

# Northern Nevada Indirect Potable Reuse Feasibility Study

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**Northern Nevada**  
**Indirect Potable Reuse Feasibility Study**  
**January 2017**

**Executive Summary**

A Reno, Nevada regional team (Regional Team) consisting of eight public agencies is jointly conducting a feasibility study (Study) to evaluate whether the State of Nevada's newly adopted "A+" reclaimed water category offers significant water resource management benefits including improving efficiency, providing flexibility during periods of water scarcity, and diversifying the region's water supply portfolio. Category A+ reclaimed water quality requirements meet all Federal and State of Nevada drinking water standards and is intended for indirect potable reuse. It is anticipated A+ quality will be achieved from a combination of advanced water treatment processes and soil-aquifer-treatment and storage.

The Study consists of multiple elements including a project rationale and justification analysis, regulatory formulation, public engagement, advanced water treatment technology pilot testing, geotechnical investigations, and field-scale indirect potable reuse demonstration trials. A specific geographic region in the Reno, NV, referred to as the *North Valleys* will serve as the Study boundary condition. The Study will likely take 3-to-4 years and approximately \$7 million to complete.

Bureau of Reclamation Title XVI funding would enable a substantially more robust analysis relating to the project rationale and justification work occurring in calendar year 2017 and early 2018, specifically enhancing the Study in the following focus areas:

- Developing a water market value impact study.
- Evaluating methods acceptable to the Nevada State Water engineer to create and account for a "new" A+ water right.
- Evaluating if indirect potable reuse enables the region's water resource portfolio with greater resiliency with respect to climate change.
- Evaluating less energy intensive water treatment technologies suitable for potable reuse, compared to reverse osmosis.

The above listed focus areas will complement the project rationale and justification work already envisioned. Developing knowledge in these focus areas will create a body of work that can be easily transferrable to future projects in Nevada and other states.

# Northern Nevada

## Indirect Potable Reuse Feasibility Study

### January 2017

#### Study Description

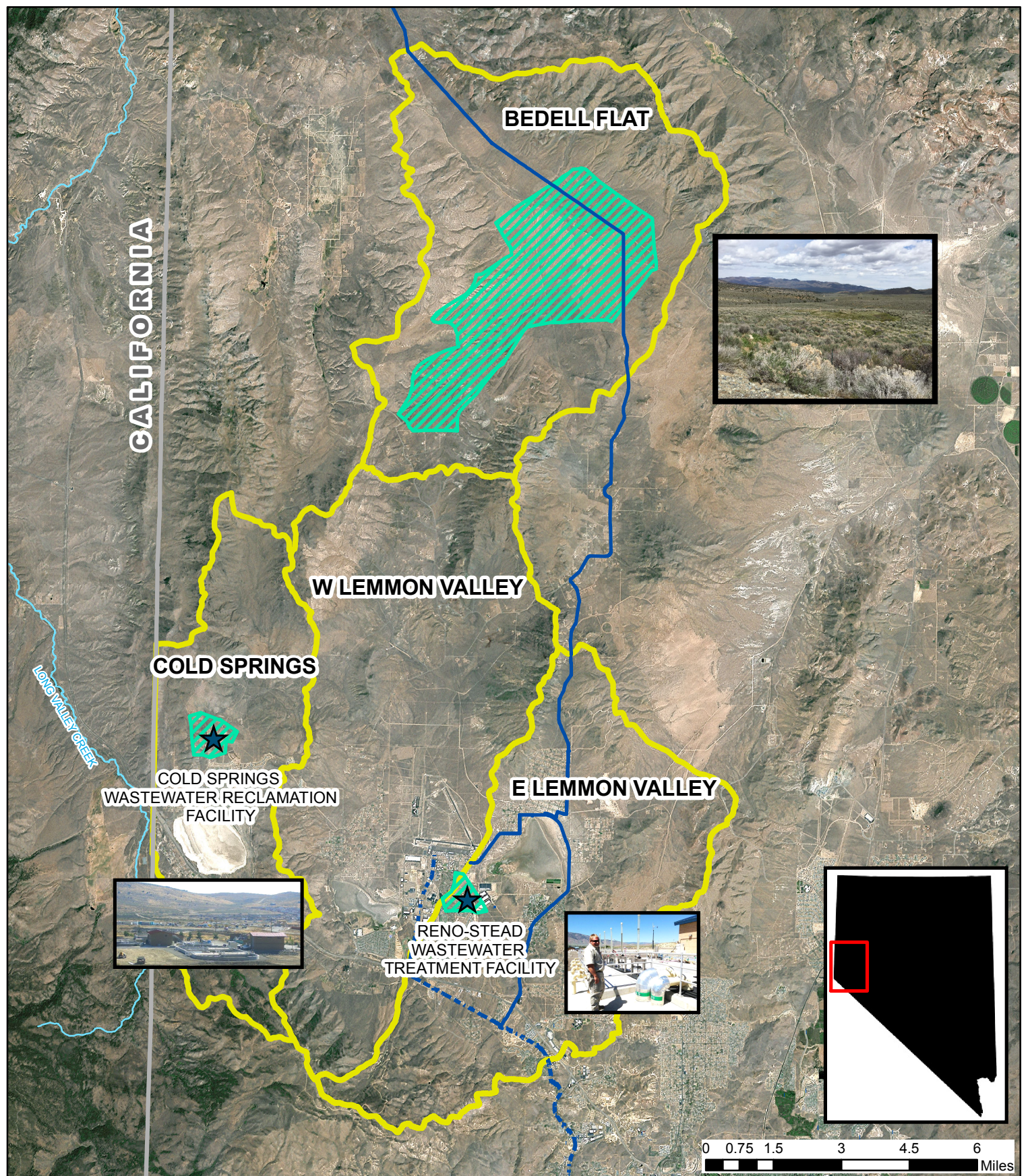
A Reno, Nevada regional team (Regional Team) of eight public agencies is jointly developing a feasibility study (Study) to evaluate whether the State of Nevada's newly adopted "A+" reclaimed water category offers significant water resource management benefits. Category A+ reclaimed water quality requirements meet all Federal and State of Nevada drinking water standards, and is intended for indirect potable reuse (IPR).

