance with water quality standards. The primary elements of this phase of the restoration project include the following: replacement and relocation of underground sewer lines, replacement and relocation of above ground sewer infrastructure (manholes and pump station infrastructure), realignment and access road improvements to waste water treatment plant through restoration area, and pre-project baseline monitoring.

Performance Measures

We propose a full range of qualitative and quantitative monitoring measures of parameters that will allow the outcome of the project to be described and assessed relative to pre-project conditions. The measures can be grouped in general categories based on their general methods/protocols and based on the likely responsible parties. Information collected using particular methods from any one of these categories may be used to calculate metrics for more than one of the desired outcomes.

- Sewer System Vulnerability
- Visual Assessment
- Photo Monitoring
- Topographic/Geomorphic Survey
- Hydrologic Observations
- Water Quality Sampling
- Vegetation Assessment
- Habitat Inventory
- Biologic Indicators

Monitoring System

Implementation of monitoring will be a joint effort of the AWG (trained volunteers and staff), the County, MPUD, and professional consultants, with data compilation and analysis led by the consultant. Some of the baseline monitoring has been conducted as part of planning studies and the 2007 design step. However, this project includes execution of a formal monitoring plan to document 'pre-project' conditions in 2013-2014 so that all the data will have at least one full annual cycle of seasonal samples prior to the first construction implementation.

The monitoring program will have a clear statement of responsible parties for various data collection, data processing/analysis, long-term data storage and reporting, and will also indicate responsibilities for 'typical operations & maintenance' for adaptive management measures. Trained volunteers will perform some of the work.

Protocols that will be used include the SWAMP Standard Operating Procedures for Bioassessment and the Citizen's Monitoring and Adaptive Management Handbook, produced by the South Yuba River Citizen's League and based on standard operating procedures from the US Environmental Protection Agency and California State Water Resource Control Board Clean Water Team.

Monitoring Location

Monitoring activities will occur throughout the project site, with a mixture of area plots, transects, and point sampling within the site as needed for particular parameters and protocols. For example, geomorphic and topography repeat surveys would be performed at repeatable, monumented transects; vegetation surveys will likely map polygons of vegetation types; aquatic habitat inventories will use repeated protocols throughout the site; while the macroinvertebrate sampling will continue to use the same on- and off- site protocols already in place.

Monitoring outside of the project site will be required to provide context and/or as a reference/comparison conditions for several variables. For example, water quality monitoring will likely include points 'upstream' including stormwater from Hwy 89, discharge points from the County Administration center, upstream on Milberry Creek and upstream on the main stem of Markleeville Creek, as well as points 'downstream' on Markleeville Creek. Additionally, visual quality or recreation use as evidenced by photographic monitoring or user interview surveys, respectively, will include sampling points on and off the site and at viewpoints and/or established visitor locations.

Data Analysis

Data will be analyzed in accordance with the Quality Assurance Project Plan (QAPP). Data will be input into a database and reviewed by the Technical Advisory Committee. Information will be compared from past years in order to assess trends. Pre- versus post- restoration comparisons; up- and down- stream monitoring.

Assessing Performance against Goals and Objectives of IRWM Plan

Monitoring will provide an assessment of success according to project goals and objectives which can then be related to the ability to contribute to a variety of the IRWMP's water quality (WQ), ecosystem restoration (ER) and integrated regional water management (IRWM) objectives. The restoration project will have multiple benefits in all categories. This proposal for the initial phase of implementation, Phase 3A, with sewer system modifications will ensure the following IRWM goals:

- WQ1: Reduce nutrient and sediment loads to receiving water bodies.
- WQ6: Increase public awareness of regional water quality issues and their role in improving the quality of local water bodies.

- ER3: Educate public about ecosystem services provided by healthy wetlands and SEZs.
- ER5: Minimize disturbance caused by urban development.
- IWM1: Ensure sound planning that is based on watershed science.
- IWM2: Encourage collaboration among multiple jurisdictions within a watershed
- IWM3: Form partnerships to share resources, take advantage of cost sharing opportunities, and exchange information.

Project 1: Markleeville Creek Restoration Project
Project Performance Measures Table

Project Goals	Desired Outcomes	Targets	Performance Indicators	Measurement Tools and Methods
1. Reduce Threat to Water Quality	A. Reduce threat of sewer system overflows or malfunctions during floods B. Pre-project baseline assessment of stream conditions	A. All manholes and the pump station will be accessible during flood events; A. MPUD access road to the wastewater treatment ponds (WWTP) will be safer during flood events B. Complete data set on stream bed and bank profile, habitat diversity and vegetation types	A. Manholes accessible from public roads and WWTP access road (4) A. Linear feet of MPUD access road out of 100-year floodplain (ft) A. Linear feet of MPUD access road out of 50-year floodplain (ft) A. Linear feet of MPUD access road out of 25-year floodplain (ft) B. Linear feet of geomorphically stable channel in site (ft); B. Area and percent of various physical habitat units B. Linear feet of channel edge B. Particle size distributions of representative surface and sub-surface locations B. Linear feet and percent of streambanks with various woody vegetation conditions	A. Engineering surveys, measurements, and calculations; comparison to modeled and calibrated floodplains. B. Repeat topographic profile of channel bed and banks and geomorphic condition assessments B. Repeat aquatic habitat inventory and measurements B. Repeat streambed pebble counts and bulk sediment sampling B. Repeat macro invertebrate sampling results B. Repeat photographs and vegetation assessments

2. Improve Community Sewer System	A. Improve life span and reliability of the sewer system B. Reduce probability of a sewer pipe or manhole failure/leak C. Enhance safety and security for MPUD infrastructure and accessibility	A. Aging pipelines, manholes, and lift station are replaced B. New PVC sewer pipes will replace the aging asbestos-concrete pipes B. New pipes will have adequate cover below finished grade B. New manholes will not be within the 100-year floodplain B. New lift station will not be within the 100-year floodplain C. MPUD access road embankment will have better protection at the downstream end C. MPUD access road will have improved profile grade line and curvature (for safer winter access) C. MPUD access road will have improved roadside drainage and Milberry Creek crossing capacity C. Lift station will be closer to public roads but more secure	A. Linear feet of pipe according to remaining life span B. Linear feet of gravity sewer pipe removed from restoration (grading) area (ft) B. Linear feet of gravity sewer pipe crossing under creeks removed (ft) B. Linear feet of gravity sewer pipe crossing under creeks replaced/reconstructed to current standards (ft) B. Lift station location out of 100-year floodplain C. MPUD road embankment percent failing (%). C. MPUD road embankment toe ability to resist projected shear under 25-, 50-, and 100-year flood events. C. MPUD road dimensions, slope, shape. C. Milberry Creek and roadside ditch capacity (peak flow cfs). C. Lift Station distance from public road (ft) and security features (locks, alarms).	A. Engineering design to current standards, field inspections and testing to verify construction to standards, routine maintenance inspections as part of adopted Sewer System Management Plan (SSMP). B. Engineering surveys, measurements, and calculations; comparison to modeled and calibrated floodplains. C. Engineering surveys, measurements, and calculations; comparison to modeled and calibrated floodplains.
3. Increase Public	A. Community attends educational	A. Project partners inform the community and visitors about	A. Number of meetings, outreach venues to inform and/or solicit	A. AWG and partner organization interviews and

Awareness and Stewardship	presentations, participates in monitoring of site conditions and supports long-term site maintenance	watershed processes and the need for restoration A. AWG continues to identify opportunities where volunteers can be trained to reliably support the official monitoring program A. AWG and other community groups continue to enlist, train, and supervise volunteer-based stewardship events	participation in project. A. Number of volunteers in continuing programs or special events. A. Number of volunteer person-days on seasonal, annual, or special maintenance events.	records or volunteer participation.

Project 2: Negro Canyon Restoration

Project Description

The goal of the Negro Canyon Restoration Project is to reduce erosion and improve habitat in the Truckee River Watershed. The Truckee River is listed as impaired for fine sediment and the adopted TMDL identified restoration of legacy erosion sites as a means of achieving sediment reductions (Lahontan Basin Plan – Section 4.13). Negro Canyon is located within the Donner Lake basin of the Truckee River watershed, and was specifically identified in the Truckee River Sediment TMDL Staff Report (Page 10-12). Past land use has led to significant erosion and habitat impacts in Negro Canyon. The current phase of the project includes restoration of three sites within the canyon.

