Project Assessment and Evaluation Plan (PAEP) Outline
Water Conservation, Reliability Enhancement, and Recycling

Northern Mill Creek Watershed Irrigation Improvement Project (Project)

I. Project Summary

A. Funding Program

This Project is funded by an Agricultural Drainage Management Loan Program (ADMLP) created by the Water Conservation and Water Quality Bond Law of 1986.

B. Project Description

This Project will purchase high efficiency irrigation equipment, and backflush recycling systems, to prevent untreated irrigation wastewater, from polluting waters of the state. The equipment purchased will be leased and operated by the Northern Mill Creek Watershed Irrigation District (District) to reduce drainage impacts and improve water use efficiency. This Project will conserve water; reduce the discharge of salt, boron, nitrogen, and sediment to Mill Creek; and provide greater drinking water supply reliability.

C. Problem Statement

The northern part of the Mill Creek Watershed has been a farming community since the 1800's, when early immigrants first settled it. Over the years, the smaller diversified farms turned to larger monoculture businesses with more intensified farming. Salmon have historically used the Northern Mill Creek Watershed as a main conduit for travel to reach their spawning headwater streams. However, increased demand for irrigation water due to larger and more intensive farming has resulted in reduced habitat and warmer stream temperatures for fish. As a result, the salmon population within Mill Creek has been declining.

Nitrogen loading from runoff, coupled with sediment runoff that contains phosphorus, has also contributed to algae blooms. And in some areas where the water table is low, nitrogen is able to infiltrate into ground water aquifers, which historically had been used as a main source for most of the community's drinking water.

i. Identify or characterize baseline data

Baseline data includes; District water use records for the past 5 Years; 10 years of Mill Creek flow and temperature data recorded by a USGS gauging station; and the Mill Creek Watershed

Protection Group data from two sampling stations in the Northern Mill Creek Watershed for Nitrogen and Salinity, 3 hour average sampling for the past two summers.

Habitat surveys for juvenile salmonids have also been conducted the Past 3 summers by the Friends of Fish 4 Mill Creek (FoF4MC). Percent of Dominant Substrate, Pool Tail Embeddedness, Pool Tail Substrate, and Substrate Composition was recorded. Bank erosion was also recorded along a 4-mile stretch of stream within this watershed.

Records of average nitrogen samples taken over 10 years for a well under flood irrigated farmland. Within these 10 years, samples were taken by three previous landowners, with one taking as little as two samples, and one taking as many as 72 samples.

ii. Identify pollution source categories

The northern end of Mill Creek is surrounded by multiple highly intensive agricultural communities. These communities have expanded greatly as a result of a historical farming infrastructure, productive land, large-scale farming investments, and close proximity to distributers in nearby urban cities. As a result of the growth in the agricultural community and change in agricultural management practices, nitrogen, sediment, and salt-loading has increased. Nitrogen infiltration has also become a problem in aquifers over agricultural land with low water tables.

iii. Identify and describe current restoration activities; Best Management Practices (BMP's); Load reduction activities; Prevention activities

A bank stabilization project was done on a .25 mile stretch of Mill Creek by the Friends of Fish 4 Mill Creek, to help deal with a sliding bank. Also, two of the farmers along Mill Creek are enrolled in the Conservation Reserve Program, and have developed a 250-foot buffer strip along each side of the stream. Although some small, separate projects have occurred, a larger more integrated approach needs to be taken.

iv. Describe the manner in which the proposed best management practices or management measures will be implemented

Loans will be made available to farmers in the District to replace their old irrigation systems with more effective high efficiency irrigation systems and backflush recycling systems. In doing so, farmers in the District will use less water, keep more nutrients on the ground and in the plants, and improve surface and ground water quality.

The program will be advertised in monthly news flyers, at regular public meetings, special informational meetings, by email, by word of mouth during interaction with local farmers, and on the local radio station.

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

Amount of total water use by the District will be calculated and compared between years. Pollution reduction will be estimated by using the results from a study at Mill Creek University.

The study will be looking at "average" concentrations of nitrogen, sediment, and salt for the various irrigation systems on the market for 4 different crops on local soil environments. Data from the study will be used to estimate the water quality improvement as a result of replacing equipment. Pollutant load reduction will be calculated based on quantity of water applied, type of equipment installed, and crop type. Calculations will be modified to account for change in soil type, as needed. The water quality pollutants will also be measured downstream of project areas over the next 10 years to help determine project success.

For at least one site, monitoring of well water will be conducted, using a University lab. Samples have been collected at this location over the past 10 years, as a result of the interest from past owners who had either lived on the land or wanted to pump the water to a nearby track of land for residential use. Another set of samples will be taken 6 months before installation of the equipment and every year following the installation until the end of the Useful Project Life.

vi. Determine "Changes in flow pattern" in affected water bodies

The District plans to conserve 1,580 acre-feet of water in the next two years by replacing its inefficient irrigation systems with more efficient irrigation systems. If this project is shown to be successful, more projects like this may be implemented in the future, allowing for more water savings. The District also plans to completely stop the infiltration of nitrogen to a groundwater aquifer on agricultural land that has a low groundwater table.

vii. Determine economic benefits of implementing project

Although there is a price tag of approximately $1,241/acre for replacement of the old equipment, the price of not replacing such equipment, is likely to create other costs now and in the future. Such costs include, reduced water supply reliability, reduced sport & commercial fishing, reduction in genetic pool & biodiversity on neighboring preservation land, and reduced property values. If these practices are implemented throughout the District, the benefit for replacement will outweigh the costs, through improved quality of life and environmental benefits.

