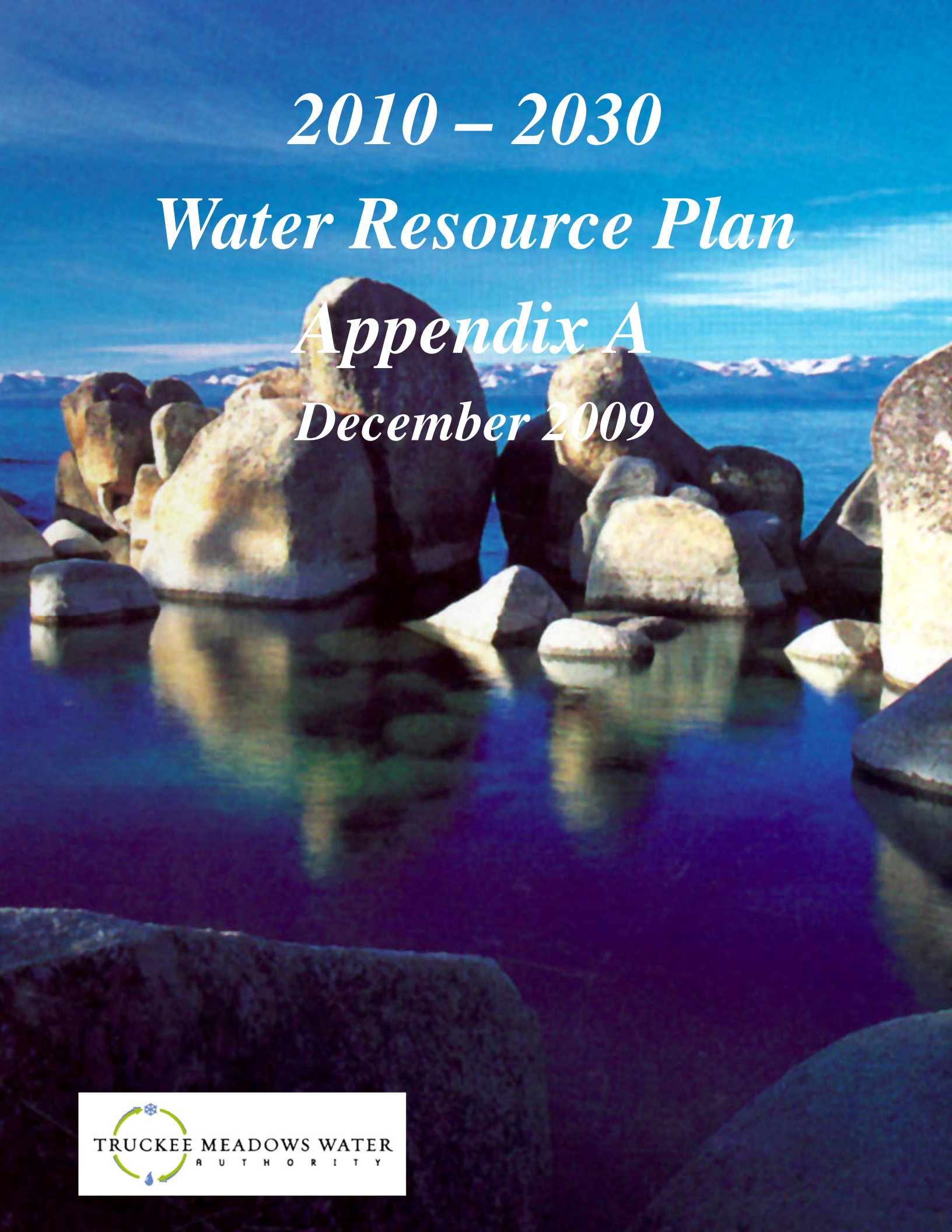

2010 – 2030
Water Resource Plan
Appendix A
December 2009

TRUCKEE MEADOWS WATER AUTHORITY

Appendix A:
Preliminary Assessment Reports for TMWA and WDWR Integration

TRUCKEE MEADOWS WATER AUTHORITY

STAFF REPORT

TO: Mark Foree, General Manager TMWA
FROM: Jeff Tissier, Chief Financial Officer
DATE: December 1, 2008
SUBJECT: **Analysis of the Truckee Meadows Water Authority's and Washoe County Department of Water Resources' Outstanding Bonds, Loans, And Notes**

RECOMMENDATION

Based on the analysis of the cost to refinance WCDWR and TMWA bonds and loans, it is the recommendation at this time that activities leading to the full consolidation[1] of WCDWR and TMWA do not proceed until demonstrable monetary savings can be achieved for water customers within the Truckee Meadows from integration opportunities that enhance economies of scale and/or other efficiencies. WCDWR and TMWA should continue to analyze opportunities for integration short of full consolidation.

BACKGROUND

Truckee Meadows Water Authority (TMWA) and the Washoe County Department of Water Resources (WCDWR) engaged Swendseid and Stern (S & S), bond counsel to both purveyors, and Public Financial Management (PFM), the common financial advisor to both purveyors, to review the legal and financial aspects of these agencies' outstanding bonds, loans, and notes with respect to consolidation/integration. It was decided to look at the two largest agencies with respect to consolidation/integration since these agencies serve over 90% of water customers in the greater Truckee Meadows and with respect to the WCDWR a certain number of sewer and reclaim water customers. The legal and financial analyses were undertaken in a manner so as to not predetermine a conclusion for consolidation/integration of these purveyors. The intent of these analyses was to provide sufficient information with respect to outstanding bonds, loans and notes to support a decision for advancing work on consolidation/integration of these agencies' functions. Also if the refinancing (defeasance) of debt for a particular or both water purveyors is a limiting factor, then this analysis would identify those limiting factors and assist in focusing resources toward other integration opportunities that may produce overall cost reduction or other monetary or non-monetary benefits to the region's customers.

[1] **Consolidation** for purposes of this report means a full combination of all financial, business, and operating functions. **Integration** is defined as a limited combination of financial, business and operational functions or developing parallel financial, business and operational processes.

As of June 30, 2008 TMWA had approximately over $500 million in outstanding bonds, loans, and notes. As of June 30, 2008 WCDWR had over $100 million in outstanding bonds, and loans.

DISCUSSION

The bond analysis is comprised of two steps: a legal review, and a financial review. The legal review was performed to determine which covenants must to be complied with and what financial and operational options are available to the two agencies from the perspective of the bond indentures. Second, a financial review was performed to calculate what financial benefits, costs, and/or impediments may exist at this time.

S & S, bond counsel to both agencies, was engaged for the legal analysis to review the bond, loan, and note covenants to determine compliance with certain covenants that would allow some form of operational consolidation/integration. Three initial alternatives were provided. ***Please refer to Attachment A.*** The first alternative was full consolidation (see Footnote 1 for definition of consolidation) of the two agencies. To achieve this goal one entity would issue new bonds to pay off the other entity's bonds and the entity that issued new bonds could become the surviving entity and owner. The existing bonds of the acquired entity must be paid off (defeased) because of a restrictive covenant. The second alternative would leave existing debt in place but have an interlocal agreement making one entity the manager of the consolidated operations. The third alternative would be a combination of the aforementioned two alternatives: create an interlocal agreement that addresses management of the consolidated operations and only new debt can be issued by the managing entity. The managing entity would then determine the time when the outstanding debt of the non-managing entity would be paid off (defeased) as bond market conditions or other opportunities allow. These alternatives are not considered comprehensive and potentially other options may become available as additional consolidation/integration analyses are preformed. This analysis does not address partial integration of certain business functions which is also an option.

PFM conducted an analysis of refinancing (defeasance) of all bonds and loans on an issue by issue basis, to integrate into the aforementioned legal alternatives. Again this analysis was not to draw any conclusions but simply perform the financial mathematics to determine the savings or costs (negative economic benefit) from refinancing the bonds and notes at this time. ***Please refer to Attachment B.***

As can be concluded from the table in ***Attachment B,*** **refinancing of all or any of the outstanding bonds and loans do not provide any savings but rather significant economic and financial costs (dis-savings).** Of particular importance are TMWA 2006 and 2007 Refunding Bonds which at this time are only refundable by issuing taxable bonds. These bonds were issued to refinance certain maturities of the 2001-A Water Asset Acquisition Bonds on an advanced basis which Internal Revenue Service (IRS) Regulations allow only once. The refinancing of these bonds is only achievable under favorable market conditions and only within 90 days before the call date of July 1, 2016 on certain maturities. Based upon current information, alternative one which discusses full consolidation under the legal analysis is clearly not an option without significant detrimental effects on customer water rates and developer fees. Alternatives two and three under the legal analysis appear to have opportunities to explore and

analyze. Also pursuit of more limited integration alternatives not discussed in the legal analysis appear feasible.

ATTACHMENT A

From: Swendseid, John O. [mailto:jswendseid@shermanhoward.com]
Sent: Tuesday, September 09, 2008 12:11 PM
To: Tissier, Jeff
Cc: Stern, Jennifer
Subject: Consolidation

Jeff: I have now looked at the debt instruments of TMWA and Washoe County. I believe there are three ways an operational consolidation could be effected under these instruments:

1. One entity or the other could issue bonds to pay off the other entity's bonds, and then the entity that issued the bonds could become the owner of the system of the other entity. The existing bonds must be paid off (or defeased) before another entity acquires the System because the bonds of each entity have in them a covenant to the effect that "neither all nor a substantial part of the System shall be sold, leased, mortgaged, pledged, encumbered, alienated or otherwise disposed of until all the Bonds have been paid in full, or unless provision has been made therefore as hereinafter provided." Note that under this option, only one entity's bonds have to be retired or defeased, not both entities. Also, if it is a cooperative venture, it is possible for GO bonds to be issued for this purpose by the County, whether the County or TMWA will be the entity that owns the consolidated system. (The County could issue GO bonds on behalf of TMWA to pay off or defease the existing County Bonds under the County Bond Bank provisions of Chapter 244A of NRS (the County has a separate debt limit for County Bond Bank Bonds), or the County could issue GO bonds on behalf of itself to pay off or defease the existing TMWA bonds.)

2. The parties could leave the existing debt in place, but have an interlocal agreement pursuant to which one entity or the other is the manager of the consolidated system. The manager would be responsible for running the System, and the interlocal agreement could specify how rates are set, how existing and future debt is handled, what if any circumstances would permit a party to end the interlocal agreement, etc. This is likely simpler to implement, but is also likely to lead to more friction in the future, as it involves debt of more than one entity, possible future negotiations over rates, debt, service areas for ratemaking purposes, ownership of assets by more than one entity, etc. Also, the non-managing entity would have to have the right to step in and take over its old system if the Managing entity was not managing the system in a way that complied with the bond covenants of the non-managing entity.

3. A sort of combination of 1 and 2 above. To start with, under an interlocal agreement, one entity would manage the consolidated system similar to 2 above. The Managing entity would agree to be responsible for paying all existing debt and complying with all existing debt covenants. No new system related debt of the non-managing entity would be issued--only new system related debt of the Managing entity could be issued. The Managing entity could decide when to pay off the debt of the non-managing entity, and once it was paid off, the assets of the non-managing entity would be transferred to the Managing entity. So this starts out like 2 above, but if all goes well, ends up like 1 above. Like in 1, is possible for GO bonds to be issued to pay off debt of the non-managing entity, whether the County or TMWA will be the entity that manages the consolidated system (though, if this was done it may be a requirement that all of the

debt of the non-managing entity be paid off or defeased at one time); also, like in 2 above, prior to the defeasance of the non-Managing entity's debt, the non-managing entity would have to have the right to step in and take over its old system if the Managing entity was not managing the system in a way that complied with the bond covenants of the non-managing entity.

I would be glad to meet to further discuss these and any other possible ideas. Please call with any questions or comments.

John O. Swendseid
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Swendseid & Stern
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ATTACHMENT B
TMWA-WCDWR
Analysis of Outstanding Debt
Refinancing/Defeasance Analysis

	TMWA Bonds/Loans	Refunded Par	Savings or (Cost) to Refinance Nominal	Savings or (Cost) to Refinance Present Value	Percentage Savings/(Cost)
1	TMWA Water Revenue 2001-A Bonds	$ 58,105,000	$ (2,833,579)	$ (4,275,876)	-7.36%
2	TMWA Water Revenue 2005-A Bonds	37,910,000	(17,893,319)	(10,984,211)	-28.97%
3	TMWA Water Revenue 2006 Refunding Bonds **(1)**	147,630,000	(202,847,073)	(90,964,038)	-60.59%
4	TMWA Water Revenue 2007 Refunding Bonds **(1)**	202,395,000	(283,442,872)	(127,617,073)	-58.81%
5	Total Senior Lien Debt	$ 446,040,000	$ (507,016,843)	$ (233,841,198)	
6	TMWA DWSRF 2005 Loan **(2)**	$ 4,384,844	N/A	N/A	N/A
7	Tax-Exempt Commercial Paper **(3)**	68,000,000	Not Analyzed	Not Analyzed	Not Analyzed
8	Total Subordinated Debt	$ 72,384,844			
	WCDWR Bonds/Loans				
9	Washoe 2001 Medium Term Bonds	$ 1,775,000	$ (440,017)	$ (464,870)	-26.19%
10	Washoe 2005 Water/Sewer Bonds	61,680,000	(25,143,281)	(16,606,083)	-26.92%
11	Total Washoe County Water/Sewer Bonds	$ 63,455,000	$ (25,583,298)	$ (17,070,953)	
12	Washoe 2006 Water/Sewer SRF	$ 4,055,106	$ (965,652)	$ (794,211)	-19.59%
13	Washoe Cold Springs Sewer SRF	2,492,208	(963,664)	(744,227)	-29.86%
14	Washoe Horizon Hills Water SRF	112,530	(586,349)	(410,114)	-364.45%
15	Washoe Valley Sewer SRF	643,949	(557,058)	(437,458)	-67.93%
16	Washoe Longley Lane Water SRF	12,594,028	(2,974,144)	(2,605,712)	-20.69%
17	Washoe Spanish Springs SRF	5,972,394	(1,972,504)	(1,530,123)	-25.62%
18	Washoe STMWRF Sewer 2001 SRF	15,580,564	(1,797,783)	(2,069,302)	-13.28%
19	Washoe South Truckee SRF	565,632	(590,479)	(436,478)	-77.17%
20	Total Washoe County SRF Loans	$ 42,016,411	$ (10,407,633)	$ (9,027,625)	
21	Total Debt Subject to the Refunding Analysis	$ 105,471,411	$ (35,990,931)	$ (26,098,578)	

(1) These TMWA Bonds were issued to refinance/refund certain maturities of the 2001-A Acquisition Bonds. Certain maturities are not refundable again on a tax-exempt basis until 90 days prior to call dates on those maturities.

(2) This loan was not analyzed and omitted in error, most likely dis-savings

(3) The TECP was not analyzed because the weighted weighted average interest rate is approximately 1.7% and interest rates vary constantly as notes maturie and are remarketed (resold). No savings would be attainable by refinancing with senior lien bonds.

Western Regional Water Commission

STAFF REPORT

DATE: July 20, 2009

TO: Chairman and Members, Western Regional Water Commission's Subcommittee on Consolidation/ Integration

THRU: Mark Foree, General Manager, Truckee Meadows Water Authority

Rosemary Menard, Director, Washoe County Department of Water Resources

FROM: **Jeff Tissier, TMWA CFO and Project Manager**

John Sherman, Washoe County Director of Finance

SUBJECT: Phase Two Financial Analysis and Business Risk Assessment

---

Recommendation

Staff recommends that a plan to integrate Truckee Meadows Water Authority (TMWA) and Washoe County Department of Water Resources, Division of Water Operations (DWR) move forward as justified through the development of a plan to address the necessary operating costs/ savings in order to achieve the goal of full consolidation. Although a significant portion of cost savings must come from operational changes within DWR, it is recognized that potential opportunities exist within TMWA to direct and facilitate initiatives (e.g., potential personnel attrition through retirements) which will contribute to combined costs savings and/or avoidances of the consolidated entity. Staff recommends proceeding with the project by preparing a draft implementation plan that lays out the roadmap to accomplish consolidation of DWR operations into TMWA. This is contingent on defeasance of a significant portion of DWR senior lien debt.