Performance Measures

Monitoring in Negro Canyon will focus on quantifying sediment loading and load reductions in targeted areas, quantifying functional improvements achieved by restoration projects, and qualitatively assessing habitat improvement. Specific performance measures are:

- Erosion monitoring to track water quality improvements
- Vegetation monitoring to track increase and enhancement of vegetation
- Hydrologic function monitoring to track restoration of natural flow paths

Monitoring System

The following techniques will be used:

- Erosion monitoring
    - Runoff simulation
    - Pine needle filter berms
    - Cross sectional measurements
- Vegetation monitoring
    - Vegetation cover
    - Photo-monitoring
- Hydrologic function monitoring
    - Visual assessment of drainage connectivity
    - Photo-monitoring

Runoff simulation. Runoff simulation is a means to measure erosion caused in typical rainfall or runoff events and is conducted using a rainfall simulator. The rainfall simulator measures the quantity and quality of surface water runoff from a known area by delivering water, mimicking rainfall at a specified rate, to the soil surface. Runoff quantity measurements include the timing of ponding, runoff formation,

and flowpath formation. The turbidity of the collected runoff is measured in the field as a surrogate for fine sediment yield, and samples are also collected and analyzed for suspended sediment concentration. Rainfall simulation gives an immediate measurement of how effective restoration work has been in increasing the infiltration capacity of the soil and reducing soil erosion through runoff.

Pine needle filter berms. Pine needle filter berms are a simple and effective way of capturing sediment in spring runoff to gain an understanding of sediment transport in ephemeral channels like those present in Negro Canyon. Pine needle berms are placed in flow paths in the fall before the onset of the wet season and retrieved after spring runoff. The amount of sediment present in the pine needles can be used as an estimate of sediment transport in the project area.

Cross-sectional measurements. Channel cross sections will be measured before and after restoration is completed to estimate the amount of fine sediment removed from the project site and to assess channel stability after restoration is completed.

Vegetation cover. Visual estimates of vegetation cover will be conducted to assess revegetation success.

Photo-monitoring. Photopoints will be established throughout the project area. Photo-monitoring will be used to qualitatively assess erosion reduction, document pre- and post-project hydrologic connectivity, and revegetation success.

Visual assessment of drainage connectivity. A primary cause of erosion in Negro Canyon is the capture of ephemeral drainages by historic roads. Conducting an assessment of drainage connectivity before and after project implementation will help to determine sediment source areas, and sediment deposition areas.

Monitoring Location

Table 1. Types of monitoring and monitoring locations, Negro Canyon Restoration.

Monitoring	Location on Figure 1
Runoff Simulation	Project G, Site 6
Pine needle filter berms	Project F, Sites 7 and 8 Project G, Sites 5 and 6
Cross Sectional Measurements	Project F, Sites 7 and 8 Project G, Sites 4, 5, and 6
Vegetation Cover	Project D Project E Project F Project G Project H Project I

Photo-Monitoring	Project D Project E Project F Project G Project H Project I
Drainage Connectivity assessment	Project D Project E Project F Project G

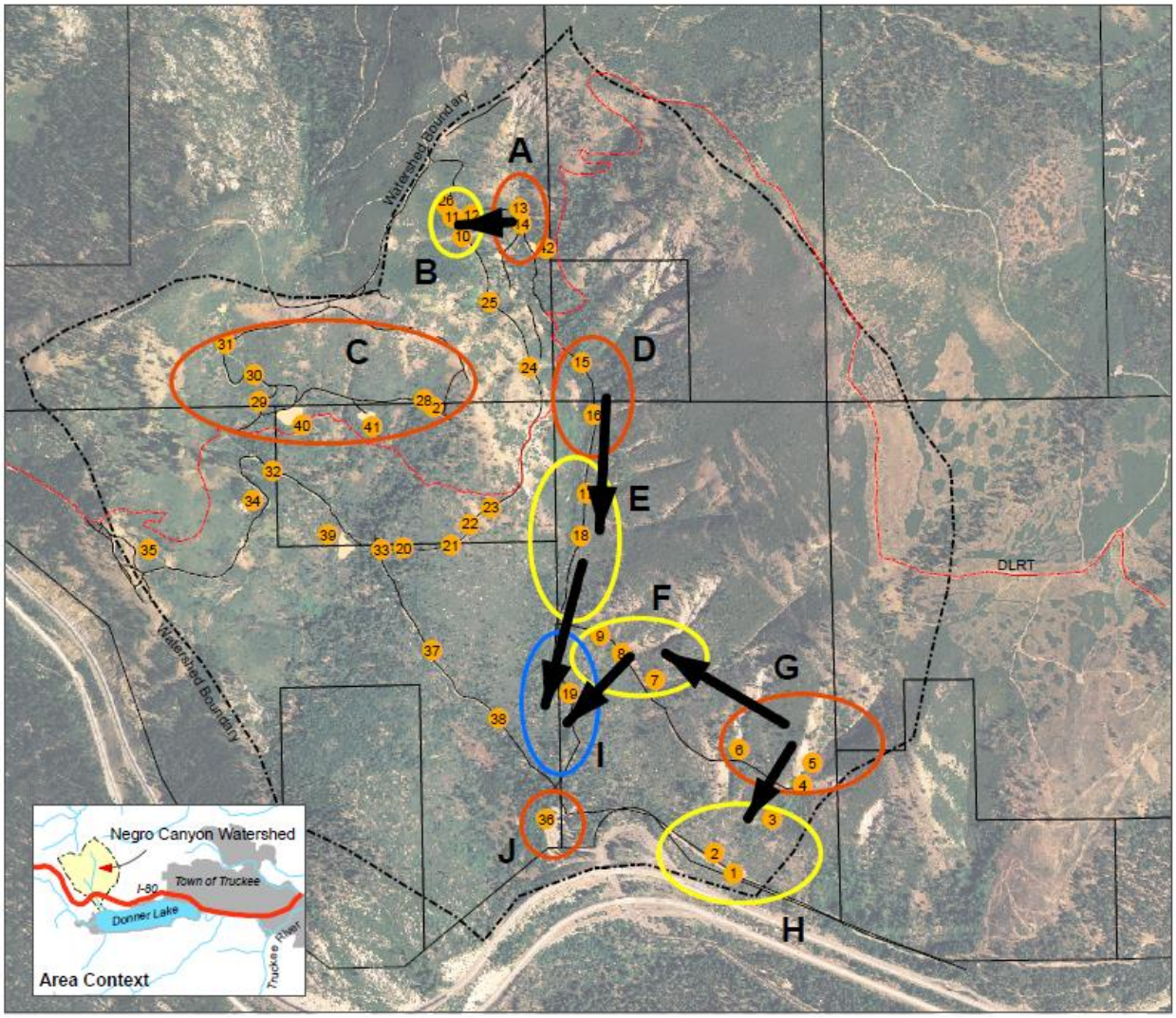


Figure 1. Site Map showing project locations where monitoring will occur.

Data Analysis

Data will be analyzed through comparing pre- and post-project measurements. In the case of quantitative measurements, we will quantify both absolute change and percent change in each metric. Qualitative data will be analyzed through simple comparison of pre- and post-project conditions.

Runoff simulation. The suspended sediment concentration (SSC) of runoff and time until rilling will be recorded before restoration and after. We will analyze the change in these metrics and report the change in SSC – absolute change and percent change, and change in time until rilling.

Pine needle berms. The amount of sediment trapped in the filter berms during spring runoff will be compared pre-project and post-project.

Cross sectional measurements. The pre-project and post-project cross sections will be compared to yield an estimate of the amount of fill (fine sediment) removed from erosional drainages. After project implementation, periodic re-measurement of monumented project cross sections will be compared to assess for stability. Cross sections will be plotted and differences measured.

Vegetation cover. Vegetation in the project sites will be monitored for total cover, mulch cover, vegetation cover, and species composition both before and after project implementation. We will compare coverages at each project site. Species composition will be qualitatively compared.

Photo-monitoring. Photo-monitoring provides an important record of site conditions. Pre- and post-project photos will be displayed side by side to better allow for detailed comparison. Drainage connectivity, vegetation vigor, and instream erosion can all be monitored through photographs.

Drainage connectivity. Drainage paths and interruptions of drainage paths will be compared pre- and post-project. Flow path diagrams will be developed during each monitoring season, and compared annually.

Assessing Performance against Goals and Objectives of IRWM Plan

The Negro Canyon Restoration project directly addresses the following goals of the Tahoe Sierra IRWM:

- Protect and improve water quality
- Contribute to ecosystem restoration

The Negro Canyon Restoration project directly addresses the following objectives of the Tahoe Sierra IRWM:

- WQ2: Reduce nutrient and sediment loads to receiving water bodies. The project will reduce sediment loads to Gregory Creek. We will document load reduction through erosion monitoring.
- WQ5: Restore degraded streams and wetlands to re-establishing natural water filtering processes. The project is designed to restore stream channels. Hydrologic function monitoring will document restored drainage paths, restored stream channels, and restored riparian vegetation.
- WQ6: Increase public awareness of regional water quality issues and their role in improving the quality of local water bodies. We will engage the public in revegetation efforts. The results of their work will be documented through vegetation monitoring.
- ER1: Enhance and restore degraded stream environment zones (SEZs) to support healthy and viable native fish populations. The project will result in improved instream habitat to support fish. We will document habitat improvement through erosion monitoring, hydrologic monitoring, and vegetation monitoring.
- ER2: Restore wetlands and natural biogeochemical cycles. The project will restore riparian areas and improve nutrient cycling. Successful restoration of riparian/wetland areas will be documented through erosion monitoring, hydrologic monitoring, and vegetation monitoring.

