Northern Nevada Water Planning Commission

STAFF REPORT

DATE: August 31, 2016

TO: Chairman and Members, Northern Nevada Water Planning Commission ("NNWPC")

FROM: Jim Smitherman, NNWPC Water Resources Program Manager

SUBJECT: Presentation of comments received on the "Wastewater and Watershed-Based Water Quality Planning" chapter for the 2016 Regional Water Management Plan ("RWMP") update; discussion and possible direction to staff.

SUMMARY

Since the last presentation of this chapter to the NNWPC at the August 3, 2016 meeting, staff has incorporated comments concerning Sections:

4.1 Wastewater Service Providers;
4.2 Water Reclamation Facilities;
4.4 Septic Systems; and
4.6.2 Truckee River total Maximum Daily Loads.

Comments have been provided by technical staff from the City of Reno, the City of Sparks, Washoe County, and the Truckee Meadows Water Authority. Recommended revisions resulting from comments received are shown as redlined edits. Staff is requesting any additional comments for this section from the Commission.

RECOMMENDATION

Staff recommends that the NNWPC accept the report on comments received and proposed revisions to the "Wastewater and Watershed-Based Water Quality Planning" chapter for the 2016 RWMP update, and, if acceptable, approve the changes and provide direction to staff as appropriate.

JS:df

Attachment: Sections 4.1 Wastewater Service Providers, 4.2 Water Reclamation Facilities, 4.4 Septic Systems, and 4.6.2 Truckee River total Maximum Daily Loads

4.1 Wastewater Service Providers

Residential and commercial/industrial wastewater services are provided by four public entities in the Planning Area.

Reno provides wastewater collection, treatment and disposal services to its customers in the Truckee Meadows, Verdi and Stead/Lemmon Valley areas. Flows in the Truckee Meadows, Verdi and a small portion of Lemmon Valley are conveyed to the Truckee Meadows Water Reclamation Facility ("TMWRF"), owned by Reno and Sparks. The majority of Reno's customers in Lemmon Valley are served by the Reno-Stead Water Reclamation Facility.

Sparks provides wastewater collection, treatment and disposal services to its customers in the Truckee Meadows and Spanish Springs areas, and conveys flows to TMWRF.

The Sun Valley General Improvement District ("SVGID") provides wastewater collection within its boundaries, which covers the majority of the Sun Valley hydrographic basin. Wastewater flows are conveyed to Reno's collection system for treatment and disposal at TMWRF.

Washoe County provides wastewater collection, treatment and disposal services to its customers in the south Truckee Meadows area where flows are conveyed to the South Truckee Meadows Water Reclamation Facility ("STMWRF"). STMWRF also provides treatment for portions of Reno's service area in the south Truckee Meadows. Washoe County also provides collection, treatment and disposal serves to its customers in Lemmon Valley using the Lemmon Valley Water Reclamation Facility (LVWRF"); and in Cold Springs using the Cold Springs Water Reclamation Facility ("CSWRF"). In addition, Washoe County provides wastewater collection to its customers in the Spanish Springs area where wastewater flows are conveyed to Sparks' collection system for treatment and disposal at TMWRF.

Figure 4-1 depicts each entity's service area and major collection system infrastructure, in addition to the wastewater treatment facilities within the Planning Area, each having well-defined service areas. These facilities are summarized in Table 4-1, and are described in the following sSections 4.2.

Table 4-1 Wastewater Treatment Facilities

Facility	2015 Average (Permitted) Daily Flow	Hydrographic Basin	Owner	Comment
Truckee Meadows Water Reclamation Facility	26.3 MGD (44 MGD)	Truckee Meadows, Sun Valley, Spanish Springs Valley, Truckee Canyon	Cities of Reno / Sparks	Discharges to the Truckee River via Steamboat Creek, with effluent reuse

~~South Truckee Meadows Water Reclamation Facility~~	~~3.1 MGD (4.1 MGD)~~	~~Truckee Meadows, Pleasant Valley~~	~~Washoe County~~	~~100% reuse of effluent~~
~~Reno-Stead Water Reclamation Facility~~	~~1.4 MGD (2.0 MGD)~~	~~Lemmon Valley~~	~~Reno~~	~~Wetlands enhancement, with effluent reuse~~
~~Lemmon Valley Wastewater Treatment Plant~~	~~0.20 MGD (0.3 MGD)~~	~~Lemmon Valley~~	~~Washoe County~~	~~Evaporation ponds provide deep water wildlife habitat~~
~~Cold Springs Wastewater Treatment Facility~~	~~0.30 MGD (0.70 MGD)~~	~~Cold Springs Valley~~	~~Washoe County~~	~~Rapid infiltration basins~~

Insert
Figure 4-1 Water Reclamation Facilities with Approximate Service Areas

4.2 Water Reclamation Facilities

Regional wastewater treatment facilities provide an effective means to manage the area's water resource and achieve water quality objectives. The water is treated to high standards, and returned back into the environment for beneficial use. Additionally, reclaimed water ~~irrigation~~ programs are underway in Sparks and Reno, and additional areas of unincorporated Washoe County. Reclaimed water use provides a predictable way to manage treated effluent, and provides a relatively drought-proof alternative water supply ~~for non-potable uses~~, thereby extending the region's limited water resources. ~~This practice is constrained, however, because when reclaimed water use diverts water that would have otherwise been returned to the Truckee River, water rights must be dedicated in order for downstream water rights to be satisfied.~~ Careful consideration must be given to the balance between the need for reclaimed water to meet disposal requirements and the water rights needed to implement the reclaimed water programs. Section 3.5 describes the current status of reclaimed water use within the Truckee Meadows. The following sections describe each of the water reclamation facilities in more detail.

Table 4-1 Wastewater Treatment Facilities

Facility	2015 Average (Permitted) Daily Flow	Hydrographic Basin	Owner	Comment
Truckee Meadows Water Reclamation Facility	26.3 MGD* (44 MGD)	Truckee Meadows, Sun Valley, Spanish Springs Valley, Truckee Canyon	Cities of Reno / Sparks	Discharges to the Truckee River via Steamboat Creek, with effluent reuse
South Truckee Meadows Water Reclamation Facility	3.1 MGD (4.1 MGD)	Truckee Meadows, Pleasant Valley	Washoe County	100% reuse of effluent
Reno-Stead Water Reclamation Facility	1.4 MGD (2.0 MGD)	Lemmon Valley	Reno	Wetlands enhancement, with effluent reuse
Lemmon Valley Wastewater Treatment Plant	0.20 MGD (0.3 MGD)	Lemmon Valley	Washoe County	Evaporation ponds provide deep water wildlife habitat
Cold Springs Wastewater Treatment Facility	0.30 MGD (0.70 MGD)	Cold Springs Valley	Washoe County	Rapid infiltration basins

* Minor discrepancies may exist between influent flow measured at headworks and flow measured at effluent pump station. Any discrepancies are within industry standards.

4.2.1 Truckee Meadows Water Reclamation Facility ("TMWRF")

TMWRF is a 40 MGD regional wastewater plant serving the majority of the Truckee Meadows. The facility is located on the east side of the Truckee Meadows, at the confluence of Steamboat Creek and the Truckee River. TMWRF serves all of the City of Sparks, Spanish Springs, Sun Valley, and that portion of the City of Reno north of Holcomb Ranch Road and South of Golden Valley. Additionally, TMWRF receives and treats biosolids from the Reno-Stead WRF and is the only treatment plant in the TMSA that receives septage. The TMWRF service area is shown on Figure 4-1.

The Cities of Reno and Sparks jointly began construction of TMWRF in 1964 and the facility began operation in 1966 as a 20 MGD secondary treatment plant. The first major expansion of TMWRF occurred in 1978 when phosphorus removal was added and the hydraulic capacity was increased to 30 MGD. Subsequent expansions in the mid-1980s added nitrification-denitrification processes, filtration and effluent reuse. This increased the hydraulic capacity of TMWRF to 40 MGD. The next plant expansion, begun in 1999, added 2 additional nitrification towers and additional aeration basins to bring TMWRF to its current hydraulic capacity of 46.5 MGD.

TMWRF currently treats approximately 26 MGD of wastewater to a stringent tertiary standard. In addition to the common BOD and TSS removal requirements, TMWRF is subject to three Total Maximum Daily Load (TMDL) restrictions. These TMDLs limit the amount of Total Nitrogen, Total Phosphorus and Total Dissolved Solids that may be discharged to the Truckee River. The Total Nitrogen limitation of 500 lbs/day is currently the limiting factor for treatment at TMWRF.