Background

At its September 12, 2008 meeting, the Western Regional Water Commission (WRWC) asked staff from the Truckee Meadows Water Authority (TMWA) and the Washoe County Department of Water Resources (DWR) to do the following:

> "Conduct a focused financial analysis to assess the feasibility of some form of utility integration using their joint bond counsel and financial advisors, Swendseid & Stern and PFM respectively. This focused financial analysis would:
>
> a) identify limitations or restrictions to utility integration resulting from existing debt (including bond/loan/note obligations) and applicable ordinances [Item completed in December 2009];
>
> b) suggest possibilities for addressing any existing limitations; and

c) outline potential financial structures of an entity created by some form of integration, if a plan for moving forward were adopted. "

At the December 2008 WRWC meeting the Phase One Financial Report was presented which consisted of a Bond Analysis addressing certain limitations and restrictions resulting from existing debt and what opportunities were available. The conclusion of this analysis pointed out significant increases in costs to water customers if TMWA was not the surviving entity, however, the possibility of consolidating the Department of Water Resources (DWR) into TMWA exists, although there would also be costs associated with defeasing DWR's debt. In lieu of full consolidation in the near-term there are opportunities to integrating certain functional areas of TMWA and DWR with a goal to fully consolidate at a later date after certain conditions are met. For purposes of this report "consolidation" means full and complete consolidation of entities' facilities and their operation while "integration" is defined as combining certain operating or financial functions of both utilities.

Summary of Phase Two Financial Analysis

Significant business risks have been identified related to full consolidation at the present time, which translate to risks to all water customers of the region. To combine the water utilities without consideration to identified business risks would be costly to all water customers. These risks must be mitigated before full consolidation can occur. The following table presents the findings of a high-level financial analysis assuming an consolidated entity.

TMWA/WCDWR Integration Analysis
Projected Combination of Water Divisions Operating Revenues and Expenses

Final Budget Projections	WCDWR	TMWA	Combined Total	Eliminations Additions	Adjusted Combined Totals
Water Sales (1,2)	$ 13,242,385	$ 75,339,744	$ 88,582,129	$ (1,800,846)	$ 86,781,283
Hydroelectric	-	2,208,589	2,208,589	-	2,208,589
Other (includes GVR)	751,117	2,067,089	2,818,206	-	2,818,206
Total Operating Revenues	13,993,502	79,615,422	93,608,924	(1,800,846)	91,808,078
Wages Salaries & Benefits (3)	3,676,944	17,241,897	20,918,841	358,897	21,277,738
Professional/Contract Services (4)	737,421	8,207,084	8,944,505	703,477	9,647,982
Supplies	1,980,853	2,934,256	4,915,109	-	4,915,109
Utilities	1,729,196	6,954,436	8,683,632	-	8,683,632
Purchased Water (5)	2,332,848	-	2,332,848	(2,332,848)	-
Overhead and Other (6)	1,058,651	4,687,363	5,746,014	(750,971)	4,995,044
Total Cash Operating Expenses	11,515,913	40,025,036	51,540,949	(2,021,444)	49,519,505
Depreciation Expense	7,046,737	21,468,108	28,514,845	-	28,514,845
Total Operating Expenses	18,562,650	61,493,144	80,055,794	(2,021,444)	78,034,350
Operating Income (Loss)	$ (4,569,149)	$ 18,122,278	$ 13,553,130	$ 220,598	$ 13,773,728
Principal	$ 2,564,135	$ 9,335,000	$ 11,899,135		
Interest	3,129,215	21,840,105	24,969,320		
	$ 5,693,349	$ 31,175,105	$ 36,868,454		
Projected water rate increase	106.0%	104.5%			

NOTES:
(1) The revenue elimination reflects reduction of wholesale revenue received from WCDWR
(2) The DWR water sales budget is virtually the same as DWR customer demand calculated with TMWA rates
(3) Personnel transfer cost change estimates, assumes all WCDWR personnel, includes deferred comp match impact
(4) DWR only not STIMGID Water Customers to Vertex + Mailing which includes past due mailings. Vertex contract extends to Feb 25, 2013
(5) Eliminate DWR wholesale water purchases from TMWA
(6) Refer to adjustments below

Additional cost reductions need exploration as a result of defining additional operational efficiencies. Certain significant financial risks that have been identified at this time which include:

- DWR Water Division's cost of service and proposed rate increases include only 20% of the approximately $5.7 million in annual debt obligations with an expectation that developer fees or certain cash reserves will fund the other 80%. This is a significant business risk because of the reliance on growth in light of current economic conditions to fund this obligation. Without growth, DWR customer rates will have to be increased above the current rate increases to cover this debt payment. Defeasance of a significant portion of the total debt would mitigate this issue.

- The General Fund of Washoe County still pays slightly over $1.0 million for certain water planning functions for DWR for fiscal year 2010 (Note: FY 2008 General Fund support was nearly $2.0 million). If this funding support disappears, other funding mechanisms will be required or some form of cost containment to compensate for this reduced funding must occur under the framework of a consolidated entity.

- The Water Division of DWR has borrowed over $5.0 million from other financial resources within DWR with an uncertain plan for repayment.

- If the entities were consolidated as they currently operate with their respective levels of staff it is estimated that a minimum of $2.1 to $3.0 million in operating expenses, on a combined basis, would have to be eliminated to be able to meet TMWA's projected financial goals. The high end of this estimate reflects the loss of funding from the Washoe County General Fund for DWR water planning.

- TMWA's primary business risk is renewing its letter of credit that supports its tax-exempt commercial paper program. This can be accomplished but pricing will be challenging. TMWA will embark on the renewal process late calendar year 2009 and early 2010 which can provide sufficient lead time before the August 15, 2010 renewal date. TMWA has few demands on commitments to growth with adequate water rights and water system capacity. Activities related to consolidation efforts must consider and protect TMWA's ability to maintain its financial integrity and achieve its financial strategic goals.

The following table highlights high-level financial performance under a consolidation framework and the potential, dilutive, accretive effects on senior lien bond coverage ratios of a fully consolidated entity.

Scenarios of Combined Sr Lien Coverage w/o Developer Fees

	---------a---------	---------b---------	---------c---------
Water Sales	$ 86,781,283	$ 86,781,283	$ 86,781,283
Hydroelectric	2,208,589	2,208,589	2,208,589
Other Misc Sales	2,818,206	2,818,206	2,818,206
Investment Income	4,729,722	3,593,454	3,593,454
Total Gross Revenues	$ 96,537,800	$ 95,401,532	$ 95,401,532
Total Consolidated Cash Operating Expenses	49,519,505	49,519,505	47,419,505
Net Revenues	47,018,295	45,882,027	47,982,027
Sr Lien Debt	35,860,580	33,575,261	33,575,261
Sr Lien Coverage	**1.31**	**1.37**	**1.43**

NOTES:
a) All debt excluding DWSRF loan has a first lien, no issue is defeased, no operating cost reductions.
b) The DWSRF loan for the Longley Plant is subordinate and $40.0 million of $65.0 million 2005 bond issue is "defeased", no operating cost reductions.
c) Longley debt subordinated, $40.0 of $65.0 million defeased, $2.1million in reduced O & M expenses on a combined basis exclude water planning.

Because most of the DWR's debt is not covered by customer water rates, DWR must "defease" a significant portion of its first lien debt by using the remaining cash proceeds of the $65.0 million bond issue (issued in 2005). It is imperative that a plan be developed for reducing combined operating expenses. These aforementioned issues highlight the most significant current challenges facing full consolidation. Staff believes that if the agencies and their governing

boards are committed to full consolidation, these measures could be successfully addressed over the next two to three years.

In addition to the financial analysis, a preliminary, detailed list of contingencies and commitments is being developed that highlights future business challenges and risks that must be addressed and/or mitigated under a consolidation framework. This is typical when undertaking merger analyses because of the various stakeholder of interest,

PRELIMINARY ASSESSMENT REPORT
DWR-TMWA INTEGRATION STUDY

TRUCKEE MEADOWS WATER AUTHORITY

Department of Water Resources

DATE: February 17, 2009

TO: Jack Byrom
Rosemary Menard

FROM: Scott Estes
Rick Warner

RE: **TMWA-DWR Integration Analysis**
Planning & Engineering Preliminary Assessment Report

Integration Study Purpose and Mission:
To explore opportunities whereby TMWA and WCDWR may, through joint operation of water system facilities and management of water resources, produce quantifiable benefits for TMWA and WCDWR customers and the community as a whole.

System Planning and Engineering Team Purpose and Scope:
The System Planning and Engineering Team was charged with identifying and evaluating the opportunities to achieve improved service levels; reduce system operating costs; reduce facility capital costs; eliminate unnecessary or redundant facilities; increase system reliability; increase water quality; and maximize conjunctive use of limited groundwater and surface water resources through implementation of operating and capital planning strategies based on the assumption that the DWR and TMWA water facilities and systems are one rather than two separate systems.

Methodology and Approach to the Evaluation:
It was determined that the most effective approach to the evaluation would be to focus on specific pressure zones located at the boundaries between the distribution systems in the South Truckee Meadows, Spanish Springs and the North Valleys. Initial discussions were facilitated through an exchange of area assessment worksheets that identified system deficiencies and/or operational concerns/constraints along with the capital improvement plans (if any) to address those issues. This allowed each purveyor to determine if there were opportunities to utilize existing facilities and/or excess capacity to potentially replace or delay expenditures planned by the other entity.

Following high level introductory discussions of each study area by the full teams during the first two meetings, it was decided to break into sub-teams to allow those most knowledgeable and experienced in each geographical study area to determine if and how the adjacent water systems could be physically integrated and to quantify the benefits. The sub-team analyses included combined water system computer model simulations when possible to analyze service levels and to provide a more detailed evaluation of conjunctive use scenarios with integrated operation.

PRELIMINARY ASSESSMENT REPORT
DWR-TMWA INTEGRATION STUDY

Summary:
The Planning and Engineering Team concluded that integration efforts could produce one or more of the following benefits in each of the study areas: improved service levels; reduced operating costs; reduced capital costs and/or facility charges; elimination of unnecessary redundant facilities; and improved water quality. Each of the study areas is discussed in greater detail in the report sections to follow.

South Truckee Meadows:
The South Truckee Meadows (STM) area presents opportunities for successful integration and/or joint operation of water system facilities. Based on very limited and cursory analyses, the opportunity scorecard for the STM area is presented below:

Will DWR/TMWA System Integration…										
	Improve Reliability?		Improve WQ?		Improve Service Levels?		Decrease Operating Costs?		Eliminate or Delay Capital Expenditures ?	
	TMWA	DWR	TMWA	DWR	TMWA	DWR	TMWA	DWR	TMWA	DWR
Potentially Yes	X	X		X	X		X	X	X	X
Probably Not			X			X				

Reliability: DWR Storage would increase reliability for TMWA customers. The radial configuration of TMWA's South Virginia system would be eliminated by looping with DWR's Double Diamond (DD) system, which would increase the reliability of supply to TMWA's Zolezzi system. Replacing 1-2 wholesale take points with several connections would increase reliability to DWR's DD system.

Water Quality: A conjunctive use operating approach with a base load surface water supply would provide a more effective method to manage the potential future impacts from arsenic that would require either blending or treatment to meet running annual average (RAA) criteria in the DD area. Conjunctive use may allow DWR to rest the DD aquifer in the winter months, which may possibly slow the migration of arsenic and/or boron into the capture zones of DWR wells.

Service Levels: TMWA could lower service pressures in the E. Huffaker area. Suction pressure to TMWA's Zolezzi pumping system and the South Virginia area would be stabilized and increased. Fire flow capacity would increase to TMWA's South Virginia corridor.

Operating Costs: TMWA may be able to reduce operating costs by eliminating seasonal continuous pumping at the Longley pump station during electric on-peak periods and by decreasing required pump horsepower. DWR may be able to reduce pumping costs by not operating DD wells in the winter/shoulder months. DWR should be able to shut down the Longley GWTP in the winter months.

Capital Expenditures: TMWA could eliminate the Longley Tank project ($4.7M). DWR may be able to delay the STM WTP project ($38M) as well as defer expansion of the Longley GWTP ($4.4M).

DWR's primary objectives in the STM area include deferring construction of their treatment plant and insuring compliance with arsenic standards. TMWA's primary objectives in the STM involve increasing system reliability. TMWA's existing facilities are capable of delivering up to 5400 GPM of surface water to the DD area. Up to 7400 GPM can be delivered to the STM area with construction of additional TMWA facilities at a cost of about $2.8 Million. Construction of those facilities might be deferred or possibly eliminated if additional TMWA surface water could be delivered to the STM area via DWR's existing 16-inch transmission main from Hidden Valley.

Spanish Springs:
The Spanish Springs (SS) area presents very limited opportunities for physical integration of water system facilities. Based on very limited and cursory analyses, the opportunity scorecard for the SS area is presented below:

Will DWR/TMWA System Integration…										
	Improve Reliability?		Improve WQ?		Improve Service Levels?		Decrease Operating Costs?		Eliminate or Delay Capital Expenditures ?	
	TMWA	DWR	TMWA	DWR	TMWA	DWR	TMWA	DWR	TMWA	DWR
Potentially Yes				X				X		
Probably Not	X	X	X		X	X	X		X	X

Reliability: DWR groundwater capacity would increase reliability for TMWA customers if there was a break on a major transmission main. However, the existing pressure zones are too disparate to achieve completely open and integrated distribution systems. The six existing interties could be utilized more effectively and additional interties constructed as necessary to maximize the capacity of existing facilities and increase system reliability and service levels.

Water Quality: A conjunctive use operating approach including providing an off-peak base load surface water supply would provide a more effective method to manage arsenic blending and meet RAA criteria in DWR's system.

Service Levels: Because existing pressure zones and boundaries would likely endure, service levels should be unaffected. Existing service levels are considered generally good.

Operating Costs: DWR may be able to reduce pumping costs by not operating SS wells in the winter months.

Capital Expenditures: DWR's commitment to limit GW pumping to 1800 AFA (reflecting over-appropriation of the SS basin), prohibits sharing excess GW capacity with TMWA during the summer peak period. Therefore, it is unlikely that TMWA will be able to delay or downsize planned capital improvements.

DWR's primary objectives in the SS area include arsenic compliance and reducing annual groundwater pumping in the basin. TMWA's challenges in the SS area involve scheduling construction of capacity improvements as necessary to maintain service levels in the northern extents of the TMWA gravity zone during peak periods. The ability of TMWA's system to deliver surface water to the SS area is limited by hydraulic constraints resulting from the extreme distance between source of supply (Glendale WTP) and the Spanish Springs Valley. The effect of distance cannot be cost effectively overcome with larger transmission mains; therefore, long-term facility plans to meet future peak demands include the development of a low-head pump zone between TMWA's current Sparks Gravity zone and Spanish Springs pumping system. Select future phases of TMWA's Sparks Feeder Main project could be delayed or perhaps downsized only with development of significant new peaking water sources north of Satellite Hills. Since groundwater resources in the hydrographic basin are apparently over appropriated now, it is likely that significant additional municipal well capacity can only be developed in the region with large scale conversion of single domestic wells to municipal supply, or possibly implementing an extensive aquifer storage and recovery (ASR) program. A conjunctive use plan maximizing the current TMWA wholesale delivery rate of 4200 gpm (the maximum contract rate) plus 1800 AFA of DWR groundwater was presented in DWR's 2007 SS water facility plan update. The analysis indicates that this conjunctive use plan could supply a DWR demand of up to 6250 AFA, but does not result in excess on-peak groundwater capacity that could be made available to the TMWA system. However, recent TMWA planning efforts reflecting revised operating plans, including on-peak support from its Hawkings Court well, indicate the TMWA system may be capable of peak period deliveries in excess of 2000 gpm at the Lazy 5 wholesale delivery point, depending on ultimate demand on the TMWA system.