Project 2: Negro Canyon Restoration
Project Performance Measures Table

Project Goals	Desired Outcomes	Targets	Performance Indicators	Measurement Tools and Methods
1. Reduce fine sediment generated from Negro Canyon	A. Reduced erosion in Negro Canyon	A. Stable post-project cross-sections B. Reduce runoff during rainfall tests by 75% C. Reduced amount of sediment trapped by pine needle berms by 75%	A. Maintenance of stream cross sections after project completed B. Change in amount of runoff generated during testing C. Change in amount of sediment trapped by filter berms	A. Repeated measurements of pre- and post-project cross sections B. Pre- and post-project measurements of runoff using a rainfall simulator C. Pre- and post- project measurements using pine needle filter berms
2. Improve riparian and instream habitat	A. Improve riparian habitat at three degraded sites in Negro Canyon	A. Increase and enhance area covered by native vegetation by 0.62 acres B. Improvement of riparian habitat along stream segments at three restoration sites totaling 1,200 linear feet	A. Change in area covered by native vegetation B. Change in habitat vigor as demonstrated through photographs	A. Visual vegetation cover estimates B. Photo-documentation
3. Restore degraded hydrologic function	A. Re-connect historic drainage patterns disrupted by historic land use	A. Reduced sediment transport along flow paths; no capture of drainages by abandoned road alignments	A. Change in flow path network	A. Visual assessment of drainage connectivity

		B. Restored stream channels functioning properly	B. Change in apparent in-channel erosion demonstrated through photo-monitoring	B. Photo-documentation

Project 3: Town of Truckee Water Quality Monitoring Program

Project Description

Implement Phase I, II, and III of the Truckee River Water Quality Management Plan (TRWQMP). The TRWQMP was created in response to an order issued by the Lahontan Regional Water Quality Control Board to create a comprehensive monitoring plan of the Middle Truckee River Basin area within Placer County and Town of Truckee jurisdictions. The Town is voluntarily implementing portions of the Town's program.

Performance Measures

Perform discrete community monitoring, rapid assessment monitoring, instream monitoring and data analysis and reporting.

Monitoring System

- Implement a comprehensive and integrated data collection analysis and reporting framework to evaluate and track resources spatially and over time.
- Focus monitoring resources on pollutants of concern and greatest risk of land use activity sources.
- Maximize monitoring resources by including a range of monitoring types that very in frequency, collection, relative cost and statistical accuracy.
- Focus monitoring resources on items of greatest expected deviation from minimally impacted locations.
- Coordinate, collaborate, and integrate with other monitoring efforts.

Monitoring Location

Monitoring locations will include the three high disturbance sub-watersheds of the Truckee River identified in the TRWQMP located in Truckee including the Truckee Town Corridor, Donner Creek/Cold Creek and Trout Creek.

Data Analysis

Data collected will be analyzed and the resulting data base will be maintained and updated throughout the implementation of the water quality monitoring program. In addition, review will be conducted of similar historical data and data being collected by others to help establish trends in the area. An annual report will be posted on the Town's website and the TRIG website for public use.

Assessing Performance against Goals and Objectives of IRWM Plan

This project addresses the following objectives contained in the Tahoe Sierra IRWMP:

- WQ1: Develop TMDL standards. The project implementation results in data analysis that will be used to develop TMDL standards.
- WQ3: Meet nutrient and sediment standards for tributary streams and stormwater runoff. Project implementation will provide data that can be used in future land use decisions, CIP project improvement decisions and prioritization, and to meet TMDL standards for the Truckee River and tributaries of the Truckee River. Monitoring provides baseline data and trends over time.
- WQ6: Increase public awareness of regional water quality issues and their role in improving the quality of local water bodies. Data will be provided during public presentations and workshops as well as data analysis and reports being available electronically to the public.
- IRM1: Ensure sound planning that is based on watershed science. Project implementation will result in data used in future Land Use decisions and CIP project implementation.
- IRM2: Encourage collaboration among multiple jurisdictions within a watershed. Collaboration is demonstrated in the development of the TRWQMP, coordination of water monitoring efforts between Placer County and the Truckee River Watershed Council, and participation in the Tahoe Sierra IRWMP.
- IRM3: Form partnerships to share resources, take advantage of cost sharing opportunities and exchange information. Partnerships with Placer County as well as the Truckee River Watershed Council continue providing a conduit for cost sharing and information exchange. Coordination efforts have filled in the 'gaps' of monitoring rather than implementing duplicative efforts.

Project 3: Town of Truckee Water Quality Monitoring Program
Project Performance Measures Table

Project Goals	Desired Outcomes	Targets	Performance Indicators	Measurement Tools and Methods
1. Perform discrete community monitoring	A. Monitoring conducted at 3 to 10 outfalls with a focus on sediment.	A. Collect Discrete Community monitoring data sets for 3-10 outfall locations that will be available to the public	A. Establish 3 to 10 community monitoring stations at outfalls that drain priority areas. Data will be reported in the annual report.	A. Sediment related monitoring data for 3 to 10 stations. B. Monitoring methods will be in accordance with the TRWQMP.
2. Perform Rapid Assessment Monitoring (RAM)	A. Perform RAM along segments of the main stem of the Truckee River and 2 of the tributaries	A. Collect RAM monitoring data sets for Truckee River and 2 tributaries that will be available to the public	A. Continue RAM along portions of the Truckee River and 1 mile upstream of the confluence on 2 tributaries. Data will be reported in the annual report.	A. Sediment size data and comparisons to previous years along the proposed reaches. B. Rapid Assessment Monitoring will be performed according the recommendations in the TRWQMP.
3. Perform Instream Monitoring	A. Perform instream monitoring in one to two locations on tributaries or in the main stem of the Truckee River.	A. Collect instream monitoring data sets for one to two stations will be available annually to the public	A. Establish one to two instream monitoring stations. Data will be reported in the annual report.	A. Grab samples and/or turbidity gauges will be used for collection of monitoring data. B. Monitoring methods will be in accordance with methods described in the

				TRWQMP. C. Analysis will be focused on sediment related constituents.
4 .Data Analysis and Reporting	A. Maintain and update Database. B. Preparation of Annual Report. C. Preparation of SAP D. Make publicly available	A. Annual Reports submitted annually to RWQCB	A. Complete annual reports. Updated data will be included in the annual report. B. Complete SAP	A. Completed Annual Report B. Completed SAP C. Provide data electronically on a publicly accessible website.

Project 4: Woodfords Community Improvement and Pipe Replacement

Project Description

The overall goals of Woodfords Community Improvement and Pipe Replacement are to reduce water demand, save sewer capacity, and save energy costs. The Woodfords Community is located in California in Alpine County and consists of 59 homes and three commercial buildings. It is located on 80 Acres in the middle Carson River watershed. Although it is one of the Reservations or Trust Lands of the Washoe Tribe of NV and CA (Tribe), preferably it is referred to as Woodfords Community. According to the 2010 census, the median household income (MHI) for Woodfords Community is $26,667.00. The Woodfords Community definitely qualifies as a DAC. This Project will benefit and involve the entire Community which is a small, severely disadvantaged rural Community. The Tribe is unique in that actually entire Lake Tahoe Watershed and the entire Tahoe Sierra Region was the aboriginal territory of the Tribe for thousands of years. It is also unique that the Tribe is now an integral part of participating in regional grant to protect and respect the water resources.

All of the Woodfords Community residents will be benefit by the reduced water demand, saving sewer capacity, the reduced energy costs and other physical benefits as summarized below. This Project by the Washoe Tribe of Nevada & California is a comprehensive water conservation program/ water efficiency program. The Project is a stand alone project with immediate implementation of four concurrent tasks: 1) Coordinate/Integrate Water Efficiency Plan with Partners, 2) Water Use Efficiency Program-Indoor and Outdoor water use activities, 3) Water Meter Program/Leak Detection and Repairs, and 4) Pipe Replacement/Weed Control/Revegetation/ Fire Hydrants.

Performance Measures

Monitoring in the Woodfords Community Improvement and Pipe Replacement Project by the Washoe Tribe of Nevada & California will focus on the reduced water supply demand, the energy saved and the GHG Emissions reduction for the entire Community and within the Tahoe Sierra IRWM Region. Water meter data and SCADA data will be used to quantify the water supply savings from comprehensive conservation activities. Over three years of pre-project water meter data indicating higher water usage than normal will be used to develop baseline data.

Monitoring System

The main monitoring technique will be the real time water meter and radio read transceivers with data being collected at a minimum of once a month. In high water use cases, a protocol will be developed to determine cause of high use and address the cause such as inside leaks, outside over watering, and system pipes leaks. Monitoring will also be coordinated and collaborative methodology considered with the other Regional Partners.

