Northern Nevada Water Planning Commission

STAFF REPORT

DATE: June 29, 2016

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

FROM: Jim Smitherman, NNWPC Water Resources Program Manager
Chris Wessel, Water Management Planner

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 5, 2015 meeting, staff has incorporated updates to some sections as provided by technical staff from the City of Reno, City of Sparks and Washoe County. Recommended revisions resulting from comments received are shown as redlined edits. Sections highlighted in gray are pending updates. Text highlighted in yellow is for staff purposes. Staff is requesting any additional comments for this chapter 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.

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Attachment: Chapter 4

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Chapter 4 – Wastewater and Watershed-Based Water Quality Planning

Purpose and Scope

This chapter provides background information as well as the current status of regional wastewater facilities and watershed based water quality issues. It also presents a number of planning and management issues that require action and/or further evaluation. These issues must be considered together with other water management planning objectives to determine appropriate future actions and recommendations.

Summary and Findings

Following are the major findings resulting from the analysis of water quality and wastewater treatment issues in the Planning Area:

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Facilities

The five publicly owned wastewater treatment facilities in the Planning Area are each processing sewage at average daily flows well below maximum capacities.

Reclaimed Water

The North Valleys Initiative process showed that reclaimed water can satisfy multiple purposes with the appropriate level of treatment for each specific use.

Expanded use of reclaimed water is feasible and could include uses such as residential landscape irrigation and groundwater recharge or indirect potable reuse ("IPR"). Such uses are being studied with respect to regulatory issues, treatment technologies and public perception. Public involvement will be an important aspect of the decision-making process concerning expanded uses of reclaimed water.

Septic Systems

An Oregon study of nitrogen-reducing septic systems installed at residences 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 milligrams per liter ("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. Artificial groundwater recharge using fresh water injected into the aquifer, such as in Golden Valley, has also proven beneficial in improving water quality with respect to nitrate.

Watershed / Water Quality

The Truckee River water quality standard for total phosphorus was established by the state 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 can be developed that is protective of the river and its beneficial uses without being overly restrictive.

The hydrologic conditions used in the 1994 Truckee River total maximum daily load ("TMDL") were based on 1988 river operations that deviated significantly from typical operations and 1988

conditions will not be applicable after the implementation of the *Truckee River Operating Agreement* ("*TROA*").

The current Storm Water National Pollutant Discharge Elimination System ("NPDES") permit was issued to the City of Reno ("Reno"), the City of Sparks ("Sparks") and Washoe County on May 26, 2010, and requires an update of the Storm Water Management Program within 18 months of the issue date (November of 2011).

Based upon conversations with the Nevada Division of Environmental Protection ("NDEP") and observations of national regulatory trends, the Storm Water Permit Coordinating Committee anticipates that there will be a waste load allocation ("WLA") assigned to Truckee Meadows storm water in the future.

Introduction

Regional wastewater treatment facilities provide an effective means to manage the area's water resources and meet water quality objectives. The treated effluent, or reclaimed water ~~is treated to~~ meets high water quality standards, and is returned back into the environment. Reno and Sparks have each created Environmental Control pretreatment programs which further protect the integrity of the large wastewater treatment systems. ~~Additionally, reclaimed water use is also providing a beneficial use for the treated effluent.~~ 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.

The Truckee River and its tributaries face water quality challenges, and varied regulations have been set forth by the Clean Water Act to protect water quality and the watershed. In addition to receiving treated effluent~~ment plant discharges~~ from the Truckee Meadows Water Reclamation Facility ("TMWRF") and an upstream California facility east of Truckee, the Truckee River carries snowmelt, rainwater and urban storm water – each of which may carry diffuse sources of pollutants, such as suspended sediment or dissolved solids. These diffuse sources ~~of pollutants~~ are referred to as non-point source pollution. Treatment plant discharges (point sources) and non-point sources ~~of pollution~~ have the potential to impair water bodies and therefore are regulated by NDEP and the U.S. Environmental Protection Agency ("EPA") to protect water quality.

A host of agencies and groups involved in monitoring water quality on the Truckee River system signed a Memorandum of Understanding ("MOU"), agreeing to coordinate their programs for better public understanding of the river's health. In efforts to manage non-point sources ~~pollution~~ entering the river, restoration projects in the Truckee River watershed have been funded and planned, and several have been implemented. A prioritized list of lower Truckee River restoration projects are in various stages of completion and monitoring. Tributaries to the Truckee River have also been assessed ~~annually~~ to prioritize stream restoration efforts. Reno, Sparks, and Washoe County jointly hold a federal NPDES permit to manage urban storm water quality and have signed an MOU for joint protection of the Truckee River watershed.

4.1 Wastewater Service Providers

Figure 4-1 depicts 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 sections. ~~Three small private facilities have also operated in the region for years;~~

~~however, two of these facilities, Verdi Meadows and Boomtown, were decommissioned recently and connected to the Lawton/Verdi interceptor, which conveys the wastewater to TMWRF for treatment.~~

Table 4-1 Wastewater Treatment Facilities

Facility	2015~~09~~ Average (Permitted) Daily Flow	Hydrographic Basin	Owner	Comment
Truckee Meadows Water Reclamation Facility	26.3~~5~~ 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
~~Verdi Meadows Wastewater Treatment Facility~~	~~Decommissioned~~	~~Truckee Canyon~~	~~Verdi Meadows Utility Company~~	~~Flows diverted to TMWRF~~
~~Boomtown Wastewater Treatment Facility~~	~~Decommissioned~~	~~Truckee Canyon~~	~~Boomtown~~	~~Flows diverted to TMWRF~~
~~Gold Ranch Wastewater Treatment Facility~~	~~0.010 MGD (0.010 MGD)~~	~~Truckee Canyon~~	~~Gold Ranch~~	~~Flows will be diverted to TMWRF~~
South Truckee Meadows Water Reclamation Facility	3~~2~~.16~~5~~ MGD (4.1 MGD)	Truckee Meadows, Pleasant Valley	Washoe County	100% reuse of effluent
Reno-Stead Water Reclamation Facility	1.4 MGD (2.0~~35~~ 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 ~~which~~ provide deep water wildlife habitat
Cold Springs Wastewater Treatment Facility	0.30~~28~~ MGD (0.70 MGD)	Cold Springs Valley	Washoe County	Rapid infiltration basins

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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 water quality objectives. The water is treated to high standards, and returned back into the environment for beneficial use. Additionally, reclaimed water ~~use is providing a beneficial use for the treated effluent. 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.

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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.~~TMWRF is located on the east side of the Truckee Meadows at the confluence of Steamboat Creek and the Truckee River. The facility serves the central Truckee Meadows, including areas within Reno, Sparks, the Sun Valley General Improvement District ("SVGID"), and portions of unincorporated Washoe County that are within the Truckee Meadows and Spanish Springs Valley. The TMWRF sewer system conveys wastewater flows from the Truckee Meadows, Spanish Springs Valley, Sun Valley, Verdi/Truckee Canyon, and portions of the Golden Valley and Lemmon Valley hydrographic basins through a combination of gravity sewers, inverted siphons and lift stations.~~ 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.

Beginning in 2012 an aggressive Capital Improvement Plan was implemented to identify and replace process equipmenet 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. ~~Reno and Sparks commissioned the construction of TMWRF in 1964 and the Cities have jointly owned and operated TMWRF since 1967, when the first phase of the present treatment facility was completed with a permitted capacity of 20 million gallons per day ("MGD"). In 1978-80 the TMWRF permitted capacity was expanded to 30 MGD and phosphorous removal facilities were added. In the 1980s the TMWRF permitted capacity was increased to 40 MGD and nitrogen removal facilities were added. The TMWRF Phase III Expansion Project was initiated in 1999 and was completed in 2007. The goal of the project was to replace older equipment, upgrade treatment processes, and increase the permitted capacity to 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.

~~TMWRF has a permitted capacity of 44 MGD, a design capacity of 40 MGD, and currently operates at about 28 MGD. The design capacity is limited by the loading capacity of the secondary clarifiers. The TMWRF unit processes are designed and operated to meet the stringent permit limits established for the discharge of nitrogen and phosphorus to the Truckee River. The total phosphorus limit of 134 pounds per day ("ppd") is maintained with aeration basins configured with selector zones to achieve biological phosphorus removal ("Bio-P"), tertiary effluent filtration and the treatment of dewatering centrate with ferric chloride. The total nitrogen limit of 500 ppd is maintained by passing all secondary clarifier effluent through nitrification towers and denitrification reactors. Typically, the filtered TMWRF effluent contains less than 0.3 mg/L of total phosphorus ("TP") and less than 2.0 mg/L of total nitrogen ("TN"). TMWRF effluent is disinfected and dechlorinated prior to discharge to Steamboat Creek. During irrigation season, typically April through September, approximately 4,000 acre feet ("af") (7 MGD) of TMWRF effluent is pumped to reuse sites in Reno and Sparks.~~

~~Primary solids are gravity thickened to 4 percent solids prior to anaerobic digestion. The primary sludge thickener serves as a fermenter, producing volatile fatty acids to support the Bio-P process. Waste activated solids are thickened to 4.5 percent solids with diffused air floatation prior to anaerobic digestion. The thickened sludge streams are combined just prior to entering the digester complex. The anaerobic digestion process includes one acid phase digester and four standard digesters. All digesters are operated in the mesophilic range with mechanical mixing. A fourth digester is used as a holding and feed tank for the centrifuge dewatering operation. The digested sludge is dewatered with vintage Bird centrifuges to 16 to17 percent solids content. The dewatered solids are hauled daily to the local municipal landfill. The gas from the acid phase digester is flared for odor and air emission control. The gas from the standard digesters is burned to heat water and the excess is flared. The hot water is used for heating digester sludge and for heating the TMWRF buildings. A project to replace the aging electricity generator, which is driven by an engine fueled with digester gas, is being developed with the goal of generating nearly 40 percent of the TMWRF electrical demand with digester gas.~~

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 the the Joint Coordinating Committee, comprised of elected and appointed representative from both cities. ~~Sparks employs the TMWRF staff and manages the day to day operations of the facility. Reno provides oversight of the TMWRF budget, capital improvements, facilities planning, regulatory compliance and permitting issues. Reno and Sparks share the cost of the TMWRF operations and maintenance budget under a long-standing agreement, which apportions costs based on the measured sewer flow generated within each City's service area. Currently, Reno funds about 70 percent of the TMWRF costs and Sparks about 30 percent. The TMWRF costs represent about 33 percent of Reno's and Sparks' non-capital sewer budgets. TMWRF has an estimated replacement value of at least $500 million.~~

~~The ownership of the TMWRF capacity is shared between Reno and Sparks via an Interlocal Agreement: Reno owns 31.9 MGD capacity (68.6 percent) and Sparks owns 14.48 MGD capacity (31.4 percent).~~

~~Reno has agreed with Sparks and Washoe County to allocate 1.35 MGD of its capacity to serve areas outside of its corporate limits. Likewise, Sparks has agreed with Reno and Washoe County to allocate 2.88 MGD of its capacity to serve areas outside of its corporate limits. SVGID has an agreement with Sparks for up to 1.80 MGD of capacity to serve SVGID customers, 0.48 MGD of which is reserved for Washoe County customers connected to TMWRF through the SVGID interceptor. SVGID has a separate agreement with Sparks to lease another 0.3 MGD capacity for future SVGID growth. Washoe County has an agreement with Sparks that reserves capacity up to 0.78 MGD to serve customers in Spanish Springs and will make capacity available to Washoe County above 0.78 MGD for customers in Spanish Springs if capacity exists.~~

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.

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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 ~~of Water Resources~~ ("WCSD~~WR~~") 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~~secondary~~ treatment facility ~~with tertiary filtration~~. The facility is presently permitted for 4.1 MGD (influent flow, 30 day average), expandable to at least 6 MGD. STMWRF ~~currently serves 11,700 customers in the South Truckee Meadows and~~ current influent flow is approximately 3.0~~2.6~~ MGD.

The treatment process consists of influent pumping, fine screening, metering, and secondary treatment by oxidation ditch process combined with four~~two~~ conventional secondary clarifiers for solids separation. ~~Effluent from the facility is f~~Filteration~~ed,~~ and disinfection~~ed~~ achieve reclaimed water meeting State of Nevada Category A standards.~~to the 2.2 Total Coliform Standard,~~ Reclaimed waer is stored year-round in the Huffaker Reservoir, and ~~re~~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~~elevation 4,482~~. Waste solids are aerobically digested, dewatered and disposed at the Lockwood Regional Landfill~~pumped to TMWRF for final treatment and disposal~~.

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. ~~The St. James's subdivision is planning a~~ A future sewer interceptor alignment that will follow U.S. 395 south through Pleasant Valley is envisioned~~before turning west toward that subdivision~~.

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~~Reno recently completed an expansion which increased treatment capacity to 2.0 MGD~~. 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~~, similar to the solids disposal operation at STMWRF~~.

The RSWRF has the capacity to treat an annually averaged monthly flow of 2.0~~35~~ MGD. Average daily flows are approximately 1.4 MGD. Treated~~he plant~~ 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 ~~All effluent~~ 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.~~Effluent discharged to the creek is dechlorinated to meet the 0.1 mg/L total residual chlorine concentration standard~~.