North Valleys:
The North Valleys (NV) areas (Lemmon Valley, Stead and Silver Lake) present limited opportunities for successful integration and joint operation of water system facilities. Based on limited/cursory analyses, the opportunity scorecard for the NV area is presented below:

Will DWR/TMWA System Integration…										
	Improve Reliability?		Improve WQ?		Improve Service Levels?		Decrease Operating Costs?		Eliminate or Delay Capital Expenditures ?	
	TMWA	DWR	TMWA	DWR	TMWA	DWR	TMWA	DWR	TMWA	DWR
Potentially Yes	X	X		X					X	X
Probably Not			X		X	X	X	X		

Reliability: DWR groundwater capacity would increase reliability for TMWA customers if there was a break on the North Virginia-Stead transmission main. In theory, Fish Springs groundwater could provide short-term drought protection for the TMWA system. Strategic interties could increase overall reliability for DWR customers in case of main breaks or disruption of normal supply.

Water Quality: Short term use of Fish Springs water by both systems would likely alleviate current pH problems caused by the reduced turnover (low demand) in the lengthy transmission system (long term WQ issues are not anticipated). Potential

issues from iron, manganese and nitrate levels in some Lemmon Valley wells could be minimized by limiting the use of those groundwater sources, or possibly blending groundwater and surface water sources.

Service Levels: No significant improvement in service levels is anticipated as a result of integrated operations.

Operating Costs: Short term seasonal pumping costs may be avoided in one or both systems if a conjunctive use operating scheme can be implemented and depending upon which resource is utilized for base load purposes.

Capital Expenditures: Differences in system pressures complicate matters, but it may be possible to avoid duplicate water main facilities in Old Virginia Road by ultimately converting the use of a single new pipeline from one pressure zone/entity to another (approx. $3.5M).

DWR's primary objectives in the NV area include construction of facilities to integrate and utilize the Fish Springs groundwater source and to manage the local groundwater basin. TMWA's challenges in the NV area involve timely replacement of aging infrastructure and the management of its west Lemmon Valley groundwater sources. Water resources allocated to the original Stead-Silver Lake retail water service area include 4.25 MGD of Truckee River rights and an additional 2-3 MGD (620 AF mid-May through mid-September) of local groundwater. Surface water deliveries to the Lemmon Valley-Stead-Silver Lake area in excess of that original 4.25 MGD are considered to be an inter basin transfer or export. Therefore, any new demand served by Truckee River rights requires an additional "return flow" water resource dedication (equal to 50% of the consumptive demand) to replace the amount of water that would normally return to the river system if the resource had been used in the Truckee Meadows. Obviously this is not a desirable use of limited Truckee River resources; therefore, TMWA has not planned to expand its existing service area beyond what can be supported with existing resources.

The Fish Springs groundwater importation project was constructed to provide a water supply for future growth in the area. Effluent disposal issues notwithstanding, long-term growth projections for the North Valleys indicate a water supply deficit even with full utilization of all available resources (Truckee River, Fish Springs and local basin groundwater). Long term displacement of Truckee River rights with Fish Springs water makes sense only if the river rights can be resold for use elsewhere in the Truckee Meadows at a price that exceeds the cost of the Fish Springs resource. However, as previously mentioned, this concept could also potentially limit overall growth in the North Valleys. In the short term, the Fish Springs resource could provide drought protection and allow TMWA to delay use of its water stored in upstream reservoirs during drought conditions. In addition, Fish Springs water could also be used to remediate the local groundwater basin through passive or active ASR programs.

Full integration of the Fish Springs resource into DWR's system requires the construction of major transmission mains from the termination of the Fish Springs project in the north to the North Virginia corridor in the south and ultimately to storage in DWR's Horizon Hills system. TMWA must also construct a transmission main in Old North Virginia to replace the existing Stead main between Golden Valley Road and the Stead Tanks. A single, appropriately sized pipe in Old Virginia between Lemmon Drive and the Stead Tanks would suffice if the main is ultimately operated as part of the Fish Springs conveyance system. Under this scenario, TMWA would deliver its Stead surface water supply to DWR's Lemmon Valley system near

the intersection of Lemmon Drive and North Virginia; and DWR would deliver the same offsetting amount of Fish Springs water to TMWA's Stead system on Old Virginia Road west of Stead Boulevard. This plan also takes advantage of the higher Fish Springs/Horizon Hills hydraulic grade line (HGL) which would be able to serve elevations along the Old Virginia corridor above those that could be served from the TMWA/Raleigh Heights HGL. In the short term, the 1000 gpm TMWA wholesale capacity requested by DWR and short-term excess capacity inherent to TMWA's new North Virginia-Stead pumping system could be used to defer construction of a portion of the Fish Springs integration facilities.

TMWA's "golf course" main provides a major transmission tie between its storage facilities at the south end of Stead Boulevard and the northern extents of the distribution system adjacent to the airport. The existing steel pipe was originally installed in the 1940's and is scheduled for replacement as part of TMWA's CIP. A main replacement in this particular corridor provides an opportunity to move significant volumes of Fish Springs water from the north to the south; however, TMWA also needs additional north to south capacity to fully utilize its local groundwater supplies. The two uses are not compatible based on respective system pressures; however, additional study may identify alternate scenarios that might work. In general, disparate pressure zones complicate system and facility integration. Very close cooperation and joint planning between TMWA and DWR will be required to develop unique solutions and insure that potential benefits are ultimately realized.

Recommendations, Limitations & Additional Studies:
This preliminary assessment relies primarily upon the professional judgment of engineers most familiar with the water systems in each study area. The "scorecards" and brief explanations for each area present the potential benefits of integrated operation based on expert opinion without detailed or rigorous engineering analysis. Some of the issues that need to be considered or that require further study and development include the following:

- This analysis does not consider what type of integration (as opposed to full consolidation) may be implemented. Facility integration would be more efficient if existing wholesale meter facilities were physically bypassed and additional connections and interties constructed. If both entities continue to control their own assets and revenues, accounting of "wholesale" deliveries would be problematic.
- Additional study and discussion will be required to address issues associated with the current agreement between DWR and STMGID in the STM including joint use of facilities, water sources, joint operations and costs.
- Based on various regional planning efforts and population projections, it is apparent that the long-term projected demand will exceed the existing supply at some point in the future. This analysis does not consider demands beyond 2030, which may exceed the current pool of available resources. It is noted that as recently as 2007, TMWA's maximum day demand (MDD) in the year 2030 was estimated to be on the order of 195 million gallons per day (MGD). New growth projections developed subsequent to the beginning of the economic slowdown predict a 169 MGD maximum day demand for TMWA's system in 2030.
- The Resource Team will need to quantify groundwater and surface water resources and determine the feasibility of conjunctive use programs on an annual and ongoing basis including the yield of the combined resources during extended drought periods.
- Where it was possible to model integrated systems, the analysis utilized system "build-out" models which may contain future facilities that may not be available in the short-term to facilitate system integration. Detailed engineering analysis should be performed to determine if additional facilities are required to implement integration

and to estimate the cost of those facilities. In addition, average day, peak hour, fire flow and operational storage utilization/recovery scenarios need to be evaluated.

- Changes to existing operating procedures need to be established and evaluated. For example, it may become necessary to operate the Glendale WTP on a year-round basis; or integrated operation may require pumping in electric on-peak periods, etc.
- Potential operating and capital cost savings identified herein need to be further analyzed, refined and measured.
- DWR is in the process of updating its water facility plans for the STM, SS and NV areas. When available, these facility plans should be reviewed and the recommended improvements incorporated into this analysis. It is anticipated that the updated facility plans will include revised future demand projections by individual pressure zone. This information will be very helpful in developing more detailed potential conjunctive use operating scenarios.

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TRUCKEE MEADOWS WATER AUTHORITY

Department of Water Resources

DATE: June 16, 2009

TO: Jack Byrom
Rosemary Menard

FROM: Vahid Behmaram
Chris Benedict
Ken Briscoe
John Erwin
Bwire Ojiambo
Shawn Stoddard
Mike Widmer

RE: **Preliminary Assessment Report: Integrated Water Resources of Truckee Meadows Water Authority (TMWA) and Washoe County Department of Water Resources (WDWR)**

Integration Study Purpose and Mission

To explore opportunities whereby TMWA and WCDWR may, through joint operation of water system facilities and management of water resources, produce quantifiable benefits for TMWA and WCDWR customers and the community as a whole.

Resource Planning and Development Team Purpose and Scope

The Resource Planning and Development Team looked to assess the potential opportunities that the region may derive from consolidated management of TMWA and WDWR water rights/resources, thereby providing opportunities to operate water production facilities in a manner that optimizes surface and ground water resources and facilities while seeking to minimize costs.

Methodology and Approach to the Evaluation

It was determined that the most effective approach to the evaluation would be to focus on the three hydrographic basins where TMWA and WDWR have adjacent facilities: Lemmon Valley, Spanish Springs, and Truckee Meadows (divided into Central and South Truckee Meadows) illustrated in Figure 1. Initial discussions were facilitated through the development of basin maps (Figures 2-5) to locate production facilities and capacities, water rights associated with production facilities, areas of water quality concerns, and geologic/hydrogeologic survey

information. This allowed each purveyor to determine if there were opportunities to utilize existing rights, contracts, and operations to potentially develop alternate operating schemes to enhance basin conditions.

Following high level introductory discussions of each study area by the full team, it was decided to break into sub-teams to allow those most knowledgeable and experienced in each geographical study area to determine if and how the adjacent water systems and their operation could benefit from a combined operation. The review addressed the following:

- quantify water rights held by lease or in fee and the type of obligations/commitments against those rights
- quantify existing well capacities and associated permits to identify any imbalances
- quantify historic operations of production facilities to identify potential improvements in management of production facilities against available water resources

For purposes of this report, the use of the phrase "conjunctive use" as it applies to water resources implies the joint or mixed use of different water sources to generate a needed water supply. For the region the water sources include tributary creek rights to the Truckee, Truckee River mainstream water rights, ground water, storage rights, and potential imported ground water. By using these multiple sources, conjunctive use can take on at least two further delineations: operational conjunctive use (OCU) and resource development conjunctive use (RCU).

The difference between OCU and RCU is the joint management of resources to generate a water supply RCU results in the ability to expand service commitments, whereas OCU relates to the joint management of resources to generate a water supply but does not create opportunity for expanding service commitments. It is assumed that both OCU and RCU result in management of resources to sustain or improve the long-term viability of resources within a hydrographic basin.

RCU has greater value than OCU because it seeks to expand the current available resource mix in order to satisfy more commitments. Therefore, to take full advantage of RCU the OCU practice within a basin must be examined to determine if there is "more room" in the resource mix to grow commitments. Alternatively stated, are there unexercised water rights/permits in a basin that if other resources were available, and just by re-managing the resources, those unexercised rights could be used to expand service commitments.

The Resource Planning and Development Team concluded that integration efforts could produce one or more of the following benefits in each of the study areas: improve aquifer supplies; improve aquifer water quality conditions; create resource reallocation opportunities; potentially reduce certain operating costs; potentially avoid certain capital costs and/or facility costs, and conjunctive use as described in the previous paragraphs. In general, the reader will find the majority of benefits of combined resource management, without clear delineation of financial impacts to be borne by either TMWA or WDWR customers, accrue to WDWR. Further clarification of certain contingencies such as potential legal obligations/constraints on some of Washoe County's water rights, financial analysis to determine the costs/benefits to the respective

utility's customers associated with providing the identified benefits, and refinement of production scheduling is required to improve upon the initial findings presented in this report. Until that occurs, it is speculative that these contingencies may be mitigated under any individual or joint operating scenario, or single entity which would result in net cost reduction or avoidance to either utility.

Details of the team's efforts are provided in the following sections identified by the hydrographic basin.

Recommendations, Limitations & Additional Studies

This preliminary assessment relies primarily upon the professional judgment of those most familiar with the respective utilities' water resources. The "scorecards" and brief explanations for each area present the potential benefits of integrated operation based on expert opinion without detailed or rigorous hydrologic/hydrogeologic, environmental, financial or economic analyses. Some of the issues that need to be considered or that require further study and development include the following:

- This analysis does not consider what type of integration (as opposed to full consolidation) may be implemented. Depending on the proposed form of integration, the outcome of findings in this report may need revision.
- The Resource Team will need to quantify ground water and surface water resources and determine the feasibility of conjunctive use programs on an annual and ongoing basis including the yield of the combined resources for normal operations, emergency conditions, and/or during extended drought periods.
- Pursue opportunities to balance water resource use within each hydrographic basin examined in this study. This implies evaluating and striking a balance between the water rights/resources of the utilities, the yield of the basin, and customer demands within the basin.
- Implement plans that make full use of available water resources including tributary creeks and Vidler Project supplies for current and future demands.
- Finalize and implement plans for new recharge projects using highly treated water resources.
- Further analysis is required to determine availability of other water resources and their potential influence on an integrated utility operation and optimization with current water resources.
- Additional study and discussion will be required to address issues associated with WDWR's remote operations.
- Explore future role of GID's in an integrated utilities scenario.

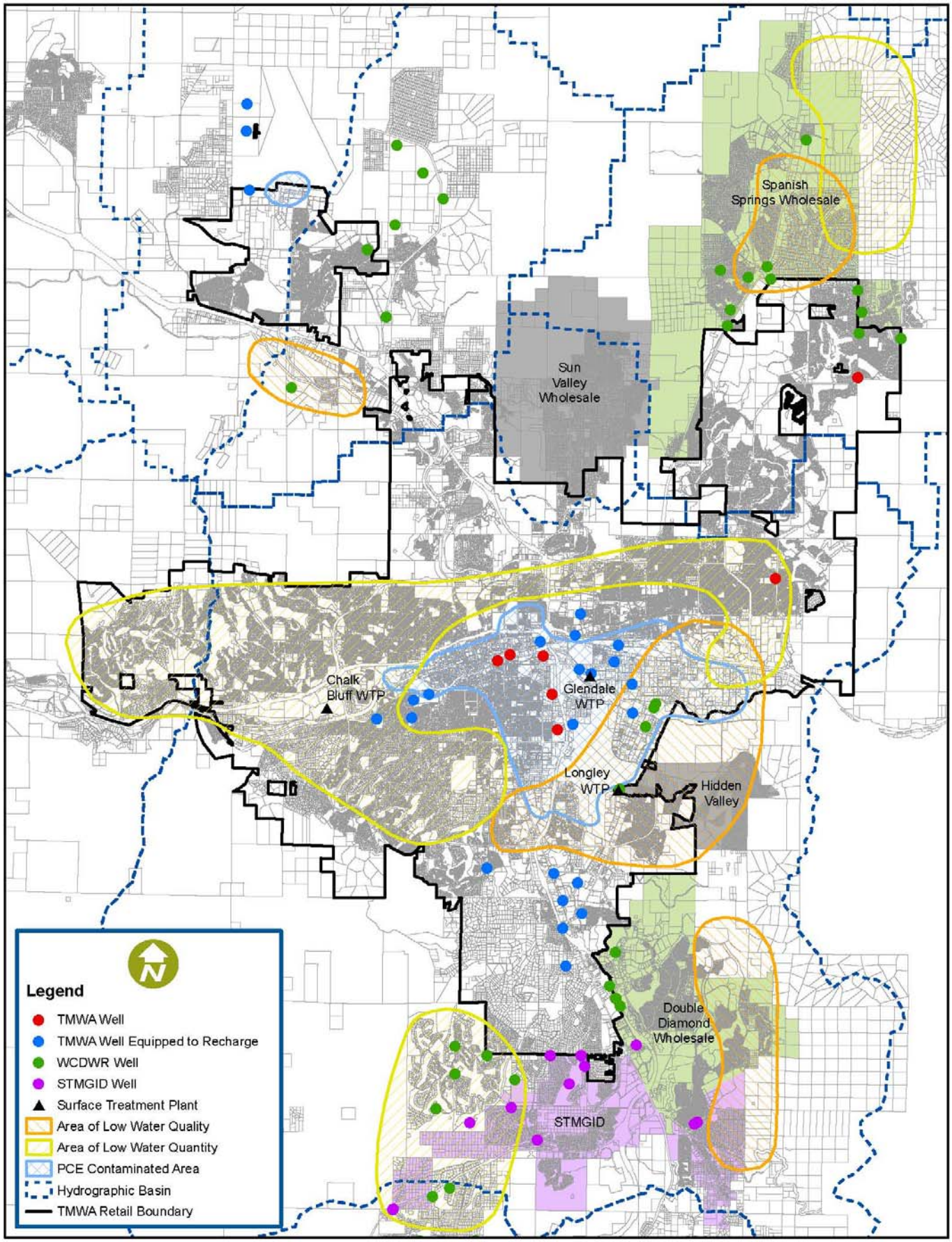


FIGURE 1. Map of Study Area

LEMMON VALLEY

Summary

The Lemmon Valley hydrographic basin is challenged by over pumping and degrading water quality in the northeastern portion of the basin. Limited opportunities exist for successful integration and/or joint management of water resources. Based on very limited and cursory analyses, the summary opportunity scorecard for the Lemmon Valley (LV) area is presented here:

Will TMWA/WDWR system integration…										
	Improve aquifer volumes?		Improve aquifer WQ?		Create conjunctive use opportunities?		Decrease operating costs?		Eliminate or delay capital costs?	
	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR
Potentially Yes		X			X	X		X		X
Probably Not	X		X	X			X		X	

Basin Conditions

Water Resources

Lemmon Valley (LV) is a topographically closed basin typical of those in the Great Basin and Range region (Harrill, 1973). The mountains surrounding and underlying the valley are complexly faulted. Regional faulting gave the mountains their large-scale size, shape, and relief. The change in elevation ranges from approximately 4914 feet above mean sea level at the eastern sub-area playa to 8266 feet above mean sea level at highest peak on Peavine Mountain at the south end of the basin. The present topography of the basin is the result of erosion and smaller scale fault structures.

The valley is a structural depression filled with unconsolidated valley-fill material and is surrounded by mountains comprised of igneous, volcanic, and metavolcanic rocks. Features other than mountain ridges in Lemmon Valley include valley-fill deposits and playa lakes. Valley fill is comprised of weathered material from the surrounding mountain ridges including layers of clay, silt, fine- to coarse-grained sand, and gravel. Generally, valley fill is coarser near the mountain ridges and becomes fine-grained in the center of the valley near the playas. Playa lake deposits are mostly clay, silt, and fine-grained sand. The aquifer system was conceptualized as three hydrostratigraphic units: 1) playa deposits; 2) alluvium; and 3) fractured bedrock. These units were identified as distinct units based on differences in geologic, hydraulic, and subsequent water yield characteristics.

LV is State Engineer designated basin number 92, but is subdivided by a fault that runs down the middle of the basin, essentially under Stead Boulevard: 92A in the west half and 92B the east half. The western segment contains Silver Lake which is surrounded by large commercial/ industrial properties to the east and northeast and residential properties to the southeast and east. North of Silver Lake are about 500 residences on domestic wells in the Silver Knolls area. TMWA serves the developed Silver Lake areas as wells as the historic and newly developed areas in Stead in the basin 92B.

The eastern section of LV, basin 92B, contains Swan Lake. WDWR serves customers from the north, the east and south of Swan Lake. WDWR also serves 152 residences in Horizon Hills at the south end of 92B. Golden Valley is a subarea in the southeast quadrant in 92B which includes over 550 properties on domestic wells.

Development began in Lemmon Valley in the 1950's with the development of the Stead Air Force Base and surrounding military residences. Residential development using domestic wells occurred in the northeast portion of the basin in the 1960's and more so in the 1970's. Utility supplied developments also began in the 1970's in the Silver Lake, Horizon Hills, and east Lemmon Valley. By the 1980's, with the commitment of existing ground water resources in the basin, little to no development occurred in the basin until additional Truckee River rights were dedicated to the valley. With the dedication of the Vidler Importation Project ("Vidler Water") in 2007, WDWR can deliver from the Honey Lake area an additional 8,000 acre feet to meet future development projections in the basin.

Natural ephemeral streams are generated from intense rainstorms or large snow melt episodes. Natural recharge is estimated at 800 af/yr in 92A and 500 af/yr in 92B (Harill, 1973). As will be seen below, well extraction exceeds recharge in both basins. Therefore, without augmentation of recharge in the basin, such as imported water, ground water pumping cannot be sustained over the long term.

Highly mineralized, poor ground water quality is found around the playa areas in both basins, and hydrothermally altered volcanic rock with high concentrations of arsenic and manganese in the southern foothills of 92B. Clean-up of TCE related material since 1999 at the Stead Solvent Site near the southern boundary of the Stead Airport in 92A has successfully reduced the spread of the contaminant plume. Septic tank effluent has polluted the ground water with nitrate in a northern portion of 92B as well as in Golden Valley.

Public Water Systems

Both TMWA and WDWR have facilities and customers in the Lemmon Valley basin.[1] TMWA provides service in the Silver Lake development and the Stead area, while WDWR predominantly serves customers in northwest and the along the east side of 92B. Brief details of the utilities for the year ending 2008 are summarized in Table 1.

[1] There is a minor utility in the Silver Knolls area, Silver Knolls Mutual Water, which serves about 64 connections.

TABLE 1. Summary Statistics for Lemmon Valley Basin (92A & 92B)

	TMWA	WDWR	Totals
A. Retail Service Connections	[1] 6,074	1,354	7,428
B. Basin Production Facilities			
1. Number of wells	3	6	9
2. Operating capacities (MGD)	6.2	3.6	9.8
3. Surface treatment facilities	na	na	na
4. Surface treatment capacity	na	na	na
C. Rights Committed to Serve Basin (acre feet)			
1. Ground water-Basin 92	883	1,398	2,281
2. Ground water-importation		8,000	8,000
3. Surface water-retail	[1] 4,241		4,241
4. Surface water-wholesale *			
5. Surface water-other **			
6. Total Rights	5,124	9,398	14,522
D. 2008 Water Supplied (acre feet)			
1. Ground water-Basin 92	611	713	1,324
2. Ground water-importation			
3. Surface water-retail	[1] 1,984		1,984
4. Surface water-wholesale *			
5. Surface water-other **	320		168
6. Total Water Supplied in 2008	2,915	713	3,628
E. Recharge (acre feet)			
1. Permitted wells	4	1	5
2. Injected volume FY08/09	320		0

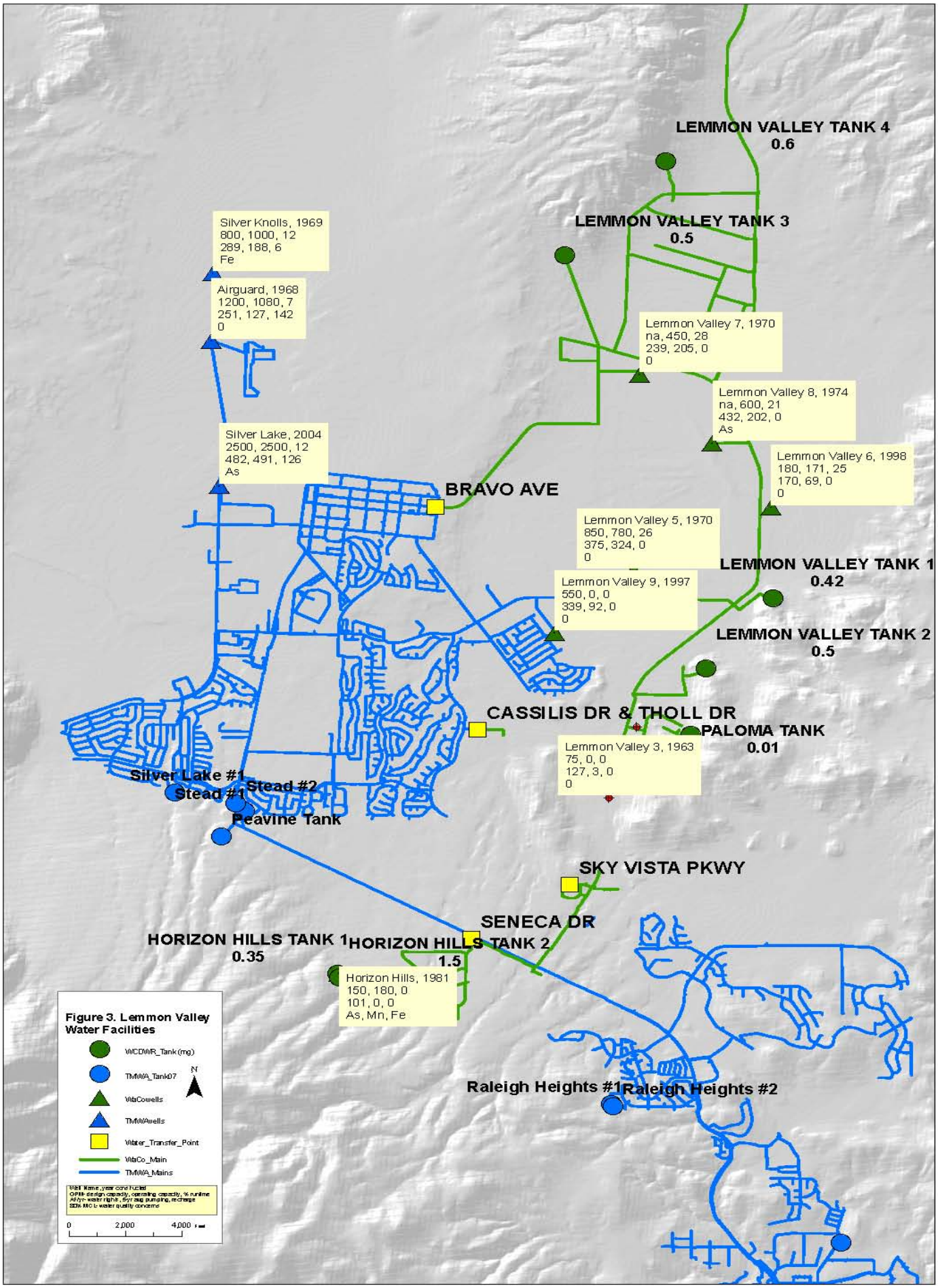
* Wholesale water from rights diverted, treated and delivered by TMWA to WDWR for use by its customers.
** Includes surface rights set aside for recharge and/or extracted after recharged.
[1] Excludes Raleigh Heights and Golden Valley services.

Current Resource Management Practices-TMWA

TMWA's primary source of water committed to LV is Truckee River. TMWA has 3 production wells in 92A with rights committed to serve customers in the area. The wells are used 4-6 months a year to augment peak flows, or during emergency conditions. TMWA has injected over 2,400 acre feet in two of its production wells since 2000.

Current Resource Management Practices-WDWR

With the exception of Horizon Hills, demands in WDWR service area is met with well water pumped from WDWR's 6 wells located in 92B. The use of Vilder Water would offset demands on wells resident in 92B and for recharge in 92B. However, the cost to operate the pump and pipeline system may influence the use of Vidler Water.


LEMMON VALLEY TANK 4
0.6
LEMMON VALLEY TANK 3
0.5
Silver Knolls, 1969
800, 1000, 12
289, 188, 6
Fe
Airguard, 1968
1200, 1080, 7
251, 127, 142
0
Lemmon Valley 7, 1970
na, 450, 28
239, 205, 0
0
Lemmon Valley 8, 1974
na, 600, 21
432, 202, 0
As
Silver Lake, 2004
2500, 2500, 12
482, 491, 126
As
Lemmon Valley 6, 1998
180, 171, 25
170, 69, 0
0
BRAVO AVE
Lemmon Valley 5, 1970
850, 780, 26
375, 324, 0
0
LEMMON VALLEY TANK 1
0.42
Lemmon Valley 9, 1997
550, 0, 0
339, 92, 0
0
LEMMON VALLEY TANK 2
0.5
CASSILIS DR & THOLL DR
PALOMA TANK
0.01
Lemmon Valley 3, 1963
75, 0, 0
127, 3, 0
0
Silver Lake #1
Stead #2
Stead #1
Peavine Tank
SKY VISTA PKWY
SENECA DR
HORIZON HILLS TANK 1
0.35
HORIZON HILLS TANK 2
1.5
Horizon Hills, 1981
150, 180, 0
101, 0, 0
As, Mn, Fe
Raleigh Heights #1
Raleigh Heights #2
Figure 3. Lemmon Valley Water Facilities
WCDWR_Tank (mg)
TMWA_Tank07
WaCowells
TMWAwells
Water_Transfer_Point
WaCo_Main
TMWA_Mains
N
0
2,000
4,000

Since 2005, domestic well owners in Golden Valley are funding WDWR purchase of approximately 125 af/yr of treated surface water from TMWA to offset declining water table in this portion of 92B through a recharge program.

Challenges

How to bring the ground water back into balance given demand and water quality challenges is the primary challenge for Basins 92A and 92B. Over pumping for Basin 92 is estimated at 2,100 af/yr (Washoe County Comprehensive Regional Water Management Plan, 2005) creating excessive water level declines in both the volcanic and alluvial aquifers.

Opportunities to Solve Challenges

Current demands can be met with existing resources and facilities. However, additional and/or alternate sources of supply are needed to mitigate the effects of over pumping that has occurred in the basin and to meet future demands. Options include:

1. *Enhanced Demand-Side Management (DSM).* Both utilities encourage their respective customers to use water efficiently. The difference between the amount of water rights committed to the basin for service commitments versus the amount of water served indicates that DSM programs may be contributing to this difference. Rates charged by the respective utilities are another factor that contribute to decreasing water use. Without further study it cannot be determined if additional reductions in water can be achieved and what the revenue/rate impacts would be on the respective utilities.

   If permanent reductions in water use can be achieved through enhancing DSM programs, WDWR could retain the savings for basin recovery purposes. If ground water production within TMWA's system in Lemmon Valley is reduced through reductions in customer demands, potential aquifer recovery may result.

   Implementation Constraints: (i) increased costs to expand DSM programs and (ii) cost recovery by the utilities for these programs.

   Potential Integrated Solutions/Benefits: (i) potential WDWR cost reductions if TMWA assumed DSM program management and (ii) cost increases to expand TMWA's existing DSM, and potentially more costs to integrate DSM programs as access to billing data of WDWR would be required.

2. *Increase Truckee River Use.* Increased use of Truckee River water by either utility in this basin would require and additional 0.5 to 1.0 acre feet of water rights be dedicated for Truckee River return flows for every acre foot of demand, whether that demand is for new development or for the offsetting use of groundwater. Increased use of Truckee River water provides blending of surface with groundwater which also solves water quality issues.

Implementation Constraints: (i) costs to buy additional water rights, including the return flow component; (ii) construction of delivery facilities and cost recovery; (iii) contracts for delivery of treated water; and (ii) recovery of increased costs to buy more treated water.

Potential Integrated Solutions/Benefits: (i) use of a portion of TMWA's unexercised surface rights would offset the need for WDWR to acquire more rights; (ii) reduce WDWR pumping costs; (iii) enhanced aquifer recovery; and (iv) enhanced for water quality mitigation.