The Study will consist of multiple elements and will take 3-to-4 years and approximately \$7 million to complete. The Regional Team is seeking up to \$150,000 from the Bureau of Reclamation funding opportunity number BOR-DO-17-F003, *WaterSMART: Development of Feasibility Studies under the Title XVI Water Reclamation and Reuse Program for Fiscal Year 2017*. Title XVI funds would enhance the Northern Nevada Study by facilitating more robust analysis evaluating water market conditions, water rights, climate change, and water treatment technologies with low energy consumption.

Although IPR alternatives have been included in previous Northern Nevada water master planning efforts, IPR was not considered viable largely because there was not a clear regulatory pathway established in Nevada. One of the most comprehensive water management plans developed to date is titled *North Valleys Effluent Disposal Options*, dated 2005. The plan evaluated numerous water supplies, wastewater treatment scenarios, and effluent management options for an area located approximately 10 miles north of Reno, Nevada, commonly referred to as the *North Valleys*. The plan continues to serve as a water, wastewater, and reclaimed water roadmap for the region. The Northern Nevada feasibility study is utilizing the North Valleys as its boundary condition.

As shown in **Figure 1. Northern Nevada Indirect Potable Reuse Feasibility Study Vicinity Map**, the North Valleys is comprised of four (4) adjacent hydro-geologic basins (Cold Springs, East Lemmon Valley, West Lemmon Valley, and Bedell Flat). Water demands are met with limited groundwater perennial yields plus the area receives drinking water from two (2) water importation projects. The Truckee Meadows Water Authority, which is a member of the Regional Team, supplies the North Valleys with 3,000 acre-feet annually potable water originating from the Truckee River, and another 8,000 acre-feet annually from Honey Lake, California through a 35-mile pipeline.





# **Legend**

- ★ Wastewater Treatment Facility
- Truckee Meadows Water Authority
- Fish Springs Water Importation Pipeline
- ▨ Potential Recharge Sites
- ▭ Hydrobasin

**FIGURE 1**

**Northern Nevada Indirect Potable Reuse  
Feasibility Study Vicinity Map  
Bureau of Reclamation WaterSmart Grant  
BOR-DO-17-F003**

Notes: The Scale and configuration of all Information shown hereon are approximate only and are not intended as a guide for design or survey work. Reproduction is not permitted without prior written permission from the Washoe County Community Services Department.  
January, 2017

Washoe County Community Services Department  
Engineering &  
Capital Projects Division  
Utility Division

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### **Scope and Responsibilities**

Although the potential use of A+ reclaimed water to augment groundwater sources in Northern Nevada is viewed favorably by water managers, the Regional Team's Study is crafted to more fully develop an understanding of the social, economic and environmental elements.

The Study will be conducted and drafted to meet the requirements of a feasibility study as defined under section 1604 of Pub. L. 102-75, and will conform to the suggested outline found in Section 4.B of the Bureau of Reclamation (BOR) Title XVI Feasibility Study Directives and Standards. Washoe County will be the lead agency and designated project sponsor with respect to the BOR funding opportunity. Funding from the Bureau of Reclamation would enable a substantially more robust analysis relating to the project rationale and justification work occurring in calendar year 2017, specifically enhancing the water markets evaluation; water rights; climate change; and low energy water treatment solutions.

### **Project Development and Rationale**

Crafting a triple bottom line analysis unique to the Reno, Nevada area is envisioned to help align the Study activities, and more clearly articulate the project purpose, goals, and metrics to the public and policy makers in the Northern Nevada community. Field demonstration-scale projects are intended to prove IPR planning concepts, measure treatment technology performance, and verify ability to meet regulatory compliance.

### **Community Engagement**

The Northern Nevada Study embraces approaches to include community engagement in the local decision making processes. The Study presently includes community engagement activities that can be described as shorter-term and longer-term initiatives.

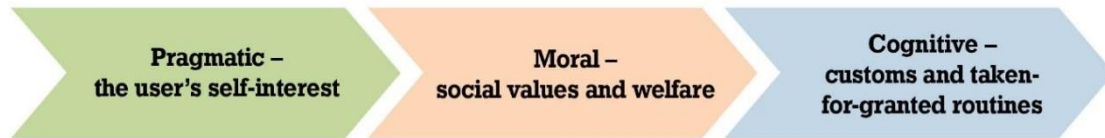
A short-term communication plan for calendar year 2016 was developed to assist local agency staff communicate predominately to local jurisdiction councils and commissions.

Throughout the Study period, a comprehensive community engagement plan will be developed to engage the general public for the purpose of informing and offering engagement opportunities for the public.

The foundational principles of the Regional Team's community engagement work relates to creating "agency legitimacy" – defined as specific and authentic actions a public agency initiates to gain the trust and acceptability from the public. Agency legitimacy is more important as communities consider reuse projects, particularly potable water reuse. Reuse projects have often been met with public opposition, despite having proven that the technology and water quality meet or exceed drinking water standards. Oftentimes,

technical professionals such as engineers and scientists believe the public will accept new technologies when it is provided with information through marketing and public education. Such outreach efforts need be authentic to achieve public support. Research shows three levels of legitimacy need to be addressed to have a successful project.