4.2.4 Lemmon Valley Wastewater 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.

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.~~In 1997, a nitrate plume in the shallow aquifer of Cold Springs Valley was found to exceed the 10 mg/L state action level. Monitoring of the shallow aquifer in 2001 showed a significant increase in the nitrate concentrations. The *Cold Springs Wastewater Facility Plan* (KJC, 2002) recommends alternatives that include sewering several areas currently served by septic systems. Based on groundwater studies, once these areas are taken off septic systems, the nitrate concentrations in the shallow aquifer should start a gradual decrease to below the 10 mg/L action level. New development in the area is connecting to CSWRF.~~

CSWRF ~~has recently been changed from the former sequencing batch reactor ("SBR") facility collecting and treating 0.35 MGD, to a new 0.7 MGD (average daily flow) facility including a new~~ consists of a headworks, oxidation ditch, ~~solids processing facilities,~~ and two secondary clarifiers~~ to aid in activated sludge wasting and recycling~~. 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.~~ sludge digestion prior to sludge dewatering via centrifuge for landfill disposal.~~

4.3 Regional Wastewater Facility Planning

(Re-word this in terms of opportunities to enhance operational flexibility and alternatives for managing reclaimed water.) ~~The reuse and disposal of r~~Reclaimed water from the various water reclamation facilities in the Planning Area may eventually be constrained by a number of factors if the respective reclaimed water systems~~y~~ continue to be operated as independent systems. Constraining factors may include compliance with existing or future water quality standards, lack of future reclaimed water customers, lack of winter storage… Regional water 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, as well as future demands within and outside the TMSA
- 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

With regional coordination and cooperation, the possible uses for reclaimed water could be expanded to include uses such as residential landscape irrigation, groundwater recharge or indirect potable reuse. NDEP does not permit the use of reclaimed water on residential homes and is not currently considering a change in this position. However, the use of high quality reclaimed water for non-potable and indirect potable~~these~~ purposes~~, or others,~~ would provide additional means of beneficially utilizing the reclaimed water, while at the same time extending the region's limited water supplies.

High-level plans for wastewater infrastructure improvements envisioned to provide for the needs of the Planning Area's service providers to the year 2030 are included in two documents completed in late 2007 and early 2008: the *City of Reno and Washoe County TMSA/FSA Water, Wastewater and Flood Management Facility Plan* (ECO:LOGIC, 2007) and the *City of Sparks Conceptual Facility Master Plan* (Stantec, 2008). Together these facility plans comprise the most current comprehensive, regional planning-level compilation available and serve as important sources of information for this chapter. Although not specifically incorporated in this Plan, the utility providers each have facility repair and replacement programs in place to upgrade the existing systems and maintain the integrity of the region's existing water and wastewater infrastructure.

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4.3.1 North Valleys Planning

In 2008, the Northern Nevada Water Planning Commission and the Western Regional Water Commission initiated a collaborative effort among key staff from Reno, Sparks, WCDWR, SVGID and the Truckee Meadows Water Authority ("TMWA") to develop recommended solutions to certain water issues in the Planning Area using current water management circumstances in the North Valleys.

It is important to recognize that the circumstances in the North Valleys that led to this planning effort included a relatively high growth rate, planned water importation and an abundance of undeveloped land uses and zoning. The *2004-2025 Regional Water Plan* anticipated significant growth in the Lemmon Valley area, as a result of approved population growth forecasts and Regional Plan designations of a Transportation Oriented Development Corridor and a Regional Center for the Stead area.

At that time, a federal environmental impact statement ("EIS") was in review for two proposed projects to import approximately 11,500 af of potable water to the North Valleys from groundwater sources further north in Washoe County. Water purveyors in Lemmon Valley include TMWA and WCDWR with SVGID immediately to the east. Water importation facilities were planned to terminate closest to WCDWR infrastructure. Reno and Washoe County were evaluating build-out wastewater collection, treatment and disposal facilities from the perspective of an integrated system within the Lemmon Valley and Stead area. Reno, planning to provide wastewater services for new growth, was engaged in final design for RSWRF improvements to increase treatment and disposal capacity to 2.0 MGD, with specific improvements sized to accommodate flows up to 4.0 MGD.

Constraints on wastewater effluent discharge to Swan Lake and effluent reuse led to the conclusion that any new potable water source brought into the Stead-Lemmon Valley area that increased wastewater flow to the RSWRF above 2.0 MGD would require additional effluent

management techniques, such as exportation from the hydrographic basin or irrigation reuse with significant off-season storage. One of the lower cost alternatives appeared to be exportation of effluent from the basin, however this option brought up issues regarding efficient use of water resources and possibly missing an opportunity to expand the total available resources in the basin.

These water, wastewater and reclaimed water issues in the North Valleys were selected as a representative example of significant multi-jurisdictional concerns to be addressed through a collaborative process, referred to as the North Valleys Initiative ("NVI"). The recommended solutions and lessons learned from this process can be applied to other similar regional water management issues within the Planning Area.

ECO:LOGIC (2007) estimated that future wastewater flows from Stead and Lemmon Valley could eventually reach as much as 8,000 af per year ("afa"), based on the long-term development potential. The Swan Lake wetlands and playa can benefit from more water, and an agreement has been reached with the Swan Lake Advisory Committee and NDEP to allow as much as 2,240 afa to be released to the playa in the future. This is the maximum amount of water that the wetlands and playa can accommodate. More water could disrupt the natural wetland and playa processes and increase potential 100-year flood hazards for surrounding properties. Other means to reuse or dispose of the reclaimed water will be needed.

Cold Springs is in a similar situation. Currently, the reclaimed water from CSWRF percolates into the groundwater through a series of infiltration basins. The amount of water the basins can infiltrate is limited; therefore, the disposal capacity will not be sufficient for the projected future flows. Because of their proximity and similarities concerning water supply and wastewater disposal, NVI considered Stead, Lemmon Valley and Cold Springs as one planning area.

A number of alternatives for reusing and/or disposing of treated wastewater effluent have been evaluated in the past. For instance, plans have been developed to expand the reclaimed water distribution system in the Stead area to include existing and future commercial irrigation demands. Future irrigation demands could require hundreds of additional af of reclaimed water per year. Some additional reuse and disposal alternatives allowed under current NDEP regulations and policies include:

- Create beneficial year-round wetlands at the White Lake playa, similar to what has been developed as a park and wildlife viewing area at Swan Lake
- Export to Long Valley Creek in California, which could provide an outlet during the non-irrigation season or other periods when not all of the reclaimed water generated in the area can be placed to beneficial use
- Export to other areas such as Bedell Flat or Warm Springs
- Considering these alternatives, the NVI team developed other options that would make better use of the reclaimed water resource. In general, potential water resource benefits could include water supply reliability for both municipal and domestic wells, a new source of water to help meet water rights and water quality obligations, and more water available for the environment.

Research of reclaimed water uses throughout the United States showed that numerous states, including California, Arizona, Washington and Idaho, allow reclaimed water use for residential landscape irrigation. Most notably, the award-winning community of Serrano, in El Dorado Hills, California, has been successfully using reclaimed water to irrigate both front and back yard landscaping throughout the development for ten years.

Citizens locally are already familiar with the reclaimed water irrigation systems in widespread use today in the South Truckee Meadows and Sparks. These systems are used to supply irrigation water to schools, parks and landscape medians. In Nevada however, NDEP does not permit the use of reclaimed water for residential homes and is not officially considering a change in this position. One reason is that Nevada's current reclaimed water regulations do not provide for the same level of treatment and reliability as required in states that allow residential landscape irrigation. To allow reclaimed water use for residential irrigation, changes to the regulations would be necessary, as would improvements at the wastewater reclamation facilities to provide the necessary high quality water.

Another use of reclaimed water in other states is groundwater recharge. California, Arizona, Texas and Florida are leading the way in advancing technologies and regulations to expand this practice. Groundwater recharge is being performed for a number of reasons, such as to form a water quality or sea water intrusion barrier, to bolster declining groundwater levels due to over-pumping, and to augment potable water supplies, referred to as indirect potable reuse ("IPR"). The Orange County Groundwater Replenishment System in California is the best example of a large-scale reclaimed water groundwater recharge project implemented in the United States. The following excerpt is taken from the Overview section of the Groundwater Replenishment System website (www.gwrsystem.com):

The Groundwater Replenishment System has evolved and changed over time as new goals, data, regulations and facts have been identified. However, the needs and benefits of the project have remained constant:

- Orange County needs more reliable, high-quality water in the future to replenish the groundwater basin, to protect the groundwater basin from seawater intrusion, and for industrial uses.
- The Groundwater Replenishment System decreases Orange County's reliance on imported water from northern California and the Colorado River.
- The Groundwater Replenishment System's locally-controlled water helps drought-proof Orange County.
- The Groundwater Replenishment System helps reduce mineral build up in Orange County's groundwater by providing a new source of ultra-pure water to blend with other sources, including imported water.

Many of these benefits, and others, could be realized locally with additional uses of reclaimed water. Residential landscape irrigation could play a significant role in meeting future water supply requirements. Highly treated reclaimed water could be used as an economic development incentive to attract specialized water intensive industries to commercial and industrial properties. Reclaimed water could be used to enhance existing wetlands, develop new ones, and help maintain important wildlife habitat. Groundwater replenishment could also be implemented with purified reclaimed water in a technically and environmentally sound manner that would enhance the sustainability of the region's water supplies.

These new uses of reclaimed water would require regional coordination and cooperation among local governments, water and wastewater service providers, regulatory entities and other stakeholders. With appropriate treatment, regulatory oversight and public engagement in the decision-making process, reclaimed water resources could be used to help provide watershed sustainability.

Reno's Advanced Treatment Pilot Test: In addition to the NVI process, an ongoing advanced treatment pilot study at RSWRF has been undertaken by Reno and ECO:LOGIC Engineering. Consideration of groundwater replenishment and IPR using highly treated municipal wastewater effluent must include demonstration of safe, reliable water quality, practicality, affordability and public acceptance. Coastal communities such as Orange County, California utilize reverse osmosis ("RO"), high-energy ultraviolet ("UV") and peroxide treatment because RO brine disposal to the ocean is available. This approach may be neither affordable nor appropriate for many inland areas such as the Truckee Meadows.

To address the feasibility of IPR without RO, Reno developed an alternative treatment demonstration project for public review and regulatory evaluation using either sand filtration or membrane filtration ("MF"), ozonation ("O3"), and biologically activated carbon ("BAC"). Reno's pilot project successfully demonstrated the ability to produce a water quality that meets or exceeds all drinking water regulations, and reduces many non-regulated compounds to very low or non-detect concentrations without increasing the corrosivity of the water (ECO:LOGIC, 2009).

Compared to RO-high energy UV systems, Reno's MF-O3-BAC process has the benefits of multi-barrier treatment for all major categories of contaminants of concern, which provides additional reliability; lower capital costs; lower operation and maintenance ("O/M") costs and simpler O/M tasks; lower energy use because of the high energy demand of RO; and eliminates treatment and disposal of process reject water.

Regulatory Collaboration: A number of specific activities and workshops were conducted for the benefit of NDEP and WCDHD. CH2MHill was hired to meet independently with regulators from NDEP and WCDHD to obtain feedback regarding the implementation of expanded reclaimed water uses. Possible changes to the existing Nevada Administrative Code ("NAC") and/or Nevada Revised Statutes ("NRS"), proposed public education and input programs, and additional studies relative to health impacts and reuse options were the primary take-home messages from these interviews.

NDEP also initiated discussions with the WCDHD concerning the potential use of reclaimed water for residential use. Issues being discussed will be addressed through NDEP's permitting process of wastewater treatment facilities and include appropriate effluent limitations, treatment reliability standards, as well as compliance points and assurances. Additionally, NDEP would need to seek a change to NAC 445A to include higher water quality standards and treatment requirements. Assuming regulatory changes were completed, a service provider would need to request a modification of its permit. NDEP does not regulate, nor does it have the authority to regulate, a residential reclaimed water program; therefore, the County or other local government would have to be the primary regulatory agency. All of these issues will need to be resolved prior to any future decision on residential reuse.

Cost of Service Evaluation: A planning level evaluation of the various costs of three disposal or reuse scenarios was also conducted. The evaluation considered the cost implications of both water supply and wastewater disposal for three scenarios. Each scenario considered RSWRF's next 2-MGD expansion for wastewater treatment and disposal. Scenario 1 is representative of the current water management approach; import water to the North Valleys, use it once, treat it and dispose of it. Discharge of the treated wastewater to Long Valley Creek was selected as a representative disposal alternative to evaluate this scenario.

Scenario 2 represents expansion of existing reclaimed water uses by incorporating front and back yard residential irrigation for new construction. Factors such as added costs for

wastewater treatment, dual water systems, reduced water rights, differences in potable water distribution piping and connection fees were taken into consideration. In coordination with the NVI team, Sparks contracted for an outside evaluation by Optimatics, Inc. to evaluate the differences between a conventional water distribution system, and a dual water system where residential irrigation demands were provided by reclaimed water. The evaluation generally concluded that a dual water system costs about twice as much as a conventional system. This result is due to the reclaimed water system requirement for a 10-hour, night-time irrigation period, rather than spreading the demand out more evenly over a 24-hour period. The local fire department's requirement to provide fire flows from the potable system also prevents downsizing the potable system.