D. The Following Project Activities or Tasks will be Completed to Address the Issues or Problems*:*

Task 1. Administration

Provide all technical and administrative services needed for Project Completion; monitor, supervise, and review all work performed; and coordinate budgeting and scheduling to assure that the Project is completed within budget, on schedule, and in accordance with approved procedures, applicable laws, and regulations. This includes, but is not limited to:

(A) Establishing the acquisition, administrative and leasing criteria necessary to implement the Project.

(B) Establishing criteria for estimating the improvements in efficiency that will result from irrigation improvements through equipment acquisitions, and for determining whether or not applicants for irrigation improvement leases are credit-worthy.

(C) Ensuring that the growers understand that they may be subject to periodic inspections.

(D) Establishing separate and complete records and files on leases made to growers for irrigation equipment acquired under the terms of this agreement.

(E) Accounting procedures shall be in accordance with generally accepted accounting principles and practices, consistently applied, and shall provide sufficient and effective accountability and control of all Project funds.

Task 2. Outreach

Conduct continuous outreach to farmers and equipment dealers to encourage participation in the program.

Task 3. Acquire "the Equipment".

Adopt a formal bid process on each project. Purchase high efficiency irrigation equipment, and backflush recycling systems by awarding subcontract(s) to appropriate organization(s) to perform tasks as outlined in the Agreement, Document steps taken in soliciting and awarding the subcontract, and submit them to the State Water Board's Project Representative for review.

Task 4. Supervise Construction/Installation

Ensure that equipment acquired under the terms of this agreement is constructed and installed correctly and expeditiously.

Task 5. Lease "the equipment"

Lease the equipment and systems (collectively, "the equipment") to contracted growers.

Task 6. Calculate Post Implementation Results

Compare the expected or the actual result in efficiency of new systems to baseline data and calculate water conservation and reduction in pollutant load (sediment, salt etc.).

Task 7. Reporting

Expeditiously provide, during implementation and upon completion of the Project and thereafter during the Useful Life of the Project, such reports, data, and information as may be reasonably required by the State Water Board's Project Representative, including but not limited to material necessary or appropriate for evaluation of the State Water Board's program or to fulfill any reporting requirements of the state government. Examples of these include:

(A) Progress Reports. Submit quarterly progress reports during Project Implementation. The description of activities and accomplishments of each task during the quarter shall contain sufficient detail to provide a basis for payment of invoices and shall be translated into percent of task work completed for the purpose of calculating invoice amounts.

(B) Project Assessment and Evaluation Plan. Shall provide data consistent with the format, schedule and other guidelines specified and shall be approved by the State Water Board's Project Representative.

(C) Final Project Summary Report. Submit to the State Water Board's Project Representative a copy of a Final Project Summary Report within 60 days following Project Completion.

Category of Project Activities or Tasks:

Tasks	**Category**
1. Administration	Planning, Research, and Assessment
2.Outreach	Education, Outreach, and Capacity-building
3. Acquire "the Equipment"	Water Conservation, Reliability Enhancement, and Recycling
4. Supervise Construction/Installation	Water Conservation, Reliability Enhancement, and Recycling
5. Lease "the Equipment"	Water Conservation, Reliability Enhancement, and Recycling
6. Calculate Post Implementation Results	Planning, Research, and Assessment
7. Reporting	Planning, Research, and Assessment

II. Project Goals & Desired Outcomes

(Unless otherwise stated, the following goals will be accomplished by the Mill Creek Water District and will occur by project completion.)

The goals of this project are:

1. *Conserve water used for irrigation purposes within the District by installing high efficiency irrigation equipment, allowing more water to remain in the stream for aquatic life.*

2. *Recycle water in the District to allow for more water to remain the stream for aquatic life.*

3. *Reduce tailwater in the District to protect against public health hazards.*

4. *Improve the reliability of low groundwater aquifers (that reside under agricultural land) as a source for drinking water.*

The desired outcomes of this project are:

1. *1,580 acre feet of water that is diverted from irrigation use to remain in Northern Mill Creek for aquatic life.*

2. *15,800 acre feet of water that is diverted from irrigation use to remain in Northern Mill Creek for aquatic life by the year 2020*.