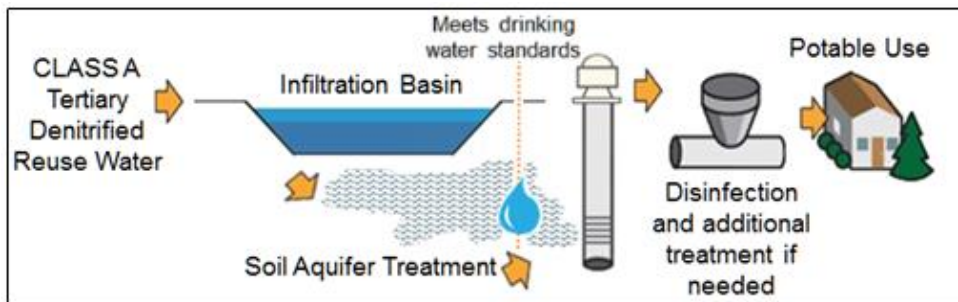
### Three Levels of Legitimacy



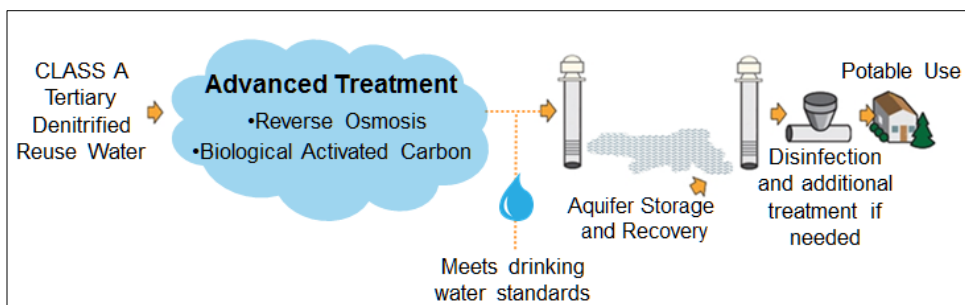
### Nevada Regulatory Framework

In December 2016, following a comprehensive two year state-wide collaborative process, the State of Nevada adopted revised reclaimed water regulations, which for the first time establishes a regulatory framework for implementing indirect potable reuse for groundwater augmentation. The newly adopted Nevada regulations permit two methods of indirect potable reuse:

- 1) Utilizing infiltration basins receiving Nevada Class A reclaimed water, as shown in **Figure 2**, which is the highest category for unrestricted non-potable uses.
- 2) Aquifer storage and recovery utilizing Nevada Class A+ reclaimed water, as shown in **Figure 3**, which is achieve by advanced water treatment processes and suitable for direct injection to groundwater aquifers.



**Figure 2 Nevada Indirect Potable Reuse through Infiltration Basins**



**Figure 3 Nevada Indirect Potable Reuse through Aquifer Injection**

### **Pilot Testing Treatment Technologies**

The Northern Nevada Study includes advanced water treatment technology pilot testing conducted in collaboration with the Water Environment and Reuse Foundation (WE&RF), Project 15-10. Focal area for WE&RF 15-10 is optimizing Ozone Biological Activated Carbon (O<sub>3</sub>-BAC) systems for trace organic constituent removal. WE&RF 15-10 is being jointly funded by WE&RF, American Water, Stantec Consulting, and Washoe County.



**Figure 4 WE&RF Project 15-10 Oxelia Pilot Unit from Xylem.**

### **Demonstration Project**

A cornerstone of the feasibility phase activities is a 50-to-100 gallon per minute (GPM) demonstration-scale advanced water treatment facility. Two (2) demonstration site locations are presently planned. One demonstration is investigating the infiltration basin approach, while the second demonstration project is utilizing “advanced water treatment” (i.e O<sub>3</sub>-BAC and RO, followed by advanced oxidation processes likely consisting of ultra-violet light and peroxide. Demonstration-scale trailers are depicted in **Figure 5**



**Figure 5 Illustration showing likely Demonstration-scale trailers configuration.**

The Regional Team has contracted with Dr. Krishna Pagilla, Professor and Environmental Engineering Program Director at the University of Nevada, Reno to operate the demonstration project for performance, reliability, and ability to robustly meet Nevada’s regulations.



## Geotechnical Investigations

Classifying hydrogeologic characteristics through groundwater modeling and field investigations will assist with sizing the demonstration project advanced treatment units as well as determining the suitability of aquifer recharge at each potential site. The Regional Team's efforts will be complimented from experts at the University of Nevada and the Nevada Desert Research Institute. Near-term options for demonstrating aquifer recharge within the Study boundary include:

- Cold Springs – utilizing existing infiltration basins at the Cold Springs Water Reclamation Facility to demonstrate soil-aquifer treatment and recovery.
- Stead/Lemmon Valley – construct injection and recovery wells demonstrating aquifer storage and recovery.
- Bedell Flat – potential site for longer term storage/water banking full scale implementation.

## Funding

A multi-year budget for the Study is presented in **Table 3 Northern Nevada Feasibility Study Budget**. The Regional Team is seeking up to \$150,000 from the Bureau of Reclamation funding opportunity number BOR-DO-17-F003, WaterSMART: *Development of Feasibility Studies under the Title XVI Water Reclamation and Reuse Program for Fiscal Year 2017*. Bureau of Reclamation funding would enable a substantially more robust analysis relating to the *project rationale* and justification work occurring throughout 2017 and the early part of 2018.

As illustrated in **Table 1**, local matching funds would come from Washoe County. Washoe County's contributions are cash, with funds allocated from Washoe County's regional reclaimed water funds, which are supported by reclaimed water privilege connection fees and user fees. Washoe County's 50-percent matching funds (\$150,000) are from cash on-hand, and do not include or require any commitments from other local, State of Nevada, or Federal contributions. **Table 2 - Proposal Bureau of Reclamation (Funded Project Activities) Budget** illustrates the preliminary activity level budget for Washoe County personnel and for consultant experts.