Scenario 3 represents one potential IPR scenario, whereby treated wastewater is purified through an advanced treatment process, and recharged to replenish the local aquifer. For cost estimating purposes, Reno's MF-O3-BAC pilot treatment process was utilized, and it was assumed that the water would be recharged on Washoe County property north of the Stead Airport, which is an area generally isolated from municipal and domestic wells.

Conclusions: The NVI team presented the findings from this work to management and director level staff of Reno, Sparks, Washoe County, TMWA and SVGID. Interestingly, based on the available information, the estimated capital costs for water and wastewater service for each of the three scenarios, including water rights, is approximately equal. After reaching this conclusion, the general consensus from the NVI team was, if the region is going to spend the same amount of money for water and wastewater infrastructure, regardless of which disposal or reuse scenario is implemented, the region should make the investment that maximizes the benefits provided by the available water resources.

An additional conclusion was that the feasibility and public perception issues associated with implementing a groundwater recharge option using reclaimed water, impacts the implementation of other forms of reuse. In many cases, groundwater recharge provides the most efficient and productive use of reclaimed water resources. It can also result in higher overall water quality for the region. Past experience in other states, however, has shown that proposals to replenish potable water supplies using reclaimed water can meet resistance despite the compelling benefits that groundwater recharge could provide. Groundwater recharge does not diminish the benefits of other forms of reuse, such as the current practice of non-potable irrigation reuse in specific areas and applications. As stated above, decision-making will require regional coordination and cooperation among local governments, water and wastewater service providers, regulatory entities, other stakeholders and the public.

Much has been learned regarding the use of reclaimed water for residential irrigation and groundwater recharge, and what will be necessary to move forward with implementation of one or both alternatives. Many issues would need to be addressed, depending on what direction the region wants to take in using reclaimed water to help develop and implement sustainable solutions, such as:

- Updating existing or establishing new reuse ordinances
- Addressing public health protection responsibilities
- Recommending and implementing new water rights policies (many potential issues, such as reduced water rights dedication could be an outcome)
- Obtaining local and state regulatory buy-in for expanded use of reclaimed water (residential irrigation/storage options/aquifer storage and recovery ("ASR")/IPR)

- Recommending and implementing more consistent reclaimed water rate structures (connection and O/M fees)
- Addressing technical challenges (storage options, effluent management plans, cross-connection control, inspection, etc.)
- Recommending administrative roles (i.e., does each utility manage their own system or does one entity oversee the entire reclaimed system?)
- Developing a community outreach program

The NVI process also resulted in a broad realization that reclaimed water is not limited to one product or one type of use. Reclaimed water is a resource that can satisfy multiple purposes where the water quality is tailored to the specific use. Reclaimed water can provide high quality water for people, a healthy economy, and a healthy environment.

4.3.2 Interconnection of Reno-Stead Water Reclamation Facility to Spanish Springs Valley

Connecting the RSWRF to the reclaimed water system in Spanish Springs with an intertie pipeline may provide substantial benefits to the community. Sparks has an extensive reclaimed water system, with existing demands approaching 2,000 afa. The City is also looking at serving additional customers, such as the West Pyramid area, which have estimated year-round demands of 750 af. If reclaimed water from RSWRF could be used to meet a portion of these existing and future demands, the displaced water from TMWRF would be available to satisfy additional beneficial uses. For example, the reclaimed water could be recharged in Spanish Springs to help replenish the local aquifer as part of a long-term groundwater management strategy. The RWPC previously determined that the available water rights are out of balance with available groundwater resources in Spanish Springs, and recommended that stakeholders in this basin work together to ensure a comprehensive sustainable management plan for the basin is implemented.

The displaced water could also be used to provide additional irrigation demands in the Truckee Meadows, such as extension of the reclaimed water system to other areas within Sparks and Reno. The displaced water could also provide increased flows in the Truckee River, as long as the TMWRF discharge permit conditions and wasteload allocations ("WLAs") are satisfied. Alternatively, an intertie pipeline could be used to convey reclaimed water from Sparks to Stead. Operation of the pipeline in this manner could be beneficial to help TMWRF meet discharge permit limitations, or it could provide additional reclaimed water for aquifer storage and recovery in Lemmon Valley or other groundwater basins.

4.3.3 Interconnection of Truckee Meadows Water Reclamation Facility to South Truckee Meadows Water Reclamation Facility

A reclaimed water intertie pipeline, which would interconnect TMWRF and STMWRF via Huffaker Reservoir, is another alternative that has the potential to provide regional benefits. The TMWRF supply would provide additional seasonal irrigation water to the South Truckee Meadows that would facilitate the earlier conversion of tributary creek water currently used for irrigation to potable supplies.

The interconnection could also provide a potential short-term solution to help TMWRF meet discharge limitations to the Truckee River. For instance, as the TMWRF service area continues to develop, reclaimed water in excess of the permit limit could be sent to Huffaker Reservoir. In this case, the excess flow could be used for irrigation in the summer months and stored in the

winter months. The winter storage volume could either be used for the next year's irrigation season or returned to TMWRF and discharged to the Truckee River during low effluent flow periods. An integrated water balance of existing and future TMWRF and STMWRF flows, discharges, reclaimed water demands and storage is needed to determine the feasibility of this alternative.

~~***4.3.4 Decommissioning of the Gold Ranch Wastewater Treatment Facility***~~

~~The Gold Ranch Wastewater Treatment Facility is a small privately-owned extended aeration activated sludge treatment facility utilizing ON/OFF aeration. It has a rated capacity of 25,000 gallons per day ("GPD") and currently processes 10,000 GPD serving the Gold Ranch tourist commercial property near the California – Nevada border. Effluent disposal is via a leach field system.~~

~~Reno and Washoe County have taken a proactive approach in developing plans to identify possible pollutant loading to the Truckee River within the Verdi area. A general consensus has been to plan for facilities that will remove the major wastewater contributions from this area and sewer to TMWRF. In 2001, Washoe County received federal grant funds and moved forward with the extension of the Lawton/Verdi Interceptor. The Boomtown and Verdi Meadows areas were connected to the interceptor, and their respective wastewater treatment facilities have been decommissioned. The interceptor will also allow for removal of numerous septic systems, and the future decommissioning of the Gold Ranch Wastewater Treatment Plant. This facility's discharge permit contains a condition requiring it to be abandoned when the Lawton/Verdi Interceptor is available.~~

4.4 Wastewater Planning for Other Areas

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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.

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Figure 4-2 Truckee River Wastewater Treatment Systems

4.4.3 Washoe Valley

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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 not easily calculable or measurable. 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. 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 system 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).

WCDWR has identified areas of water 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.

Using lessons learned in these areas, and especially in Spanish Springs Valley, WCDWR expanded the scope of the septic system effluent investigation throughout the densely populated portions of Washoe County (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 water quality degradation. The final report identifies data gaps, prioritizes and makes recommendations for further study and analysis.

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

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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), 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:

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- 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 state and 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.

4.6 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 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~~'s~~ 2012~~06~~ Water Quality Integrated Report ("Integrated Report"~~303(d) Impaired Waters List ("303(d) List")~~ 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~~by all~~ sources, and form~~s~~ the basis for targeting water bodies for watershed-based solutions. Nevada's most recent Integrated Report with its ~~303(d) L~~list of impaired waters was~~,~~ approved by the EPA in 2014~~09,~~ and can be obtained online at http://ndep.nv.gov/bwqp/file/IR2012_Report_Final.pdf~~http://ndep.nv.gov/bwqp/file/303d_list09-att1.pdf~~.

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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 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").

Truckee River Total Maximum Daily Loads

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~~the~~ five year ~~303(d) listing~~ 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. 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.

TMDL Review ~~and Revision~~

An effort has been~~is~~ 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~~is~~ parties believed the effort ~~i~~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~~can~~ 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 c~~C~~onditions 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 Modeling for Water Quality

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. 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.

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

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 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 forecasts 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.

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4.6.3 Coordination with the PLPT's Water Quality and 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.

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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.

4.6.4 Truckee Meadows Regional Storm Water Quality Management Program

In the 1980s, studies conducted by the EPA and others indicated that storm water runoff from urbanized areas is a leading cause of impairment to the nation's receiving water bodies. These studies and numerous legal actions by environmental organizations culminated with the publication of federal regulations that required municipalities to control non-point source pollution in urban runoff that flows through their storm drain systems. The regulatory process began in 1987 when Congress amended the CWA. In 1990, under Phase I, the EPA required NPDES permit coverage for storm water discharges from medium and large municipal separate storm sewer systems ("MS4s") located in urban areas with populations of 100,000 or more. On March 10, 2003, Phase II of the NPDES storm water program became effective. In addition to requiring permit coverage for certain regulated small MS4s, Phase II also lowered the threshold for regulation of construction activities from 5 acres to 1 acre of land disturbance.

The following policy supports the Truckee Meadows Storm Water Quality Management Program ("TMSWMP"):

Policy 3.1.f: Adoption of Uniform Storm Water Quality Programs

> *A storm water quality program shall be implemented region-wide, including the continuation and/or enhancement of existing programs in Reno/Sparks/Washoe County, such as the Truckee Meadows Regional Storm Water Quality Management Program, to address not only urban runoff but also other non-point source contributions.*

Storm Water NPDES Permits Pertinent to the Truckee Meadows and Nevada

Per federal regulations (40 CFR § 122.26), NDEP has issued the following three baseline general permits that regulate storm water discharges in the Truckee Meadows:

- The Municipal Storm Water Discharge Permit (NVS000001) was issued to Reno, Sparks and Washoe County~~. The current~~ effective ~~term is~~ May 26, 2010 to May 25, 2015, renewed permit has been requested and is expected in 2016;
- The General Permit for Storm Water Discharges Associated with Construction Activity (NVR100000), effective January 5, 2015 to January 2020~~term: September 16, 2007 to September 15, 2012~~;
- The General Discharge Permit for Industrial Activity (NVR050000), effective ~~term:~~ September 22, 2008 to September 21, 2013.

The full text of each of these permits can be viewed at http://ndep.nv.gov/bwpc/storm01.htm. The requirements of these permits apply to all urban development, whether public or private. Each permit indicates that a minimum set of BMPs shall be implemented and pollutants in storm water discharges shall be controlled to the maximum extent practicable. Maximum extent practicable ("MEP") is a regulatory standard developed by the EPA that has been interpreted to give local governments some flexibility in developing storm water management programs that are adapted to their local conditions.

Truckee Meadows Municipal Storm Water Discharge Permit

The Municipal Storm Water Discharge Permit authorizes storm water discharges into receiving waters of the United States within Reno, Sparks and Washoe County. The permitted area includes the limits of the urbanized area within the TMSA as established by the Truckee Meadows Regional Plan. This area includes areas which are, or could reasonably be, urbanized within the time covered by the permit.

Program Schedule and Annual Reporting Requirements

The most recent five-year permit was issued to the Truckee Meadows on May 26, 2010. Reno, Sparks and Washoe County ~~a~~were required to update the *Storm Water Management Program* ("SWMP"), the document describing permit compliance for all components of the program for the~~is~~ permit term. Stantec Consultants was hired to provide an updated SWMP in December 2011, providing ~~within 18 months of the issue date or by November of 2011. This will warrant~~ an analysis~~evaluation~~ of the program element needs, activities and schedule for the permit term ~~from the present to 2015~~. This document will remain in place until a new permit is issued and will describe the timeline for annual report submittals in January each year to report on the previous fiscal year. When a new permit is issued, the SWMP will require an update to meet regulatory requirements described in the new permit.
~~The permit also outlines the structure and requirements for an annual report that must be submitted to NDEP each January.~~

Background

The NDEP issued the first NPDES Municipal Storm Water Discharge Permit jointly to Reno, Sparks, Washoe County and the Nevada Department of Transportation ("NDOT") in 1990. The four entities entered into an interlocal agreement and formed the Truckee Meadows Storm Water Permit Coordinating Committee ("SWPCC"). The purpose of the committee was to define responsibilities and funding options for implementing the required components of the permit, and to submit annual reports to NDEP and the EPA.

Early on, the SWPCC conducted monitoring of various land uses, drafted a construction site best management handbook in 1994, and considered impacts of various street sweeping technologies. The NPDES storm water permit has a five-year term. However, NDEP did not issue the second permit until the year 2000. The 2000 permit more explicitly directed the four permitted entities to develop, administer, implement and enforce a SWMP that addressed:

- Intergovernmental Coordination
- Construction
- Industrial
- Illicit Discharge and Detection
- Monitoring

- Land Use Planning
- Structural Controls
- Municipal Operations
- Public Outreach

Each of the elements will be discussed further as to what has been accomplished, future compliance issues and needs, and the role of the Regional Water Management Fund ("RWMF") will be summarized.

The goal of the program is to implement BMPs and reduce the pollution in urban runoff prior to it entering the permittees' storm drain systems and discharging to receiving waters such as the Truckee River and its tributaries. Urban runoff includes dry weather flows from activities such as watering and outdoor washing, illegal connections and discharges to the storm drain system, as well as runoff from storm events.

In August 2000, the SWPCC began the process of developing a SWMP with the required elements specific to the Truckee Meadows. A series of public meetings and workshops were conducted throughout 2000 and 2001 to define local water quality goals, resources, stakeholders and interested parties.

The finalized TMSWMP presented a comprehensive approach to implementing each program element and contained priorities, approaches, guidance and schedules for programs, activities and effectiveness evaluation. The schedule for program implementation extended past the permit term.