The Tribe's Woodfords Community has difficult pipe replacement problems caused by its remote and seismic zone 4 location in Alpine County, California. Water meter data from the last three years has indicated high water use in the Community. The water meter program is still in need of repairs and

calibration and these repairs are planned as part of this grant. Currently each month just over half of the installed water meters and radio read transceivers are readable.

A Project Component is and will be on-going integration and collaboration with the Regional Water Use Efficiency Program. As a water supplier in the Tahoe Sierra IRWM region, the Tribe plans to participate closely with other regional partners in the Regional Water Use Efficiency Program. The regional approach to water conservation practices was initiated in the Lake Tahoe basin in 2012, utilizing Prop 84 Round One Implementation Funds. The Tribe looks forward to participating with the Round One Partners in this Regional approach as developed by STPUD, TCPUD, and NTPUD.

Initial efforts with this Regional program will continue to focus on coordinating with the Partners and the exchange of water conservation information and materials. A water efficient water closet and appliance rebate program and a small landscape conversion rebate program as previously launched will be continued and refined as needed.

Although the shift towards a regional program is in progress, each agency and especially the Tribe will plan and continue to have individual approaches to water conservation. The Partner agencies and the Tribe can save money by incorporating additional regional approaches such as: ordering water saving appliances and fixtures in bulk; utilizing a single website to advertise programs; utilizing agency water specialists to train each other on implementing new programs within the region, and unifying efforts within the region.

There are substantial economies of scope and scale to be gained through the commitment to intra-regional cooperation. These include the sharing of data and best management practices, development of replicable materials and programs for distribution-wide (examples include the development of a Drought Action Plan template that emphasizes integrated resource planning, as well as stakeholder involvement through each step).

Sharing information and working collaboratively on common products is an efficient method for accomplishing the goals of water use efficiency, infrastructure planning and update, aquifer protection, drought preparedness, and environmental flow/habitat contributions. The implementation of this project will protect water resources and the enhancement of the environmental flows and quality of life/stewardship of the Tribe.

The following description of the monitoring systems both currently in place and to be concurrently implemented will be used to verify Project performance. Following this discussion are the Project Performance Measures tables for each component of this Tribal Community Project in the Tahoe Sierra IRWMP Implementation Grant Proposal.

Data Analysis

Data will be analyzed utilizing the meter reads and through the pre- and post- project conditions. Adding more meters, by repairing, replacing, or reprogramming will complete the capability and readability of reaching the goal of meter reads for all of the homes in the Community.

Data will be collected on each property in the Community. This Project as part of the Tahoe Sierra IRWM is completely focused on a small, rural, and severely disadvantaged Community (DAC). The Washoe Tribal Community of Woodfords is also sometimes known as Woodfords Colony. The preferred Community reference is to Woodfords Community. This Project will affect the entire 80 acre, 59 homes and 3 commercial, approximately 350 residents qualified as DAC based on 2010 average income less than $26,000. Lot sizes in the Community range from small, quarter acre to larger one acre in size. A summary below is of the monitoring and assessment activities specific to this comprehensive water conservation/BMPs and targeted water meter, leak detection and repairs Project.

The three major objectives of this Project are the dynamic development and implementation of a cost effective comprehensive water conservation/BMPs/Water Use Efficiency Program as follows:

- Aim to meet or exceed the State mandated per capita use reduction target of 25 gallons/capita/day (gpcd) by 2020 (SB x7-7).
- Helps the Tribe's Woodfords Community become more self-sufficient and cost-efficient with its water supply.
- Reduce water demand with associated chemicals, energy and GHG reductions.

The process used to refine the planned comprehensive water conservation plan will include concurrently and on-going collaboration with the Regional Water Use Efficiency Program which includes five of the projects in this Tahoe Sierra IRWM application counting the Tribe as one of the five regional collaborators.

Data collection will also be in the form of daily logs and will address as needed the following implementation considerations:

- Prioritize measures for implementation with those that contribute the most to meeting the per capita use targets given highest priority for implementation.
- Consider working with the 10 highest (per water meter reads) water using customers to try to determine high usage causes (leak, over watering, etc.)
- Develop an annual work plan in concert with budget constraints
- Outsource if needed to gain staff and community support
- Set up a 20 x 2020 Working Group with Regional Partners
- Develop refined analytical tools to track water use by customer
- Class and overall per capita water use, adjusted for the weather
- Set up a database to store and manage measure participation, cost
- Use input from the proposed 2020 Working Group to amend plan

Data will be recorded concerning partnering with Water Use Efficiency Program-Indoor and Outdoor water use Regional and System losses activities.

Concurrent with reviewing water conservation activities/measures with the Regional Partners, the Tribe will start immediately to implement the water use efficiency recommended programs per Regional

Partners. Existing pre-project water meter data will be continued with monthly, at a minimum, acquisition of meter reads and will develop a protocol to respond to high use reads in terms of determining whether a customer or system source of high usage. Response within a couple days of high reads is planned.

In addition, recommend the Tribe's Woodfords Community consider becoming a member of the California Urban Water Conservation Program (CUWCC) and to rejoin the American Water Works Association (AWWA) to share water conservation measures analysis on a even broader scale then the Regional Partners.

The Tribal staff will consider a process of analyzing and monitoring conservation measures and programs using the Least Cost Planning Water Demand Management Decision Support System Model (DSS Model). This Model will help to evaluate the net effect of running multiple measures together over time.

Data will be reported on the number of meters and MXUs repaired. The meter and MXU database in Caselle Clarity software has never been verified and not all meters are readable. The goal is to correct these deficient meter/MXU and increase to at least 95 % of the meter/MXU to be read by the Sensus handheld Automatic Meter Read system. This is valuable information and the main monitoring tool to be used in leak detection. It also provides continual Project and house specific data. In addition, it is Community education as many residents ask questions as the data is being obtained from the street rather than opening the meter pit in the resident's yard. Troubleshooting the non-operating is a delicate matter as it often requires assess to the meter pit in the Tribal members yard. This program will allow meter performance issues to be identified and the meter/MXU that are deficient to be repaired or replaced.

Leak Detection is a very important part of this Project and to any comprehensive water conservation plan. As this project is implemented, the monitoring for the project will be the ongoing meter reading on at least a monthly basis. This will help detect whether unexpected water use has occurred and/or is occurring. In the summer months, during the irrigation season of the homes in this semi-arid remote location of this Project, meter reading is planned for every two weeks.

Monitoring data will consist of these meter reads and will help detect and identify degraded pipe section creating chronic leaks, as well as unexpected, large scale leaks. Appropriate action will be taken if a leak is detected. If a line segment becomes degraded to the point of needing replacement and is determined by volume of water leaking to be the highest priority it will be replaced by either the WUMA crew or the Contractor selected through the Tribal procurement bidding process which meets State and Federal standards. If the break is an emergency, it will be repaired as quickly as possible.

Pipe Replacement/Weed Control/Revegetation/ Fire Hydrants:

Data will be recorded on the location of leak repairs, amount of repair, and associated costs. There is no actually effective way to monitor subsurface pipes, with the exception of the meter reading as defined in the leak detection strategy (above). The same monitoring that is being used for leak detection will be used to monitor pipe repair, replacement, and interties. In the Woodfords Community , where the lines

were installed in the early 80's, often requiring blasting in the unfriendly geology of volcanic soils and rock mixed with granite basement rock, some sections of pipe replacement will be more difficult. Again very careful prioritizing will be planned to optimize the dollars available as all the almost 5000 feet of pipe in the Community cannot be replaced. The goal for each year is to replace 1000 feet of leaking pipe sections per year of the grant.

In Addition, Integrated Water Shortage contingency and a draft Comprehensive Drought Preparedness Program will be assessed. The evaluation of pre- and post-Project water uses will help to determine impact of the program on consumer behavior. The attendance at a proposed event or each year at Tribal Earth Day, will be recorded, along with post-event surveys.

The presence of an actual drought plan cannot be monitored, but project participants and the WEPD staff will monitor whether implementation of the drought plan is effective. A draft drought plan for the Woodfords Community is suggested to be a product of Community participation and/or a Tribal focus group.

Assessing Performance against Goals and Objectives of IRWM Plan

The project will address the following goals of the Tahoe Sierra IRWM plan:

- Protect community water supply
- Implement integrated watershed management throughout the region

The project will address the following objectives of the IRWM plan:

- WS2: Build reliable infrastructure to supply water. The project will result in more reliable water supply infrastructure for the Woodfords Community. We will assess progress against this objective through measuring the linear feet of pipe replaced and analyzing leak repair records.

- WS3: Implement and promote water conservation measures and practices. The project will result in reduced water consumption for landscaping and interior use. Progress against this objective will be measured through pre- and post-project meter readings and the number of people contacted through outreach efforts.

- WS4: Install water meters to track water use and encourage water conservation. The project includes installing new meters and repairing non-functioning meters. Progress against this objective will be measured through the number of meters installed or repaired.