**Table 1 Summary of Non-Federal and Federal Funding Sources**

FUNDING SOURCES	AMOUNT
<b>Non Federal Entities</b>	
1. Washoe County	\$150,000*
<b>Non-Federal Subtotal</b>	\$150,000
<b>Other Federal Entities</b>	
1. Not Applicable	
<b>REQUESTED RECLAMATION FUNDING</b>	\$150,000

\*In-kind contribution

**Table 2 Proposal Bureau of Reclamation (Funded Project Activities) Budget**

BUDGET ITEM DESCRIPTION	COMPUTATION		Quantity Type	TOTAL COST
	\$/Unit	Quantity		
Salaries and Wages including Fringe				
Employee – Lydia Peri	\$ 48.28	280	hourly rate	\$ 13,518
Employee – Rick Warner	\$ 78.20	69	hourly rate	\$ 5,361
Employee – Vahid Behmaram	\$ 68.00	90	hourly rate	\$ 6,120
Trip 1				\$ -
Trip 2				\$ -
Contractual/Construction				
University of Nevada – Water Markets	\$45,000	1	Not to Exceed Contract	\$ 45,000
University of Nevada – Climate Change	\$25,000	1	Not to Exceed Contract	\$ 25,000
University of Nevada – Low Energy Treatment Processes	\$100,000	1	Not to Exceed Contract	\$ 100,000
Desert Research Institute - Climate Change	\$40,000	1	Not to Exceed Contract	\$ 40,000
National Water Research Institute - Expert Panel	\$40,000	1	Not to Exceed Contract	\$ 40,000
Water Rights Consultant	\$25,000	1	Not to Exceed Contract	\$ 25,000
Other				
Other				\$ -
TOTAL DIRECT COSTS				\$
Indirect Costs				
Type of rate	percentage			\$ -
TOTAL ESTIMATED PROJECT COSTS				\$ 300,000

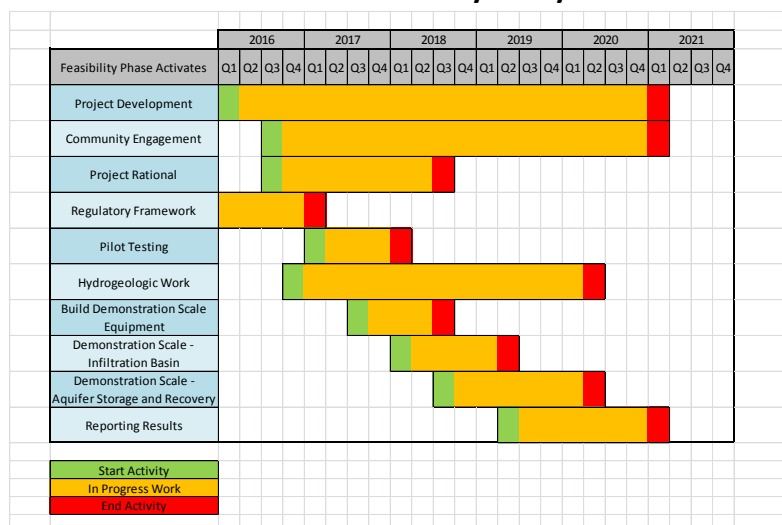
**Table 3 Northern Nevada Feasibility Study Budget**

BUDGET ITEM DESCRIPTION	TOTAL COST
1. Project Development	\$ 305,000
2. Community Outreach	\$ 160,000
3. Regulatory Framework	\$ 65,000
4. Pilot Testing / Advanced Water Treatment Technologies	\$ 2,389,000
5. Demonstration Project	\$ 2,330,000
6. Hydrogeological Investigations	\$ 1,490,000
<b>TOTAL ESTIMATED PROJECT COSTS</b>	<b>\$ 6,739,000</b>

## Schedule

The Northern Nevada agencies anticipate feasibility study activities to extend through 2020. BOR funded activities will occur and be completed with other Project Rational Activities – within 18 months to comply with the funding requirements.

**Table 4 Northern Nevada Feasibility Study Schedule**



## Discussion

The Regional Team has developed a collaborative and comprehensive feasibility approach which includes staff from eight regional water agencies, researchers from the University of Nevada, international experts, and water research organizations. Funding from the Bureau of Reclamation would enable a substantially more robust analysis relating to the project rationale and justification work occurring in calendar year 2017, specifically enhancing Regional Team’s Study in the following focus areas:

- Developing a water market value impact study.
- Evaluating methods acceptable to the Nevada State Water engineer to create and account for a “new” A+ water right.
- Evaluating if indirect potable reuse enables the region’s water resource portfolio with greater resiliency with respect to climate change.
- Evaluating less energy intensive water treatment technologies suitable for potable reuse, compared to reverse osmosis.

## Key Regional Team Members

Regional Team members responsible to deliver the overall Northern Nevada Regional Feasibility Study include the professionals listed below. Not shown is approximately twenty others that have significant leadership on key feasibility phase activities. The Northern Nevada effort is truly a large and effective collaboration, which has developed a work plan to achieve success.

**Rick Warner, P.E.**  
***Washoe County***

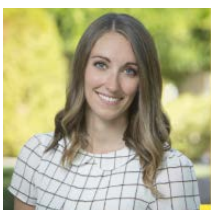
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Rick Warner, P.E. is the 2016-17 President of the Water Environment Federation (WEF), an international organization of water quality professionals headquartered in Alexandria, Va. Rick also presently serves on the Board of Directors of the Water Environment and Reuse Foundation. In addition, he is a senior engineer for the Washoe County (Nevada) Community Services Department. In that role he is responsible for planning, design, and construction for regional water resource recovery and recycled water projects. Rick is a registered professional engineer in the state of Nevada.

**Lydia Peri,**  
***Washoe County***

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Lydia Peri is an Environmental Engineer with the Washoe County (Nevada) Community Services Department. Lydia earned a bachelor's in ecohydrology from the University of Nevada, Reno in 2011 and earned a dual master's in hydrogeology and civil and environmental engineering in 2015 also from the University of Nevada, Reno. She recently accepted a position as a Ph.D. candidate in the Environmental Engineering Program with Dr. Krishna Pagilla at the University of Nevada, Reno. Her work with the University will primarily focus on the hydrogeologic investigations for the Northern Nevada potable reuse initiative.

**Krishna Pagilla, Ph.D., P.E., BCEE**  
***University of Nevada, Reno***

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Krishna Pagilla, Ph.D., P.E., BCEE is a Professor and Environmental Engineering Program Director at the University of Nevada, Reno. Prior to relocating to Reno, Prof. Pagilla was a professor of Environmental Engineering at the Illinois Institute of Technology and is a licensed engineer in California and Illinois. He is an Associate Editor of Water Environment Research and is a Fellow of both Water Environment Federation (WEF) and International Water Association (IWA). He has received numerous awards for his work including the Harrison Prescott Eddy Medal from WEF in 2011 and Bill Boyle Outstanding Education Award from the Central States Water Environment Association.