In January of 2002, EPA conducted an audit of the Truckee Meadows. As a Phase 1 community, EPA expressed that the Truckee Meadows should have had many of the required elements well underway. The repercussions of the audit impacted both the state and the Truckee Meadows programs. NDEP added staff and became more proactive in the implementation of the storm water NPDES program throughout the state. For the Truckee Meadows, the most significant outcome was the requirement that the program elements for construction and industrial storm water inspections be accelerated and in place by July 2003. This was the effective date of CWA Storm Water Quality Phase 2 which lowered the threshold of construction sites requiring a Storm Water Pollution Prevention Plan ("SWPPP") from five acres to one acre.

Intergovernmental Coordination

The SWPCC has continued to implement and update the SWMP. In 2004, NDOT withdrew as a permittee to be permitted independently. This prompted the need to amend the Interlocal Agreement originally approved in 1990. While considering amending the agreement to address the withdrawal of NDOT, other changes were incorporated. The SWPCC concluded that their efforts would be better served by two representatives from each permitted entity, now Reno, Sparks and Washoe County (the "co-permittees"). Reno continues as the lead agency and provides the program coordinator, legal and secretarial support.

In 2003, the Regional Water Planning Commission ("RWPC") funded and accepted a *Watershed Management Plan* for the Truckee Meadows. It was suggested that an oversight committee be developed for the implementation of this plan. The SWPCC recognized that the SWMP is a substantial aspect of watershed management and, since the SWPCC has equal representation of the responsible governmental entities in the Truckee Meadows, it was also

concluded that expansion of the purview of the committee to include watershed management for water quality was appropriate.

The amended Interlocal Agreement, approved by Reno, Sparks and Washoe County in March 2004, explicitly states that the SWPCC is to advise the City Councils of Reno and Sparks, and the Washoe County Commission with respect to any and all matters relating to storm water permit compliance and policies (relative to matters relating to watershed management and protection), which encompasses only the water quality impact to the watershed. The SWPCC will continue to review, modify and update the *Watershed Management and Protection Plan* dated May 9, 2003. Consequently, the SWPCC is also known as the Truckee Meadows Watershed Committee ("TMWC").

The SWPCC was providing funds for surveys throughout the region and a Watershed Assessment for Tributaries to the Truckee River, completed annually by Hillside Design until 2012. These assessments implemented methods described in the 2003 document for surveying and identifying non-point source pollution issues in the watersheds. CDM Smith was hired to perform the annual assessments using a mapping approach starting in 2015, because the SWPCC realized the value in such a document.

Construction Site Discharge Program

The Construction Site Discharge Program integrated storm water quality management and the requirements of the NPDES General Construction Permit into existing local construction permitting and inspection programs. Erosion, sediment transport and pollutant discharges from construction sites are of significant concern to NDEP and EPA. The Construction Site Discharge Program element was in place and effective by June of 2003 to meet an EPA directive. NDEP re-issued a five-year General Discharge Permit for Storm Water Discharges Associated with Construction Activity (NVR100000) effective January 5, 2015~~September 16, 2007 to September 15, 2012~~.

Two primary resources have been developed to assist the construction~~development~~ community:

- *Truckee Meadows Construction Site BMP Handbook*
- *Nevada Construction Site BMP Field Guide*

The *Truckee Meadows Construction Site BMP Handbook* was finalized in March 2003, and updated in 2007 and 2015. Policies and procedures were updated~~developed~~ to provide regional consistency as well as consistency with the state general permit. The documents developed along with the Handbook include a Construction Permit Submittal Checklist, a Performance Standards Compliance Checklist, a Construction Site Inspection Checklist and a model.

The development of the Handbook was made a priority and a template was created for SWPPP. Concurrently, the co-permittees internally developed inspection programs according to their individual plan review and inspector resources.

Once the Handbook was completed and accepted by the RWPC, community outreach and education was conducted through the American Society of Civil Engineers ("ASCE"), the Builders Association of Northern Nevada ("BANN"), Associated General Contractors ("AGC") and others. The permittees offer on-going basic training in the proper use of BMPs at construction sites typically in the spring and fall through BANN and AGC.

Subsequently, a pocket-sized, waterproof~~laminated~~ field guide was developed to assist the construction industry in better understanding installation and maintenance of construction BMPs for storm water quality management. To leverage funding opportunities, this guide was developed with the intent that it could be used throughout the state. The Field Guide was developed by Kennedy Jenks Consultants ("KJC") and managed by the SWPCC. Funding was provided by Reno, Sparks, Washoe County, NDEP, and the RWMF. -The field guide was updated in 2013, with funding provided by the Western Regional Water Commission, and is available at Construction Site BMP Trainings for all attendees, as well as through the Nevada Circuit Rider program. The Truckee Meadows Construction Site BMP Handbook was updated by Farr West Engineers in 2015 and accepted by the SWPCC. All guidance documents including~~Reproduction assistance was provided by BANN and the Builder's Magazine. Clark County Flood Control District, Carson City, Elko County, Lyon County, and Douglas County all participated in the purchase of the first run of the Field Guide bringing the cost down as a result of the large volume order. T~~the *2015 Truckee Meadows Construction Site BMP Handbook update*~~, SWPPP template,~~ and the 2013 Nevada BMP Field Guide are available for download at www.TMstorm water.com.

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Industrial Discharge

Concurrent with the development of the Construction Site Discharge Program, the entities considered how the industrial inspection program would be implemented. The State of Nevada would be primarily responsible for determining what businesses needed permits and for issuing permits. The permittees are responsible for implementing a program to keep polluted runoff from entering their respective MS4s. Reno and Sparks already had an active staff of inspectors for wastewater pretreatment inspection for businesses throughout the Truckee Meadows. Moreover, there was already an agreement between the Cities and Washoe County to conduct pretreatment inspections within the unincorporated areas. It was concluded that using the existing pretreatment programs would be the most effective means of implementing the Industrial Discharge element.

The co-permittees funded development of the Industrial Program Video for outreach to commercial operations and provided it to each business in Reno, Sparks and Washoe County visited by the inspectors over a one-year period. An Industrial BMP manual was also developed and is available for download at www.TMstorm water.com, or in hard copy at the City of Reno and City of Sparks offices.

Illicit Discharge Detection and Elimination

Illicit discharges are typically identified through public reporting, inspections, outfall sampling, or by maintenance crews during day-to-day cleaning of the storm sewer systems.

The co-permittee's maintenance divisions have been advised that in the event they find discoloration, odors, or other evidence of pollution, they are to contact Environmental Control ("EC") staff. Subsequent investigations may lead to identification of illicit discharges that can be remedied. Annual staff trainings occur on a rotating basis between the copermittees to support the IDDE program.

Reno and Sparks EC staffs conduct inspections of the major outfalls along the Truckee River annually. The inspection is intended to occur during a period when there should not be any flow of storm water. If there is flow from the outfalls, they are sampled and analyzed for evidence of basic pollutants. Through this exercise, there have been illicit discharges identified and corrected. In some cases, however, the source cannot be identified.

Public Education and Outreach

The website at www.TMstorm water.com provides information~~portals~~ for all ~~three~~ audiences: citizens; industry and developers; and regulators or other parties interested in the SWPCC. Each of these portals provides contents for the respective audience, including contact information for committee members; program elements; posted guidance documents; upcoming trainings; online mapping; data and permit tools; program news and meetings; frequently asked questions; hotlines for reporting spills and water quality related issues; information about storm water pollution and the storm drain system; related community programs; federal and state requirements; BMPs; commonly used terms; and other sources of information. Downloads of all guidance and technical documents are available on the website.

Numerous approaches to Public Education and Outreach have been conducted. Staffs have provided many presentations about the program to the professional community and to the public. Collaborative efforts such as with the University of Nevada Cooperative Extension ("UNCE") have implemented programs utilizing television and Non-point Education for Municipal Officials ("NEMO"). Other efforts have included public participation to clean up areas within the watershed and storm drain stenciling. Outreach is an ongoing effort. Current activities are further described in Section 4.6.12.

Storm Water Discharge Monitoring

The objective of the Storm Water Discharge Monitoring program is to quantify the benefits of program implementation. The SWPCC ~~developed~~ updated the Sampling and Analysis Plan, describing monitoring activities most recently in 2015 (Balance Hydrologics) that has been accepted by NDEP and took effect on October 1, 2015. The SWPCC also requested a shift from monitoring on a calendar year basis to a water year basis, which took place in 2015. The water year is defined as October 1 through September 30, and monitoring data collected during this time will be reported in the Annual Report due January 15 each year~~a monitoring plan in 2003 that was approved by NDEP~~. The focus was~~has been~~ on monitoring tributaries upstream and downstream of urbanized areas to observe water quality and quantity changes with mixed land usages and significant areas of new development until 2015. With constraints on budgets, and a desire by the SWPCC to seek further analysis of impairments, the program surrendered some upstream monitoring locations that provide a consistently unimpaired dataset, in order to expand on downstream locations. A nested approach has been introduced to get more clarity on issues impacting the urban watershed of the Truckee River.

Currently, ambient conditions are measured twice annually in three locations of Steamboat Creek, two locations in North Truckee Drain, one downstream location in each Thomas Creek and Whites Creek, Alum Creek, and Chalk Creek. As well, the SWPCC has expanded the storm event monitoring program to include the above named sites, as well as a series of urban outfalls to the Truckee River. Equipment usage has expanded to incorporate autosamplers to capture hydrologic limb-based water quality for a series of one to two storms per site, and contractors have been brought in to capture the less predictable storm discharges in the rain shadow of the Sierra, here in the Truckee Meadows~~ In-stream water samples are collected during storm events and quarterly from the upper and lower reaches of Steamboat Creek, Whites Creek, Thomas Creek, and the North Truckee Drain. Monitoring of Chalk Creek in northwest Reno has been added, as described below~~.

Constituents to be analyzed are focused on those for which TMDLs on the Truckee River have been established: (P, N, and TDS). The storm water monitoring data is being posted on the Truckee River Information Gateway ("TRIG") website (www.truckeeriverinfo.org). The 2010

Storm Water NPDES permit ~~has~~ placed a greater emphasis upon quantifying the contribution of pollutants to the Truckee River and its tributaries. Based upon conversations with NDEP and observations of national regulatory trends, it is anticipated that there may~~will~~ be a WLA assigned to storm water in the future. Locally, storm water contributions to the TMDL have been regarded as background and included in the LA. It is not yet known how, when or for what constituents a storm water WLA will be implemented, but the SWPCC remains in close communication with NDEP.

Under the Storm Water Discharge Monitoring program, the SWPCC ~~has~~ monitored four tributaries quarterly for the permit period 2005-2010. The 2015~~04~~ Sampling~~e~~ and Analysis Plan (Balance Hydrologics) associated with this permit outlines monitoring sites, field procedures and laboratory analyses. The SWPCC has been accounting for TMDL constituents, as well as water quality impairments as defined by the 2012 Integrated Report, in building an understanding of storm water quality and impacts on any impairments. Through this evolution, the SWPCC, staff, and consultants gather~~ed~~ water quality measurements and grab samples for TN, TP and TDS, accounting for flows and generated loading values. Data generated by this program may be found in the Truckee River Info Gateway website, data section at www.truckeeriverinfo.org.

Historically, sampling locations on tributaries were chosen to compare upstream and downstream water quality on tributaries around urbanized areas. The SWPCC has expanded the approach and refined questions asked of the monitoring data, intending to evaluate urban outfalls to the Truckee and an understanding of the effects of storm patterns on the watershed, as they pertain to timing, peak flows, and water quality.~~Sampling locations on each tributary were chosen to provide a comparison of water quality upstream and downstream of urbanized areas. Members of the Monitoring Subcommittee to the SWPCC began collecting quarterly data in March 2003 through September 2010 under this Plan (in the four tributaries involved in this program). Data has been collected on Chalk Creek since March 2007 by Reno and Sparks staff, and results are reported on TRIG as well.~~

Chalk Creek was not included on the original storm water permit, but was added later when high levels of TDS, N and P were identified. This historically ephemeral subwatershed underwent heavy urbanization between 1986 and 2006, and now has perennial~~year-around~~ flow. The Hunter Creek sandstone layer underlying most of the area has been shown to be problematic for water quality with efficient transport of N and P applied to outdoor areas (*Chalk Creek Watershed Characterization*, JBR Environmental Consultants, 2010). The same geologic formation, once transformed with development and irrigated regularly, also leaches minerals from soils, mostly present as sulfates, which seep out through the creek's banks as highly 'salty,' algae-rich waters. The upper reaches of Chalk Creek remain ephemeral in areas of development in the upper watershed, and the creek becomes perennial in the urbanized area. For this reason, there has been~~is~~ no sampling point reflecting upstream, non-urban conditions on this creek.

Consistent with the findings from waters in urban areas around the country by the U.S. EPA, local creek data shows declining water quality as creeks pass through developed areas. The SWPCC is in the process of initiating a trend analysis for storm water data and evaluating performance of BMPs in the watershed relative to water quality.

Subwatersheds in the Truckee Meadows region are characterized by historical land uses, which include timber collection, mining, and heavy geothermal activity. This lends complexity to sample results due to influences from mineralization, mining, geothermal activity and geologic formations. In a June 16, 2013 Tech Memo prepared by Stantec, there was an analysis

provided of background conditions provided by ambient water quality results, which addressed current impairments and whether storm water contributed to the impairments.