- IWM1: Encourage collaboration among multiple jurisdictions within a watershed. The project includes collaboration with other water suppliers in the Tahoe Sierra IRWM region including STPUD, TCPUD, and NTPUD.

- IWM2: Form partnerships to share resources take advantage of cost sharing opportunities, and exchange information. Information and resource sharing is included in this project. Progress

against this objective will be measured through the amount of materials jointly developed and distributed, items ordered in bulk for cost savings, and the development of a joint outreach website.

Project 4: Woodfords Community Improvement and Pipe Replacement
Project Performance Measures Table

Project Goals	Desired Outcomes	Performance Indicators	Measurements Tools & Methods	Targets
1. Decrease the amount of water consumed in Woodfords Community & Region for **outdoor, irrigation** purposes	A. 1,131,000 G of water demand saved & available annually for other beneficial uses B. Conduct two low water use landscaping workshops C. Program brochures & info flyers	A. Number of homes & commercial units implementing outdoor conservation BMPs A. Monthly water meter reading for participating properties are over 20% lower B. # of low water use landscaping workshops B. Audit 45 units for landscape irrigation efficiency & provide installation rebates	A. Water meter readings that demonstrate at least a 20% reduction in water use over two months A. Number of contacts B. Number of workshops	A. Number of square feet of turf replaced times estimated amount of water usage per sq. feet to establish water savings A. Number of landscape irrigation efficiency improvements times estimated amount of water usage per system to establish water savings
2. Decrease residential/commercial **interior water usage** in Woodfords Community & Region	A. 1,101,000 G of water demand saved & available annually for other beneficial uses	A. Number of homes & commercial units implementing indoor conservation BMPs A. Monthly water meter	A. Number of contacts A. Number of rebates A. Water meter readings that demonstrate at least	A. Number of High Efficiency Toilet Rebates times annual estimated water savings per toilet A. Number of high

	B. Program brochures & info flyers	reading for participating properties are over 20% lower A. Conduct home water audit on prioritized homes utilizing water meter database and monthly readings B. Web page developed & updated.	a 20% reduction in water use over two months A. # of retrofit kits distributed B. Number of hits on web page	efficiency/water savings washing machine rebates times estimated annual water savings per machine B. Water conservation activity or workshop to evaluate and prioritize measures for the Community specific
3. Decrease Water Demand	A. Use pre-project meter data to plan home water audits	A. Water use communicated to user & plan reduction in use A. Develop protocol for high reads to WUMA staff	A. Meters read monthly at homes A. Totalizers at both wells read for monthly	A. Unaccounted for system water losses reduction by 5% per year
4. Increase # of Meters as Repaired, Readable & Calibrated	A. Commercial meters repaired and readable	A. # of AMR Meters Read increased to 90% B. Metering data on all homes	A. Totalizers at both wells read for monthly B. Meters read monthly at homes	A. High water users – find leaks or over use sources
5. Decrease system water loss	A. Reduced Water use & pumping & chemicals	A. Number of leaks repaired A. Decrease in real water losses	A. Meters at wells and at homes and commercial units A. Obtain Water Audit Software v2.0 AWWA	A. Measurable reduction in Real Water losses A. Decreased volume of water to pump & treat

		A. Percent reduction of amount of apparent and real water losses A. SCADA alarms less frequent		
6. Pipe replacements to repair system priority leaks/losses resulting in improved water system	A. Decreased water loss, and increased water quality within the distribution system	A. Complete leak repairs on Awohopi Street and repair leaks in 100 feet of the least the highest priority leaks A. Complete Dutch Valley Street lateral repairs on meters and MXU and add reads to the Meter database	A. Pre- and Post water meter data	A. Number of linear feet of pipes replaced A. Log/Records of time / foot, material/pipe used and GPS UTM coordinates A. Photo documentation log of each segments of pipe replaced
7. Reduce the occurrences of infestation of invasive weeds and increase the native plants	A. Less scattered infestations of Yellow Starthistle and Defuse Knapweed as the pipes are replaced	A. Number of scattered infestations eradicated B. Amount of chemicals and time of staff to treat and Number of customers educated	A. Square footage of Eradicated weeds after pipe installations A. Photo documentation A. Visual survey B. Records of numbers of infestations eradicated	A. Total of scattered infestations treated

8. Decrease overall customer water demand	A. Perform residential and commercial water surveys	A. Number of residential surveys performed A. Number of recommendations made A. Number of recommendations implemented A. Log or Record of retrofit activities and corresponding address to relate to water meter database.	A. Customer participation in plans review and/or preparation A. Presence of water meter reads indicating reduction in water use	A. A stakeholder or focus group from the Community is established in reviewing plans
9. Increase water supply reliability and flexibility	A. Include customers in drought preparedness through stakeholder education	A. Drought/water shortage stages identified with focus group as needed	A. Customer participation in plans review and/or preparation	A. The Water Shortage Response Feasibility Study and Action Plan and the Drought Preparedness Plan are complete by the end of 2015

Project 5: Regional Aquatic Invasive Species Outreach Framework

Project Description

The proposed project will help protect multiple inland waters from the introduction of AIS by developing a regional prevention and outreach framework designed to unify consistent messaging, provide useful tools for collaboration, and identify shared resource possibilities. The development and approval of the framework will be accomplished through a coordinated Regional Outreach Committee. Currently, the regional focus of this proposed project includes the entire Tahoe Sierra IRWM with the inclusion of the west slope of El Dorado County. The Tahoe Resource Conservation District (Tahoe RCD) and current project partners wish to expand the current regional boundary to include participation from a wide regional area, and will include but is not limited to additional counties, groups, water managers, etc. to participate in the development of a regional outreach framework.

Performance Measures

Monitoring will be carried out through:

- Analyzing boater use surveys and inspections
- Analyzing feedback from collaborative entities.

Monitoring System

- Protect multiple inland waters from the introduction of aquatic invasive species
- Increase awareness of Clean, Drain, Dry practices
- Expand the regional boundary of aquatic invasive species collaboration

Monitoring Location

Monitoring, through boater surveys and/or inspections, will occur at multiple inland waterbodies, including but not limited to Stampede, Boca and Processor Reservoirs, Ice House Reservoir, Wrights Lake, Donner Lake, Lake Tahoe, Jenkinson Lake and Big Canyon Reservoir. In addition monitoring will occur at regional collaborative meetings.

Data Analysis

All boater use and inspection data will be analyzed for improvement from existing conditions and the number of users aware of and utilizing Clean, Drain and Dry practices. Feedback from collaborating entities will be reviewed and recorded.

Assessing Performance against Goals and Objectives of IRWM Plan

The project will address the following goals of the IRWM Plan:

- Protect and improve water quality
- Contribute to ecosystem restoration

The project will address the following objectives of the IRWM Plan:

- WQ6: Increase public awareness of regional water quality issues and their role in improving the quality of local water bodies. This project is enhancing public awareness and stewardship by collaborating on consistent, regional messaging for clean, drain and dry practices by motorized and non-motorized watercraft users.
- ER1: Enhance and restore degraded stream environment zones (SEZs) to support healthy and viable native fish populations. By preventing the introduction of unwanted aquatic invasive species, native fish populations will benefit by a protecting food sources and habitat.
- IWM2: Encourage collaboration among multiple jurisdictions within a watershed. This project directly encourages multi-jurisdiction collaboration by forming and facilitating a Regional Outreach Committee.
- IWM3: Form partnerships to share resources, take advantage of cost sharing opportunities, and exchange information. The intended outcome of the formation of a Regional Outreach Committee is to identify and provide for shared resources, information exchange and cost sharing as it relates to aquatic invasive species prevention.

Project 5: Regional Aquatic Invasive Species Outreach Framework
Project Performance Measures Table

Project Goals	Desired Outcomes	Targets	Performance Indicators	Measurement Tools and Methods
1. Develop a framework that provides a coordinated effort in prevention outreach across the region.	A. Establishing a functional outreach committee B. Initiate a cooperative MOU C. Develop a framework package with implementation tools	A. Regional outreach committee B. Signed MOU from regional partners C. Regional distribution of framework package	A. Attendance by Regional partners B. Signatures C. Implementation of the framework	A. Meeting minutes, attendance records B. Authorized MOU C. Measure effectiveness through survey to implementing entities
2. Support implementing entities with limited resources	A. Coordinate inspection protocols B. Coordinate outreach efforts and messaging C. Identify reciprocity opportunities	A. Acceptance of regional protocols B. Acceptance of regional messaging C. Implement reciprocity where feasible	A. Implementation of regional protocols B. Implementation of regional messaging C. Implementation of reciprocity	A. Measure effectiveness through survey to implementing entities

Project 6: West Lake Tahoe Regional Water Treatment Plant

Project Description

The West Lake Tahoe Regional Water Treatment Plant project includes the design, permitting and construction of a permanent all season surface water treatment plant utilizing Lake Tahoe as the water source. The West Lake Tahoe Regional Water Treatment Plant will be located in the Homewood area on the west shore of Lake Tahoe. The plant will provide adequate water supply and storage to serve nine small water companies in the project area, addressing their existing source capacity issues for primary and back-up water sources.