**Laura Haak,**  
***University of Nevada, Reno***

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Laura Haak is a Ph.D. student in Environmental Engineering at the University of Nevada, Reno. She completed her M.S in Environmental engineering and B.S. in Mechanical Engineering from Illinois Institute of Technology. Her research focuses on the development of a decision making tool for water resource management and planning to improve water security at a regional scale. This research utilizes a holistic modeling approach by incorporating socio-economic, hydrologic, and biophysical impacts of water management and infrastructure scenarios to assess net social benefits generated by local water resources.

**Vijay Sundaram, P.E.**  
***Water Reuse Technology Leader***

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Vijay Sundaram, P.E. leads the Stantec water reuse technology practice and is Stantec's national technical lead for water regulations and compliance. Vijay has well-rounded experience in designing and evaluating processes for municipal and industrial water and wastewater treatment, including work with advanced treatment, water recycling, and energy optimization. of the Ozone-BAC technology for potable reuse.



# **Northern Nevada Indirect Potable Reuse Feasibility Study January 2017**

## **Evaluation Criterion**

Bureau of Reclamation Title XVI funding would enable a robust analysis relating to the project rationale and justification work occurring in calendar year 2017 and early 2018, specifically enhancing the Northern Nevada Indirect Potable Reuse Feasibility Study in the following focus areas:

- Developing a water market value impact study.
- Evaluating methods acceptable to the Nevada State Water engineer to create and account for a “new” A+ water right.
- Evaluating if indirect potable reuse enables the region’s water resource portfolio with greater resiliency with respect to climate change.
- Evaluating less energy intensive water treatment technologies suitable for potable reuse, compared to reverse osmosis.
- 

## ***Evaluation Criterion 1—Statement of Problems and Needs***

A Reno, Nevada regional team (Regional Team) consisting of eight public agencies is jointly conducting a feasibility study (Study) to evaluate whether the State of Nevada’s newly adopted “A+” reclaimed water category offers significant water resource management benefits.

BOR funding support more critical review of regional water resource management alternatives, particularly with respect to if indirect potable reuse can have a positive impact upon the region’s water portfolio for drinking water resiliency or addition recreational and environmental benefits.

### ***Statement of Problem Discussion.***

Although IPR alternatives have been included in previous Northern Nevada water master planning efforts, IPR was not considered viable largely because there was not a clear regulatory pathway established in Nevada. One of the most comprehensive water management plans developed to date is titled *North Valleys Effluent Disposal Options*, dated 2005. The plan evaluated numerous water supplies, wastewater treatment scenarios, and effluent management options for an area located approximately 10 miles north of Reno, Nevada, commonly referred to the *North Valleys*. The plan continues to serve as a water, wastewater, and reclaimed water roadmap for the region.

Water resources within the Truckee River watershed are primarily derived from snowpack accumulated during the winter season. Although the regional effects of climate change are uncertain, the region expects to incur more frequent or extended drought periods and a

transition from river flows derived from melting snowpack to rainfall. The potential shift in precipitation patterns from snowfall to rainfall may have dramatic impacts on future water planning due to effects on water storage and quality; currently surface water supply primarily originates from snowmelt during spring and summer months. Concern over quantity and quality of water supplies within the region also drives competition between downstream and upstream users that rely largely on the Truckee River to support sensitive ecologies, agricultural uses, industrial development, and diverse communities.

Water resources within the Truckee River watershed are fully allocated and several basins within the region are closed, relying on groundwater flows, inter-basin transfers of surface water from the Truckee River, and imported water to meet water demand. If the water portfolios of these closed-basins are not expanded, imported water may play an increasing role in satisfying water demand. However, the local water authority has limited control over imported water resources, and it is also an expensive resource that requires significant elements to manage and is associated with a large carbon footprint due to pumping requirements.

The North Valleys is comprised of four (4) adjacent hydro-geologic basins. Water demands are met with limited groundwater perennial yields plus the area receives drinking water from two (2) water importation projects. The Truckee Meadows Water Authority, which is a member of the Regional Team, supplies the North Valleys with 3,000 acre-feet annually potable water originating from the Truckee River, and another 8,000 acre-feet annually from Honey Lake, California through a 35-mile pipeline.

To address and consider possible impacts from climate change, it is likely that the Water for the Seasons (WftS) program and the Desert Research Institute (DRI) will collaborate with the Regional Team on this portion of the feasibility study. WftS is a partnership between Northern Nevada scientists, water managers and water right holders in the Truckee-Carson River System to investigate new strategies and solutions for addressing extreme climate events such as droughts and floods.

## ***Evaluation Criterion 2—Water Reclamation and Reuse Opportunities***

The feasibility study will examine water resource availability, quality, and other characteristics throughout the watershed, and targeting key basins that are focal points of residential, economic and ecosystem water demands for review of water security over the next 20 years. Through this feasibility study, methods acceptable to the Nevada State Water engineer to create and account for a “new” A+ water right will be evaluated.

BOR funding would also support water markets study to for the North Valleys that could potentially be applied regionally. The scope of this work is not fully developed, although is intended to provide a potential mechanism to promote efficient water uses and minimize the economic impacts of periodic drought conditions. This project activity would provide a case

study analysis of water markets to inform the Regional Team of potential options for development of an expanded water market as an alternative or companion to other opportunities to improve regional water supply conditions. Conceptually, the water markets work would consider the regulatory conditions, water supply and demand, market participation, and water pricing and cost of alternatives.

#### *Water Reclamation and Reuse Opportunities Discussion.*

The examination will consider trends in population growth and commercial development at key basins, specifically the North Valleys, and regionally. Potable reuse of water may help to stabilize and better distribute water values across the Truckee River watershed by helping to decouple water supply from uncertain precipitation conditions. Much like reservoir and aquifer storage, potable reuse adds a source of water that is more secure than annual precipitation: the volume of water that can be treated and stored is not only dependent on annual precipitation. With greater security in potable water resources, the use of water may also become more efficient by encouraging more diversified economic uses of reclaimed water resources than purple pipe programs may achieve. Additionally, improved planning of available water resources can aid in management of instream surface water flows to meet the needs of sensitive ecosystems.