Municipal Operations Program

The Municipal Operations Program is improving over time. Maintenance activities such as street sweeping, catch basin cleaning, ditch cleaning, and waterway maintenance were primarily focused upon flood conveyance and capacity. Now, there is much more of an awareness to conduct these activities in a way that considers water quality as well.

Street sweeper equipment in all three jurisdictions have been upgraded to vacuum and regenerative air sweeper truck models, which reduces the amount of pollutants reaching the storm drain system and helps the municipalities meet air quality particulate matter ("PM10") requirements set by the EPA. New air quality regulations were enacted in the Truckee Meadows in 2003 with the intent to reduce PM10. The regulations required that all publicly owned street sweepers purchased after January 1, 2002 must be certified under clean air standards. Public entities must reduce the amount of road sand applied during winter storms and sweep up after a sanding event within four days or as soon as weather permits.

Since Reno and NDOT corporation yards are located near the Truckee River, they were the first to be addressed during the 2002 EPA audit. Of greatest concern was sand/salt storage. Each entity has since implemented improvements to cover sand and salt stockpiles as well as apply BMPs to their facilities and make operational modifications to protect the quality of storm water runoff leaving their sites.

In the 2013 audit of the SWMP performed by NDEP and EPA, the corporation yards were evaluated at each of the three co-permittees yards. One of the requests made of the staff was the development of a site inspection form and checklist, to be performed regularly by each agency. Entities incorporated this regular inspection during FY 2014-15 and reported results in annual reporting.

Structural Controls

Structural Controls and Low Impact Development are approaches intended to provide post construction storm water quality management. Structural treatment controls can be considered public domain treatment controls or manufactured (proprietary) treatment controls. Public domain treatment controls are those that can be designed by an engineer and have been implemented and tested by numerous communities throughout the nation. Manufactured (proprietary) treatment controls are patented devices that have been engineered and constructed by private companies. Low Impact Development ("LID") is considered a public domain treatment control. It is a methodology for accommodating storm water runoff within new development and redevelopment that mimics natural hydrologic functions within a site. Rather than conventional hard-piping from impervious surfaces, LID uses features such as vegetated swales, bioretention systems and permeable pavements.

These types of features:

- Utilize natural biological, physical and chemical treatment processes for treatment
- Promote percolation and water table recharge
- Slow runoff flows and reduce runoff volumes
- Reduce pollutant loads gathered from impervious surfaces sheet flow

The result is:

- Improved water quality to the receiving water
- Decreased runoff volumes and flows
- Improved water table recharge

In January 2004, the *Structural Controls Handbook* was finalized. Structural Controls program implementation is not clearly defined by the EPA or NDEP and is left up to the community. Public meetings and handbook development processes have prompted numerous questions: what is a practical threshold to impose structural controls for new development and redevelopment, what should be involved in the permitting, application and design approval process and how should the structural controls be tracked, inspected and maintained? To answer these questions fairly, it was the consensus of the SWPCC that the use of a professional advisory group ("PAG") was warranted. The PAG was comprised of local engineers, planners, developers and contractors. Several facilitated meetings of the PAG took place over the course of a year.

By May 2005, the SWPCC accepted the *Final Recommended Policies and Procedures for Structural Controls and LID in the Truckee Meadows* (prepared by KJC). One of the PAG recommendations was the development of standard design worksheets to aid in simplifying implementation of the Storm Water Quality Management practices and LID. KJC was retained for this purpose with the cost shared by Reno, Sparks, Washoe County and the RWMF.

The purpose of the Standard Guidance Worksheets is to aid in simplifying implementation of the Storm Water Quality Management practices and LID standards. The standard design templates assist community development staffs during plan review by providing readily accepted storm water design templates. Worksheets were updated in 2012 to include Self Treating Areas. The design templates are posted on TMstorm water.com so that they can be easily accessed.

In September 2007, staff from Reno, Sparks and Washoe County provided all-day training on the implementation of Structural Controls for Post Construction in a workshop sponsored by ASCE and the American Public Works Association ("APWA").

In addition, Reno has adopted an ordinance requiring the use of structural controls for post construction storm water management for new development and redevelopment. This ordinance was updated in 2016 with the updates of the Structural Controls and LID Manuals, as they were codified. Updates to the manuals included a reformatting and integration into one manual, the Truckee Meadows Structural Controls Design and LID Manual.

Land Use Planning

Post-construction storm water management is required for New Development and Significant Redevelopment. The tools that have been created through the SWPCC and watershed facilitation have prepared the Truckee Meadows to implement a program. The *Low Impact Development Manual* provides planning assistance while the *Guidance on Source and Treatment Controls for Storm Water Quality Management* assists the designer to incorporate Post Construction Storm Water management into their projects. Engineering analysis must show that the proposed storm water quality management measures are capable of capturing runoff and potential pollutants from the site in compliance with the specifications of the *Truckee Meadows Structural Controls Design and Low Impact Development Manual* ~~and the *Truckee*~~

~~*Meadows Structural Controls Design Manual*~~. The analysis must illustrate the drainage subareas and demonstrate the proposed mitigation measures are designed to meet or exceed the minimum treatment standard required. The Design Guidance Worksheets have been created to provide a consistent submittal format and when properly completed, demonstrate sufficient engineering. The worksheets are provided in Appendix D of the manual and are also available online at tmstormwater.com.

Storm Water Program Needs

The Storm Water Management Program for the Truckee Meadows ~~needs to~~will be updated with new priorities and timelines developed for the current permit term, once the new permit is issued.

The state of the economy has affected local monitoring efforts. The monitoring locations on the tributaries were selected to leverage monitoring sites already being maintained by the United States Geological Survey ("USGS"). Because of funding constraints, monitoring sites along the Truckee River and on the tributaries are being called into question. Consequently, it is becoming apparent that greater funding resources will need to be allocated to the monitoring element. A new monitoring plan was ~~will need to be~~ developed to ~~meet the requirements of the 2010 permit and better~~ assist the SWPCC to quantify the program effects. This document was named the Truckee Meadows Sampling and Analysis Plan. The intent is also to further benefit from the regional model; WARMF, a watershed model adapted to the Truckee River basin, to forecast non-point source loads under current and future land uses and project potential non-point source load reductions.

Use of structural controls and applying LID principles to new development and redevelopment is still a new approach. The development community needs continued education and training in the design, construction and maintenance of structural controls and LID features. ~~-~~With updates to the guidance documents associated with structural controls and LID will come trainings for staff and consulting community alike.

The tributary watershed assessments were~~have been~~ conducted from 2003 to 2012, at which time the SWPCC determined it was time to implement projects identified in the reports~~for several years~~. Monitoring the effects of development upon the area's streams has increased awareness of the need for stabilization. There are numerous issues to consider in the maintenance of waterways, stabilization techniques, invasive weed eradication, restoration efforts and buffer zone implementation. A common understanding or MOU and funding source should be established for the Truckee Meadows tributaries and ditches that convey flow to the Truckee River. Implementing educational programs for ~~maintenance staff,~~ inspectors and plan checkers for BMPs ~~for~~on and around these waterways is needed.

4.6.5 Truckee River Coordinated Monitoring Program

Background: The Truckee River watershed is currently monitored and sampled by many different groups for water quality. Under the CWA, the Truckee Meadows Municipal Storm Water Permit permittees monitor six Truckee River tributaries on a regular basis, ~~the North Truckee Drain, Whites Creek, and Steamboat Creek, above and below heavily developed areas quarterly~~ per the MS4 permit requirements and Sample Analysis Plan. In recent years, the SWPCC has also monitored urban outfalls to the Truckee River to understand better changes to water quality resulting from storm events. TMWRF monitors the Truckee River at various points upstream and downstream of the urbanized area, as well as Steamboat Creek above and below the discharge point, to track potential water quality impacts on the river, per discharge permit

requirements. The quality of the Truckee River water ~~supply~~ is monitored at treatment plant intakes by TMWA and Washoe County under the Safe Drinking Water Act. The Truckee River Flood Project ("TRFP") monitors flows for flood prediction and future projects. NDEP monitors streams for setting standards and identifying Impaired Water Bodies to update the Nevada Integrated Report~~303(d) List of Impaired Waters~~.

Raising concerns over the health of the Truckee River, the Legislative Committee to Oversee the Western Regional Water Commission ("LOC") requested a bill draft in August 2008 for a Truckee River monitoring resolution. With the Legislative direction (BDR R-237, SCR-2), NDEP gathered a working group to create a MOU to encourage entities that are engaged in water quality monitoring of the Truckee River to coordinate activities. With 14 signatories, the MOU sought to bring parties together, provide a platform for collaboration and quality control, provide a data clearinghouse for technical resources and dissemination of public information on the health of the Truckee River.

The TMWC, aka SWPCC applied to NDEP for CWA Section 319(h) funding, and was awarded a grant to hire a consultant to facilitate the coordinated monitoring efforts. Reno, as lead agency for the TMWC, entered into a grant agreement with NDEP for facilitation support. Reno managed~~released~~ a Request for Qualifications ("RFQ") in ~~the fall of~~ 2009, and the ~~MOU~~ Committee selected KJC to facilitate a process and~~from among 14 firms. A kickoff meeting was held in May 2010, with the goals of determining a roadmap~~ ~~to~~ create a Coordinated Monitoring Plan. With a full year of extensive technical meetings and compiling information KJC produced~~, and scheduling a series of technical meetings to compile and coordinate information. The group envisions a fully edited~~ the Coordinated Monitoring Plan which was published in June~~February~~ 2011~~ to report back to the LOC~~. This compendium may be found on TRIG at www.truckeeriverinfo.org/cmp.

4.6.6 Truckee River Information Gateway

Regional Stakeholders recognized a great need for a watershed clearinghouse for all stakeholders to share technical data, maps, and other valuable resources collected on the Truckee River and tributaries. The TRIG, www.truckeeriverinfo.org, was developed in 2004 by Ecological Resource Associates ("ERA"), primarily funded by Reno and Sparks, and has become the premier data gathering/sharing tool for technical users in the Truckee River watershed. This resource is intended to save time and local computing resources by providing a platform and online database to share valuable information and build better understanding of the Truckee River watershed's complexity. The TRIG server is housed in the Information Center for the Environment at University of California Davis, where it is maintained seamlessly by ERA and updated routinely. ~~In 2009, the TRIG server was moved from its original home at University of California Davis to the Nevada Department of Information Technology, to provide local website hosting. The RWMF began sharing the cost of the local website hosting contract in 2010.~~

Truckee River Water Quality Monitoring Data

As required by NPDES permits to discharge to the Truckee River, Tahoe-Truckee Sanitation Agency ("T-TSA") and TMWRF monitor water quality monthly at various points on the mainstem river and nearby tributaries. The following bar charts depict contaminants of concern per TMDLs set by NDEP on the lower Truckee River. Constituents are measured at three locations: Farad (by T-TSA), and East McCarran and Lockwood (by TMWRF). Chemical and biological indicators of water quality are included in data gathering efforts under permit. Data may be found on the TRIG website at www.truckeeriverinfo.org/data.