The project includes plans, specifications and estimates; CEQA compliance, permitting, public outreach; and construction of a permanent all season surface water treatment plant.

Performance Measures

- Increase production of high quality domestic water
- Improve water quality

Monitoring System

- Monitor daily water production
- Monitor water system demand
- Conduct relevant water quality testing

Monitoring Location

Most parameters will be monitored at the physical water treatment plant using flow measurement and water quality monitoring devices. Water system demand will be determined by individual customer metered usage, distribution system metering and data analysis of water demand parameters such as production rates, water tank levels and water tank level fluctuation. Reduction of the corrosiveness of the water will be monitored by a Lead and Copper sampling program in the distribution system as well as Corrosivity and pH water quality testing at the plant. Residual chlorine levels will be monitored at the plant and in the distribution system, and Disinfection Byproducts will be monitored in the distribution system.

Data Analysis

All water quality data will be analyzed for improvement from existing conditions, compliance with Federal and State standards and number of customer complaints. Daily water production data and water system demand data will be reviewed and recorded. The water treatment plants ability to meet system demand will be evaluated by reviewing production and demand data and determining whether a surplus or deficit of water production exists.

Assessing Performance against Goals and Objectives of IRWM Plan

This project addresses the following objectives contained in the Tahoe Sierra IRWMP:

- **WQ4: Ensure that drinking water continues to meet the standards of the Safe Drinking Water Act.** Currently there are eight separate water systems along the West Shore of Lake Tahoe that provide water service to 2,820 residents and businesses. None of these systems is in full compliance with current California Department of Public Health standards. Two of the systems are in violation of primary drinking water standards and all have source capacity issues for either their primary or back-up sources. Also, there is a lack of adequate storage to meet fire suppression standards throughout the area.
  The new water treatment plant will improve water quality for up to eight independent water systems by addressing the following water quality issues that currently exist in some of the systems including: high levels of iron, manganese, arsenic, radon, bacteriological contaminants, and carbon dioxide.

- **WS1: Provide adequate water supply for a 20-year management window.**
  The West Lake Tahoe Regional Water Treatment Plant project will produce up to 1,820 GPM, producing enough water to address the water supply needs for all eight of the water systems in the project area and provide emergency back-up supply and storage through an integrated water system. The new treatment plant has a 40 year design life.

- **WS2: Build reliable infrastructure to supply water.**
  The West Lake Tahoe Regional Water Treatment Plant project involves building a reliable infrastructure with the capacity supply up to eight separate water systems, serving 2,820 water connections.

  Currently, the eight separate water systems are all dependent on groundwater sources which leaves the region vulnerable if a drought were to occur and poses a threat to the reliability of water delivery in the region. By diversifying sources with a surface water treatment plant, it decreases the likelihood of negative impacts to limited groundwater sources.

- **IWM2: Encourage collaboration among multiple jurisdictions within a watershed.**
  The West Lake Tahoe Regional Water Treatment Plant project provides a consolidated effort to protect source water supply, safeguarding public and environmental health for up to eight water systems, serving 2,820 water connections.

- **IWM3: Form partnerships to share resources, take advantage of cost sharing opportunities, and exchange information.**
  Currently, there are eight separate water systems, with different ownerships, serving approximately 2,820 connections. Some are under public control, some private investor-owned, and some are mutual water companies. Due to the small numbers of connections in each system (most under 500 connections) these systems are significantly undercapitalized to meet today's drinking water standards. The West Lake Tahoe Regional Water Treatment Plant project

will provide adequate water source to address these water supply needs on an integrated, regional basis.

Project 6: West Lake Tahoe Regional Water Treatment Plant
Project Performance Measures Table

Project Goals	Desired Outcomes	Targets	Performance Indicators	Measurement Tools and Methods
1. Increase water production	A. Provide high quality domestic water to meet water demand for up to 9 small water systems and 2820 connections	A. Provide capacity to produce up to 1820 gallons of water per minute and emergency capacity for fire suppression	A. Peak demand met on continuous basis	A. Monitor water system demand and water production levels to measure water treatment plant's ability to provide stated capacity.
2. Improve domestic water quality - inorganics	A. Reduce levels of inorganic contaminants including iron, manganese and arsenic in water	A. All constituents shall be reduced to below State or Federal Maximum Contaminant Levels (MCL) for Drinking Water	A. Results show levels are below allowable MCL's	A. Perform relevant water quality sampling to determine compliance with the stated goal.
3. Improve domestic water quality – bacteriological contaminants	A. Eliminate bacteriological contaminants in water	A. All constituents shall be reduced to below State or Federal Maximum Contaminant Levels (MCL) for Drinking Water	A. Test results are negative for bacteriological contaminants	A. Perform relevant water quality sampling to determine compliance with the stated goal.

4. Improve domestic water quality - corrosiveness	A. Reduce corrosiveness of finished or delivered water	A. Compliance with the Federal Lead and Copper Rule and compliance with corrosive indicators such as pH and Corrosivity.	A. Test results show Lead below 0.015 mg/L and Copper below 1.3 mg/L	A. Perform relevant water quality sampling to determine compliance with the stated goal.
5. Improve domestic water quality – residual disinfectants	A. Reduce levels of residual disinfectants and resultant byproducts in the distribution system	A. Compliance with the Disinfection Byproducts Rule as well as minimizing customer complaints related to chlorine taste and odor issues.	A. Test results are below threshold of Disinfectant Byproducts Rule	A. Perform relevant water quality sampling to determine compliance with the stated goal.

Project 7: Regional Water Use Efficiency Program

Project Description

Urban water suppliers within the Tahoe Sierra IRWM region, including South Tahoe Public Utility District (STPUD), Tahoe City Public Utility District (TCPUD), and North Tahoe Public Utility District (NTPUD), created a regional approach to water conservation practices in the Lake Tahoe basin in 2012, utilizing Prop 84 Round One Implementation Funds. The initial efforts of the regional program were focused on coordinating with the partners and the exchange of water conservation information and materials. A water efficient appliance rebate program and a small landscape conversion rebate program were also launched as a result of the initial program funding. Although the shift towards a regional program is in progress, each agency continues to have individual approaches to water conservation. The partner agencies can save money by incorporating additional regional approaches to include: ordering water saving appliances and fixtures in bulk; utilizing a single website to advertise programs; utilizing agency water specialists to train each other on implementing new programs within the region, and unifying efforts within the region.

Performance Measures

Measures utilized to estimate whether the goals and objectives as established below for the Regional Water Use Efficiency Program will be actual numbers of best management practices (bmp) implemented times the estimated water use of each bmp (with the exception of goal #5). The goals and objectives are listed below:

1. Reduce turf by 126,000 sq ft and improve 120 site irrigation efficiencies to save approximately 2,772,000 MG of water annually
2. Implement water savings best management practices in commercial/residential units to include high efficiency toilets, high efficiency clothes washer and leak detection to save approximately 2,055,812 MG of water annually
3. Reduce energy usage by 19,069 kWh annually through the reduction in water production/treatment necessary to meet water user need
4. Reduce 13.5 Metric Tons of Carbon Dioxide Equivalent annually through reduction in energy usage
5. Provide a minimum of 500 regional commercial/residential water users with information about the benefits of water use efficiency and the related impact on energy reduction and the reduction in greenhouse gas (GHG) emissions

An example of the performance measures utilized for Goal #1 would be the total amount of square feet of turf removed and site irrigation efficiencies implemented times the estimated amount of water saved per square foot by both best management practices implementation. At sites that have established water meters, the pre-and –post water usage data will be utilized to calculate actual water savings. At unmetered sites (largely residential units), an estimated 22 gallons per acre foot is utilized to calculate

water savings. The 22 gallons per acre foot was derived from previous studies in comparable programs and adjusted to fit the weather and irrigation practices in the Tahoe Sierra IRWM region. The performance measure for #5 will be the total number of water users the program performs outreach for, including those who choose to implement water use efficiency bmp's and those who don't. In addition to these, all information distributed at outreach events such as Earth Day, FireFest, etc. will be counted to meet the estimated 500 water users. For more information on the determination of project benefits and the documentation in support of the estimated gallons utilized as a performance measure for each best management practice, please see Attachment 7 of this application: Technical Justification.

Monitoring System

The monitoring system methods will be different for each implementation goal and objective, but primarily share in the ability to measure/calculate water saved x the cost of each gallon of water production. The monitoring system calculates the water saved by reduction of water usage in metered accounts and by an estimated reduction in the case of non-metered accounts.

Monitoring Location

Monitoring is performed on each site that a water use efficiency best management practice is implemented. For example, in the case of the turf removal and irrigation efficiencies to be implemented at the DAC site, Sierra Gardens, the water meter data from that site will be used to estimate the water savings. At an unmetered residential site that has turf removal, irrigation efficiencies, leak detection audits, or any other water use efficiency best management practice implemented, the estimated water savings for each of the bmp's will be calculated for that individual site.