3. *2º C Colder water in refugia pools to reduce the stress of migrating salmonids by the year 2025.*

4. *250 acre-feet of water treated and recycled back onto farmland to remain in Northern Mill Creek for aquatic life.*

5. *90% of farms in the District without tailwater to prevent against public health hazards.*

6. *Elimination of all Tailwater from the District to protect again public health hazards by 2020.*

7. *A policy set in place restricting tailwater.*

8. *Provide for improvement in at least one well, through this project to act as an example for others with low water tables over agricultural land in the District.*

9. *Three aquifers in the district that meet the drinking water standard within the next 50 years.*

III. Project Performance Measures Table

Table 5
Water Conservation, Supply Reliability Enhancement & Recycling
Northern Mill Creek Agricultural Drainage Management Loan (ADMLP) Program

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools & Methods	Targets
1. Conserve water used for irrigation purposes within the District by installing high efficiency irrigation equipment, allowing more water to remain in the stream for aquatic life	1. More water in the creek for aquatic life. 2. Colder water in refugia pools to reduce the stress of migrating salmonids.	1. Pages of Water Use Records 2. Number of high efficiency irrigation units installed. 3. Pages of Temperature Data.	1. Number of Acre-feet of water conserved. 2. Number of Acre-feet of water conserved 3. Degree in temperature decrease.	1. Tools- District Water Use Records Methods- Calculate an average year of water use from the stream before equipment installation and after equipment installation. 2. Tools- District Water Use Records Methods- Calculate an average year of water use from the stream before equipment installation and after equipment installation. 3. Tools- Hobo Temperature Autosampler recorded during salmonid migration season by *FoF4MC.* *Methods*-Compare average yearly temperature before and after installation of equipment.	1. Conserve 1,580 acre feet of water by project completion. 2. Conserve 15,800 acre feet of water by the year 2020. 3. Decrease in average refugia holding pools temperature by 2º C for by the year 2025.
2. Recycle water in the District to allow for more water to remain the stream for aquatic life.	1. More water in the Creek for aquatic life 2. Colder water in refugia pools to reduce the stress of migrating salmonids.	1. Pages of Water Use Records 2. Number of tailwater recirculation units installed. 3. Pages of Temperature Data.	1. Number of Acre-feet of water recycled 2. Degrees in temperature decrease	1. Tools-Water Use Records from the District Methods Calculate an average year of re-use of water before & after equipment installation 2. Tools-HoboTemperature Autosampler, Methods: *FoF4MC* record hourly temperature data in holding pools during salmonid migration seasons and compare over time	1. 250 Acre-Feet of water recycled by the end of the Useful Life of the Project. 2. Decrease in average refugia holding pools temperature by 2º C by the year 2025.

Table 5 (continued)
Water Conservation, Supply Reliability Enhancement & Recycling
Northern Mill Creek Agricultural Drainage Management Loan (ADMLP) Program

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
3. Reduce tailwater in the District to protect against public health hazards	1. A reduction in tailwater in the District . 2. Elimination of all Tailwater from the District by 2020 to protect against public health hazards. 3. A district policy set in place restricting tailwater by 2020.	1 Number of high efficiency irrigation units installed. 2. Number of sprinkler and gated pipe systems removed. 3. Draft tailwater policies	1. Percent of the District property owners without tailwater. 2. Percent of the District property owners without tailwater 3. Presence of a tailwater policy in the Districts policy that restricts tailwater.	1. Tools- District GIS Maps, aerial photos ,and direct survey. Methods- Use recent property GIS layer and present/future aerial photos to determine past tailwater locations and locations after the Useful Life of the Project. Verify on the ground. 2. Tools- District GIS Maps, aerial photos, and direct survey. Methods- Use recent property GIS layer and future aerial photos to determine 2020 locations. Verify on the ground. 3. Tools- A record of the District Policies Methods Verify that a tailwater policy is in place by checking district records up to 2020	1. 90% of District property owners without tailwater by the end of the Useful Life of the Project. 2. 100% of the District property owners without tailwater by 2020. 3. A policy set in place restricting tailwater by 2020.
4. Improve the reliability of low groundwater aquifers (that reside under agricultural land) as a source for drinking water	1. Provide for improvement in at least one well, through this project to act as an example for others with low water tables under agricultural land in the district. 2. Three aquifers in the district, that meet the drinking water standard that had not previously met the drinking water standard.	1. Number of projects installed over low aquifer agricultural land. 2. Number of total nitrogen samples taken. 3. Number of projects installed over low aquifer agricultural land. 4. Number of total nitrogen samples taken.	1. Number of wells that have a lower average of nitrogen levels in the water that meet drinking standards then those that did before project implementation. 2. Number of aquifers that meet the drinking standard for nitrogen, but didn't meet it 50 years ago before "high efficiency irrigation projects" were installed	1. Tools Nitrate samples/records of samples from the well before and after the project. Methods- Compare historical samples as well as University sample taken 6 months before the project to samples taken at the end of the project. Follow project monitoring plan, QAPP, and SWAMP protocols. 2..Tools Nitrate samples/records of samples from the well before and after the project. Methods- Compare historical records/before samples to samples taken 50 years later. Follow SWAMP protocols.	1. One well over agricultural land that has lower average nitrogen levels in the water that meet drinking water standards (that had not met standards before equipment installation) by the end of the Useful Life of the Project. 2. Three aquifers that meet the drinking water standard for nitrogen (that had not previously met it before "high efficiently irrigation projects" were placed on the ground), within the next 50 years.