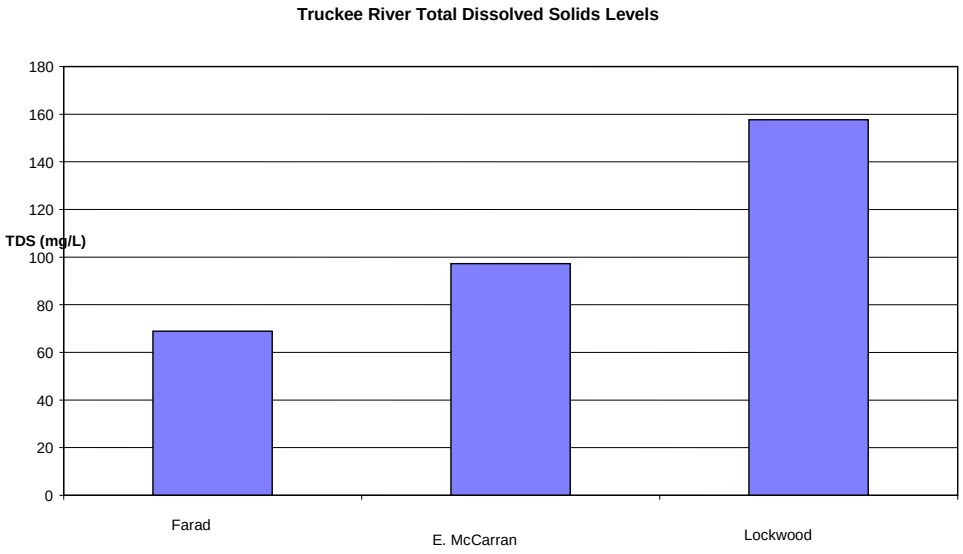

Figure 4-4 Total Dissolved Solids on the Truckee River

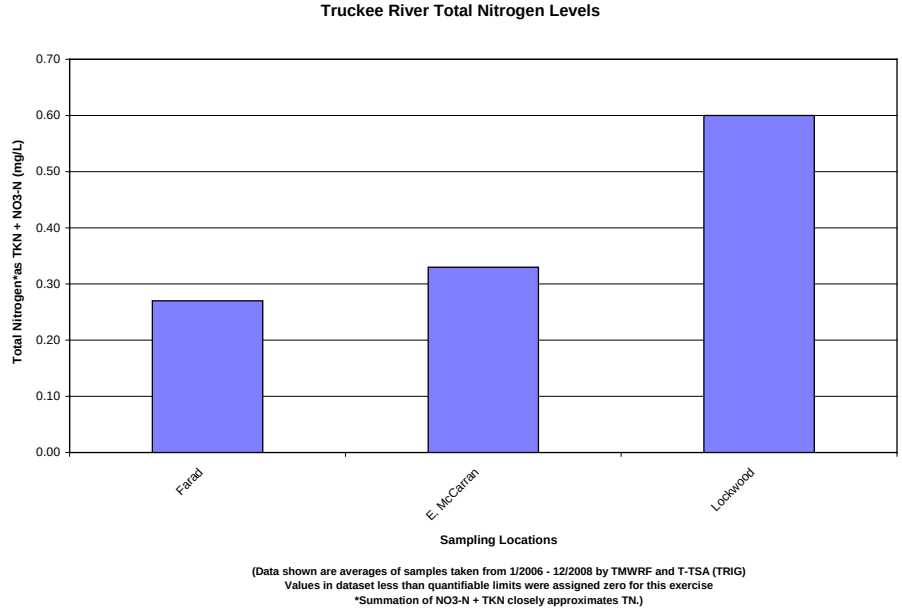

Figure 4-5 Total Nitrogen on the Truckee River

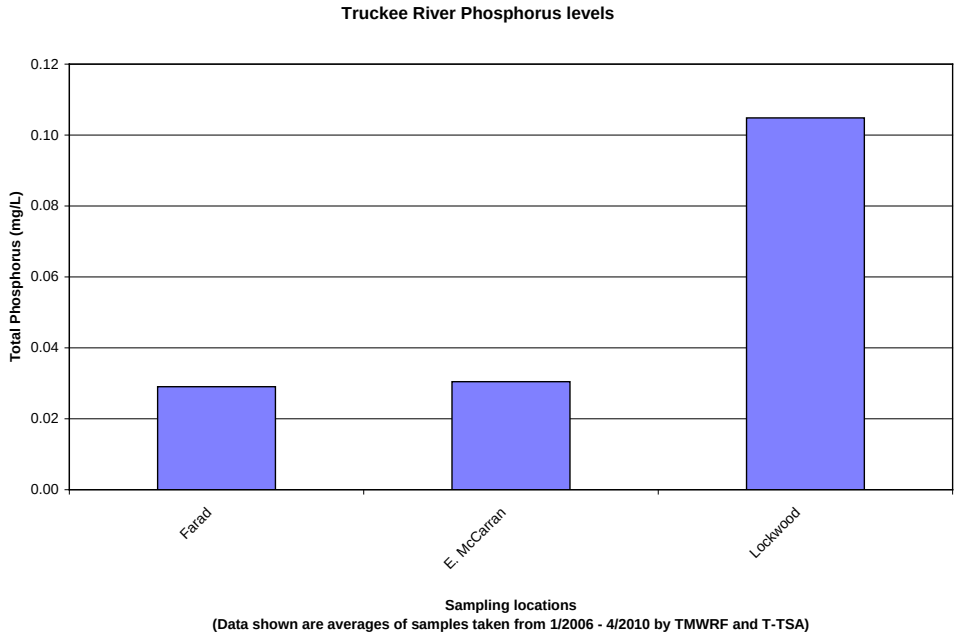

Figure 4-6 Total Phosphorus on the Truckee River

Referring to Figure 4-6 (a graph of average TP concentrations), it is evident that the Water Quality Standard for TP is exceeded at Lockwood. The current TP Water Quality Standard for the Truckee River at Lockwood, 0.05 mg/L, has been in place for many years and was based on non-site specific national standards. The TP Water Quality Standard was derived from a national criterion designed for the protection of downstream lakes rather than from site specific criteria and riverine processes. Upstream of Lockwood at East McCarran, the Water Quality Standard for TP is 0.10 mg/L. The 2008 PLPT Water Quality Standard for P at the tribal boundary is expressed as 0.05 mg/L of dissolved reactive phosphorus orthophosphate. The dissolved form of P is considered to be the readily bioavailable component. Given the variety of water quality standards for P throughout the Truckee River system, beneficial uses are being maintained in the lower river and the criterion used to select the TP standard at Lockwood. This is sound rationale supporting the ongoing review of the state water quality standard for P.

Water quality at Farad, California just west of the state line, reflects water quality upstream of the Truckee Meadows, and is considered background water quality for the Truckee Meadows area. Monitoring results at East McCarran Boulevard in the east Truckee Meadows, reflect changes to water quality that occur within the urbanized area. Results at Lockwood, below the Truckee River narrows east of Sparks, reflect water quality downstream of the Truckee Meadows. Truckee River water quality reflects the national trends observed and reported by the EPA on waterways passing through urbanized areas.

Tributaries with high levels of P-containing compounds, identified by NDEP and added to the Nevada 303(d) List, include Alum Creek (TP), Chalk Creek (Ortho P), and Whites Creek (TP).

A technical review, *Truckee River Water Quality: Current Conditions and Trends Relevant to the TMDL and WLAs* (2007, Jassby et al), suggests the Truckee River behaves as if it is P-limited (http://www.truckeeriverinfo.org/files/truckee/Jassby_2007_Truckee.pdf).

4.6.8 River and Stream Restoration

Stakeholders are actively engaged in restoration efforts on the Truckee River from Lake Tahoe to Pyramid Lake. Land uses (including flood control, irrigation, channelization, and urbanization with resulting hydromodification downstream) have greatly altered instream and adjacent riparian habitats. In some locations, such alterations to waterways have eliminated floodplains and meanders, causing steeper stream gradients, bank erosion, channel downcutting, lower stream bed elevations and lower water tables. Lowered water tables result in loss of streamside vegetation. In the Truckee River watershed, this has resulted in loss of shade, warmer in-stream water temperatures and subsequent reduced amounts of DO available for native fish communities. The reduced or absent riparian and in-stream complexity has caused a decline in habitat available to fish as cover, for spawning, and migration. The results of all this have led to the non-functional river and stream reaches observable today, necessitating watershed restoration efforts.

Tahoe to Verdi

The "middle" Truckee River, from Tahoe City to the Verdi area, has many beneficial uses and demands. Land uses include timber harvesting and ski resorts. The Truckee River Watershed Council is a California-based nonprofit organization committed to "collaborative solutions to protect, enhance, and restore the Truckee River watershed", and facilitating partnerships to benefit the watershed. High priority projects are located throughout the middle Truckee River, and on tributaries feeding it, including restoration projects as well as behavior-changing education on BMPs.

Projects have been planned with a wide assortment of stakeholders and include meadow and riparian restoration to re-establish properly functioning conditions and reduce erosion; urban stream management using BMPs to reduce storm water pollution; stabilize banks of incised creeks; restore floodplain, habitat and agricultural lands; acquire, assess and restore key properties in the river canyon; improve roads to decrease sediment loads to streams and the river; map forest road and trail networks; upgrade and replace culvert and bridge systems; reduce fuels; and implement low impact development projects to recharge local aquifers, treat runoff and prevent hydromodification from urbanization wherever possible.

Truckee Meadows to Pyramid Lake

The Lower Truckee River, running from the Truckee Meadows metropolitan area to Pyramid Lake, is a vital resource that serves multiple public and private benefits. Due to significant channelization efforts during the 20th century much of the river between Sparks and Wadsworth has been highly degraded. The extent, size and condition of the riparian forest, and of bird, amphibian and native fish species, are greatly reduced compared to 19th century pre-settlement conditions. Restoration requires rebuilding the physical environment, especially to restore channel geometry and the connection of the river to the floodplain, and active reintroduction of native plants.

The Nature Conservancy ("TNC") began working in partnership with a team of public agencies toward a sustainable Truckee River from its headwaters in the Sierra Nevada to its terminus at Pyramid Lake. TNC has been working actively to restore key reaches of the lower river and

floodplain since 2000 when it purchased the McCarran Ranch along five miles of the river. TNC's partner agencies each have their own distinct goals for the river, but as a whole they are compatible and mutually reinforcing: improve water quality, wildlife habitat and the fishery; flood protection; and opportunities for recreation.

Partner agencies include:

- U.S. Bureau of Reclamation ("BOR")
- City of Reno ("Reno")
- City of Sparks ("Sparks")
- U.S. Bureau of Land Management ("BLM")
- U.S. Fish and Wildlife Service ("FWS")
- Nevada Department of Wildlife ("NDOW")
- Washoe County
- Water Planning Commission ("WPC")
- Truckee River Flood Project ("Flood Project")

The overall goal of TNC's Truckee River Project is to conserve priority native Truckee River plants and animals by protecting and restoring the lands and waters they need to survive. The project has two separate but integrated parts. On the lower river in Nevada, downstream of the Truckee Meadows to Wadsworth, TNC is implementing a large-scale floodplain acquisition and restoration program. The riparian forest and wetlands, and the birds that depend on them, are TNC's interests in the lower river. Restoration will also improve the river's ability to sustain a higher flow for eventual flood protection efforts in the Truckee Meadows. River restoration is considered a "non-structural improvement" in Reno and Sparks wastewater facility planning for water quality improvements. Reno and Sparks began participating in river restoration on the lower Truckee River in 2003 when the McCarran Ranch pilot project was initiated.

2002 Memorandum of Understanding

The three local governments and the PLPT have signed a MOU supporting the multiple goals to be achieved through river restoration acknowledging a regional collaborative effort to restore the lower Truckee River below Vista. The MOU generally describes the benefits, goals and management principles that the major stakeholders agree are necessary to develop a comprehensive program to restore the lower Truckee River.

The lower river falls under the jurisdiction of multiple local, state, and federal agencies and units of government, and involves multiple private landowners. To successfully take advantage of this opportunity, public agencies and private landowners needed to cooperate and coordinate their river restoration activities. This statement of public benefits, goals, and management principles agreed upon by key lower-river stakeholders, represented a common understanding and foundation from which more detailed work programs have been pursued with a high likelihood of success.

These goals and benefits are:

Public Benefits:

- Recreation, open space, fishing, non-motorized boating and activities that are fundamental to the region's quality of life

- Water quality and the related wastewater treatment capacity of the region, which is fundamental to economic growth
- Attenuation of peak flood flows for public safety and to protect private and public property and infrastructure
- Habitat and wildlife benefits for fish, birds, mammals and plant communities that are part and parcel of our region's natural heritage

Public Goals:

- Mitigation of flood flows
- Cost-effective wastewater quality treatment
- Public recreation opportunities that are high quality, easy to access and ample in number
- Preservation and restoration of aquatic and terrestrial habitat in the river corridor

Management Principles:

- The goals of public recreation, water quality, flood attenuation, and habitat restoration are, by and large, compatible.
- Planning and implementation efforts for any single public goal (e.g. flood protection) in the lower river corridor shall consider and be consistent with other public goals, private interests, regional economic growth and preservation of tax revenue and public fiscal capacity.
- Coordination of lower river activities is highly desirable to achieve economies of scale and avoid potential conflicts.

Restoration Efforts

TNC's McCarran Ranch demonstration project began in 2001 with revegetation. In 2003, TNC and partner agencies implemented a $1.2 million one-mile pilot restoration project that included channel and floodplain restoration and additional revegetation.

From 2003 until November 2005, the Cities and TNC worked to implement the remainder of the McCarran Ranch restoration project under the auspices of an ACOE 1135 Ecosystem Restoration Project. Under that program, the Cities would have funded roughly 35 percent of the costs, and the federal government would have provided the remainder. In the aftermath of Hurricane Katrina, however, nearly all discretionary funds for the ACOE were redirected to the Gulf recovery effort, and the near term McCarran Ranch project funding was lost.

The Desert Terminal Lakes ("DTL") program was created by Senator Reid for purposes of restoring the health of Walker Lake and Pyramid Lake. The BOR issued a Request for Proposals in May 2005 for projects to improve the health and increase flow to Pyramid Lake and the Truckee River. Together Reno, Sparks and TNC were awarded $9.6 million to complete river restoration at McCarran Ranch and implement restoration at Mustang Ranch, Lockwood and below Derby Dam. To satisfy the requirement of the DTL grant program to increase flows to Pyramid Lake, the Cities committed 250 af of TMWRF treated effluent groundwater component to Pyramid Lake. An additional $5 million of Nevada Question 1 funds, administered by Washoe County, has also been used to implement the program.

The entire McCarran Ranch site is 305 acres and has five miles of restored river. Habitat improvements include 120 acres of native plantings, 18 riffles, 11 wetlands, and improved channel sinuosity.

The Lockwood property, owned by Washoe County, is located about 10 miles downstream of Reno. Completed in 2009, the restoration includes a new river meander, eight riffles, two wetlands, and 28 acres of revegetation. The Lockwood restoration project also includes recreational elements such as a non-motorized, multi-use trailhead; onsite parking; restroom facilities; picnic tables; and interpretive signs.

Improvements at the Mustang restoration site completed in February of 2010 include new meanders in the river channel.

Below Derby Dam, the initial vision was an installation of a low flow channel to assist in fish passage. However, after the EIS was completed, it was concluded that revegetation alone would be most beneficial. A revegetation and white top control project was launched in 2009.