3. *Artificial Recharge*. Recharge with Truckee River water in winter months. TMWA currently injects about 200-300 af/yr in 3 wells in 92A. WDWR is in the process of implementing this option using Vidler Water in 92B. This option could also help to improve the water quality issues in the basin.

   Implementation Constraints: (i) WDWR complete permitting through State Engineer and NDEP to inject treated groundwater in their wells in 92B; (ii) construction of delivery facilities and cost recovery; and (iii) recovery by WDWR of increased costs to operate Vidler Water.

   Potential Integrated Solutions/Benefits: (i) use of a portion of TMWA's unexercised surface rights could offset the need for WDWR to use Vidler Water; (ii) reduce WDWR pumping costs; (iii) enhanced aquifer recovery; and (iv) enhanced water quality mitigation.

4. *Import Vidler Supplies***.** Increase use of Vidler supplies to meet demands and/or for recharge. Other interbasin sources could be considered as well.

   Implementation Constraints: (i) design and construct distribution pumps/pipelines along with recovery of those costs; and (ii) recovery of ongoing operating costs.

   Potential Integrated Solutions/Benefits: Integration may allow more flexibility in utilization of this project.

5. *Any combination of Options 1 thru 4.*

   Implementation Constraints: All the constraints identified above would apply should the options be developed in any combination.

   Potential Integrated Solutions/Benefits: All the benefits identified accrue to the utilities.

6. *Ground Water Replenishment Systems.* Ground Water Replenishment Systems (GWRS) injects highly-treated-recovery water at the north end of the basin to offset the over pumping and provide supply augmentation. WDWR operates a 0.3 MGD wastewater treatment plant and the City of Reno operates a 2.25 MGD wastewater treatment in 92B.

An investigation is underway to determine the feasibility associated with a combined plant and GWRS.

Implementation Constraints: (i) completion of feasibility testing; (ii) obtaining permits through State Engineer and NDEP to inject treated-recovery water; (iii) design and construct pumps, pipeline and wells; and (iv) recovery of increased costs to build facilities and purchase treated recovery-water from either a combined City of Reno or a smaller version developed by WDWR for its existing facility.

Potential Integrated Solutions/Benefits: Without further economic analysis, benefits to either TMWA or WDWR individually or as an integrated utility cannot be quantified.

SPANISH SPRINGS

Summary

Spanish Springs Valley (SSV) is State Engineer designated basin 85. SSV is challenged by over pumping in the basin and degrading water quality in the northern and western portions of the basin. There exists some opportunities for successful integration and/or joint management of water resources allocated to the basin. Based on very limited and cursory analyses, the summary opportunity scorecard for the SSV area is presented here:

Will TMWA/WDWR system integration…										
	Improve aquifer volumes?		Improve aquifer WQ?		Create conjunctive use opportunities?		Decrease operating costs?		Eliminate or delay capital costs?	
	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR
Potentially Yes		X		X	X	X		X		X
Probably Not	X		X				X		X	

Basin Conditions

Water Resources

Spanish Springs Valley is a basin bounded on the east by the Pah Rah range and on the west by the Hungry Ridge range covering an area of approximately square miles. The basin can be divided into two aquifer systems from which water is pumped into public water systems: (1) a volcanic rock aquifer located on the east side of the basin and (2) an alluvial aquifer in the western and central portion of the valley. A third portion of the basin, a granitic aquifer on the northeast basin slopes of the Pah Rah Range, is a meager aquifer that barely supports 380 domestic wells.

Natural ephemeral streams are generated from intense rainstorms or large snow melt episodes. The Orr ditch imports irrigation water from the Truckee River and the North Truckee Drain was constructed to return irrigation runoff to the Truckee Meadows. Natural groundwater recharge in the basin is estimated at 800AF/yr. Recharge from the Orr Ditch is estimated at 1,200AF/yr, but this amount is diminishing due conversion of irrigable lands and their water rights to residential housing and overall reductions of flow in the Orr Ditch.[2] Therefore, without augmentation of recharge in the basin, such as imported water, groundwater pumping cannot be sustained over the long term.

Poor groundwater quality is found in the southwest quadrant of the valley due to hydrothermally altered volcanic rock with high concentrations of arsenic and sulfate. Septic tank effluent has polluted groundwater in the northwest quadrant of Spanish Springs with nitrate. Nitrate contamination persists over the northwest quadrant of Spanish Springs, rendering six production wells at risk.

[2] The amount of irrigation water will significantly decline in the next several years from historic amounts of 9,220AF to an expected 685AF by 2010 (Eco:Logic, 2004).

Public Water Systems

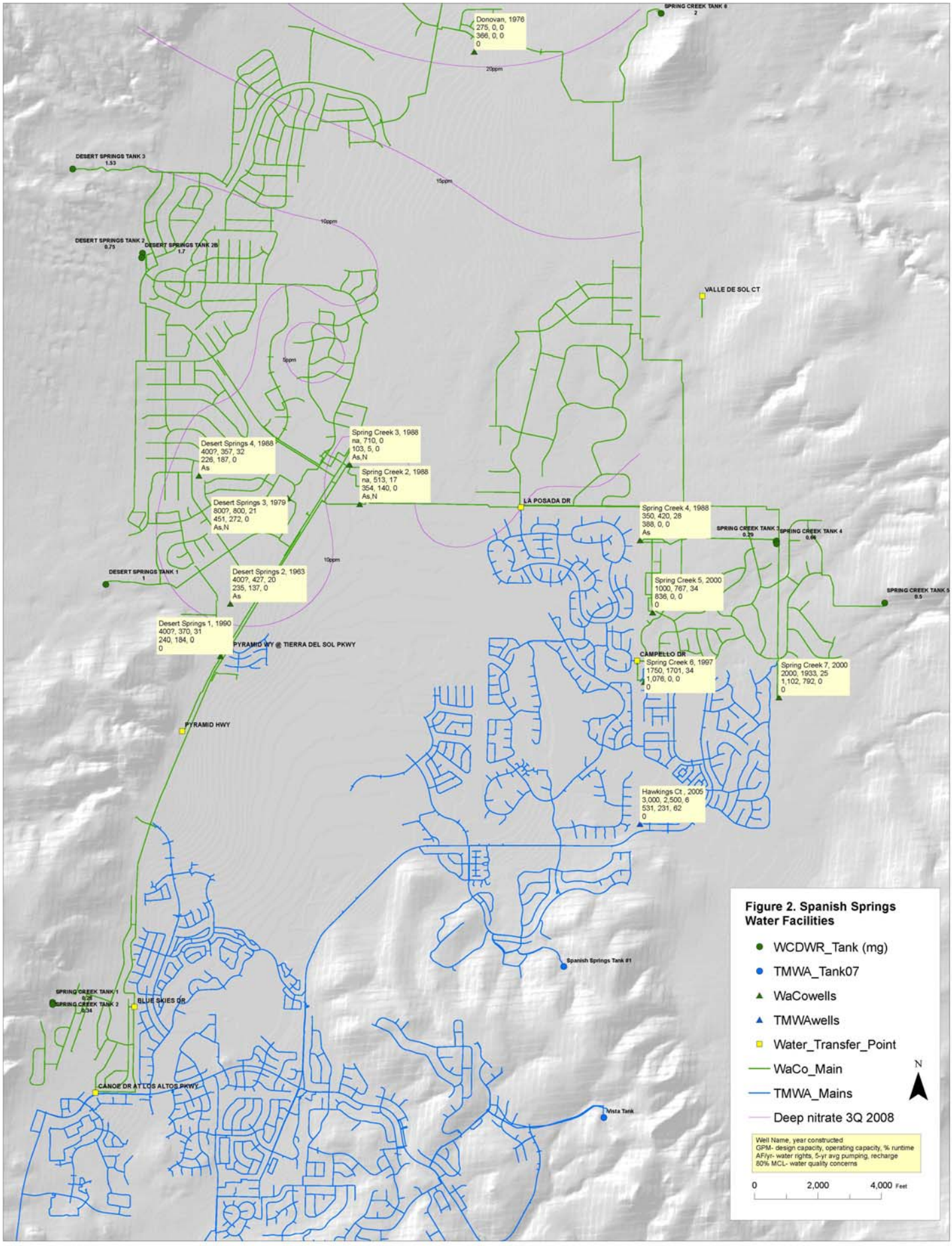
Both TMWA and WDWR have facilities and customers in the Spanish Springs basin. Essentially, the basin is divided by La Posada Drive so that TMWA serves its retail customers within the City of Sparks in the southern half of the basin while WDWR serves its retail customers in the northern half of the basin.[3] TWMA also provides wholesale water service to WDWR. Brief details of the utilities for the year ending are summarized in Table 2.

TABLE 2. Summary Statistics for Spanish Spring Basin (85)

	TMWA	WDWR	Totals
A. Retail Service Connections	9,156	5,774	14,931
B. Basin Production Facilities			
1. Number of wells	1	11	12
2. Operating capacities (MGD)	4.3	11.5	15.1
3. Surface treatment facilities	na	na	na
4. Surface treatment capacity	na	na	na
C. Rights Committed to Serve Basin (acre feet)			
1. Groundwater-Basin 85	247	3,378	3,625
2. Groundwater-importation			
3. Surface water-retail	5,353		5,353
4. Surface water-wholesale *		2,298	2,298
5. Surface water-other **		300	300
6. Total Rights	5,600	5,976	11,576
D. 2008 Water Supplied (acre feet)			
1. Groundwater-Basin 85	231	2,555	2,786
2. Groundwater-importation			
3. Surface water-retail	4,781		4,781
4. Surface water-wholesale *		872	872
5. Surface water-other **			
6. Total Water Supplied in 2008	5,012	3,427	8,439
E. Recharge (acre feet)			
1. Permitted wells	1		1
2. Injected volumes	0		0

* Wholesale water from rights diverted, treated and delivered by TMWA to WDWR for use by its customers.
** Includes surface rights set aside for recharge and/or extracted after recharged.

[3] There is a third utility, Utilities Inc, in the basin that services about 580 connections in the Sky Ranch area. This utility was not considered as part of this integration review process.


Donovan, 1976
275, 0, 0
366, 0, 0
0
SPRING CREEK TANK 6
2
20ppm
DESERT SPRINGS TANK 3
1.53
15ppm
10ppm
DESERT SPRINGS TANK 2
0.75
DESERT SPRINGS TANK 2B
1.7
VALLE DE SOL CT
5ppm
Spring Creek 3, 1988
na, 710, 0
103, 5, 0
As,N
Desert Springs 4, 1988
400?, 357, 32
226, 187, 0
As
Spring Creek 2, 1988
na, 513, 17
354, 140, 0
As,N
Desert Springs 3, 1979
800?, 800, 21
451, 272, 0
As,N
LA POSADA DR
Spring Creek 4, 1988
350, 420, 28
388, 0, 0
As
SPRING CREEK TANK 3
0.29
SPRING CREEK TANK 4
0.6
10ppm
DESERT SPRINGS TANK 1
1
Desert Springs 2, 1963
400?, 427, 20
235, 137, 0
As
Spring Creek 5, 2000
1000, 767, 34
836, 0, 0
0
SPRING CREEK TANK 5
0.5
Desert Springs 1, 1990
400?, 370, 31
240, 184, 0
0
PYRAMID WY @ TIERRA DEL SOL PKWY
CAMPELLO DR
Spring Creek 6, 1997
1750, 1701, 34
1,076, 0, 0
0
Spring Creek 7, 2000
2000, 1933, 25
1,102, 792, 0
0
PYRAMID HWY
Hawkings Ct , 2005
3,000, 2,500, 6
531, 231, 62
0
Spanish Springs Tank #1
SPRING CREEK TANK 1
0.28
SPRING CREEK TANK 2
0.34
BLUE SKIES DR
CANOE DR AT LOS ALTOS PKWY
Vista Tank
Figure 2. Spanish Springs Water Facilities
WCDWR_Tank (mg)
TMWA_Tank07
WaCowells
TMWAwells
Water_Transfer_Point
WaCo_Main
TMWA_Mains
Deep nitrate 3Q 2008
N
Well Name, year constructed
GPM- design capacity, operating capacity, % runtime
AF/yr- water rights, 5-yr avg pumping, recharge
80% MCL- water quality concerns
0
2,000
4,000 Feet

Current Resource Management Practices-TMWA

TMWA's primary source of water committed to the Spanish Springs basin is Truckee River. TMWA has 1 well in Spanish Springs with rights committed to serve customers in the area. The well will be used 2-4 months a year to augment summer peak flows, or during emergency conditions. TMWA began testing recharge at this well in 2009 and anticipates permits to be issued in time for recharge to begin in Fall 2009.

Current Resource Management Practices-WDWR

Non-irrigation season demands are met with well water that also includes some wholesale water. Wholesale water is used in the summer to meet peak day demands and water quality issues. Facilities were completed in 2009 that allows WDWR to ramp up the amount of wholesale water so that reliance on wells for winter supplies can be reduced. The waste water management plan for nitrate is to hook-up septic tanks to TMWRF. This is occurring at a slow pace with 10% of the 2,100 tanks converted to sewer. Blending with wholesale water and other well water is the current groundwater treatment practice for nitrate and arsenic. Increasing the amount of artificial recharge (ASR) at WDWR wells is a future alternative to help mitigate water quality issues.

Challenges

How to bring the groundwater back into balance given demand and water quality challenges is the primary challenge. Over pumping is estimated at 2,700AF (Eco:Logic, 2004) at full valley build out creating excessive water level declines in both the volcanic and alluvial aquifers. WDWR estimates that 4,500AF of new source water will be needed by 2030 given a reduction of pumping to 1,800AF/yr (ibid).

WDWR production constraints are mostly limited to arsenic and nitrate contamination in west central production wells. WDWR's alluvial aquifer is also subject to nitrate contamination from septic tanks. Even if the high density septic systems are hooked-up up to sewer, nitrate plumes are expected to persist. Over pumping may cause poor water quality migration from the southwest portion of the valley to well fields.

Opportunities to Solve Challenges

Current demands can be met with existing resources and facilities. However, additional and/or alternate sources of supply are needed to mitigate the effects of over pumping that has occurred in the basin and to meet future demands. Options include:

1. *Enhanced Demand-Side Management (DSM).* Both utilities encourage their respective customers to use water efficiently. The difference between water rights committed to the basin for service commitments versus the amount of water served indicates that DSM programs may be contributing to this difference. Rate charged by the respective utilities are another factor that contribute to decreasing water use. Without further study it cannot be determined if additional reductions in water can be achieved and what the revenue/rate impacts would be on the respective utilities.

If permanent reductions in water use can be achieved through enhancing DSM programs, WDWR could retain the savings for basin recovery purposes. Further water reductions within TMWA's system in Spanish Springs would result in less water being delivered to the basin which would not aid in aquifer recover.

Implementation Constraints: (i) increased costs to expand DSM programs; (ii) long term maintenance of the groundwater resources without the ability to prove beneficial use; and (iii) cost recovery by the utilities for these programs.

Potential Integrated Solutions/Benefits: (i) potential WDWR cost reduction if TMWA assumed DSM program management; (ii) WDWR provision of drought relief and/or peaking supply using groundwater resources; and (iii) cost increases to expand TMWA's existing DSM, and potentially more costs to integrate DSM programs as access to billing data of WDWR would be required.

2. *Increase Truckee River Use*. Increased use of Truckee River water by WDWR to meet base flow demands and using wells for peaking is apparent and can occur (a) using existing unexercised surface water rights committed for wholesale use or (b) by WDWR acquiring more Truckee River rights. Contracts are in place and sufficient rights have been committed to the area for wholesale water service that allow increasing current use from 886 acre feet (2008) to over 2,200 acre feet. With facilities in place, WDWR has begun to take more wholesale water. The observed consumption levels of WDWR customers which are below existing commitments together with full utilization of all the WDWR Truckee River water rights could result in reduction of groundwater pumpage by WDWR to a range of 1,200 to 1,500 acre-feet annually from previous level of 3000 acre-feet.