TMWRF diverts approximately 4500 acre-feet of treated effluent annual for use as irrigation and industrial process water. This effluent is treated to the same level as the water that is discharged to the Truckee River, but is diverted prior to discharge to the effluent reuse system. This diversion occurs largely between April and October although there is some minor year-around effluent reuse.

Beginning in 2012 an aggressive Capital Improvement Plan was implemented to identify and replace process equipment that was at the end of service life. The CIP is addressing the electrical power distribution system, various pumping and piping systems, HVAC, clarifiers and other equipment that requires refreshing to continue reliable service.

In 2014 and energy service project (ESCO) was implemented to address areas that required improvements but that would also provide intifiable cost savings for the facility. This project replaced low efficiency lighting, added a new digester gas co-generation engine, new dewatering centrifuges and on Ostara Nutrient Recovery System. This project is expected to save approximately $1.1 million per year in operating costs for the facility and will be completed in 2016.

The major emphasis of the current CIP in the next five years is to rehabilitate or replace equipment and infrastructure throughout the facility that is approaching the end of its useful and reliable service life. The planning portion of the CIP continues to evaluate new technologies that could assist the facility in more efficiently meeting discharge permit requirements and could potentially increase the facility's future treatment capacity. Additional master planning and improvements are anticipated as the facility flows and constituent concentrations continue to increase, and to meet regional growth projections.

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TMWRF is jointly owned by the Cities of Sparks (31.37%) and Reno (68.63%). An interlocal agreement was implements in 1980 that defined the operation of the facility. The City of Sparks operates the plant and all facility staff are Sparks employees. The City of Reno manages the Capital Improvement Program for the facility. The facility's operational and capital improvement budgets are approved by~~the~~ the Joint Coordinating Committee, comprised of elected and appointed representative from both cities.

Pretreatment Programs

Reno and Sparks each maintain a pretreatment program which protects the wastewater treatment infrastructure. These programs are applied to the entire Truckee Meadows Service Area ("TMSA") which includes SVGID and other unincorporated areas of Washoe County. The Cities have an agreement to perform pretreatment services for Washoe County, work with Washoe County on spill identification, response and disposal, and lastly protect all waterways from illicit discharges, including illicit discharges from irrigation ditches.

The term "pretreatment" refers to federal, state and local requirement that non-domestic sources discharging wastewater to publicly owned treatment works ("POTW") control their discharges and meet discharge limits established by the EPA (40 Code of Federal Regulations Part 403). The program is federally mandated for municipalities processing wastewater with a flow greater than 5 MGD. The purpose of the federal pretreatment program is to protect wastewater treatment facilities from receiving incompatible waste streams that may cause inhibition, interference or pass through of contaminants resulting in pollution of the receiving stream; in this case the Truckee River. The control of pollutants may require treatment prior to discharge to the POTW, hence the term "pretreatment". The term POTW refers to the sewers, pipes, lift stations and conveyances to the treatment plant and includes any devices and systems used in the storage, treatment, recycling and reclamation of municipal sewage.

Reno Environmental Control and Pretreatment Program

Reno's pretreatment program (Reno Municipal Code 12.16) is designed to reduce the level of pollutants discharged by industry and other non-domestic wastewater sources into municipal sewer systems and, thereby, reduce the amount of pollutants released into the environment. The objectives of the pretreatment program are to protect the POTW from pollutants that may interfere with treatment plant operations, protect personnel working for the POTW, prevent the pass through of pollutants into the environment and to improve POTW opportunities for the beneficial reuse of sewer effluent and bio-solids.

Reno Environmental Control has staff on-call 24 hours every day to respond to sewer overflows, illicit sewer and storm drain discharges, hazardous material spills and other environmental emergencies. Staff works with the Reno Fire Department, Reno Police Department, Reno Public Works Department, Reno-Stead Water Reclamation Facility ("RSWRF"), TMWRF, Washoe County District Health Department ("WCDHD"), private contractors, and NDEP to mitigate such emergencies.

Sparks Environmental Control and Pretreatment Program

In 1977, TMWRF received approval from the EPA for the first Wastewater Pretreatment program in the nation. Sparks Environmental Control Section ("ECS") staff performs a variety of duties to protect TMWRF and the municipal separate storm sewer systems ("MS4"). Staff members guide the industrial and residential community in the proper handling, treatment and disposal of wastes that may be incompatible with the environment. In the industrial community this is accomplished through on-site inspections and issuance of a Wastewater Inspection Certificate containing pretreatment requirements and Sparks waste water regulations (Sparks Municipal Code 13.33). Wastewater sampling is routinely conducted on industrial users' waste streams to insure compliance. Notices of Violation and Misdemeanor Citations are issued for non-compliance of discharge limits as well as other infractions of Sparks wastewater regulations and federal regulations.

Additionally, the Sparks ECS staff maintains a 24-hour spill hot line. Staff and equipment are available 24 hours a day to respond to any incident that may threaten the sanitary or storm sewer systems. The ECS protects the environment and serves the local community while being equitable and sensible in all situations.

4.2.2 South Truckee Meadows Water Reclamation Facility

Washoe County Community Services Department ("WCSD") manages the County-owned South Truckee Meadows Water Reclamation Facility ("STMWRF"). Located at the southern base of the Huffaker Hills and originally constructed in 1991, STMWRF is a tertiary treatment facility. The facility is presently permitted for 4.1 MGD (influent flow, 30 day average), expandable to at least 6 MGD. STMWRF current influent flow is approximately 3.0 MGD.

The treatment process consists of influent pumping, fine screening, metering, and secondary treatment by oxidation ditch process combined with four conventional secondary clarifiers for solids separation. Filteration and disinfection achieve reclaimed water meeting State of Nevada Category A standards. Reclaimed water is stored year-round in the Huffaker Reservoir, and used for irrigation water. Huffaker Reservoir has a storage capacity of 4,000 af, and was

recently improved with a partial membrane liner to create 2,000 af of impermeable storage. Waste solids are aerobically digested, dewatered and disposed at the Lockwood Regional Landfill.

Improvements in wastewater collection system infrastructure consist principally of expansion of sewer interceptors, particularly those serving the Galena Fan area. The Mt. Rose interceptor was recently extended from the Montreux subdivision to the Mt. Rose ski area. A future sewer interceptor alignment that will follow U.S. 395 south through Pleasant Valley is envisioned.

An updated 20-year facility plan was completed in 2016 with assistance from Carollo Engineers. A capital improvement plan, identifying sanitary sewer interceptor and wastewater treatment improvements was produced. The plan identifies improvements needed for repair and replacement, upgrades due to meet permit requirements, and additional capacity for anticipated growth. Approximately $60 million of infrastructure improvements is identified, which will be phased over the next 20-year planning period. CH2M Engineers assisted Washoe County to prepare a complimentary 20-year facility plan looking specifically at the South Meadows reclaimed water system improvements. Approximately $34 million of reclaimed water transmission piping, water storage and treatment facilities are identified.

4.2.3 Reno-Stead Water Reclamation Facility

The Reno-Stead Water Reclamation Facility ("RSWRF") is located in Stead and is owned and operated by Reno. It serves the area of Stead within the Reno city limits on the west side of Lemmon Valley, including the Stead Airport and Silver Lake areas as shown in Figure 4-1. In 1974, Reno replaced the original trickling filter plant with an activated sludge plant. The plant was modified in 1987 to improve the secondary clarification and effluent disinfection processes and in 1994, the sludge drying beds were replaced with centrifuge dewatering. The plant was upgraded in 2000 to provide high quality effluent for reuse purposes. With another round of improvements in 2006 Reno expanded treatment capacity to 2.0 MGD and transformed the Reno-Stead Water Reclamation Facility ("RSWRF") into a state of the art wastewater treatment and water reclamation facility. The improvements included a new headworks, new aeration basins and blower building, an additional secondary clarifier, activated sludge pump station improvements, conversion of the oxidation ditch to an emergency storage basin, new tertiary filter equipment, and a new solids handling and disposal system. Waste solids are now pumped to TMWRF for final treatment and disposal.