Restoration at the BLM-owned 102 Ranch includes two new river meanders, six riffles, five wetlands, and 115 acres of revegetation.

NV Energy is collaborating with TNC on restoration on about 65 acres and a mile of river at Tracy. The project, initiated in 2013, includes five new river meanders, six riffles, one wetland and about 55 acres of revegetation.

Since 2003, 11 miles of floodplain along the lower river between Sparks and Wadsworth has been restored. Revegetation and establishment is ongoing and when finished, the restored sites will improve fish habitat, boost water quality and allow floodwaters to spread naturally over the floodplain.

~~Negotiations for restoration of the 102 Ranch located about 20 miles downstream of Reno have progressed since the BLM acquired ownership. Reno and Sparks funded the design at the 102 Ranch and construction funding came through the AB 5 allocation to the Flood Project and additional DTL funds from BOR. The restoration at the 102 Ranch includes two new river meanders, six riffles, five wetlands, and 115 acres of revegetation~~.

~~The Truckee River Flood Project and River Restoration~~

~~The Truckee River Flood Project's community-preferred "Living River Plan" includes the following Ecosystem Restoration Project Goals:~~

- ~~Restore 50 miles of the Truckee River's ecosystem (Sparks to Pyramid Lake)~~
- ~~Restore fisheries, including the threatened Lahontan Cutthroat Trout and endangered Cui-ui~~
- ~~Enhance deer, mountain lion, duck, and song-bird habitat~~
- ~~Enhance water quality~~
- ~~Provide enhanced recreation opportunities, river access, and open-space~~

~~Eleven lower river ecosystem restoration project locations are identified in the Living River Plan, some of which are described above. Section 5.6.6 briefly discusses each project. Restoration outcomes common to each project include:~~

- ~~Increasing river sinuosity~~
- ~~Reconnecting the flood plain to the river~~
- ~~Mitigate for loss of flood plain storage due to construction of floodwalls and flood structures upstream~~
- ~~Correct damage done to the river from previous channelization projects~~

Collaboration and cost sharing by agencies, land owners and other stakeholders will, in many instances, help achieve the greatest river restoration benefits in a cost-effective manner. The following policy supports Truckee River restoration:

Policy 3.1.d: Truckee River Restoration

> *In review of proposed projects and proposed land use changes within the areas identified for restoration~~ in Figures 5-3, 5-4, 5-5 and 5-6~~, the local governments shall make findings supporting the implementation of potential restoration projects as identified in the Lower Truckee River Restoration Plan and~~or~~ the TRFMA-approved Local Rate Plan~~ruckee River Flood Project being developed in conjunction with the ACOE~~.*

Steamboat Creek Restoration

Several studies based on water quality monitoring data have shown that Steamboat Creek is a major contributor of non-point source pollution to the Truckee River. The pollution results from bank erosion, exotic weed populations, geothermal mineral deposits, irrigation return waters, urban storm water, and the cumulative impacts of human activities throughout the watershed. Steamboat Creek flows from Washoe Lake through Pleasant Valley, Steamboat Valley, and along the eastern edge of the south and central Truckee Meadows before discharging to the Truckee River. Steamboat Creek receives water from many streams flowing down the north Carson Range, including Browns, Galena, Jones, Whites, Thomas, Dry and South Evans Creeks, most of which have undergone significant urbanization in the last twenty years, changing their functionalities and increasing non-point source pollution.

Steamboat Creek restoration projects were evaluated and the sub-watershed assessed for feasibility and prioritization. Unfortunately, mercury has been identified in project reaches and creates a significant obstacle to restoration. Mercury is a neurotoxin, and once converted from elemental mercury to methylated mercury, effectively makes its way up the food chain. Mercury originated at Washoe Lake where Comstock-era gold and silver mills used the metal to process ore. Studies have also shown that geothermal areas in the Truckee Meadows are high in mercury, and that fish in Washoe Lake are recognized as containing high levels of methyl mercury. Projects implementing the Steamboat Creek Restoration Master Plan, including excavation and re-vegetation of new floodplains, would liberate mercury that is currently buried in sediment. In addition, wetlands creation may exacerbate the production of methyl mercury. These projects have been postponed indefinitely. Recent studies, however, indicate that streambank stabilization could reduce mercury loading to the creek.

The Regional Transportation Commission ("RTC") is planning a new southeast connector route in the Truckee Meadows, which would run north-south through the Steamboat Creek area. While the planning is still underway for this project, there would be significant changes to the location of this drainage, as well as its configuration.

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4.6.9 Watershed Management and Protection in the Truckee Meadows

Watershed health is greatly dependent upon the integrity of riparian conditions, proper stream function and the absence of excessive erosion. In annual assessments, named streams have been rated for how well they behave as naturally functioning drainageways, and how vulnerable they are to degradation caused by improper adjacent land use. Year-by-year comparisons are made in annual assessments with recommendations for maintenance and restoration of each stream. The *Truckee Meadows Watershed Protection Manual* was developed by KJC in 2005. This manual, funded by the RWMF and NDEP, was produced to establish the assessment protocol.

Watershed Assessments for Tributaries to the Truckee River (historical)

In 2002, the Washoe County Department of Water Resources, the UNCE, and the Washoe-Storey Conservation District ("WSCD") partnered to develop a Watershed Management and Protection Plan. The RWPC published the *Watershed Assessment for Tributaries to the Truckee River* (Widmer and Jesch, 2002), to provide the community a report card on the baseline condition of tributaries. Tributary creeks are shown on Figure 4-7.

It was suggested that comparing this baseline to current conditions of each tributary annually would provide decision makers, planners and regulators with relevant and up-to-date information concerning restoration, weed populations, opportunities for watershed protection, whether BMPs are mitigating storm water pollution, and locations for trails or other open space amenities. This report contains substantial mapping of geographic information and stream surveys noting the condition of the various stream reaches that were used to trace the sources of watershed problems.

Stream Surveys (current)

The *Watershed Protection Manual* (KJC, 2005) provided a reference and compendium of watershed protection activities and programs developed in 2004 and 2005 for Reno, Sparks, and Washoe County. Twenty-five tributaries draining to the Truckee River were assessed initially in 2002, most of which have been assessed annually beginning in 2005. Upper, middle and lower creek reaches were established in 2002 and assessed on a rotating basis, funded by the TMWC / SWPCC:

- North Carson Range - Peavine Creeks: Hunter, Alum, Peavine, Mogul, Chalk, North Evans, Dog, Sunrise, Bull Ranch, and Towers/Roberts
- Washoe Valley Creeks: Jumbo, Davis, Ophir, Winter, Lewers, Franktown, McKewen and Muskgrove
- North Truckee Drain
- South Truckee Meadows Creeks: Galena, Whites, Thomas, Jones, Bailey and Browns

Watershed Assessments for Tributaries to the Truckee River (from 2005 through 2009) provide annual survey results for streams, including apparent hydrologic functioning patterns and trends for each stream, and prioritization for restoration. *The Watershed Protection Manual* identified methods available for evaluating stream health and reaches of each tributary for assessment. Information from the assessments has been used in the development of Reno's Truckee River Mapserver and Truckee River Watershed Map Tool. In an effort to involve more local experts in assessments, invitations are offered for volunteers to provide assistance. Team assessments

are performed during summer months and scheduled to facilitate attendance of agency representatives.

In the *2009 Watershed Assessment* (Jesch and Jesch), the program was expanded to include water quality, geographic information system ("GIS") access, and six tributaries listed on the Nevada 303(d) List. Basic water chemistry measurements were made during one week in October, which included temperature, pH, electrical conductivity and DO in the streams. Photo points and assessment team observations were provided in a GIS database. This GIS data should facilitate a better understanding of specific locations, familiarity with the streams and watersheds.

Streams were assessed in groupings of geographic area, and ranked from low to high for restoration priorities. The North Truckee Drain had no high priority needs in 2009. The Northern Carson, Verdi and Peavine Creeks had some high priority needs, including Alum Creek, Hunter Creek, and North Evans Creek. The Southwest Truckee Meadows watersheds had high priority needs also, including Jones Creek, South Evans Creek and Whites Creek. Washoe Valley streams had no high priority restoration needs, as all streams appear to be functioning properly. See Tables 4-4, 4-5 and 4-6 for these listings and action items established to restore stream and watershed health.

Insert

Figure 4-7 Tributary Creeks in the Truckee Meadows Area

Table 4-3 Northern Carson, Verdi, and Peavine Creeks

Creek	Trend	Restoration Priority	Reshape Channel Banks	Restore Channel Floodplain	Restore Riparian Vegetation	Storm water Runoff Treatment	Control Encroachment	Reduce Lawn Care Chemicals	Control Invasive Weeds	Enforce Construction Site BMPs	Public Education	Limit Herbicide Applications	Monitor Water Chemistry	Monitor Channel Stability	Control Head-Cut Erosion
Alum Middle	Not Apparent	High			✓			✓			✓		✓	✓	✓
Alum Lower	Not Apparent	High			✓			✓			✓	✓	✓	✓	✓
Mogul Upper	Upward	Low													
Mogul Middle	Upward	Low											✓		
Mogul Lower	Not Apparent	Low	✓	✓			✓		✓				✓		
Chalk Upper	Not Apparent	Med		✓			✓	✓	✓	✓	✓				✓
Chalk Middle	Upward	Low							✓		✓	✓	✓		
Chalk Lower	Not Apparent	Med			✓	✓			✓				✓		
Hunter Middle	Upward	High				✓			✓						
Peavine Upper	Upward														
Peavine Middle	Downward	Med			✓		✓		✓		✓	✓			
N Evans Upper	Not Apparent	Med			✓				✓						
N Evans Middle	Upward	High							✓						✓
N Evans Lower	Upward	Low													
Dog Lower	Upward	Low							✓						
Roberts Lower	Not Apparent	Low	✓	✓	✓				✓						
Sunrise	Upward	Low							✓						

Source: Watershed Assessment for Tributaries to the Truckee River (Jesch and Jesch, 2009)

Table 4-4 Southwest Truckee Meadows Creeks

Creek	Trend	Restoration Priority	Reshape Channel Banks	Restore Channel Floodplain	Restore Riparian Vegetation	Storm water Runoff Treatment	Control Encroachment	Reduce Lawn Care Chemicals	Control Invasive Weeds	Enforce Construction Site BMPs	Public Education	Control Impacts From Vehicles	Monitor Channel Stability	Reduce Livestock Impacts	Monitor Water Chemistry
Browns Middle	Upward	Low													
Dry Middle	Upward	Med	✓	✓	✓		✓		✓		✓			✓	
Galena Middle	Not Apparent	Low	✓	✓	✓				✓						
Jones Middle	Downward	High	✓	✓	✓	✓	✓		✓				✓		
S. Evans Mid/Upper	Not Apparent	High	✓	✓	✓								✓		
S. Evans Mid/Mid	Varies	High	✓	✓	✓	✓			✓	✓				✓	
S. Evans Mid/Lower	Not Apparent	High			✓	✓			✓						✓
S. Evans Lower	Not Apparent	Low		✓	✓	✓							✓		✓
Thomas Middle	Not Apparent	Low							✓			✓			
Whites North Mid/Upper	Not Apparent	Low													✓
Whites North Mid/Lower	Downward	High							✓				✓		✓
Whites South Middle	Not Apparent	High	✓	✓	✓	✓			✓				✓		✓

Source: Watershed Assessment for Tributaries to the Truckee River (Jesch and Jesch, 2009)

Table 4-5 North Truckee Drain

Reach	Trend	Restoration Priority	Restore Low Flow Channel	Erosion Control Channel Banks	Restore Channel Floodplain	Restore Riparian Vegetation	Storm water Runoff Treatment	Control Encroachment	Reduce Lawn Care Chemicals	Control Invasive Weeds	Enforce Construction Site BMPs	Public Education	Treatment Basins	Monitor Water Chemistry	Monitor Channel Stability
NTD A Upper	Upward									✓	✓				
NTD B Middle	Upward									✓		✓			
NTD C Middle	Not Apparent	Med.		✓			✓		✓	✓		✓	✓	✓	
NTD D Lower	Downward	Low		✓		✓		✓		✓				✓	✓

Source: Watershed Assessment for Tributaries to the Truckee River (Jesch and Jesch, 2009)

As evaluated between 2005 and 2009, construction and development projects remain the largest single land use affecting stream health, when BMPs are not used to protect riparian buffer zones around streams. Encroachment at Jones Creek and Hunter Creek has caused dramatic changes in the stream zone in the affected area and downstream.

Reno and Washoe County have adopted watershed protection ordinances over the last few years, for example, the Reno Structural Controls Ordinance, passed in 2009. Waterways should, therefore, be better protected through local code enforcement. As the economy improves, development projects requiring mitigation of streams may be directed towards high priority stream restoration needs.

In 2010, the TMWC / SWPCC agreed to concentrate funds on evaluating tributaries impacted by development and reduce efforts on those tributaries emptying into Washoe Lake, which do not appear to be under development pressures.

4.6.10 Watershed Management and Protection Projects

Chalk Creek

Chalk Creek was identified in the *Watershed Assessment for Tributaries to the Truckee River* (Jesch and Jesch, 2009, and prior years) as contributing significant TDS, N, and P loads to the Truckee River. Levels of these three constituents have been measured regularly as one to two orders of magnitude higher than other tributaries in the Truckee Meadows. Chalk Creek is also included on the current Nevada 303(d) List. A Reno - Sparks cooperative monitoring program has established long-term water quality trends. Data collected and processed has been posted to TRIG.