To correlate changes in water allocations under status-quo and IPR paradigms with net social benefits, economic approaches will be used. Net social benefits are influenced by a combination of social, economic and environmental outputs. Factors such as carbon footprint, water footprint of economic activities and domestic use, benefits or value of goods or services produced through water use, and ecological resilience of habitats significant to wildlife and recreational activities play important roles in assessing net social benefits. Thus, an economic simulation can be used to model the magnitude of the factors that drive net social benefits based on allocations of water to economic sectors, residential users, and ecosystem services at each demand node. Utilizing an economic approach such as partial-equilibrium modeling to identify how water resources are allocated between competing water users within a demand node. Water allocations between the various users at demand nodes can then be correlated to social benefit factors under status-quo and IPR scenarios. Thus, it is possible to estimate the overall change in social welfare through IPR based on the extent to which water resources are reallocated to more socially beneficial activities such as enhanced ecosystem flows.

### ***Criterion 3—Description of Potential Alternatives***

Water supply and water quality objectives are diligently analyze through a complex network of regional, State, and Federal agencies. Although the objectives of this feasibility study will focus on the potential use and benefits of indirect potable reuse, to be successful, the study objectives must fit into a regional context. The Regional Team has selected the North Valleys area of Reno, Nevada as the Study boundary, which is an area that has established water facility

and management planning. A summary of current water and wastewater management alternatives is included in the discussion below.

To accomplish success, the Region Team will utilize the BOR funding to greatly broaden the IPR evaluation to include water rights, water markets evaluation, energy consumption, and climate change. These additional efforts require collaboration from region experts including the Dessert Research Institute and the University of Nevada. Public engagement and vetting of concepts is envisioned to be accomplished with assistance from the National Water research Institute.

#### *Description of Potential Alternatives Discussion*

The Study is critical to Northern Nevada at this time: post-recession economic development is robust; population and job growth are steadily increasing; increasing demands on potable water supplies in arid regions like Nevada must be thoroughly examined with respect to resource sustainability; managing wastewater effluent within closed hydro basins is challenging; and, developing resource resiliency strategies which considers climate change adds complexity.

Previous water and wastewater facility planning efforts identified nine (9) effluent management options for the North Valleys, including IPR. The current regional feasibility study considers the North Valleys as a boundary condition – allowing presently identified water supply and effluent management alternatives to be reexamined with a new vantage point considering IPR as a potentially viable option. This is the main focus of the feasibility study – examine options as a fully vetted IPR analysis is developed. This approach allows IPR to be more completely evaluated based upon viability, capital and operating costs, regional benefits, obstacles, public engagement, environment impacts, etc. The North Valleys serves also as an ideal focus study area, and the feasibility study findings will be transferable to other Nevada regions.

The presently identified nine (9) North Valleys wastewater effluent management options, ranging for \$30 million to \$60 million, listed below, will be reevaluated and updated with current IPR evaluations and additional analysis, to form the framework for the current feasibility efforts.

- Option 1 - Expanded Effluent Reuse
- Option 2 - Rapid Infiltration Basins
- Option 3 – Potable Reuse with Direct Injection/Aquifer Storage and Recovery
- Option 4 – Potable Reuse with Vadose Zone Infiltration Wells
- Option 5 - Convey Sewage to Regional Treatment Plant
- Option 6 - Surface Discharge of Effluent to Bedell Flat
- Option 7 - Pyramid Lake Discharge
- Option 8 - Convey Effluent to Spanish Springs
- Option 9 - Surface Discharge of Effluent to Long Valley Creek



## ***Evaluation Criterion 4—Stretching Water Supplies***

Indirect potable reuse, as a means to recharge groundwater basins, has the promise to benefit how Northern Nevada manages Truckee River diversions, groundwater pumping, and expanding use of utilizing reclaimed water for expanded uses, including as a new potable supply.

### ***Stretching Water Supplies Discussion.***

Potable reuse may help to close the demand deficit in some basins, reducing or eliminating the need to import drinking water and reducing the need for inter-basin transfers that utilize Truckee River water.

Both growth in water demand and uncertainty in water supply are driving local interest in potable reuse. Diversifying water resources may have an important impact on the Truckee River watershed by reducing the need for inter-basin transfers and improving water management decisions. As precipitation patterns shift as a result of climate change, a diversified portfolio of water resources can play a critical role to ensure adequate Truckee River flows to preserve the maintenance of ecosystems critical to threatened species

IPR is expected to reduce the need to import water and the need to expand inter-basin transfers of water to meet future demand. Additionally, there is a regional trend towards decreasing groundwater withdrawals in several basins as users transition from domestic wells to municipal supply. These trends are expected to continue, and would expand the customer base for potential IPR water use. This impact will be examined through hydrologic modeling.

## ***Evaluation Criterion 5—Environment and Water Quality***

The Study area is four closed hydrobasins and is not have direct connectivity to federal water bodies such as the Truckee River, thus the immediate study area would not specially include endangered species and highly regulated surface waters. The study area does receive imported water from the Truckee River, thus the overall regional study would include analysis relating to benefits for Trustee River water quality and water quantity. IPR in the North Valleys is thought to most benefit groundwater supplies and enable the ability to manage the local reclaimed water in a much more beneficial manner, including mitigating that possibility that reclaimed water generated in the North Valleys would have to be “disposed” o an adjacent watershed.