Data Analysis

All individual site information from the implementation of the water use efficiency best management practices will be kept on a water savings database, including the water use information from metered customers and the water savings information as calculated for non-metered best management practices implementation sites. The water savings database will then calculate the water savings from each site on an annual Million gallon basis, which will then be utilized to calculate energy savings and Greenhouse Gas Emissions (GHG) reductions.

Site information is stored by APN number, which is then utilized to map implementation within the region.

Assessing Performance against Goals and Objectives of IRWM Plan

The Tahoe Sierra IRWM Plan has specifically identified Water Supply Objectives as a regional priority and chose one of the following water supply objectives for implementation of specific projects (TSIRWM Plan, 2007, pg. 17)

- WS3: Implement and promote water conservation measures and practices. (The Regional Water Use Efficiency Program will be directly implementing and promoting water conservation measures and practices.)

In addition, the Tahoe Sierra IRWM Plan Water Management Strategies includes the following:

Tahoe Sierra partners recommend that local and regional agencies involved in land use planning consider the limitations set by the Interstate Water Compact, and that the State's water quality program takes the availability of water into account. In addition the following strategies are critical to preserving and maintaining the current water supply:

- WMS1: Encouragement of the use of Best Management Practices to minimize water use for agricultural, landscape, and turf irrigation. These practices should also encourage the use of water saving devices and appliances for both public and private water users. (TSIRWM Plan, 2007, pg. 22) The regional water use efficiency program encourages the use of Best Management Practices such as irrigation efficiencies; lawn removal and replacement with water saving landscaping, and promotes such water saving devices and appliances as ultra low flow toilets, water saving showerheads and faucets, water saving washing machines, and promotes locating and repairing interior and exterior water leaks.

As the implementation of the Tahoe Sierra IRWM Regional Water Use Efficiency program will meet Water Supply Objective #2 and Water Management Strategy #1 directly, all monitoring efforts will serve to reinforce that these region-wide plan objectives have significant, integrated benefits to the region through the water savings calculations proposed. In addition, the reduction in energy savings and greenhouse gas emissions data derived from the implementation of the Regional Water Use Efficiency program can be utilized to evaluate the success of the Tahoe Sierra IRWM in meeting climate change objectives to be established in the revision of the Tahoe Sierra IRWM plan for 2014.

Project 7: Regional Water Use Efficiency Program
Project Performance Measures Table

Project Goals	Desired Outcomes	Targets	Performance Indicators	Measurement Tools and Methods
1. Decrease amount of water consumed in region for residential/ commercial irrigation purposes	A. 2,772,000 MG of water available annually for other beneficial uses	A. Remove approximately 126,000 sq. feet of turf B. Audit approximately 120 commercial, residential, multifamily units for landscape irrigation efficiency improvements and provide installation rebates for improved systems	A. Increase in the amount of water available compared to historic levels in previous years B. Decrease in water usage as per all commercial/residential customers as compared to water usage prior to irrigation adaptations	A. Number of square feet of turf replaced times estimated amount of water usage per sq. feet to establish water savings B. Number of landscape irrigation efficiency improvements times estimated amount of water usage per system to establish water savings
2. Decrease residential/ commercial interior water usage in region	A. 2,055,812 MG of water available annually for other beneficial uses	A. Process approximately 100 HE toilet rebates B. Process approximately 20 HE washing machine rebates	A. Increase in the amount of water available compared to historic levels in previous years B. Decrease in water usage as per commercial/residential customers as compared to	A. Number of High Efficiency Toilet Rebates x annual estimated water savings per toilet B. Number of high efficiency/water saving washing machine rebates x

		C. Process approximately 100 leak repair rebates	water usage prior to HE appliance installation/leak repair.	estimated annual water savings per machine C. Number of leak detection audits that result in fixtures/appliances/water pipe repair x amount of gallons saved per leak
3. Increase residential/commercial water user's knowledge of the benefits of water use efficiency best management practices, including correlations between water savings, energy savings, and reduction in greenhouse gas emissions.	A. Provide a minimum of 500 regional commercial/residential water users with information about the benefits of water use efficiency and the related impact on energy reduction and the reduction in greenhouse gas (GHG) emissions	A. Through outreach activities to commercial/residential water users, track sites and events to reach a total of 500 participants with informational material about water use efficiency efforts and best management practices	A. Increase in the number of participants in the regional water use efficiency implementation program and number of participants who volunteer to receive information regarding water use efficiency from each water supplier or at outreach events	A. Number of commercial/residential water users who participate in the water use efficiency program, or who are tracked by requesting information about the program or the best management practices implementation
4. Decrease energy usage for water production, treatment and distribution and wastewater treatment	A. Reduce energy usage by 19,069 kWh annually through the reduction in water production/treatment necessary to meet water user need	A. Through the implementation of water use efficiency best management practices, reduce approximately 4.9 MG of water annually	A. Decrease in the amount of water usage and energy usage for that water production, treatment and distribution (wastewater impacts as well)	A. Amount of water reduced annually by Million gallons x the kWh per MG that would typically have been generated
5. Decrease GHG emissions (Carbon Dioxide	A. Reduce 13.5 Metric Tons of Carbon Dioxide	A. Through the implementation of water	A. Decrease in the amount of water usage and energy	A. Amount of energy reduced annually through

Equivalent)	Equivalent annually through reduction in energy usage	use efficiency best management practices, reduce approximately 4.9 MG of water annually, resulting in the reduction of energy usage by 19,069 kWh per year	usage for that water production, treatment and distribution (wastewater impacts as well)	water savings calculated into GHG savings

Project 8: Griff Creek Water Quality Improvement

Project Description

Griff Creek runs through the urbanized area of Kings Beach California and outlets directly into Lake Tahoe. Do to development and urbanization the creek has lost its natural meandering and flood control characteristics and has become an eroded stream channel and a sediment pollution source to Lake Tahoe. In additions no water quality treatment facilities exist in the Griff Creek watershed to treat urban runoff before it enters Griff Creek. This project will reintroduce SEZ area and natural flood control zones helping to take some of the pressure off of the main Griff Creek Channel. In addition multiple water quality features will be constructed to treat the urban runoff before it enters Griff Creek all helping to reduce the sediment load in Lake Tahoe.

Performance Measures

Success of the project will be based on reduction in fine sediment attributing to the total maximum daily load (TMDL) in Lake Tahoe, function and efficiency of water quality improvement features, and revegetation success in the project area.