The RSWRF has the capacity to treat an annually averaged monthly flow of 2.0 MGD. Average daily flows are approximately 1.4 MGD. Treated effluent either discharges by gravity to Swan Creek, which drains to the Swan Lake wetlands, or it is reclaimed and pumped to several sites within the community for turf irrigation. Reclaimed water is also available for purchase at the RSWRF at a truckfill station. This water is used primarily for construction/dust control. All reclaimed water is disinfected to meet the Total Coliform Standard for unrestricted reuse. The reclaimed water typically carries a residual chlorine concentration of 1 mg/L. A permit modification in 2014 allowed for discontinuation of dechlorination prior to discharge to the creek. Of the approximately 1500 acre ft per year of wastewater flowing into RSWRF, approximately 1000 acre ft is released to Swan Creek, and approximately 500 acre ft is provided to the reclaimed water system. The City has committed 490 acre feet a year to Swan Lake itself..

4.2.4 Lemmon Valley W~~astew~~ater Reclamation Facility~~Treatment Plant~~

The Lemmon Valley Water Reclamation Facility ("LVWRF") is located in East Lemmon Valley at the southeast end of Swan Lake and is owned and operated by Washoe County. It currently serves 1,100 homes within East Lemmon Valley, Black Springs, and Horizon Hills. It is a secondary treatment plant and was built in 1971. It currently processes 0.26 MGD and has a permitted capacity of 0.3 MGD.

The treatment plant consists of a grit well, comminutor, wet well pump station, contact stabilization tank, secondary clarification, and aerobic sludge digestion. Effluent is discharged to evaporation ponds, including a 0.65 MGD discharge allowed to the Swan Lake playa for water balance management. The facility does not have an effluent reuse program. Digested solids are sent to sludge-drying beds or to solids ponds during wet weather months.

An infrastructure facility plan is presently being conducted in collaboration with the City of Reno and assisted by Stantec Engineering. In early 2017, it is anticipated the City of Reno and Washoe County will complete a joint facility plan for the combined sanitary sewer service areas of Reno-Stead Water Reclamation Facility and the Lemmon Valley Water Reclamation Facility.

4.2.5 Cold Springs Water Reclamation Facility

Washoe County also owns and operates the Cold Springs Water Reclamation Facility ("CSWRF"), a secondary treatment plant located in the northern portion of Cold Springs Valley. The plant currently serves approximately 1,800 homes, and the average daily influent flow is about 0.35 MGD. Permitted capacity is 0.70 MGD.

CSWRF consists of a headworks, oxidation ditch, and two secondary clarifiers. Secondary treated effluent is denitrified and disposed of at 12 rapid infiltration basins, which range in size from 1.2 to 2.1 acres. With these recent upgrades, reclaimed water may be used onsite and for irrigation at approved sites in the near future. Additionally, plant capacity may be expanded to 1.2 MGD by adding another oxidation ditch when growth requires it. In the past, sludge was dried in lined sludge lagoons. Presently, the three original SBR basins are used for Waste solids are aerobically digested, dewatered and transported to the Lockwood Regional Landfill.

An infrastructure facility plan is presently being conducted in collaboration with the City of Reno and developers, with assistance from Farr West Engineering. The developers involved represent several development projects presently in the planning process. The facility plan will be completed by the end of 2016.

4.3 Regional Effluent Management Planning

The use of reclaimed water from the various water reclamation facilities in the Planning Area may eventually be constrained by one or more factors, which could include compliance with existing or future water quality standards, lack of future reclaimed water customers, insufficient winter storage and/or conveyance infrastructure. Regional water management challenges in the Planning Area include such complex, integrated issues as:

- Ensuring that the existing wastewater treatment plants are prepared to meet existing nutrient limitations in the face of anticipated growth
- Ensuring that the responsibility to meet any new water quality standards that affect receiving waters are shared by all entities contributing to the poor water quality
- Ensuring sustainable water supplies and infrastructure to meet the needs of existing customers, and future demands within and outside the TMSA (same as 1st bullet)
- Providing appropriate water quality and treatment capacity at various wastewater treatment facilities
- Providing for adequate reclaimed water demands, reclaimed water system capacity and effluent disposal capacity
- Addressing competing needs for the limited water resources available in the Planning Area to meet commitments to water supply, water quality, instream flows and the environment

In 2008, the NNWPC and WRWC initiated a collaborative effort among key staff from Reno, Sparks, Washoe County, SVGID and TMWA to develop recommendations to address effluent management issues in the Planning Area, using circumstances that existed in the North Valleys at that time: a high growth rate, high population growth projections, planned water importation and an abundance of undeveloped land uses and zoning. Staff concluded that, if the region is going to spend the same amount of money for water and wastewater infrastructure, regardless of effluent disposal or reuse methods, the region should make the investment that maximizes the benefits provided by the available water resources.

Enhanced Nitrogen Removal Planning Study

In 2013, following an upset at TMWRF resulting in a nitrogen discharge violation, the WRWC funded~~paid for~~ the Enhanced Nitrogen Removal Planning Study conducted by Carollo Engineers. The final Technical Memorandum prepared for the City of Reno identified three treatment technologies, one of which may be selected to supplement existing nitrogen treatment at TMWRF: enhanced coagulation; advanced oxidation; and reverse osmosis ("RO"). Additional evaluations of enhanced nitrogen removal technologies are ongoing.

Although TMWRF operations have been smooth with no upsets since the 2013 violation, discharge limitations for nitrogen may present significant compliance challenges as wastewater flows and/or strength increase over time. Of the three enhanced nitrogen removal treatment technologies studied by Carollo, RO has the advantage of removing not only nitrogen, but phosphorus, total dissolved solids and other compounds that may be of concern in the future. Disadvantages include a concentrate (brine) stream generated by RO treatment consisting of approximately 10-15 percent of the feed flow. Water reclamation facilities in coastal locations typically use ocean discharge for concentrate disposal, but inland facilities must develop alternative management strategies. Options for the management and disposal of reject concentrate from the RO treatment process have not been investigated. This topic was not within the scope of the Carollo study, which assumed deep-well injection for concentrate disposal. Enhanced coagulation and advanced oxidation have a greater viability in this region because there is no brine stream requiring disposal. Both technologies are relatively expensive however, requiring significant energy and/or chemical addition.

In December 2014, the NNWPC directed staff to summarize wastewater master planning in the Planning Area and outline a scope of work for a wastewater and effluent management master plan update. Technical staff from the City of Reno, the City of Sparks, Washoe County and the Truckee Meadows Water Authority had been meeting to discuss regional effluent management issues since April 2014, and welcomed NNWPC participation. This informal group is generally referred to as the "Regional Effluent Management Team" (the "Team"). The Team is working toward regionally-based solutions to several near-term effluent management issues; acknowledging that the strategies developed may form the framework for an up-to-date regional effluent management master plan that will cover all of the Planning Area's publicly-owned water reclamation facilities and service areas.

The near-term effluent management issues focus on reducing the nitrogen load to the Truckee River by maximizing the use of Truckee Meadows Water Reclamation Facility ("TMWRF") reclaimed water at locations away from the river in allowable quantities and during appropriate times of the year, while maintaining a balance with Truckee River flows consistent with State water law and TROA. A variety of alternatives and scenarios are being evaluated using population and employment growth projections to estimate wastewater flow increases over time. The Team is taking steps to ensure a thorough understanding of the complex implications for effluent management scenarios before making any recommendations.

Scenarios being evaluated include:

- Developing a year-round reclaimed water demand, possibly Tahoe Reno Industrial Center ("TRI Center") and/or infiltration to groundwater
- Constructing an intertie pipeline, between TMWRF and Huffaker Reservoir, located at STMWRF, allowing for seasonal storage of TMWRF effluent and greater flexibility for reclaimed water use
- Demonstrating advanced water treatment technology consistent with proposed revisions to State regulations concerning "exceptional quality" recycled water standards

Water balance scenario evaluation using linear optimization programming

Desert Research Institute ("DRI") is using a linear optimization model to compare strategies for distributing effluent between TMWRF and STMWRF to meet customer demands while minimizing the nitrogen load to the Truckee River. DRI's scope of work includes an evaluation of strategies and constraints including:

- a proposed intertie pipeline to connect TMWRF and STMWRF/Huffaker Reservoir using the Southeast Connector Roadway Project right of way;
- existing customer effluent demands;
- future effluent demands including potential large volume customers such as TRI Center;
- Rapid Infiltration Basin(s) ("RIB"); and
- water rights constraints

Initial findings from the evaluation include the following:

- Annualized use of effluent is beneficial for reducing nitrogen loading to river.
- Huffaker Reservoir provides a cushion in the event of a plant upset at TMWRF and off-season storage of TMWRF effluent..