Reno has implemented a three-part approach to assess possible options for reducing pollutants in Chalk Creek: 1) evaluate treatment options, 2) investigate pollutant sources, and 3) public

outreach. Part one studied the feasibility of treatment technologies potentially available to treat Chalk Creek water. The second investigated the source of contaminants with a complete Chalk Creek sub-watershed characterization. Part three, public education, targeted homeowners and large turf properties in the Chalk Creek drainage to encourage responsible outdoor water and chemical use (see Section 4.6.12, below).

ECO:LOGIC Engineering studied treatment technologies and concluded that a low-tech constructed wetland utilizing microbial action to reduce sulfate in the system would be most feasible and effective for treating TDS. Reno, using additional support from the Truckee River Fund and community volunteers, constructed a pilot-scale sulfate-reducing wetland in May 2010. As most of the TDS in Chalk Creek is in the form of sulfate, a reduction in TDS is expected as a result of sulfate reduction in the wetland.

JBR Consultants conducted a comprehensive watershed characterization and discovered that the system was historically ephemeral and that all warm weather flows are the result of irrigation. The study also revealed that Chalk Creek is located on a particularly vulnerable soil type which leaches salts and nutrients when heavily irrigated. Heavy development and turf planting were discovered to be a source of TDS and nutrients.

A cooperative venture with University of Nevada, Reno ("UNR") will provide monitoring for water quality and performance for a year. If the project is found to remove sulfate efficiently, the technique may be used elsewhere to improve water quality reaching the Truckee River.

Alum Creek

Alum Creek was listed as high priority in the *Watershed Assessment for Tributaries to the Truckee River* (Jesch and Jesch, 2009) due to poor water quality. The creek has also been listed on the Nevada 303(d) List for *E. coli*, ortho-P, TP, TDS, total suspended solids ("TSS"), turbidity, and metals (lead and iron). Alum Creek has a five square mile watershed and flows over forest lands in the upper reaches, through the 2,300-acre creekside community of Caughlin Ranch and city park property before emptying into the Truckee River. This stream is atypical in that the majority of the irrigation season flow is diverted from Steamboat Ditch. High pressure utility lines buried in the creek are threatened by significant stream bank erosion caused by variable ditch water diversions and storm water runoff from impervious pavement flowing through a riparian zone that has been reduced in size and converted to turf grass landscape.

Reno staff initiated outreach to the Caughlin Ranch Homeowner's Association, which owns and maintains most of the middle watershed, to advise of the 303(d) listing and to seek cooperation in watershed protection. Also, UNR is interested in understanding the flow dynamics and began monitoring water levels and water quality in 2009. Data collected in 2010 will be necessary for designing effective restoration projects to stabilize the creek banks.

North Truckee Drain

The North Truckee Drain ("NTD") has a drainage area of nearly 77 square miles, primarily in Spanish Springs Valley and Sparks, and an average streamflow of 1-5 cubic feet per second ("cfs"). The NTD has been recorded over time as having elevated levels of TN, TP, and TDS. The latest watershed assessment found an improving functionality trend over the last few years (Jesch and Jesch, 2009), with riparian and stream vegetation flourishing and providing habitat. The NTD Relocation Project, currently in the construction phase, is identified as a Truckee River Action Project ("TRAction Project"). The project will focus on flood mitigation by realigning the

NTD and relocating the confluence with the Truckee River approximately 4,500 feet downstream.

4.6.11 Other Programs

Hill Slope Development

Truckee Meadows Regional Plan Policy 2.2.1 requires local governments to develop management strategies for areas with slopes greater than 15 percent but less than 30 percent within one year of adoption of the *Truckee Meadows Regional Plan* (TMRPA, 2002). Proposals for watershed changes in areas with slopes greater than 15 percent are of concern as they relate to subjects of the *Regional Water Plan*. Therefore, the management strategies that are developed as a requirement of Regional Plan Policy 2.2.1 shall be submitted to the NNWPC for review, comment and recommendation.

Policy 3.1.g: Management Strategies for Slopes Greater than 15 Percent

> *Local government management strategies for hillsides with natural slopes greater than 15 percent and less than 30 percent shall be submitted to the NNWPC for review, comment, and recommendations prior to incorporation into local government Master Plans.*

Local government management strategies should ensure that:

- Activities comply with the terms of the storm water NPDES permits
- Development on such slopes incorporates on-site and/or off-site mitigation measures for impacts to habitat and water quality
- Ordinances are enforced with respect to erosion control and runoff
- Local governments and entities with responsibility for the provision of utilities such as water, wastewater, and flood control services have identified the additional costs of infrastructure, operations, and maintenance associated with development in these areas, and said costs are economically feasible
- Natural recharge areas are identified and protected
- An analysis is performed to identify flood and erosion hazard areas, and potential mitigation measures

Noxious Weed Control

“The rapid spread of invasive species remains one of our country's biggest environmental problems, a situation complicated by the sheer number of invasive species, lack of a coordinated and comprehensive effort to prevent introductions, monitor and survey for new introductions, and the remarkable ability of invasive species to adapt, reproduce and ultimately overtake entire ecosystems” (Western Governor’s Association Policy Resolution 10-4). Invasive weeds are increasingly recognized as threats to water quality, wildlife habitat, recreational activities and the economic stability of the agricultural industry. They increase the cost of water purification, power generation and irrigation supply, reduce property values, and degrade ecosystem functions.

In 2004, in an effort to better coordinate the management of invasive weeds, the Truckee Meadows Weed Coordinating Group was formed. Members include federal agencies, state agencies, county and city parks and roads staff, environmental organizations, the UNCE, and others. Operating under an MOU and annual action plans, this group seeks grant funding to inventory, control and monitor weeds, as well as restore degraded sites. In 2009, a weed

management plan was completed. No dedicated funds are supplied to the group. Projects include broad weed surveys in 2005 and 2007; weed mapping; guidelines on preventing the spread of weeds; weed treatment along tributaries to the Truckee River, as well as along the river; weed treatment in other areas, such as Swan Lake Nature Study Area; weed management and restoration of burned sites; a website with a weed reporting form; and broad public outreach. The group seeks to avoid duplication of efforts and strategically focus on those invasive weeds that represent the greatest opportunity for successful elimination, such as medusahead, as well as the species that impair riparian habitat.

In 2010, with grant funds from the Truckee River Fund, a boat inspection program modeled on the program at Lake Tahoe was launched on Boca and Stampede Reservoirs and Independence Lake to monitor for invasive aquatic organisms including quagga mussels and Asian clams, as well as invasive aquatic weeds. If the Truckee River becomes infested with invasive mollusks, costs for water treatment and energy production are expected to increase sharply. A focus on proactive monitoring and prevention techniques will help reduce the threat of invasion, but the program requires continuing funding.

4.6.12 Public Outreach Programs

Non-point Education for Municipal Officials

The UNR Cooperative Extension houses and staffs the NEMO Nevada Program. NEMO has provided workshops and education for advisory board members, city councils, county commissioners, planners, engineers, and others since 2004. The program is funded via 319(h) grants from Nevada Division of Environmental Protection. Free 3.5-hour trainings are offered in the spring and fall each year to help attendees understand the link between changes in land use and water quality impacts. The trainings focus on the use of LID as a tool for capturing and processing storm water. Beginning in the Truckee Meadows, the program has now expanded to include Douglas and Lyon Counties.

Many presentations have also been made directly to the state land-use planning advisory committee, advisory boards, planning commissions, conservation districts, river coalitions, landscape architects, master gardeners and others interested in strategies for managing storm water pollution. Special seminars address issues such as water harvesting, riparian buffers, and slope stabilization. In 2010, NEMO began offering free field trainings in the appropriate choice and correct installation and maintenance of construction site BMPs. The NEMO program also led a Riparian Buffers workshop in March 2010, the first of its kind in the Truckee Meadows.

Additional educational elements include a website (www.unce.unr.edu/nemo) that includes information on local LID projects, a photo gallery, a searchable database of plants for LID, and many publications and action guides. These publications are available upon request for use at public events.

River Permitting

Working in or around the Truckee River on restoration, flood control, and construction projects requires many permits, protective measures and monitoring to meet federal, state and local guidelines and regulations. The RWMF funded the *Truckee River Restoration and Construction Site Permitting Handbook* (Kennedy Jenks Consultants 2009), which includes a Permitting Process Flowchart to assist users in completing all required permits for river protection, available for download at www.tmstorm water.com or www.washoecounty.us/water/index.htm).

In May 2009, the Handbook was used for a Working in the River and Permitting Workshop, offered in Reno to guide users through the Handbook and the permitting process. Along with development of the Handbook, mapping was created to show the regulatory authorities governing various reaches of the river from the state line to Pyramid Lake. This map has been integrated as an interactive tool in the Watershed Map Server (see below).

Watershed Map Server

The Reno Map Server is a tool available to all internet users through the Reno website (http://maps.cityofreno.net/). In 2007, sufficient interest built in extending mapping abilities to the watershed by incorporating tributaries to the Truckee River, including all creeks assessed in the Watershed Assessments (Jesch and others, 2005-2009). The City built a Watershed Map Server as part of the existing GIS tool, but took information directly from the Assessments.

The Watershed Map Server

The website (http://maps.cityofreno.net/watershed/) includes: Photos and photo points referenced on the map, introduction, assessment text of middle and lower reaches of each stream, and "tips to help your creek". Individual maps may be accessed by creek name or region, and drilled down to an aerial photo at the greatest level of resolution. Technical users who understand GIS are able to optimize its use and the latest in upgrades to this system include a permit area portal. Parties looking at completing a construction, restoration, or flood project on a portion of the Truckee River, can access all permitting agencies for that location by zooming to "permit area". This last section was completed to accent the River Permitting class offered in 2008.

Truckee River Watershed Map Tool

The Truckee River Watershed Map Tool was initiated by Reno, with support from the Truckee River Fund as an outreach tool targeting middle and high school students. The existing Map Server, as a GIS tool, was not readily usable by non-technical internet users. This interactive, intuitive map-based tool allows users to view and explore the creeks near homes and schools online. The tool includes vegetation, wildlife, photos from the *Watershed Assessment* (Jesch and Jesch, 2009), and other interesting facts about each subwatershed. This tool has been shared with teachers throughout the Washoe County School District and throughout northern Nevada.

Over 40 teachers throughout the Washoe County School District have been advised of this tool, while it was still in the production phase. Teachers will be trained on using the Truckee River Watershed Map Tool with students, as the last phase of this project. This will be completed in conjunction with existing trainings throughout the school district, as well as with environmentally-directed teacher trainings hosted by NDEP such as Project Wet.

Chalk Creek Outreach

The watershed assessments have found that Chalk Creek in northwest Reno has elevated P, N and TDS. As part of a three-part approach to address this problem, Reno used Truckee River Fund support to retain Olsen and Associates to develop and implement a public outreach program, one of the three parts. The effort targeted residents and owners of large turf areas to encourage adoption of more responsible outdoor water and chemical use practices.

Initial meetings with residents emphasized a positive, stewardship-based message and avoided creating fear about contaminating the water supply. Owners of large turf areas were also

identified. In addition, residents were surveyed concerning their knowledge of outdoor runoff and storm water pollution both before and after informational presentations based on the results of technical studies. Ninety-seven percent of post-presentation surveys indicated an increased awareness of what goes into neighborhood creeks and 82 percent agreed with the statement, "The presentation influenced me to change my watering, yard care and/or storage practices."

TMWA Outdoor Water Conservation

TMWA offers an online water efficient landscape guide for maximizing responsible water use in the desert, using the seven horticultural principles to reduce outdoor irrigation while providing a lush and attractive outdoor area. The vast array of informational topics covered in the interactive tool include: landscape design and proper planning, planning an efficient irrigation system, plant search (by exposure or other needs), soil improvement, mulching, planting and maintenance.

This online, interactive guide for homeowners can be found at www.tmwalandscapeguide.com/landscape_guide/interactive/index.php. TMWA also provides an incentive to reducing water use outdoors, the Water Efficient Landscape Awards. This annual competition has two categories for either design by homeowner or designer, and TMWA provides free community tours of the winners' properties the following year, to share the wealth of learning by seeing conservation in action.

TMWA Watershed Academy

TMWA is dedicated to educating our youth for better tomorrows. The watershed academy web site (http://www.tmwaacademy.com/index.shtml) is provided to inform students and teachers and to give them the skills and knowledge they need to become informed conservers and consumers. Educational curriculum is available for teachers to use with students in four grade ranges, from kindergarten through high school. TMWA routinely holds poster contests for students and the educational approach is a high TMWA priority in outreach. Resources available to teachers include lesson plans for each grade, as well as online tools for use with students, a library of TMWA and other water-related publications, and other resources.

Truckee Meadows Urban Forestry Coalition

In 2008, led by TMWA, a group of agency members began meeting with the goals of preserving, protecting, and promoting a sustainable urban forest for the Truckee Meadows community. The group drafted a MOU to recognize this commitment, and Sparks, Reno, TMWA, and the Washoe County Department of Parks and Recreation signed on as members. The priorities of this Coalition are public education, community benefits and buy-in, and protecting and saving areas of concern within the Truckee Meadows.

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