### ***Environment and Water Quality Discussion.***

Hydrology modelling will also investigate changes in quality and quantity parameters of surface water flow. The reduced demand for surface water to meet customer demands in closed basins as well as the improved ability of the water authority to plan resource use throughout the year could result in higher volumetric flows of freshwater in the Truckee River which may improve river water quality. These quality improvements may play an important role under climate

change scenarios because the higher proportion of rainwater supply to the watershed may result in larger sediment loads, lower flows throughout the dry season, and higher risk for algal blooms and dissolved oxygen depletion (Whitehead et al, 2009). It should be noted that the Truckee River System is very complex with respect to operating scenarios and water rights, and that any potential benefits contemplated would require evaluations with respect to complex jurisdictional constraints. While not intended to fully address the full complexity of water rights and water quality correlations, the BOR funding request includes a water rights activity at a feasibility study level. This is critical work, and the expected findings from the feasibility study would identify more detailed processes required for regional IPR implementation.

### ***Evaluation Criterion 6—Legal and Institutional Requirements***

BOT funding is proposed in part to help fund a water rights analysis for “new” potable water rights originating from potable reuse projects. While the Regional Team has evaluated Nevada water rights and have many water rights expert on out regional staffs, proposed for this feasibility study would is a thorough water rights evaluation relative to IPR. The expected outcome is simple: make certain that IPR projects are creating water supplies that are well managed and water rights associated with these types of projects are well understood by regional utilities, State of Nevada Engineer, stakeholders, and other regional water rights holders.

The scope of work envisioned is a series of workshops with all stakeholders including the State of Nevada Engineer. Outcomes may be policy updates and or a series of agreed upon operating protocols. This work can be viewed as somewhat collaborative and may not require extensive use of water rights expert consultants.

#### ***Environment and Water Quality Discussion.***

The regional study is also developing a hydrologic model that would include a careful definition of water rights as decreed for regular and drought conditions, Truckee River Operating Agreement (thought to be needed for one of the water importation projects) operations, and any other regulations that would influence water allocations to the municipality and other water rights holders (primarily agriculture).

### ***Evaluation Criterion 7—Renewable Energy and Energy Efficiency***

The Regional Team’s feasibility study will include an economic model which will simulate water allocations to all major regional uses, including hydro-electric dams at upstream reservoirs. The simulation will identify the water volume that would be allocated to power generation based on the equilibrium between water demand at downstream demand nodes, water availability, and the net benefits attained through use of water for power generation. Assessment of net benefits would include water footprint, carbon footprint, value of energy produced, and impacts on ecological resilience. This work serves also serves to establish a base case for the North Valleys, where other water management options, such as IPR can be compared.

Relating to energy efficiency, two prominent Northern Nevada Regional Team members are Vijay Sundaram and John Enloe, who are tasked with investigating potable reuse treatment technologies for the regional feasibility study. Reported findings from their pioneering work has been published and presented (first recognized paper is: *Saving Energy and Costs on Micro-constituent Removal and Inland Desalination*, prepared for the 2009 WateResue Symposium. Their body of work continues to expand and Mr. Sundaram will be presently working towards a PhD at the University of Nevada as part of the Regional Study. The Regional Team is most interested in IPR solutions that are low energy consumption. Renewable energy, including geothermal and solar

#### *Renewable Energy and Energy Efficiency Discussion.*

The Regional Team continues to investigate low energy potable reuse systems – with particular interest in systems that do not rely upon reverse osmosis. Ozone – biologic activate carbon (O3-BAC) system appears to be promising to the Northern Nevada efforts. Pilot testing and demonstration scale tests are important elements of the regional study. Data from pilot tests and full scale facilities show the significant potential capital and operating cost savings of ozone – biologic activated carbon systems compared to reverse osmosis based treatment systems.

#### ***Evaluation Criterion 8—Watershed Perspective***

The Northern Nevada Water Planning Commission (NNWPC) has developed a “*Regional Water Master Plan*” that includes a section on Wastewater and Watershed-Based Water Quality Planning. The chapter provides information regarding the current status of regional wastewater facilities and watershed based water quality issues. It also presents a number of planning and management issues that would likely require action or further investigations. These planning issues must be considered together with other water management planning objectives in order to determine appropriate future actions and recommendations.

In respect to the North Valleys, it was determined that reclaimed water could satisfy multiple purposes such as residential landscape irrigation and IPR through groundwater recharge. One recommendation of the report was to continue studies in the North Valleys with respect to treatment technologies, hydrological investigations and public perception and involvement.

Watershed management is an integrated approach to protecting water resources. The watershed approach coordinates environmental management within geographic boundaries to focus public and private stakeholders on the highest priority water quality problems. The objective of watershed protection is to develop management strategies that allow demands on water resources to be met while protecting beneficial uses throughout the watershed. The watershed approach allows water resource specialists within the Truckee River watershed to develop creative solutions to issues that extend downstream and upstream across political jurisdictions, implement watershed management plans, and evaluate effectiveness.



January 4, 2017

Bureau of Reclamation  
Financial Assistance Operations Section  
Attn: Mathew Reichert  
Mail Code: 84-27852  
P.O. Box 25007  
Denver, Colorado 80225

RE: Letter of Support  
Bureau of Reclamation WaterSmart Grant,  
FOA BOR-DO-17-F003

Dear Mr. Reichert,

The Truckee Meadows Water Authority (TMWA) is pleased to offer our support for the *Northern Nevada Indirect Potable Reuse Feasibility Study*.

A Northern Nevada Regional Team is developing an indirect potable reuse feasibility study consisting of multiple elements including technical, social, environmental and financial analyses, regulatory compliance, public engagement, advanced treatment pilot testing, geotechnical investigations, and field scale treatment demonstration projects.

This feasibility study is consistent with regional water management goals and policies to manage water resources in a sustainable manner. The study will examine water resource availability to improve long-term regional planning efforts while employing a total water management strategy. The feasibility study will also consider water supply resiliency strategies to address future uncertainties of drought and climate change.

The Regional Team, comprised of TMWA, Washoe County, the Cities of Reno and Sparks, the Truckee Meadows Water Reclamation Facility and the Northern Nevada Water Planning Commission, is well suited to conduct this work with the guidance and support from international water quality experts and the State of Nevada. In addition, the team has a collaborative agreement with the University of Nevada, Reno that can offer extensive research capabilities.