   Assuming existing Truckee River commitments are maximized, more Truckee River rights could be acquired to displace the use of groundwater by WDWR. A mechanism whereby an additional 5% or some factor could be added to all Truckee river water rights dedications by developers as a surcharge for basin recovery could provide the necessary resources in the long term.

   Increased use of Truckee River water provides blending of surface with groundwater which also solves water quality issues.

   Implementation Constraints: (i) recovery by WDWR of costs to buy additional wholesale water (which may not be fully offset by reduction of pumping costs) and (ii) costs to acquire more water rights above current commitments and/or resistance by development community to pay for a surcharge.

   Potential Integrated Solutions/Benefits: (i) use of a portion of TMWA's unexercised surface rights would offset the need for WDWR to acquire more rights; (ii) reduce WDWR pumping costs; (iii) enhanced aquifer recovery; and (iv) enhanced water quality mitigation.

3. *Artificial Recharge*. Recharge (Spring Creek wells 4, 5, 6 and 7) with Truckee River water in winter months. This option could also help to improve the water quality issues at the Desert Springs water systems, particularly at Desert Springs 4 and Spring Creek 2 wells.

   Implementation Constraints: (i) WDWR complete permitting through State Engineer and NDEP to inject treated surface water in their wells; (ii) source/cost of surface rights; (iii) recovery by WDWR of increased costs to buy additional water rights; and (iv) recovery by WDWR of increased costs to buy additional treated water above current wholesale amounts.

   Potential Integrated Solutions/Benefits: (i) use of a portion of TMWA's unexercised surface rights could offset the need for WDWR to acquire more rights for this project if wholesale costs are favorable; (ii) reduce WDWR pumping costs; (iii) enhanced aquifer recovery; and (iv) enhanced water quality mitigation.

4. *Ground Water Replenishment Systems***.** Ground Water Replenishment Systems (GWRS) inject highly-treated-recovery water at the north end of the basin to offset the over pumping and provide supply augmentation.

   Implementation Constraints: (i) completion of feasibility testing; (ii) WDWR obtaining permits through State Engineer and NDEP to inject treated-recovery water; (iii) design and construct pumps, pipeline and wells; and (iv) recovery by WDWR of increased costs to buy treated-recovery water from the City of Sparks and operate GWRS.

   Potential Integrated Solutions/Benefits: Integration may preclude the need for this project from a water supply perspective.

5. *Any combination of Options 1 thru 4.*

   Implementation Constraints: All the constraints identified above would apply should the options be developed in any combination.

   Potential Integrated Solutions/Benefits: All the benefits identified accrue to the utilities.

6. *Import Vidler Supplies***.** Redirect a portion of Vidler supplies to the basin to meet demands and/or for recharge. Other interbasin sources could be considered as well.

   Implementation Constraints: (i) permitting to redirect Vidler water from Lemmon Valley POU to Spanish Springs; (ii) WDWR obtaining permits to inject treated ground water in their wells; (iii) design and construct pumps/pipeline; (iv) recovery of construction and ongoing operating costs; and (v) cost/benefit comparison to available interbasin sources.

   Potential Integrated Solutions/Benefits: Integration may allow more flexibility in utilization of this project.

TRUCKEE MEADOWS

The principal source of ground water in the Truckee River basin in Nevada is the Truckee Meadows. Ground water occurs beneath Truckee Meadows and has been pumped from the ground water reservoir for over fifty years. Large quantities of ground water are available from that part of the reservoir containing unconsolidated rocks of alluvial origin. Ground water also is available from consolidated rocks, generally in the foothills surrounding Truckee Meadows.

The ground water reservoir is essentially full in much of the Truckee Meadows. The water-bearing materials in the Truckee Meadows are recharged from infiltration of precipitation which falls in the mountains and on the land surface, seepage from streams and the Truckee River entering or crossing the Meadows, underflow from tributary valleys, seepage from irrigation ditches, deep percolation of water applied for irrigation of pasture, row crops, lawns and other greenscape areas, and from waste water discharged from septic tanks, and from the injection of treated surface water into public supply wells used for artificial recharge. On the eastern slopes of the Sierra, where recharge occurs, precipitation ranges from 8 to 20 inches per year. The natural ground water discharge supports vegetation principally in the western portion of the Truckee Meadows and provides water directly to drains and creeks passing through the Meadows. A significant amount of recharge to the water-bearing materials in Truckee Meadows is due to seepage from irrigation canals and deep percolation of water applied for irrigation. In the past, it has been estimated that approximately 25% of water applied for irrigation percolates into the ground water reservoir. It has been assumed that as land is converted from irrigated pasture or row crops to lawns or other types of water consumptive landscaping, the recharge from the land would be reduced. Ground water discharge also occurs when wells are pumped to provide water for various uses in the Truckee Meadows.

The basin is divided into two regions: Central Truckee Meadows (CTM) and South Truckee Meadows (STM). The central area extends as far south as the Holcomb Lane area and includes Hidden Valley. The south Truckee Meadows portion of the basin is the area south of the Holcomb Lane area including Double Diamond, the Mt Rose fan and foothill areas, and the Virginia Foothills. Although TMWA's facilities are within the CTM, WDWR's Hidden Valley resources are included as part of the CTM discussion.

Truckee Meadows - Central (CTM)

Summary

The Central Truckee Meadows hydrographic basin primary challenge is the PCE impacts that are affecting or have affected 12 TMWA and 1 WDWR wells in CTM. The PCE contamination occurs in several plumes located along the current and historical commercial/industrial corridors along old US40 (Fourth Street/B Street/Prater Way), Virginia Street, and Kietzke Lane. Mitigation of the PCE contamination is addressed through the Washoe County Central Truckee Meadows Remediation District (CTMRD) program. WDWR's Hidden Valley and Heron's Landing systems are located in the east-southeast portion of CTM. WDWR canceled wholesale water service to Hidden Valley once WDWR began operating its 4 MGD Longley Treatment Plant (LTP) in 2006. Limited opportunities exist for successful integration

and/or joint management of water resources. Based on very limited and cursory analyses, the summary opportunity scorecard for CTM is presented here:

Will TMWA/WDWR system integration…										
	Improve aquifer volumes?		Improve aquifer WQ?		Create conjunctive use opportunities?		Decrease operating costs?		Eliminate or delay capital costs?	
	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR
Potentially Yes					X	X				
Probably Not	X	X	X	X			X	X	X	X

Basin Conditions

Water Resources

When compared to other basins in the Great Basin Province of Nevada, the uniqueness of the Truckee Meadows hydrographic basin is the presence of the Truckee River which flows west to east through the central Truckee Meadows (CTM) portion of the Truckee Meadows basin. The Sierra Nevada mountain range on the west side of the basin and underlying the valley are complexly faulted. Regional faulting gave the mountains their large-scale size, shape, and relief. The change in elevation ranges from approximately 4914 feet above mean sea level at the eastern sub-area playa to 10,620 feet above mean sea level at highest peak on Mt Rose at the southwest end of the basin. The present topography of the basin is the result of erosion and smaller scale fault structures.

Along the east side of the basin, the Virginia Range and Pah Rah Mountains are comprised of igneous, volcanic, and metavolcanic rocks. The resulting valley is a structural depression filled with unconsolidated valley-fill material comprised of weathered material from the surrounding mountain ridges including layers of clay, silt, fine- to coarse-grained sand, and gravel. Generally, valley fill is coarser near the mountain ridges and becomes fine-grained in the center of the valley. The aquifer system is conceptualized as a complex aquifer system comprised of: 1) alluvium; 2) partly confined alluvium; and 3) fractured bedrock. These units were identified as distinct units based on differences in geologic, hydraulic, and subsequent water yield characteristics.

Together, CTM and STM, make up State Engineer designated Basin 87. The geologic and hydrogeologic characteristics of the southern portion of the basin (STM) differ from CTM which are described later in the report. Average annual rainfall in the basin ranges from 7.5 to 16 inches.

Ground water quality varies throughout the Truckee Meadows hydrographic basin. Highly mineralized ground water is generally found at the southeast side of the basin. Low water quantity areas run east-to-west to the north of the Truckee River. Geothermal areas are present in the west and southwest areas of CTM.

Public Water Systems

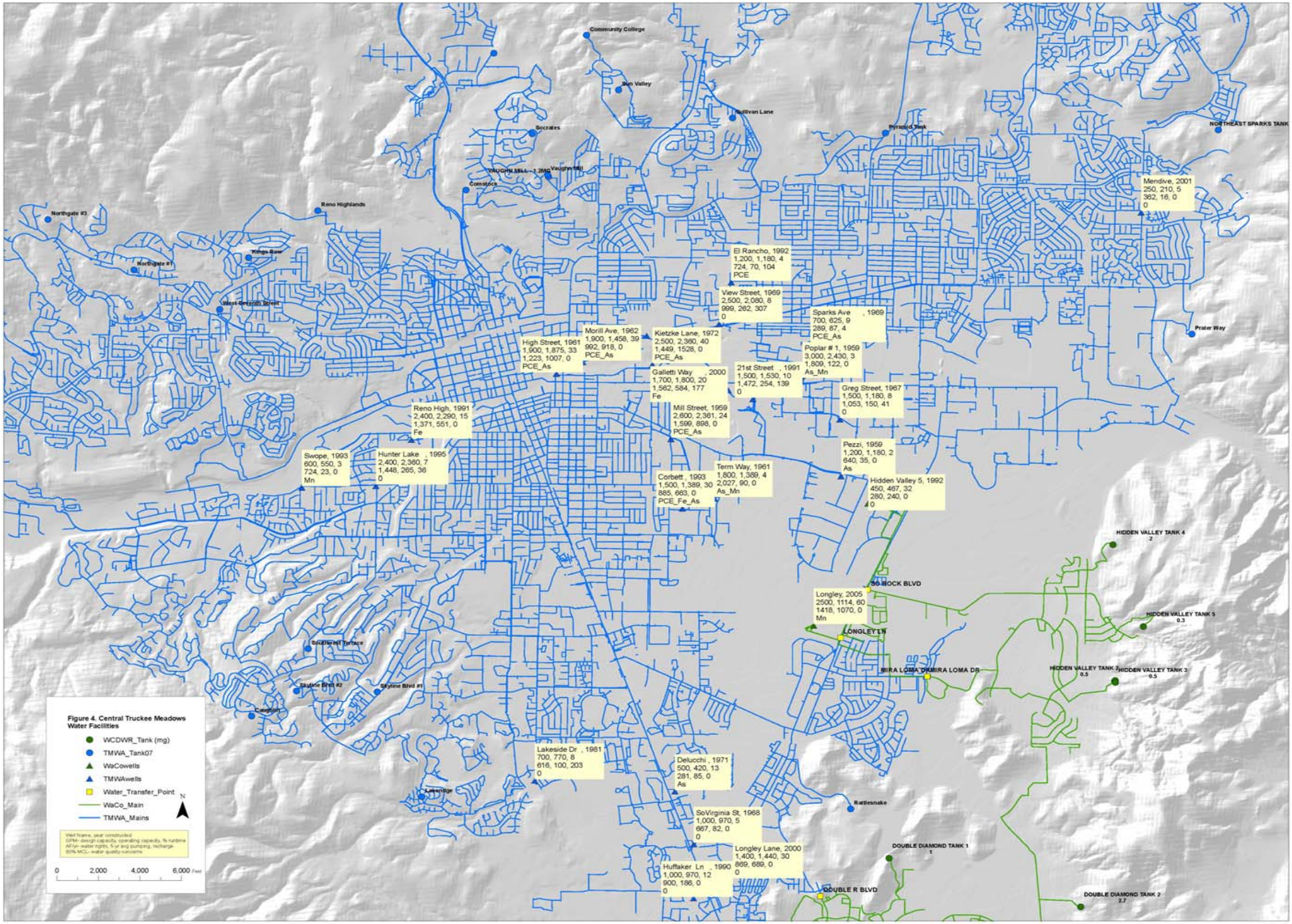
Both TMWA and WDWR have facilities and customers in the Central Truckee Meadows basin.[4] Brief details of the utilities for the year ending 2008 are summarized in Table 3.

TABLE 3. Summary Statistics for Central Truckee Meadows Basin (87)

	TMWA	WDWR	Totals
A. Retail Service Connections	[2] 73,167	1,750	74,917
B. Basin Production Facilities			
1. Number of wells	28	3	31
2. Operating capacities (MGD)	59.7	4.3	64.0
3. Surface treatment facilities	2	1	3
4. Surface treatment capacity (MGD)	110	4	114
C. Rights Committed to Serve Basin (acre feet)			
1. Ground water-Basin 87	[1] 14,633	805	16,855
2. Ground water-importation	na	na	na
3. Surface water-retail	51,319	1,242	52,561
4. Surface water-wholesale *			
5. Surface water-other **			
6. Total Rights	65,952	2,047	70,365
D. 2008 Water Supplies (acre feet)			
1. Ground water-Basin 87 ***	9,770	2,409	12,179
2. Ground water-importation			
3. Surface water-retail	[2] 49,616		49,616
4. Surface water-wholesale *			
5. Surface water-other **	1,703		1,703
6. Total Water Supplied in 2008	61,089	2,684	63,773
E. Recharge (acre feet)			
1. Permitted wells	23		5
2. Injected volume FY08/09	1,703		0

* Wholesale water from rights diverted, treated and delivered by TMWA to WDWR for use by its customers.
** Excludes TMWA's storage rights of 22,250 af used only in droughts.
[1] TMWA's ground water rights are limited in operation under State Engineer Order 1161 which allow increased pumping in drought years up to 22,000 afa.
[2] Includes water use in Raleigh Heights, Golden Valley, Truckee Canyon and Sun Valley.
*** Some of the WDWR production is attributed to water rights and customers in STM. WDWR Longley Lane Well 1 is connected to both CTM and STM infrastructure.

[4] WDWR operates the Hidden Valley water system which includes Heron's Landing.


Community College
Sun Valley
Sullivan Lane
Pyramid Peak
NORTHEAST SPARKS TANK
Socrates
Vaughn Hill
Comstock
Reno Highlands
Northgate #3
Northgate #1
Kings Row
West Seventh Street
Mendive, 2001
250, 210, 5
362, 16, 0
0
El Rancho, 1992
1,200, 1,180, 4
724, 70, 104
PCE
View Street, 1969
2,500, 2,080, 8
999, 262, 307
0
Sparks Ave , 1969
700, 625, 9
289, 87, 4
PCE_As
Prater Way
Morill Ave, 1982
1,900, 1,458, 39
992, 918, 0
PCE_As
High Street, 1961
1,900, 1,875, 33
1,223, 1007, 0
PCE_As
Kietzke Lane, 1972
2,500, 2,360, 40
1,449, 1528, 0
PCE_As
Poplar # 1, 1959
3,000, 2,430, 3
1,809, 122, 0
As_Mn
Galletti Way , 2000
1,700, 1,800, 20
1,562, 584, 177
Fe
21st Street , 1991
1,500, 1,530, 10
1,472, 254, 139
0
Greg Street, 1967
1,500, 1,180, 8
1,053, 150, 41
0
Reno High, 1991
2,400, 2,290, 15
1,371, 551, 0
Fe
Mill Street, 1959
2,600, 2,361, 24
1,599, 898, 0
PCE_As
Pezzi, 1959
1,200, 1,180, 2
640, 35, 0
As
Swope, 1993
600, 550, 3
724, 23, 0
Mn
Hunter Lake , 1995
2,400, 2,360, 7
1,448, 265, 36
0
Corbett , 1993
1,500, 1,389, 30
885, 663, 0
PCE_Fe_As
Term Way, 1961
1,800, 1,389, 4
2,027, 90, 0
As_Mn
Hidden Valley 5, 1992
450, 467, 32
280, 240, 0
0
HIDDEN VALLEY TANK 4
2
SO ROCK BLVD
Longley, 2005
2500, 1114, 60
1418, 1070, 0
Mn
HIDDEN VALLEY TANK 5
0.3
LONGLEY LN
Southwest Terrace
MIRA LOMA DR
MIRA LOMA DR
HIDDEN VALLEY TANK 2
0.5
HIDDEN VALLEY TANK 3
0.5
Skyline Blvd #2
Skyline Blvd #1
Cavalier
Lakeside Dr , 1981
700, 770, 8
616, 100, 203
0
Delucchi , 1971
500, 420, 13
281, 85, 0
As
Lakeridge
Rattlesnake
SoVirginia St, 1968
1,000, 970, 5
667, 82, 0
0
Longley Lane, 2000
1,400, 1,440, 30
869, 689, 0
0
Huffaker Ln , 1990
1,000, 970, 12
900, 186, 0
0
DOUBLE DIAMOND TANK 1
1
DOUBLE R BLVD
DOUBLE DIAMOND TANK 2
2.7
Figure 4. Central Truckee Meadows Water Facilities
WCDWR_Tank (mg)
TMWA_Tank07
WaCowells
TMWAwells
Water_Transfer_Point
WaCo_Main
TMWA_Mains
N
0
2,000
4,000
6,000 Feet

Current Resource Management Practices-TMWA

The annual average amount of water that crosses the California-Nevada via the Truckee River is over 500,000 acre feet of which TMWA diverted 67,500 acre feet in 2008. Truckee River rights provide on average 85-90 percent of TMWA's water supplies while ground water supplies the balance.