- TRI Center demands were used in the model as a surrogate for other potential year round demands such as RIBs, other large industrial uses, and/or groundwater replenishment.
- Intertie pipeline and TRI Center could provide a firm a demand for future TMWRF and STMWRF effluent.
- STMWRF effluent provides water with no additional return flow water rights requirement.

Ongoing DRI modeling simulations continue to refine the evaluation of the intertie pipeline, in addition to the feasibility of various TRI Center deliveries for current and future scenarios through 2034. The model has been updated to reflect new information, including STMWRF effluent demand projections, seasonal TRI Center demands and the addition of a 1,400 AF effluent storage reservoir at TRI Center.

One of the key considerations of the current evaluation involves the effluent return flow requirement for the Truckee River. The model tracks TMWA's groundwater and surface water production during both drought and normal years to estimate the seasonal groundwater component of the effluent. Taking the results from the DRI model, the Team will consider the groundwater component, Water Quality Settlement Agreement ("WQSA") water rights, and other surface water resource options to ensure that the effluent return flow component is satisfied under varying demand and hydrologic conditions, consistent with TROA operations.

The model results will provide decision makers with the technical information to consider whether the intertie pipeline and/or a year round effluent demand to a use such as TRI Center and/or groundwater replenishment is a sound long-term strategy for TMWRF to reduce nitrogen loading to the Truckee River.

Exceptional Quality Reclaimed Water Feasibility Study

The Team is jointly developing a feasibility study to evaluate whether the State of Nevada's proposed "exceptional quality" standard for reclaimed water offers regional long-range water supply resiliency benefits. Criteria for exceptional quality reclaimed water, achieved through a series of advanced water treatment and natural processes, are included in proposed draft State regulations to permit the use of reclaimed water for groundwater augmentation. The Team envisions a 5-year feasibility study that consists of multiple elements including social, environmental and financial analyses, regulatory compliance, public engagement, advanced treatment pilot testing, geotechnical investigations, and field scale treatment demonstration projects.

A growing number of national and international communities have developed advanced-treatment reclaimed water projects as an efficient use of water resources. Projects defer expenditures on future water importation projects, provide a local drought proof water supply, and provide for a more resilient total water management strategy. Within the water sector, projects using advanced treatment for reclaimed water are typically referred to as potable reuse projects. While the Team seeks to develop a more comprehensive assessment through a demonstration-scale groundwater replenishment project, there is no current plan to augment local potable water supplies at full scale. A panel of international water reuse experts is guiding the Team's feasibility phase activities.

The advanced water treatment investigations would be conducted over the next 3 to 4 years, led by researchers at University of Nevada, Reno (UNR). UNR will develop the technological justification for selecting the advanced water treatment systems; establish the field scale demonstration project design basis and testing plan; assist acquiring the necessary water treatment equipment; assist during the installation of the demonstration project; conduct startup of the treatment facility, optimizing the treatment unit processes; perform monitoring and testing of the operating strategies, process control, and performance parameters during steady state operations; analyze data, and prepare a final report.

Technological options considered for advanced treatment of reclaimed water to meet drinking water standards include a reverse-osmosis (RO) based treatment train and a biological filtration based treatment train. The former has the distinct disadvantage of side-stream RO brine disposal, which is a challenge for inland regions. Therefore, to meet the study goals, the reclaimed water will be further treated through a series of advanced water treatment and natural processes, likely including biological activated carbon ("BAC") filtration, advanced oxidation, UV disinfection, and soil aquifer treatment ("SAT"). A further review of the applicability of this treatment compared with other alternatives will be explored during the initial stages of this project.

Advanced water treatment technology has been studied locally in the recent past. From 2008-2010 the City of Reno supported WateReuse Research Foundation Project 08-04 to investigate Ozone – Biological Activated Carbon (O3-BAC) as an advanced water treatment alternative to reverse osmosis. The results demonstrated O3-BAC as a viable method for potable reuse. Presently, the regional agencies are supporting WateReuse Research Foundation Project 15-10, which is intended to look more closely at optimal O3-BAC operating conditions. Following an approximately 6 month project scoping and review phase that began in January 2016, it is envisioned that pilot operation will occur over a 9-12 month period. WRRF 15-10 project is being jointly funded by WRRF, American Water, and Stantec Consulting. The pilot unit will be located at the South Truckee Meadows Water Reclamation Facility.

Expert Panel

A panel of international water reuse experts (the "Panel"), managed by the National Water Research Institute ("NWRI") with general guidance from the Team is helping to develop feasibility phase goals and a work plan, providing critical review concerning work progress and making regular recommendations. Jeff Mosher, NWRI Executive Director, an established potable water expert, is the primary point of contact. The Panel is comprised of members with expertise in all aspects of potable reuse project implementation, including regulatory, public heath, public engagement, advanced water treatment technologies, and groundwater hydrogeology. Panel members are also helping to craft an opportunity statement unique to the Truckee Meadows to help align the feasibility phase activities and more clearly articulate the project purpose to policy makers and the community.

The Panel will be supported by an advisory committee comprised of state and local public health, planning, regulatory, and water utility agencies. The following organizations have been identified as likely advisory committee participants:

- Nevada Division of Environmental Protection
- Nevada State Health Division
- Northern Nevada Water Planning Commission

- City of Reno
- City of Sparks
- Truckee Meadows Water Authority
- Truckee Meadows Water Reclamation Facility
- University of Nevada Reno
- Washoe County Community Services Department
- Washoe County Health District
- Desert Research Institute

Geotechnical Investigations

A main component of the demonstration project is to physically analyze aquifer recharge potential through either an infiltration basin and/or injection wells. Potential sites under consideration include Stead/Lemmon Valley, Cold Springs and Bedell Flat. Classifying hydrogeologic characteristics through groundwater modeling and borehole investigations will assist with sizing the demonstration project advanced treatment units as well as determining the suitability of aquifer recharge at each potential site.

~~*4.4 Wastewater Planning for Other Areas*~~

~~In addition to the existing water reclamation facilities, wastewater facility planning for other developing areas needs to be coordinated with ongoing, regional planning efforts~~.

~~*4.4.1 Lower Truckee River*~~

~~*Mustang and Patrick / Tracy Areas*~~

~~Significant undeveloped, industrial zoned lands are located in the Mustang and Patrick / Tracy areas, including 2,205 acres adjacent to Interstate 80 E., approximately eight miles east of Vista Boulevard proposed for the development of a technology park. The developer contemplates the use of 4,000 afa of TMWRF reclaimed water via a new pipeline in addition to 1,125 af of permitted groundwater rights. The reclaimed water would be utilized for water cooling a state-of-the-art energy generation complex to supply dedicated power to a technology campus hosting a data center.~~

~~In addition to the potential development of industrial areas within Sparks' East Truckee Canyon Planning Area, there is also significant development potential on the Storey County side of the river. This area includes existing industrial development such as Kal Kan and Kaiser Aluminum, and continued commercial and industrial development within the Tahoe Reno Industrial Center ("TRIC"). Wastewater from the existing industries is treated either through on-site facilities, or in the case of TRIC, through a small community sewer collection and treatment system.~~

~~Wastewater disposal is managed by a combination of reclaimed water irrigation and/or sub-surface infiltration. Wastewater treatment facilities along the Lower Truckee River are shown in Figure 4-2. To help protect water quality within the Truckee River, wastewater facility plans for these areas recommend that treatment facilities be implemented that include biological nitrogen removal, with subsurface disposal and/or landscape irrigation. Joint wastewater treatment and~~

~~facility planning could be economically advantageous to both Washoe and Storey counties and should be considered in future work.~~

~~As this area of Sparks and Storey County continues to grow, it will be important to monitor groundwater and surface water quality to check for non-point source pollutants entering the Truckee River. These additional pollutant loads have the potential to impact sensitive river water quality improvement programs underway in Washoe County.~~