The TMWA supports the feasibility study and is enthusiastic that its findings will benefit the Northern Nevada region by crafting a diversified portfolio of water resources. Thank you for considering this request, and please don't hesitate to contact me if we may provide additional information on activities in our unique watershed.

Sincerely,

John P. Enloe, P.E.  
Director, Natural Resources Planning & Management



# Northern Nevada Water Planning Commission

P.O. Box 11130, Reno, NV 89520-0027 · Tel: (775) 954-4665 · Fax: (775) 954-4610

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January 4, 2017

Bureau of Reclamation  
Financial Assistance Operations Section  
Attn: Mathew Reichert  
Mail Code: 84-27852  
P.O. Box 25007  
Denver, Colorado 80225

RE: Letter of Support  
Bureau of Reclamation WaterSmart Grant  
FOA BOR-DO-17-F003

Dear Mr. Reichert,

The Northern Nevada Water Planning Commission (NNWPC) is sending this letter in support of the referenced WaterSmart proposal being submitted by Washoe County. The project titled, "*Northern Nevada Indirect Potable Reuse Feasibility Study*" is of great interest to the NNWPC and also to the water and wastewater utilities in the Truckee Meadows region of Northern Nevada.

The NNWPC supports and actively participates on the Northern Nevada Regional Team (Regional Team), which consists of the Truckee Meadows Water Authority, Washoe County, City of Reno, City of Sparks, the Truckee Meadows Water Reclamation Facility, and the NNWPC. The Regional Team is developing an indirect potable reuse feasibility study that contains numerous components including technical, social, environmental and financial analyses, state regulations, public engagement, advanced treatment pilot testing, geotechnical investigations, and field scale treatment demonstration projects. This feasibility study is consistent with the regional water management objectives of managing Northern Nevada resources in a sustainable and viable manner. The feasibility study will not only analyze water resource availability for long term planning, it will also consider the uncertainties of drought and climate change.

The NNWPC is confident that the Regional Team is well suited to perform this feasibility study, which has recently gained the support of international water quality experts and the State of Nevada. The partnership with the University of Nevada, Reno is a meaningful and substantial collaboration that promises to offer extensive research capabilities and opportunities for new connections.

The NNWPC fully supports the Regional Team and its feasibility study, which will greatly benefit the water resources and citizens of the Northern Nevada region. Thank you for the opportunity to express support for the referenced proposal. Please feel free to contact me if I can provide additional information.

Sincerely,



Jim Smitherman

Program Manager, Northern Nevada Water Planning Commission

**Northern Nevada  
Indirect Potable Reuse Feasibility Study  
January 2017**

**Study Budget**

A multi-year budget for the Study is presented in **Table 3 Northern Nevada Feasibility Study Budget**. The Regional Team is seeking up to \$150,000 from the Bureau of Reclamation funding opportunity number BOR-DO-17-F003, WaterSMART: *Development of Feasibility Studies under the Title XVI Water Reclamation and Reuse Program for Fiscal Year 2017*. Bureau of Reclamation funding would enable a substantially more robust analysis relating to the *project rationale* and justification work occurring throughout 2017 and the early part of 2018.

As illustrated in **Table 1**, local matching funds would come from Washoe County. Washoe County's contributions are cash, with funds allocated from Washoe County's regional reclaimed water funds, which are supported by reclaimed water privilege connection fees and user fees. Washoe County's 50-percent matching funds (\$150,000) are from cash on-hand, and do not include or require any commitments from other local, State of Nevada, or Federal contributions. **Table 2 - Proposal Bureau of Reclamation (Funded Project Activities) Budget** illustrates the preliminary activity level budget for Washoe County personnel and for consultant experts.

**Table 1 Summary of Non-Federal and Federal Funding Sources**

FUNDING SOURCES	AMOUNT
<b>Non Federal Entities</b>	
1. Washoe County	\$150,000*
<b>Non-Federal Subtotal</b>	\$150,000
<b>Other Federal Entities</b>	
1. Not Applicable	
<b>REQUESTED RECLAMATION FUNDING</b>	\$150,000

\*In-kind contribution

**Table 2 Proposal Bureau of Reclamation (Funded Project Activities) Budget**

BUDGET ITEM DESCRIPTION	COMPUTATION		Quantity Type	TOTAL COST
	\$/Unit	Quantity		
Salaries and Wages including Fringe				
Employee – Lydia Peri	\$ 48.28	280	hourly rate	\$ 13,518
Employee – Rick Warner	\$ 78.20	69	hourly rate	\$ 5,361
Employee – Vahid Behmaram	\$ 68.00	90	hourly rate	\$ 6,120
Trip 1				\$ -
Trip 2				\$ -
Contractual/Construction				
University of Nevada – Water Markets	\$45,000	1	Not to Exceed Contract	\$ 45,000
University of Nevada – Climate Change	\$25,000	1	Not to Exceed Contract	\$ 25,000
University of Nevada – Low Energy Treatment Processes	\$100,000	1	Not to Exceed Contract	\$ 100,000
Desert Research Institute - Climate Change	\$40,000	1	Not to Exceed Contract	\$ 40,000
National Water Research Institute - Expert Panel	\$40,000	1	Not to Exceed Contract	\$ 40,000
Water Rights Consultant	\$25,000	1	Not to Exceed Contract	\$ 25,000
Other				
Other				\$ -
TOTAL DIRECT COSTS				\$
Indirect Costs				
Type of rate	percentage			\$ -
TOTAL ESTIMATED PROJECT COSTS				\$ 300,000

**Table 3 Northern Nevada Feasibility Study Budget**

BUDGET ITEM DESCRIPTION	TOTAL COST
1. Project Development	\$ 305,000
2. Community Outreach	\$ 160,000
3. Regulatory Framework	\$ 65,000
4. Pilot Testing / Advanced Water Treatment Technologies	\$ 2,389,000
5. Demonstration Project	\$ 2,330,000
6. Hydrogeological Investigations	\$ 1,490,000
<b>TOTAL ESTIMATED PROJECT COSTS</b>	<b>\$ 6,739,000</b>