Development began in CTM in the 1850's as agricultural diversion of the Truckee River dominated the Truckee Meadows. Since that time, irrigated lands have given way to residential and commercial developments that service a population for the greater Reno/Sparks area of over 375,000 people.

TMWA has 28 production wells in the Truckee Meadows basin used for potable water. In addition there are 2 wells --Peckham and Stanford-- that are unsuitable for drinking purposes but are used for non-potable applications such as construction water. In 1987, testing of TMWA's wells identified the presence of an organic solvent known as perchloroethylene and tetrachloroethylene (PCE). This solvent has been used since the 1930's in a variety of commercial/industrial operations such as commercial dry cleaning, paint manufacturing, and auto repair. The PCE contamination occurs in several plumes located along the current and historical commercial/industrial corridors along old US40 (Fourth Street/B Street/Prater Way), Virginia Street, and Keitzke Lane. Mitigation of the PCE contamination is addressed through the Washoe County Central Truckee Meadows Remediation District (CTMRD) program. Mitigation of the PCE plumes is managed by the CTMRD program which has paid for three air-stripping-treatment facilities that remove PCE from five of TMWA's 28 wells: Keitzke Lane, Mill Street, High Street, Morrill Avenue, and Corbett School. The CTMRD program has achieved success in plume capture and containment resulting from the implementation of a prescriptive pumping schedule of the TMWA wells fitted with PCE treatment equipment. The PCE plumes do not appear to be moving or growing. TMWA is an active participant with the CTMRD program in planning for and implementing mitigation of PCE.

Attaining allowable arsenic levels (the maximum contaminant level (MCL) for arsenic of 10 part per billion (ppb)) from ground water sources is an issue for TMWA's well operations. At 10 ppb, 11 of TMWA's 28 wells are affected. Four of the wells that exceed the 10 ppb MCL (Greg, Pezzi, Poplar #1, and Terminal) are piped to Glendale Treatment Plant ("GTP") for treatment and/or blending with treated surface water. Two of the five PCE (Mill and Corbett) are also piped to GTP. The other three PCE wells (High Street, Morrill, and Kietzke) may be piped to GTP in the future while two other wells (View Street and Poplar #2), though not close enough to a treatment plant, may require special mitigation for arsenic. Because of TMWA's ability to maximize Truckee River water and minimize ground water use to the summer months, USEPA recognize annual running average of TMWA's water supplies to attain drinking water standards.

TMWA also has permits to inject treated surface water into 23 of its CTM wells. In 2008, TMWA injected 1,714 acre feet in 10 of the permitted wells.

Current Resource Management Practices-WDWR

Demands in Hidden Valley and Heron's Landing service areas are met with a combination of surface water and ground water that is treated at the Longley Lane Treatment Plant. The well field consists of one induction well along the Truckee River and three ground

water production wells. Treatment consists of manganese and arsenic filtration and chlorination. This treated water can also be pumped via pipeline to the south Truckee Meadows.

Challenges

Availability of Truckee River water, TWMA's primary water supply, is challenged during periods of drought. TMWA manages its reservoir and ground water supplies to meet the worst 8-year-drought cycle (1987-1994) of record, and is capable to meet 9 to 10-years. As the Truckee River Operating Agreement (TROA) moves toward implementation, managing droughts should be less of a burden on resources. TMWA's greatest challenge in CTM is PCE mitigation. The PCE plumes are located along the historical commercial and industrial corridors that have developed along US40 (Fourth Street/B Street/Prater Way), Virginia Street, and Kietzke Lane. WDWR (through the CTMRD program), in cooperation with TMWA, uses air-stripping technology to remove PCE from well water. WDWR is also working with local and state agencies to reduce and possibly eliminate PCE discharges at their various sources.

WDWR's greatest challenge in CTM is to drill and construct additional water wells or increase diversion capacities from the Truckee River (Hidden Valley Well 4) to meet future demands as they occur.

Opportunities to Solve Challenges

Current demands can be met with existing resources and facilities. However, additional and/or alternate sources of peaking supply are needed to meet future demands. Options[5] include:

1. *Enhanced Demand-Side Management (DSM).* Both utilities encourage their respective customers to use water efficiently. The difference between water rights committed to the basin for service commitments versus the amount of water served indicates that DSM programs may be contributing to this difference. Rates charged by the respective utilities are another factor that contributes to decreasing water use. Without further study it cannot be determined if additional reductions in water can be achieved and what the revenue/rate impacts would be on the respective utilities.

   If permanent reductions in water use can be achieved through enhancing DSM programs, WDWR could retain the savings and commit the reduction to new service. Further water reductions within TMWA's system in CTM would increase reservoir storage opportunities when TROA is implemented.

[5] TMWA currently injects about 1,500-2,500 af/yr in its CTM wells. There are potentially significant WQ benefits (associated with the PCE challenges) that could be attained in the CTM with increased ASR activities using the TMWA wells which warrant further evaluation. Recharge may be possible in WDWR Hidden Valley wells using WDWR facilities. This option could also help to improve the water quality for the Hidden Valley area but it is uncertain whether the aquifer can accommodate injection. Since individually each utility can recharge using existing facilities and rights, it does not appear recharge benefits are gained through integration.

Implementation Constraints: (i) increased costs to expand DSM programs and (ii) cost recovery by the utilities for these programs.

Potential Integrated Solutions/Benefits: (i) potential WDWR cost reduction if TMWA assumed DSM program management; and (ii) cost increases to expand TMWA's existing DSM, and potentially more costs to integrate DSM programs as access to billing data of WDWR would be required.

2. *WDWR increase Truckee River Use*. Increased use of Truckee River water by WDWR in this basin would require more water rights to augment use of ground water and increase blending of surface with ground water to improve water quality issues. Facilities are in place to implement this option.

   Implementation Constraints: (i) construction of delivery facilities and cost recovery; (ii) contracts/costs for delivery of treated water; and (iii) recovery of increased costs to buy more treated water.

   Potential Integrated Solutions/Benefits: (i) use of a portion of TMWA's unexercised surface rights would offset the need for more rights; (ii) reduce WDWR pumping costs; (iii) enhanced aquifer recovery; and (iv) enhanced water quality mitigation.

3. *Any combination of Options 1 and 2.*

   Implementation Constraints: All the constraints identified above would apply should the options be developed in any combination.

   Potential Integrated Solutions/Benefits: All the benefits identified accrue to the utilities.

Truckee Meadows - South (STM)

Summary

The STM area is hydraulically part of the Truckee Meadows basin, but is separated for discussion purposes due to the hydrogeologic differences between this area and the CTM and the impacts on water availability in this area. Although TMWA serves Truckee River water to services in this area, it does not have well production facilities in the area. Based on very limited and cursory analyses, the summary opportunity scorecard for STM is presented here:

	Will TMWA/WDWR system integration…									
	Improve aquifer volumes?		Improve aquifer WQ?		Create conjunctive use opportunities?		Decrease operating costs?		Eliminate or delay capital costs?	
	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR	TMWA	WDWR
Potentially Yes		X			X	X				X
Probably Not	X		X	X			X	X	X	

Basin Conditions

Water Resources

When compared to other basins in the Great Basin Province of Nevada, the uniqueness of the Truckee Meadows hydrographic basin is the presence of the Truckee River which flows west to east through the central Truckee Meadows (CTM) portion of the Truckee Meadows basin. The Sierra Nevada mountains on the west side of the basin and underlying the valley are complexly faulted. Regional faulting gave the mountains their large-scale size, shape, and relief. The change in elevation ranges from approximately 4914 feet above mean sea level at the eastern sub-area playa to 10,620 feet above mean sea level at highest peak on Mt Rose at the southwest end of the basin. The present topography of the basin is the result of erosion and smaller scale fault structures.

Along the east side of the basin, the Virginia Range and Pah Rah Mountains are comprised of igneous, volcanic, and metavolcanic rocks. The resulting valley is a structural depression filled with unconsolidated valley-fill material comprised of weathered material from the surrounding mountain ridges including layers of clay, silt, fine- to coarse-grained sand, and gravel. Generally, valley fill is coarser near the mountain ridges and becomes fine-grained in the center of the valley. The aquifer system is conceptualized as a complex aquifer system comprised of: 1) alluvium; 2) partly confined alluvium; and 3) fractured bedrock. These units were identified as distinct units based on differences in geologic, hydraulic, and subsequent water yield characteristics.

Small perennial streams flow from the Sierra eastward and are tributary to Steamboat Creek. These streams, Galena, Whites, and Thomas, have very good quality and can be used for potable purposes. These streams historically were used for irrigation, but now mostly serve municipal services. Consequently, this source of ground water recharge has largely been eliminated.

Ground water is largely generated in the snow melt areas of the Sierra and upper alluvial fans. Its volume is estimated at 14,000 to 16,000 AF (Hydro-Search, Inc. 1992).

Ground water quality varies throughout the south Truckee Meadows basin. Low TDS ground water is found within the alluvial fans at the base of the Sierra. The water quality deteriorates at the valley floor where it mixes with highly mineralized geothermal waters discharged from the Steamboat Springs Geothermal Area at the south end of the valley (Steamboat Hills).

Public Water Systems

TMWA does not have production facilities in STM, but it does serve Truckee River water to 1,063 services in the area. WDWR has well facilities and is the largest purveyor in STM.[6] WDWR is also the operator of the South Truckee Meadows General Improvement District (STMGID) with 3,704 customers served by 9 production wells. Brief details of the utilities for the year ending 2008 are summarized in Table 3.

[6] WDWR serves customers in Arrow Creek, Double Diamond, Mt Rose, and Thomas Creek Service Areas.

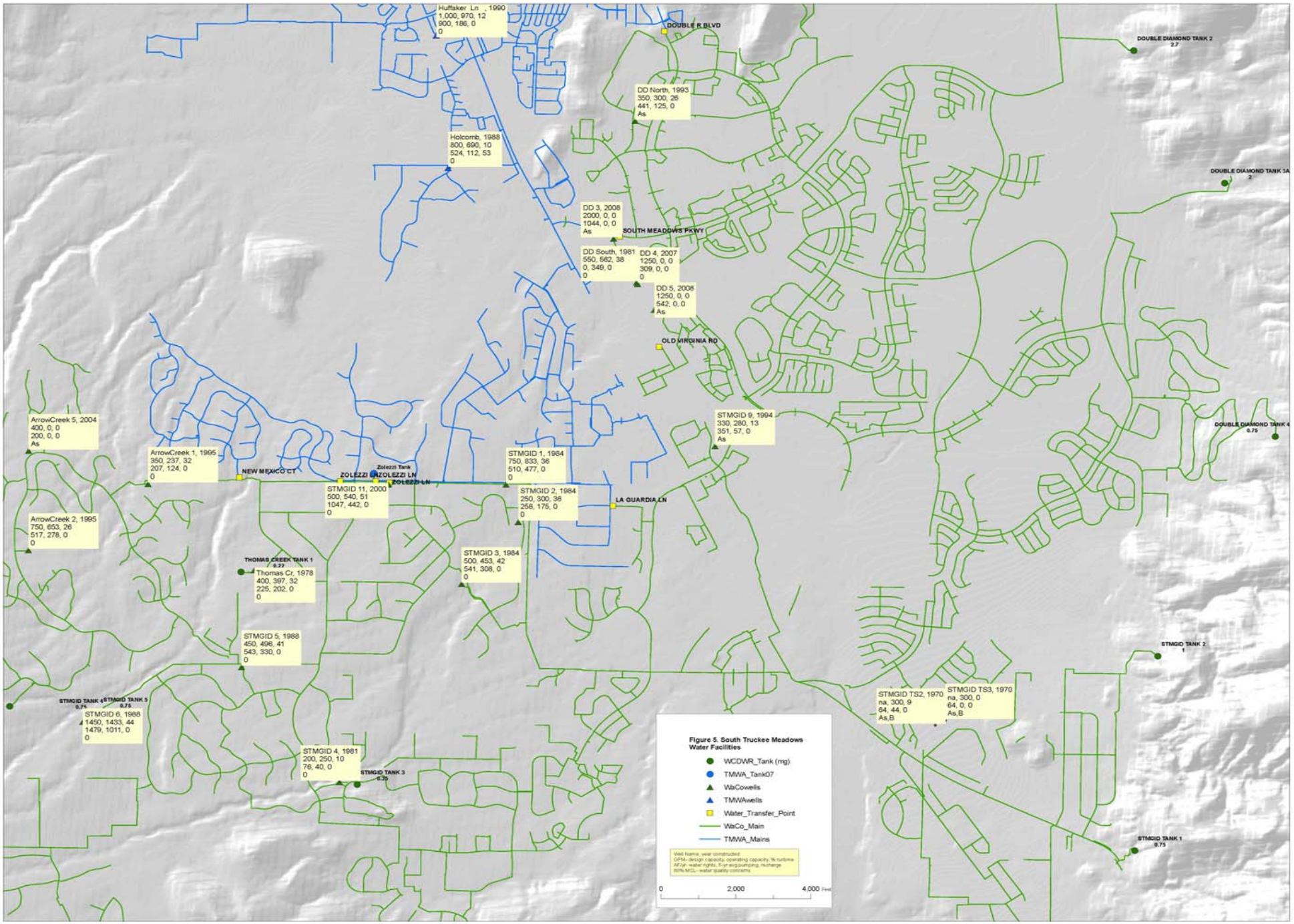
TABLE 3. Summary Statistics for South Truckee Meadows Basin (87)

	TMWA	WDWR	Totals
A. Retail Service Connections	1,063	7,993	9,056
B. Basin Production Facilities			
1. Number of wells		*** 11	13
2. Operating capacities (MGD)		11.5	13.0
3. Surface treatment facilities	na	na	na
4. Surface treatment capacity (MGD)	na	na	na
C. Rights Committed to Serve Basin (acre feet)			
1. Ground water-Basin 87 & 88		2,581	11,173
2. Ground water-importation			
3. Surface water-retail	1,828		1,828
4. Surface water-wholesale *		2,610	2,610
5. Surface water-other **			
6. Total Rights	1,828	13,788	15,611
D. 2008 Water Supplies (acre feet)			
1. Ground water-Basin 87 & 88		1,592	1,592
2. Ground water-importation			
3. Surface water-retail	1,404		1,404
4. Surface water-wholesale *		1,982	1,982
5. Surface water-other **			
6. Total Water Supplied in 2008	1,404	3,574	4,978
E. Recharge (acre feet)			
1. Permitted wells			
2. Injected volume FY08/09			

* Wholesale water from rights diverted, treated and delivered by TMWA to WDWR for use by its customers.
** Includes storage rights and creek rights.
***Includes five unequipped production wells, but not STMGID wells and 2 wells in Basin 88.