~~Wadsworth Wastewater Treatment Facility~~

~~This area's long-term sewer and potable water supply may require a separate planning effort as this area continues to grow. Possible solutions include an interagency approach for combined facilities with the Pyramid Lake Paiute Tribe ("PLPT"), the City of Fernley and Washoe County. Currently, the PLPT facility provides secondary treatment and disposal through sedimentation and facultative lagoons for the town of Wadsworth. Rapid infiltration basins are constructed, but evaporation in the lagoons has dominated the disposal process. Current influent flow is approximately 35,000 GPD. No discharge permit is required for this facility. The Wadsworth Wastewater Treatment Facility is mentioned for regional information and coordination purposes only; it does not fall under the jurisdiction of this Plan.~~

~~Septic systems will continue to be used in this area within the planning time frame. There is evidence of nitrate contamination to the groundwater within the Wadsworth area, indicating the need for community sewering. Additionally, the Stampmill Estates subdivision may need sewering. A large residential development has been proposed adjacent to Stampmill Estates, which would require a municipal water and sewer system. If this project develops in the future, Stampmill Estates should be included in plans for municipal sewer service. Discussions among Washoe County, the PLPT, and the City of Fernley to seek an area-wide water and wastewater strategy should also be revisited.~~

~~4.4.2 Warm Springs~~

~~Septic systems will continue to service a majority of this area. However, within the Specific Plan Area east of Pyramid Highway, a future wastewater treatment plant is anticipated to eventually serve a planned development of approximately 750 lots. The proposed 0.2 MGD treatment plant would be built in phases, with effluent disposal from the first phase accomplished using rapid infiltration basins. For future phases, seasonal storage and irrigation using reclaimed water will likely be considered. The planned development is not being actively pursued at this time.~~

Insert

Figure 4-2 Truckee River Wastewater Treatment Systems

~~**4.4.3 Washoe Valley**~~

~~Within New Washoe City, nitrate contamination to the groundwater system is occurring. Effluent from septic systems is identified as the nitrate source (Zhan, H. and W.A. McKay, 1998). New Washoe City is served by private domestic wells; however, the extent to which this contamination is a health problem to the New Washoe City population has not been determined. Further investigation and planning are needed to quantify the problem and develop creative alternatives.~~

~~4.4.4 Spanish Springs~~

~~In 2000, NDEP issued a directive to the County to plan for sewering of existing lots with septic systems in the Spanish Springs area due to elevated nitrate concentrations detected in public drinking water wells. The subdivisions which are not sewered include: Bridle Path, Sky Ranch, Surprise Valley Ranchos Phase I, Desert Springs and Pyramid Ranch Estates. Various design alternatives associated with the construction of a new facility in Spanish Springs Valley that would provide service to the residents in Spanish Springs were evaluated by Washoe County. The two primary alternatives were the construction of a new plant in Spanish Springs Valley and continued servicing via TMWRF. *The Spanish Springs Valley Wastewater Reclamation Facility Plan*, drafted in November 2004, indicates that the alternatives are essentially of equal cost. However, the connection fee for a new Spanish Springs plant would exceed the current rate being offered by Sparks for a connection to TMWRF. Thus, the recommended alternative was to continue service to TMWRF and negotiate an acceptable service agreement with Sparks.~~

~~The facility plan was adopted by the Board of County Commissioners for phased sewering of the existing lots with septic systems in the area. The plan requires 75 percent grant funding for the sewering to proceed. Phased sewering commenced in early 2005; Phase 1A of the program is complete and serves approximately 230 homes. Washoe County recently received grant funding from the Army Corps of Engineers ("ACOE") for the construction of Phase 1B.~~

~~The wastewater collection systems have been and will continue to be extended into new areas of growth.~~

~~4.4.5 Lemmon Valley and Golden Valley~~

~~Both the East and West Lemmon Valley hydrographic basins and Golden Valley, a sub-basin within East Lemmon Valley, are deficient in sustained perennial yields for water supply. All of Golden Valley's domestic wastewater treatment and disposal needs are provided by individual septic systems.~~

~~Groundwater samples from some areas of Golden Valley exceed state and federal drinking water standards for nitrate. Additionally, Widmer and McKay (1994) predicted that nitrate concentrations would increase over time. Washoe County and the Bureau of Reclamation~~

~~("BOR") implemented a federally funded artificial groundwater recharge pilot project by injecting fresh water into the Golden Valley aquifer from 1989 to 1998. Results of the study indicated that injection improved water quality with respect to nitrate.~~

~~Based on the groundwater recharge pilot project, a recharge program has been approved, funded by establishing a Golden Valley recharge service area, and implemented. Presently, the program injects approximately 60 af of fresh water per year into the Golden Valley aquifer, and WCDWR is investigating further options of expanding the injection system.~~

4.5 Septic Systems

The cumulative effect of septic systems on surface waters is difficult to ~~not easily~~ calculate~~bl~~e or measur~~abl~~e. It may take years to begin detecting increased pollutant loads in surface water resources. Because groundwater quality is protected to drinking water standards, which are commonly less restrictive than aquatic life criteria that apply to creeks and rivers, protection of groundwater quality to the level of the drinking water standards may not provide adequate protection to nearby surface waters. There is concern that this situation may potentially exist in the Verdi, Spanish Springs, Mogul, Ambrose Park, and Island 18 areas (Figure 4-3). In areas where there is little groundwater recharge, effluent from septic systems can recycle through the groundwater system, potentially increasing pollutants to unacceptable levels.

In some areas of Washoe County, the number of allowable septic systems has been limited based on an analysis of the potential impacts to water quality. One such area is Verdi, where the Washoe County Comprehensive Plan allows a maximum of 1,300 septic systems (Washoe County, 2002).

Washoe County~~DWR~~ has identified areas of groundwater quality degradation as a result of septic system effluent, occurring predominantly in areas with high septic system densities. In addition to high densities, contributing factors to water quality degradation include shallow depths to ground water, permeable soil conditions, and proximity to sensitive receptors, such as water supply wells, creeks, rivers, and lakes. These conditions are present in Spanish Springs Valley, Golden Valley, Washoe Valley and Lemmon Valley. In Spanish Springs Valley, 15 years of groundwater quality monitoring have shown increasing levels of nitrate contamination in municipal wells. Almost 2,000 septic systems are located within a four square-mile area, with almost half of these systems within 2,000 feet of one or more municipal water supply wells. Two of six municipal wells in the highly developed portion of Spanish Springs Valley have nitrate concentrations at or approaching the drinking water standard of 10 mg/L nitrate as N, and their use has been discontinued.

Using lessons learned in these areas, and especially in Spanish Springs Valley, Washoe County~~CDWR~~ expanded the scope of ~~a~~the septic system effluent investigation throughout the densely populated portions of Washoe County. The study was titled *Phase I: Prioritization of Study Areas & Assessment of Data Needs* -(WCDWR, 2007). The goals of the study were to investigate the potential for nitrate contamination in the metropolitan and suburban areas, and to provide recommendations for prioritizing additional study of areas potentially contaminated by septic systems. Determining where groundwater quality is at risk from septic systems is essential information for regional water management and planning activities.

Sixteen Project Areas were identified for investigation. Data from these specific areas were analyzed to determine the potential for areas with high-density septic systems to contribute to contribute to water quality degradation. The final report identifies data gaps, prioritizes and makes recommendations for further study and analysis. Recommendations led to a follow up study: *Septic Nitrate Baseline Data and Risk Assessment Study, Phase II: In-depth Analysis of Prioritized Study Areas, Creation of Baseline Data Set and Risk Assessment* ("Phase II study").

The Phase II study prioritized nine areas (Mt. Rose, Ambrose, Hidden Valley, Huffaker, Verdi, Geiger, Island 18, Mogul, and Pleasant Valley) needing more in-depth analysis to fill data gaps identified in Phase I. Of 173 groundwater samples collected in 2014 and 2015 from domestic wells in the nine study areas, only 2 domestic wells, located in the Mt. Rose and Verdi areas, recorded nitrate levels above the maximum contaminant level ("MCL") of 10 mg/L.

Samples were also collected from areas of known impact (Washoe Valley, Cold Springs and Heppner) that had not been sampled for 10 to 20 years to determine long term trends. 133 groundwater samples were collected from domestic wells in these three revisited study areas. Twenty-two of 83 samples from Washoe Valley were above the MCL and the highest was 50 mg/L. Of the 33 samples from Heppner, 5 were above the MCL with a high of 19 mg/L. In Cold Springs, none of the 17 samples were above the MCL.

In July 2016, the Washoe County Community Services Department distributed approximately 5,000 informational letters to domestic well owners within, or in the vicinity of, each of the 12 study areas. The letters serve as a resource guide to educate homeowners on nitrate in groundwater and provide a summary of nitrate concentrations found within their study area.