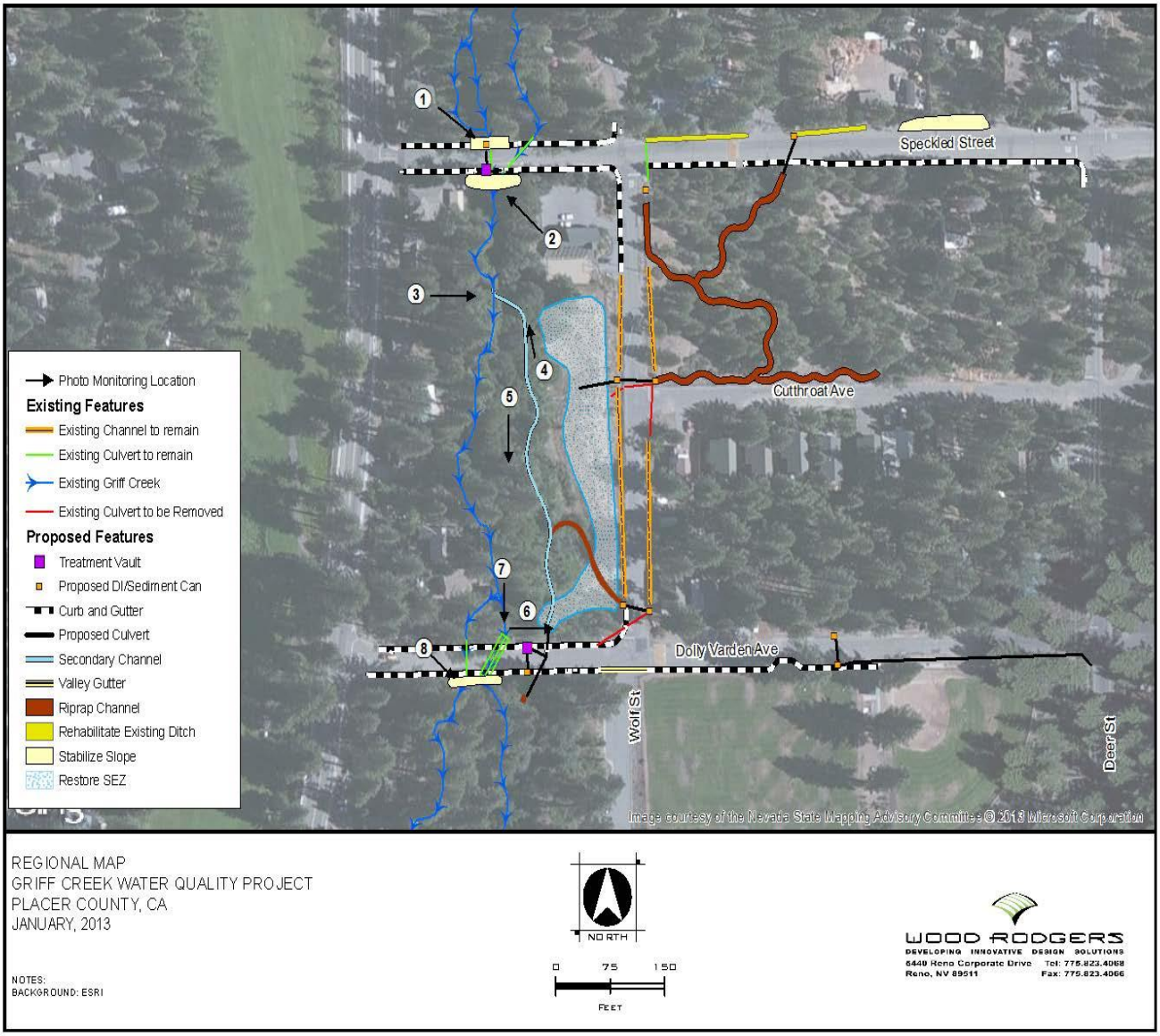
Monitoring System

The following monitoring techniques will be used:

1. Hydrologic/Water Quality (H/WQ) - To provide hydrologic and loading baseline data to be utilized for evaluating post-construction watershed BMP retrofits
    - Placer County staff will collect storm water grab samples from post-construction storm events in order to determine the correlation between precipitation, flow, and the concentration of fine sediment. This will allow for an accurate estimation of the annual fine sediment load captured by the Project improvements and measure the volume / flow reduction as a result of the Project as well.
    - Per Lahonton regulatory requirements a computer generated Pollutant Load Reduction Model (PLRM) will be run pre and post project to quantify the fine sediment TMDL reduction for the project.
2. Photographic (P) – To track project success of revegetation and erosion control improvements
    - As required by the State grant guidelines and TRPA/Lahontan regulatory permit requirements pre-construction, construction, and post-construction photographic documentation will be provided for key components in the project area.

Monitoring Location

Grab Samples for hydrologic/water quality monitoring will be conducted in Griff Creek at the upstream and downstream project boundary limits. Photographic monitoring will be conducted at the locations shown in the attached figure.



Data Analysis

Data will be analyzed through comparing pre- and post-project measurements. For Hydrologic/Water Quality (H/WQ) monitoring PLRM will be developed to show analytical pre and post construction results. Qualitative data will be analyzed through simple comparison of pre- and post-project conditions based on photographic monitoring.

Assessing Performance against Goals and Objectives of IRWM Plan

The Griff Creek Water Quality Improvement project directly addresses the following objectives of the Tahoe Sierra IRWM:

- WQ2: Reduce nutrient and sediment loads to receiving water bodies. The project is reducing nutrient and sediment load to Lake Tahoe and will monitor the reduction in fine sediment TMDL using a computer generated pollutant load reduction model (PLRM).
- WQ3: Meet nutrient and sediment standards for tributary streams and storm water runoff. The project is implementing water quality features to treat urban storm water runoff before it enters Griff Creek and Lake Tahoe. Grab samples and PLRM will be conducted to track efficiency.
- WQ4: Ensure that drinking water continues to meet the standards of the Safe Drinking Water Act. These improvements will reduce fine particle and sediment pollutants that are discharged into Lake Tahoe which is a drinking source for Basin communities. PLRM will be conducted to determine the pollutant reduction.
- WQ5: Restore degraded streams and wetlands to re-establishing natural water filtering processes. SEZ restoration is part of this project and will be photographically monitored
- ER1: Enhance and restore degraded stream environment zones (SEZs) to support healthy and viable native fish populations. SEZ restoration is part of this project and will be photographically monitored
- ER2: Restore wetlands and natural biogeochemical cycles. SEZ restoration is part of this project and will be photographically monitored.
- ER5: Minimize Disturbance caused by urban development. The project is removing fill placed in the SEZ do to urban development. This activity will be photographically monitored.

Project 8: Griff Creek Water Quality Improvement
Project Performance Measures Table

Project Goals	Desired Outcomes	Targets	Performance Indicators	Measurement Tools and Methods
1.Increase acreage of Stream Environmental Zone	A. Increase areas defined as riparian.	A. Increase SEZ by 20% over existing area. Constraints will be private property	A. Percent increase in defined wetland areas pre- and post- projects.	A. Photo monitoring
2. Contribute to achievement of reduced fine sediment TMDL target	A. Reduction of sediment concentration at Griff Creek outfall to Lake Tahoe.	A. Reduction of fine sediment concentrations between pre-and post-project conditions and project implementation by 40% after 10 years.	A. Percent reduction of sediment and nutrients, based on flow rate.	A. Computer generated PLRM and grab sampling (samples will be analyzed for turbidity and fine sediment)

Project 9: BMP Retrofit on Private Parcels in the Lake Tahoe Basin

Project Description

Lake Tahoe is federally designated as an Outstanding National Resource Water due to its exceptional clarity. Increased pollutant loading from urban development in Tahoe's watershed has led to an alarming rate of clarity decline since the 1960's. The Lake Tahoe TMDL recognizes stormwater runoff from urban uplands to be the primary source of fine sediment (<16microns) and nutrients contributing to clarity decline (TMDL Technical Report, 2007) and identifies implementation of Best Management Practices (BMPs) on urban uplands as a key strategy to restore Lake Tahoe's clarity. BMP implementation is also recognized by the Lake Tahoe Watershed Assessment, which states that "restoration of existing erosion problems" and "treatment of urban surface flow" are two of the "most appropriate courses of action" to stop the decline in Lake Tahoe's clarity (USDA Forest Service et. al, 2000, p. 306).

Through implementation of Lake Tahoe Private Parcel BMP Retrofit Program, the TRPA Stormwater Management Program will engage property owners and assist them in designing and installing low impact development practices and water quality best management practices (BMPs) on their properties. This will include the installation of stormwater treatment and infiltration as well as stabilization of eroding areas and restoration of disturbed soils. Thus far, this program has resulted in an estimated 47 million dollars being invested by property owners to control runoff and sediment from private property properties.

Performance Measures

Performance measures this project will include the number of sites that install Best Management Practices(BMPs) and Low Impact Development Building techniques and the pollutant load reductions achieved though implementation of this project. The outreach component of this project will be measured by the number of people who receive outreach materials.

Monitoring System

Implementation of BMPs will be tracked using the online Tahoe Regional Planning Agency BMP Database. Outreach activities will be tracked though publication circulation numbers, workshop attendance, and website analytics.

Monitoring Location

Monitoring will occur throughout the Lake Tahoe Basin, on parcels where BMPs are implemented.

Data Analysis

Implementation data will be analyzed using the pollutant concentration coefficients (per land use type) developed for the Lake Tahoe TMDL Pollutant Load Reduction Model. This data will then be used to determine the load reduction resulting from the implementation of BMPs on private parcels. The public outreach component of this project will help to meet the Tahoe Sierra IRWM Water Quality Objective 6 by increasing public awareness of regional water quality issues and their role in improving the quality of local water bodies.

Assessing Performance against Goals and Objectives of IRWM Plan

The BMP Retrofit on Private Parcels in the Lake Tahoe Basin project directly addresses the following objectives of the Tahoe Sierra IRWM:

- WQ2: Reduce nutrient and sediment loads to receiving water bodies. Progress against this objective will be monitored through pollutant concentration coefficient data.
- WQ3: Meet nutrient and sediment standards for tributary streams and stormwater runoff. Progress against this objective will be monitored through pollutant concentration coefficient data.
- WQ6: Increase public awareness of regional water quality issues and their role in improving the quality of local water bodies. The public outreach component of this project will help to meet this objective by increasing public awareness of regional water quality issues and their role in improving the quality of local water bodies. Progress towards this objective will be monitored through publication circulation numbers, workshop sign-in sheets, and website analytics.

Project 9: BMP Retrofit on Private Parcels in the Lake Tahoe Basin
Project Performance Measures Table

Project Goals	Desired Outcomes	Targets	Performance Indicators	Measurement Tools and Methods
1. Implementation of BMPs on Private Parcels	A. Reduced nutrient and sediment loading to Lake Tahoe	A. Retrofit Implementation equal to 150% of new construction BMP implementation	A. BMP Certificates	A. TRPA BMP Database
2. Provide education and outreach to Lake Tahoe property owners, residents and visitors.	A. Increased public awareness of regional water quality issues and their role in improving the quality of water bodies	A. Provide information to over 50,000 members of the target audience.	A. Advertisements, workshop flyers, website screenshots	A. Publication circulation numbers, workshop sign-in sheets, website analytics.