Results of this study and previous studies point to the importance of septic system density, parcel size and distance to sensitive receptors.

Insert

Figure 4-3 Parcels Served by Septic Systems

Management options for mitigation of nitrate contamination due to high densities of septic systems have been studied regionally (AGRA, 2000), (Lombardo and AMEC, 2012), in Spanish Springs (WCDWR, 2002), Cold Springs (Kennedy/Jenks, 2002) and Golden Valley (WCDWR, 2004). The results of these various analyses have coalesced around four possible mitigation strategies:

- Conversion of septic systems to a municipal sewer system
- Conversion of septic systems to nitrate reducing septic systems
- Dilution of groundwater via artificial recharge with treated drinking water resources
- Pumping of high nitrate groundwater for non-potable uses to remove nitrates from the groundwater aquifer

The WCDHD has undertaken several measures to reduce future potential impacts from septic systems. For example, effective 2001, the minimum lot or parcel size for new subdivisions and second or subsequent parcel maps proposing to use septic system disposal was established at five acres. Smaller lots may be considered if it can be shown that adequate measures have been taken to ensure that the smaller lot area will not have a greater impact to the groundwater quality than the five acre lot size.

Adequate measures might include the installation of nitrate reducing septic systems. These systems received considerable interest from the public in Spanish Springs Valley as a potential low cost alternative to conventional sewer service for dwellings currently using septic systems.

The Oregon Department of Environmental Quality (2005) conducted a multi-year project to study the performance of eleven individual nitrate reducing systems installed at residences near La Pine, Oregon. The study found that, although several systems showed high levels of nitrogen reduction in test centers, they did not perform as well in the field. Nitrogen reduction below 10 mg/L appears to be difficult to achieve consistently without a secondary carbon source.

Conversion of septic systems to a municipal sewer system appears to be the most reliable, albeit expensive, mitigation of nitrate contamination due to high densities of septic systems. Other solutions include artificial groundwater recharge using fresh water injected into the aquifer, such as in Golden Valley, which has also proven beneficial in improving water quality with respect to nitrate.

The 2009 Nevada Legislature approved Assembly Bill 54 authorizing Washoe County to establish a financial assistance program to help property owners, among other things, connect to a public sewer system. The program is a direct response to property owner needs that are the result of changing economic conditions. When a property owner's on-site septic system fails and a community sewer system is available, existing ~~s~~State and County~~WCDHD~~ regulations require that the property be connected to the municipal system.

The following policy, in conjunction with WCDHD regulations and Washoe County development policies, responds to issues of groundwater contamination resulting from septic systems.

Policy 2.2.a: Septic Tank Density and Groundwater Pollution

Future development using septic systems should not be allowed in densities that would risk groundwater or surface water quality degradation such that applicable water quality standards are threatened. When adverse surface water or groundwater impacts occur as a result of existing or proposed increases to the concentration of septic systems in an area, alternative sewage disposal, groundwater treatment, or other mitigation measures must be implemented based on cost, longevity of the solution, and existence of a credible entity to be responsible for the continuing performance of the selected system.

4.5.1 Golden Valley

Both the East and West Lemmon Valley hydrographic basins and Golden Valley, , are deficient in sustained perennial yields for water supply. All of Golden Valley's domestic wastewater treatment and disposal needs are provided by individual septic systems.

Groundwater samples from some areas of Golden Valley, a sub-basin within East Lemmon Valley, exceed state and federal drinking water standards for nitrate. Additionally, Widmer and McKay (1994) predicted that nitrate concentrations would increase over time. Washoe County and the Bureau of Reclamation ("BOR") implemented a federally funded artificial groundwater recharge pilot project by injecting fresh water into the Golden Valley aquifer from 1989 to 1998. Results of the study indicated that injection improved water quality with respect to nitrate.

Based on the groundwater recharge pilot project, a recharge program has been approved, funded by establishing a Golden Valley recharge service area, and implemented. Presently, the program injects approximately 60 af of fresh water per year into the Golden Valley aquifer, and Washoe County CSD is investigating further options of expanding the injection system.

4.5.2 Spanish Springs

In 2000, NDEP issued a directive to the County to plan for sewering of existing lots with septic systems in the Spanish Springs area due to elevated nitrate concentrations detected in public drinking water wells. The subdivisions which are not sewered include: Bridle Path, Sky Ranch, Surprise Valley Ranchos Phase I, Desert Springs and Pyramid Ranch Estates. Various design alternatives associated with the construction of a new facility in Spanish Springs Valley that would provide service to the residents in Spanish Springs were evaluated by Washoe County. The two primary alternatives were the construction of a new plant in Spanish Springs Valley and continued servicing via TMWRF. *The Spanish Springs Valley Wastewater Reclamation Facility Plan*, drafted in November 2004, indicated that the alternatives were essentially of equal cost. However, the connection fee for a new Spanish Springs plant would exceed the rate offered by Sparks for a connection to TMWRF. Thus, the recommended alternative was to continue service to TMWRF and negotiate an acceptable service agreement with Sparks.

The facility plan was adopted by the Board of County Commissioners for phased sewering of the existing lots with septic systems in the area. The plan requires 75 percent grant funding for the sewering to proceed. Phased sewering commenced in early 2005; Phase 1A of the program is complete and serves approximately 230 homes. Washoe County recently received grant funding from the Army Corps of Engineers ("ACOE") for the construction of Phase 1B.

The wastewater collection systems have been and will continue to be extended into new areas of growth.

4.5.3 Warm Springs

Projections indicate that septic systems will continue to service this area for the next 20 years. However, within the Specific Plan Area east of Pyramid Highway, a future wastewater treatment plant is anticipated to eventually serve a planned development of approximately 750 lots. The proposed 0.2 MGD treatment plant would be built in phases, with effluent disposal from the first phase accomplished using rapid infiltration basins. For future phases, seasonal storage and irrigation using reclaimed water will likely be considered. The planned development is not being actively pursued at this time.

4.5.~~4.3~~ Washoe Valley

As described above, ~~Within New Washoe City,~~ nitrate contamination to the groundwater system is occurring in the eastern portion of Washoe Valley.. Effluent from septic systems is identified as the nitrate source (Zhan, H. and W.A. McKay, 1998). ~~New Washoe City is served by private domestic wells; however, the extent to which this contamination is a health problem to the New Washoe City population has not been determined. Further investigation and planning are needed to quantify the problem and develop creative alternatives.~~

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~~The facility plan was adopted by the Board of County Commissioners for phased sewering of the existing lots with septic systems in the area. The plan requires 75 percent grant funding for the sewering to proceed. Phased sewering commenced in early 2005; Phase 1A of the program is complete and serves approximately 230 homes. Washoe County recently received grant funding from the Army Corps of Engineers ("ACOE") for the construction of Phase 1B.~~

~~The wastewater collection systems have been and will continue to be extended into new areas of growth.~~

~~**4.4.5 Lemmon Valley and Golden Valley**~~

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4.6 Watershed Management Programs to Protect the Availability and Quality of Water Resources

The Truckee River, critical to the local economy and quality of life, is a shared resource in the Truckee Meadows and among upstream and downstream users. Effective watershed protection requires cooperation among two states, one sovereign Indian nation, multiple counties, cities, towns, various utilities, other entities and the public.

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 brings together stakeholders most affected by management decisions, facilitates sharing of data and other technical resources, and encourages consensus building. Stakeholders may use an iterative process to identify and assess problems, prioritize, set environmental objectives, and develop management options and action plans. 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.

4.6.1 Regulatory Considerations

Clean Water Act

In 1972, Congress passed the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act ("CWA"). The CWA's objective was to "restore and maintain the chemical, physical, and biological integrity of the nation's waters" and its main goals included: 1) "that the discharge of pollutants into the navigable waters be eliminated by 1985", and 2) "that wherever

attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983".

NPDES Permit Program

One of the first steps taken by the EPA to implement the CWA was the creation of the National Pollutant Discharge Elimination System ("NPDES") program, which controls water pollution by regulating point sources that discharge pollutants into waters of the United States. The CWA defines "point source" as "any discernible, confined, and discrete conveyance including but is not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation or vessel or other floating craft from which pollutants are or may be discharged" (CWA Section 502[14]). Industrial, municipal, and other facilities must obtain NPDES permits if their discharges go directly to surface waters.

Unlike pollution from industrial facilities and municipal sewage treatment plants, non-point source pollution comes from many diffuse sources and is caused by rainfall or snowmelt moving over and through the ground picking up and carrying natural and human-made pollutants to lakes, rivers, other water bodies and groundwater.

Although the NPDES program succeeded in controlling many significant municipal and industrial point sources of pollution, studies conducted by the EPA and others in the 1980s identified storm water runoff from urbanized areas (i.e. non-point source pollution) as a leading cause of impairment to the nation's water bodies. Additionally, EPA reported in the early 1990s that nearly 40 percent of surveyed waters in the United States remained too polluted for fishing, swimming and other uses, and pollutants such as silt, fertilizer, metals, oil and grease were among the leading causes.

During this time, the EPA developed the *Watershed Protection Approach Framework* (published in 1991) as one strategy to address these issues. In addition, amendments to the CWA resulted in EPA requirements for NPDES permit coverage for storm water discharges from medium and large municipal separate storm sewer systems beginning in 1990. This addition to the NPDES program essentially shifted municipal storm water discharges from non-point source status to regulation as a point source. This is an example of the progressive nature of the NPDES program whereby over the years more sources have been included under the definition of point source pollution. The local NPDES storm water program is described in Section 4.6.4.

Water Quality Standards

The CWA also requires specific water quality standards to be set based on the intended use of the water, i.e. "beneficial uses". These include water quality for aquatic life propagation, recreational, agricultural, industrial, municipal and many other uses. Specific water quality standards are set by states, territories, and authorized tribes, which associate the beneficial uses for each water body with scientific criteria to support those uses. States cannot set standards that allow higher concentrations of pollutants than EPA standards; they can be more restrictive, but not less. Water quality standards for Nevada are contained in NAC 445A.118-225.

Section 303(d) List of Impaired Waters

Section 303(d) of the CWA requires that each state develop a list of water bodies that need additional work beyond existing controls to achieve or maintain water quality standards, and submit an updated list to EPA every two years. The law requires that states establish priority rankings for waters on "303(d) lists" and develop total maximum daily loads ("TMDLs") for these waters if they meet criteria.

The Nevada 2012 Water Quality Integrated Report ("Integrated Report") provides a comprehensive inventory of water bodies throughout the state, including a list of impaired waters now identified as Class 5 (previously labeled 303(d) waters). Impairments may be of all types and sources, and form the basis for targeting water bodies for watershed-based solutions. Nevada's most recent Integrated Report with its list of impaired waters was approved by the EPA in 2014 and can be obtained online at: http://ndep.nv.gov/bwqp/file/IR2012_Report_Final.pdf.

Total Maximum Daily Load

The additional work that may be necessary beyond existing controls for listed water bodies includes the establishment of one or more TMDLs. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive from all sources and still meet water quality standards. The TMDL process provides an analytical framework to identify the sources and causes of pollution, identify the relative contributions of each pollutant and establish allocations for each specific pollutant as needed to attain water quality standards. The calculation must include a margin of safety to ensure that the water body can be used for the purposes the state has designated. The calculation must also account for seasonal variation in water quality. The point source portion of a TMDL is called a wasteload allocation ("WLA") and the non-point source portion, including background sources is called a load allocation ("LA").

4.6.2 Truckee River Total Maximum Daily Loads

Background on Truckee River Nutrient WQS and TMDLs

TMDLs have been established for the Truckee River within the State for three constituents, TN, TP, and total dissolved solids ("TDS"). TMDLs are measured at Lockwood under the assumption that if the TMDLs are being met at this location, downstream from TMWRF, they are being met on the rest of the "impaired" river reach.

The Truckee River downstream of the Truckee Meadows historically has been challenged with difficulty meeting aquatic life uses under existing water quality standards and TMDLs. In the 1980s, water quality sampling indicated that the Truckee River was impaired for low dissolved oxygen ("DO"). An overabundance of benthic algae was determined to be the primary cause of low DO. Benthic algae, also called periphyton, thrive in conditions with ample bioavailable nutrients (nitrogen and phosphorus) and shallow water depth (allowing for light penetration to the bottom) and increased opportunity for photosynthesis. Primary sources of nutrients to the Truckee River include natural background sources, nonpoint sources (e.g., stormwater, irrigation return flows, septic systems), and point source discharges. The largest point source in the watershed is the Truckee Meadows Water Reclamation Facility ("TMWRF") that serves the cities of Reno and Sparks and portions of Washoe County. Total nitrogen (TN) and total phosphorus (TP) water quality criteria for the Truckee River were developed by the Nevada Division of Environmental Protection (NDEP) in the 1970s and have been refined over time, with

the current standards set in 1984. In 1994, NDEP established Total Maximum Daily Loads (TMDLs) for TN and TP in the Truckee River (NDEP, 1993). The 1994 Truckee River TMDL resulted in a total nitrogen allocation of 1000 lb/day, with half of the load (500 lb/day WLA) allocated to TMWRF and the bulk of the remainder to nonpoint sources. The TMDL also specifies a total phosphorus allocation of 214 lb/day, with 134 lb/day allocated to TMWRF and the remainder to nonpoint sources.

~~TMDLs have been established on the lower Truckee River for three constituents, TN, TP, and total dissolved solids ("TDS"). TMDLs are measured at Lockwood under the assumption that if the TMDLs are being met at this location, downstream from TMWRF, they are being met on the rest of the "impaired" river reach. These are by no means the only pollutants in the water at Lockwood; however, they are the pollutants identified as causing water quality impairment and low dissolved oxygen levels. TMDLs are established for pollutants that exceed water quality standards 10 percent or more of the time for a five year period.~~

~~WLAs have been determined for each identified pollutant at each point source. For example, there are allocations for TMWRF, Vista Canyon, and the Sparks Marina Park, which all discharge to the Truckee River.~~ The TMDLs are summarized in Table 4-2. Each entity must comply with its NPDES permit requirements, including discharge limitations designed to meet the WLAs. LAs have also been determined for background and non-point sources. ~~The TMDLs are summarized in Table 4-2.~~

With the exception of TDS, the Truckee River was generally listed as impaired from the reach immediately downstream of Lockwood and continuing downstream to Pyramid Lake. TDS was only shown to impair the river between the east McCarran Bridge and Lockwood, downstream.

In 1994, the state completed three separate TMDLs for TP, TN, and TDS respectively (see Table 4-2). The TN TMDL was set to minimize dissolved oxygen ("DO") violations for the 1988 low flow year. Both the TP and TDS TMDL were set based on average annual flow conditions. TP and TN were addressed in TMDLs due to the relation between nutrient loads, algal breakouts, and the resulting depletion of DO. Once a constituent is addressed in a TMDL, it can be taken off the 303(d) list; therefore, TN, TP and TDS were removed in 1994.

Third Party TMDL Review

From LimnoTech (2016): Reno, Sparks, Washoe County and the Truckee Meadows Water Authority (TMWA) began leading a third-party effort to review the Truckee River total nitrogen and total phosphorus TMDLs starting in the mid-2000s (LimnoTech, 2005). Several factors motivated the TMDL review. Although TMWRF is currently able to comply with the waste load allocation (WLA) designated by the 1994 TMDL, the ability of TMWRF to meet the TN WLA and serve future growth of the service area was thought in the early 2000s to require very costly advanced treatment technologies. In addition to regional growth, other driving factors to TMDL revision included improved river flow operations, advances in understanding the science of river processes, and a desire for more flexible solutions to water quality management. During the years since the 1994 TMDL was approved, new data were collected, new modeling tools were developed, and operation of the Truckee River dams and diversions had changed. The additional data and enhanced modeling tools have improved the understanding of how the river assimilates (i.e., takes up or absorbs) nutrients, and how improved river flows may result in a higher assimilative capacity for nutrients.

NDEP and USEPA agreed that a third-party review of the 1994 TMDL is appropriate to determine whether the assumptions underlying the 1994 TMDL remained valid, and to identify new scientific and technical information and/or changes in conditions and river operations that may warrant a different approach to addressing nutrient issues in the watershed. NDEP has the authority to adopt, modify or reject a third-party Party TMDL based on a variety of factors. USEPA approval of TMDLs is required.

A Truckee River WQS/TMDL Working Group (Working Group) was formed included representatives from Reno (third-party), Sparks (third-party), Washoe County (third-party), TMWA (third-party), Western Regional Water Commission, NDEP, USEPA Region 9, LimnoTech (consultant) and Stantec (consultant). In 2011, the third-parties, NDEP and EPA jointly developed and finalized a TMDL/WQS Review Work Plan to describe process for the review including roles, responsibilities and expectations. In consultation with NDEP and USEPA, the third-parties agreed to facilitate public outreach and obtain input from affected stakeholders at key decision points in the review and revision process.
~~An effort has been underway among Reno, Sparks, Washoe County and TMWA, in collaboration with NDEP and EPA, to conduct a Third Party review of the 1994 nutrient TMDL and applicable water quality standards. The parties believed the effort was appropriate for the following reasons:~~

- ~~Scientists and engineers now have a better understanding of river processes and there have been significant advancements in available software and the predictive capabilities of watershed and water quality models.~~
- ~~Significantly more data exists than were available during the development of the 1994 TMDL. Since 1990, there has been an increase in cooperative data collection on the Truckee River through the Coordinated Monitoring Program, the TRIG web data portal and other efforts.~~
- ~~The combination of extensive data and improved computer modeling tools has greatly increased the general understanding of the Truckee River and related watershed processes and has increased the ability to better simulate the river and watershed with computer models.~~
- ~~The water quality standard for TP was established using a national guideline, rather than a site-specific approach. With advancement in the understanding of Truckee River functions and processes, a site-specific standard may be developed that is protective of the river and its beneficial uses without being overly restrictive.~~
- ~~The hydrologic conditions used in the 1994 TMDL were based on 1988 river operations that deviated significantly from typical operations. 1988 conditions will not be applicable after the implementation of *TROA*.~~
- ~~Low flow projections for a revised TMDL should reflect current and probable future low flow conditions and regulatory requirements as defined by *TROA* implementation.~~
- ~~Determination of the requirements for discharges to the Truckee River will allow long-range wastewater infrastructure planning to be conducted properly.~~
- ~~The 1994 TMDL was not flexible enough to consider restoration and potential future benefits which could result due to changes in the physical conditions of the Truckee River system.~~

~~4.6.2~~ Truckee River Water Quality Modeling ~~for Water Quality~~

The third-parties, with funding from the Western Regional Water Commission (WRWC), retained the services of the consulting firm LimnoTech to conduct the majority of the technical work related to the TMDL review. The foundation of the technical work is the development and application of a set of watershed and river water quality models that provide linkage between nutrient levels in the Truckee River and resulting dissolved oxygen levels.

- Watershed Analysis Risk Management Framework (WARMF) – watershed model
- Hydrological Simulation Program FORTRAN (TRHSPF) – river water quality model

The combination of extensive data and improved computer tools had greatly increased the general understanding of the Truckee River and related watershed processes as well as improved the ability to better simulate the river and watershed under contemporary conditions. The two linked models were run together to provide an understanding of how the Truckee River system assimilates nutrients and complies with dissolved oxygen criteria under a representative flow condition. The models simulated the complex relationship of how nitrogen and phosphorus, in combination with other factors such as temperature and light, can lead to excessive growth of algae and ultimately a situation of depleted dissolved oxygen. The following sections provide a brief summary of both models.

Truckee River Hydrological Simulation Program FORTRAN ("TRHSPF") is an in-stream water quality model used to predict occurrences of low dissolved oxygen resulting from benthic algae, low flow, and other pollutants. It incorporates peer-reviewed empirical and theoretical equations related to the growth, death, nutrient preferences and removal of benthic algae based on the

Table 4-2 Summary of Truckee River Total Maximum Daily Loads, Waste Load Allocations and Load Allocations

DSSAMt model, which is a variation of the DSAMM III model used for the 1994 Truckee River nutrient TMDL.. TRHSPF inputs include projected point source flows and diversions as generated by a water operations model, and tributary flows and non-point source loads from a watershed model.

Source	Nitrogen	Phosphorus	TDS
Load Allocation			
Non-Point Sources/Background	450 lbs/day	75.25 lbs/day	None assigned
Waste Load Allocation			
TMWRF	500 lbs/day (annual average) 500 lbs/day (30 day average, May–Oct.)	134 lbs/day	120,168 lbs/day
Vista Canyon Group	16.7 lbs/day	4.75 lbs/day	9,730 lbs/day
Sparks Marina Lake	33.3 lbs/day	WLA Trade Agreement	19,390 lbs/day
Total Maximum Daily Load			
TMDL	1,000 lbs/day	214 lbs/day	900,528 lbs/day

The Truckee River Operations Model ("TROM") is a water operations model that projects regulatory flows (reservoir releases, diversions) with and without different flow management strategies (e.g., *TROA*) in place. The model accounts for future municipal and industrial ("M&I") demands, and conversion of water rights from agricultural use to M&I. TROM was used to support the *TROA* Environmental Impact Statement/Environmental Impact Review ("EIS/EIR") analysis released in 2008. TROM output, available for a 100-year period, is used for input to the watershed and water quality models to define conditions with and without flow management in place.

Watershed Analysis Risk Management Framework ("WARMF") is a watershed model adapted to the Truckee River basin that predictsforecasts non-point source loads under current and future land use as well as projects potential non-point load reductions. WARMF inputs include meteorology, land use, as well as managed flows provided by TROM (e.g., reservoir releases,

municipal and agricultural diversions). WARMF calculates the distinction between storm water and non-storm water non-point sources and also simulates potential improvements and reductions of non-point source loads from best management practices ("BMPs"), conversion of agricultural lands, and removal of septic systems.

Tributary flows and non-point source loads predicted by WARMF are linked to the in-stream water quality model, TRHSPF. TRHSPF calculates in-stream temperature and constituent concentrations (e.g., nutrients, DO), and has the capability to assess potential nutrient assimilative capacity benefits due to deeper water and cooler temperatures realized through stream restoration. The three linked models, run together under various flow management scenarios, provide an understanding of how the Truckee River system assimilates nutrients and complies with water quality standards. These modeling runs and improved descriptions of riverine conditions are provided on the Truckee River Info Gateway (documents for the runs may be found at www.truckeeriverinfo.org/tmdl) including The Final Truckee River Water Quality Standards Rationale report by LimnoTech (date).

Nevada Nutrient WQS Review

~~4.6.3 Coordination with the~~ PLPT~~'s~~ Water Quality ~~Standards Review and Revisionsand Quantity Goals~~

In January 2007, EPA granted the PLPT "treatment as a state" status for adoption of water quality standards and conducting CWA Section 401 water quality certifications within the boundaries of the Pyramid Lake Paiute Indian Reservation. In September 2008, the PLPT adopted a *Water Quality Control Plan* ("WQCP"), which addresses issues such as beneficial uses, antidegradation, water quality criteria, scientific justification, and implementation plans. The EPA approved the WQCP on December 19, 2008. The WQCP includes narrative and numeric water quality standards for Pyramid Lake, the lower Truckee River and all surface waters within the Reservation.

The WQCP includes numeric water quality criteria for both nitrogen and phosphorus. The total nitrogen standards in the WQCP are identical to the state criteria applicable to the river from McCarran Boulevard to Wadsworth. However, with regard to phosphorus, the WQCP criterion is expressed as orthophosphate, in contrast to the state's 1984 criterion for TP, which is a more stringent standard. The WQCP criterion is designed to protect the most sensitive beneficial uses of the downstream reaches of the river. According to the WQCP, the orthophosphate criterion is "based on its secondary importance in regulating algal growth" (PLPT, 2008). The WQCP notes the advantage of this criterion over TP is that "it regulates the availability of phosphorus to the algae" and avoids triggering exceedances of the water quality standards due solely to increased turbidity, which is separately regulated. The Nevada standard was likely adapted from EPA 304(a) advisory criteria and is acknowledged to be a provisional value awaiting better science.

As noted above, the PLPT recently developed criteria for orthophosphate applicable to downstream reaches of the river within the PLPT's jurisdiction. Given the inconsistency between the two criteria, and the more current nature of the scientific studies underlying the PLPT standards, the Third Parties are pursuing possible revisions to the existing state criteria.

Related triennial reviews have caused delays in the Nevada-based Truckee River standards review, including those for Lahontan Reservoir and Pyramid Lake. As of January 2015, the PLPT has undergone a Triennial Review of their water quality standards and made recommendations for an update to NDEP and US EPA. This review is being reviewed by the regulatory agencies currently. This action has halted Nevada reviews until it is finalized.