Current Resource Management Practices-TMWA

As noted above TMWA deliveries water to 1,063 services in this area from its pool of resources. Sufficient delivery capacity exists within TMWA's system to meet customer demand in this area therefore development of additional ground water production facilities in this area is not needed and would potentially interfere with existing WDWR ground water facilities and/or domestic well users.


Huffaker Ln , 1990
1,000, 970, 12
900, 186, 0
0
DOUBLE R BLVD
DOUBLE DIAMOND TANK 2
2.7
DD North, 1993
350, 300, 26
441, 125, 0
As
Holcomb, 1988
800, 690, 10
524, 112, 53
0
DOUBLE DIAMOND TANK 3A
2
DD 3, 2008
2000, 0, 0
1044, 0, 0
As
SOUTH MEADOWS PKWY
DD South, 1981
550, 562, 38
0, 349, 0
0
DD 4, 2007
1250, 0, 0
309, 0, 0
0
DD 5, 2008
1250, 0, 0
542, 0, 0
As
OLD MIRGINIA RD
ArrowCreek 5, 2004
400, 0, 0
200, 0, 0
As
STMGID 9, 1994
330, 280, 13
351, 57, 0
As
DOUBLE DIAMOND TANK 4
0.75
ArrowCreek 1, 1995
350, 237, 32
207, 124, 0
0
NEW MEXICO CT
Zolezzi Tank
ZOLEZZI LN
ZOLEZZI LN
STMGID 1, 1984
750, 833, 36
510, 477, 0
0
STMGID 11, 2000
500, 540, 51
1047, 442, 0
0
STMGID 2, 1984
250, 300, 36
258, 175, 0
0
LA GUARDIA LN
ArrowCreek 2, 1995
750, 653, 26
517, 278, 0
0
STMGID 3, 1984
500, 453, 42
541, 308, 0
0
THOMAS CREEK TANK 1
0.22
Thomas Cr, 1978
400, 397, 32
225, 202, 0
0
STMGID 5, 1988
450, 496, 41
543, 330, 0
0
STMGID TANK 2
1
STMGID TANK 4
0.75
STMGID TANK 5
0.75
STMGID 6, 1988
1450, 1433, 44
1479, 1011, 0
0
STMGID TS2, 1970
na, 300, 9
64, 44, 0
As,B
STMGID TS3, 1970
na, 300, 0
64, 0, 0
As,B
STMGID 4, 1981
200, 250, 10
76, 40, 0
0
STMGID TANK 3
0.75
STMGID TANK 1
0.75
Figure 5. South Truckee Meadows Water Facilities
WCDWR_Tank (mg)
TMWA_Tank07
WaCowells
TMWAwells
Water_Transfer_Point
WaCo_Main
TMWA_Mains
0
2,000
4,000 Feet

Current Resource Management Practices-WDWR

Demands in STM service areas are primarily served with ground water and augmented with wholesale water from TMWA. The wholesale water is limited to serving the valley floor. Sharing of resources between STMGID and WDWR occurs throughout the year. The equipping of three new production wells on the valley floor will result in reduced need of wholesale water in the short term. During the non-irrigation months, certain wells are allowed to recover in order to reduce long term impacts to domestic wells.

Challenges

Water supplies to TMWA customers in STM are similar to those described previously under CTM Challenges WDWR's greatest challenge in STM is meeting peaking demands at the upper pressure zones particularly within the STMGID system. Impacts to domestic wells from production pumping are becoming more prevalent.

Opportunities to Solve Challenges

Current demands can be meet with existing resources and facilities. However, additional and/or alternate sources of supply are needed to meet peaking demands and future demands. Options include:

1. *Enhanced Demand-Side Management (DSM).* Both utilities encourage their respective customers to use water efficiently. The difference between water rights committed to the basin for service commitments versus the amount of water served indicates that DSM programs may be contributing to this difference. Rates charged by the respective utilities are another factor that contributes to decreasing water use. Without further study it cannot be determined if additional reductions in water can be achieved and what the revenue/rate impacts would be on the respective utilities.

   If permanent reductions in water use can be achieved through enhancing DSM programs, WDWR could retain the savings and reserve the reduction for basin management purposes. Further water reductions within TMWA's system in STM would increase reservoir storage opportunities when TROA is implemented.

   Implementation Constraints: (i) increased costs to expand DSM programs and (ii) cost recovery by the utilities for these programs.

   Potential Integrated Solutions/Benefits: (i) potential WDWR cost reduction if TMWA assumed DSM program management and (ii) cost increases to expand TMWA's existing DSM, and potentially more costs to integrate DSM programs as access to billing data of WDWR would be required.

2. *WDWR increase Truckee River Use.* Increased use of Truckee River water by WDWR in this basin would require more water rights to augment use of ground water. Truckee

River water use in STM is also subject to return flow requirements similar to those in Lemmon Valley. Increased use of Truckee River water provides blending of surface with ground water which potentially also solves water quality issues. Facilities are in place to implement this option.

Implementation Constraints: (i) construction of delivery facilities and cost recovery; (iii) contracts for delivery of treated water; and (ii) recovery of increased costs to buy more treated water.

Potential Integrated Solutions/Benefits: (i) use of a portion of TMWA's unexercised surface rights would offset the need for more rights; (ii) reduce WDWR pumping costs; (iii) enhanced aquifer recovery; and (iv) enhanced water quality mitigation.

3. *Artificial Recharge*. Recharge with Truckee River water in winter months. Recharge is possible in several STMGID wells; this option could also help to improve the water quality in STM.

   Implementation Constraints: (i) WDWR complete feasibility analysis and permitting through State Engineer and NDEP to inject treated surface water in their wells; (ii) source of surface rights; (iii) recovery by WDWR of increased costs to buy additional water rights; (iv) construction of delivery facilities and cost recovery; and/or (v) recovery by WDWR of increased costs to buy additional treated water if purchased from TWMA.

   Potential Integrated Solutions/Benefits: (i) use of a portion of TMWA's unexercised surface rights could offset the need for WDWR to acquire more rights for this project; (ii) reduce WDWR pumping costs; (iii) enhanced aquifer recovery; and (iv) enhanced water quality mitigation.

4. *Increase use of creek rights***.** TMWA has 1,057 acre feet of creek rights (167 af Thomas, 141 af Evans Creek, and 749 af Steamboat Creek) and WDWR has 4,372 acre feet of creek rights (1,136 af Thomas, 2,846 af Whites Creek, 162 af Galena Creek, and 228 af Steamboat Creek). WDWR is in the process of obtaining permits to exercise its rights by allowing the creek waters to flow into the Truckee River and diverting equal or lesser amounts near or upstream of the confluence of the creeks with the river. WDWR will use its LTP to treat Truckee River water for delivery into STM. Use of these rights could serve future commitments, displace current ground water uses in STM, and/or be used for recharge. Under integrated scenario, TMWA's creek rights could be used in a similar fashion to augment supplies to STM.

   Implementation Constraints: (i) obtaining permits through State Engineer and (ii) recovery of WDWR increased costs to operate LTP (which costs may be offset by avoided well pumping costs).

   Potential Integrated Solutions/Benefits: If successful, the use of creek rights can improve aquifer conditions in STM. An integrated utility would increase benefits derived from increase creek right use.

5. *Ground Water Replenishment Systems***.** GWRS may be possible in STM using treated-recovery water from the South Meadows Wastewater Recovery Plant. Analysis is required to determine availability of recovery-water supplies and feasibility of injection.

   Implementation Constraints: (i) completion of feasibility testing; (ii) obtaining permits through State Engineer and NDEP to inject treated-recovery water; (iii) design and construct pumps, pipeline and wells; and (iv) recovery of WDWR increased costs to construct and operate GWRS.

   Potential Integrated Solutions/Benefits: At this time there are no quantifiable benefits of GWRS in the STM or how these benefits could be realized under an integrated utility.

6. *Any combination of Options 1 thru 5.*

   Implementation Constraints: All the constraints identified above would apply should the options be developed in any combination.

   Potential Integrated Solutions/Benefits: All the benefits identified accrue to the utilities.

PRELIMINARY ASSESSMENT REPORT
INTEGRATION STUDY

TRUCKEE MEADOWS WATER AUTHORITY

Department of Water Resources

DATE: May 30, 2009

TO: Jack Byrom
Rosemary Menard

FROM: Paul Miller
Joe Howard

OPERATIONS TEAM MEMBERS:	Geoff Daforno	John Hulett
	Dennis Dobyns	Rob Kelly
	Pat Nielson	Curt Orthel
	Keith Ristinen	Scott Smiley

RE: **TMWA-DWR Integration Analysis**
Operations Team Preliminary Assessment Report – Final Draft

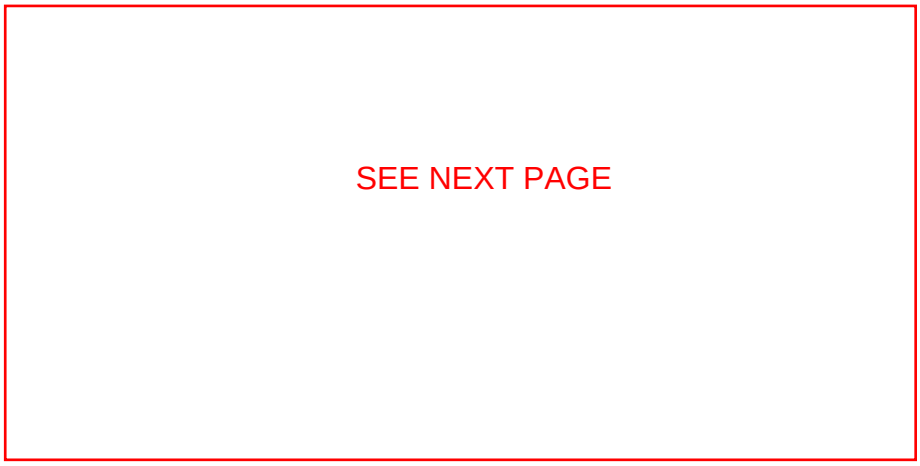
Integration Study Purpose and Mission:
To explore opportunities whereby TMWA and WCDWR may, through joint operation of water system facilities and management of water resources, produce quantifiable benefits for TMWA and WCDWR customers and the community as a whole.

Scope: The Operations Team was charged with identifying and evaluating opportunities to improve service levels and reduce operating costs based on thinking of DWR and TMWA facilities, staff, and systems, operating as one rather than two separate systems for the water, hydroelectric, wastewater and reclaimed water operating areas.

Methodology and Approach to the Evaluation:
The Operations Team identified existing functions performed by each utility. Each of the operations functions was evaluated to determine if there were opportunities for improved efficiency/synergy/or other quantifiable benefits. Benefits identified are in the form of improving system reliability, water quality, and service levels to our customers. As shown on Figure 1 the following work areas were identified and evaluated:

PRELIMINARY ASSESSMENT REPORT
DWR-TMWA INTEGRATION STUDY

Insert Figure 1



TMWA

Treatment Operations

17 members
- 4 - 4 person crews
- 1 apprentice
- 24/365 schedule
- 2 - SWTP's
- 3 - PCE TP's
- 32 Wells
- SCADA System
- 39 Tanks - 71 MG
- 139 Pressure Reg Stations
- 106 Pump Stations
- 108 Sq mile service territory

Water Quality/Laboratory Ops

7 members
- 2 chemists
- 2 microbiologists
- 1 WQ specialist (TCR)
- 1 WQ/Ops Engr
- 1 Lab Tech
- On call 24/365

State Certified Lab
- Inorganics
- Volatile Organics
- Wet Chemistry
- Total Coliforms
- Fecal Coliforms
- HPC

EPA certified 1623
- Cryptosporidium and Giardia

Treatment Operations Maintenance

17 members
- 1 supervisor
- 2 equip specialists
- 5 mechanics
- 2 mechanic apprentices
- 1 water supply specialist
- 5 SCADA techs
- 1 SCADA tech apprentice

Maintain:
- Plants, wells, tanks
- Reg stations, Pump Stations
- No system pipes

Distribution Maintenance

25 members
- 1 supervisor
- 1 coordinator
- 7 light/heavy foremen
- 5 fitters
- 1 fitter/welder
- 5 apprentice fitters
- 4 equipment operators
- 1 helper

Maintain:
- 90,000 service connections
- 1300 miles pipe > 6-inches
- Heavy Crews (4-man)
- Light Crews (2-man)
- Fire Hydrants (Sparks

Customer (Field and Meter) Services

1 supervisor and 1 coordinator

7 Servicemen
- meter change outs
- emergency cut out/in
- customer calls
- leak investigations
- repairs
- testing

4 service utilitymen
- meter readers (monthly)
- cut in/out
- rereads

Facilities Location

1 member
undergound utilities location

Backflow

1 administrator
- annual inspections
- initial testing
- training

Field Inspection Services

7 members
- Developer projects
- TMWA projects
- Water Leaks
- Customer Calls
- New Business

Construction Management/Engr

3 members
- 2 engineers
- 1 coordinator

Capital and O&M projects

Hydroelectric Operations

7 members
- 1 foreman
- 3 operators
- 1 diesel mechanic
- 1 electric tech
- 1 diesel tech

3 hydroelectric plants
River operations
Maintain
Distribution system generators
Flumes and ditches

Buildings and Grounds Maintenance

3 members
- 1 Coordinator
- 1 Groundsman
- 1 Helper

Maintain
- Plants
- Reservoirs
- Office Bldgs
- HVAC

Potential Efficiency/Synergy Gained thru Integration?

Probably Yes ⟷

Probably Yes ⟷

Probably Yes ⟷

Probably Yes ⟷

Probably Yes ⟷

Probably Some →

Probably Some ←

Probably Yes ⟷

WCDWR

Treatment Operations

2 members
- operate 06:30 to 15:00
- 24/365 on call
- 1 fully staffed plant - arsenic, manganese, UDI Source
- TCR Lab
- 3 satellite treatment facilities
  - arsenic
  - antimony
  - uranium
  - Iron manganese

Water Quality/Laboratory Ops

2 members
- all regulatory reporting
- maintain lab certification & Quality Control
- source water monitoring
- outsource all analytical work

Utility Operations (water)

North Team

Maintain 10 watersystems - Spanish Springs, North Valleys, Wadsworth, and Hidden Valley
- 7 members
- 29 Wells
- 9 boosters
- 28 Storage Tanks
- 56 Pressure Reg Stations
- possibly adding Verdi Meadows utility

South Team

Maintain 9 watersystems - Washoe Valley, Galena & Double Diamond. Includes contract operations of STMGID.
- 7 members
- 27 Wells
- 7 boosters
- 23 Storage Tanks
- 121 Pressure Reg Stations

Maintain:
- 19 separate distribution systems
- 46 tanks
- 56 wells
- 177 prv's
- 16 booster pump stations

Meter Technicians

4 members
- - read & repair
- - turn on/off

1 SCADA tech

Operations Support Staff

4 members
- work orders & preventative maintenance program
- receiving & warehousing

Cross Connection Control

flexibly staffed - 1 F.T.E.
- 2,000 backflow devices
- annual testing & notification
- reclaim cross connection testing

Construction Management and Inspection

7 members
- Inspect all projects (capital, O&M) & developer, WCDWR

Wastewater and Reclaimed Water Ops

5 members
- 3 treatment plants (contract operated)
- 3 reclaimed water storage reservoirs
- 2 reclaimed water booster stations
- 270 miles of collection system piping
- RCW cross-connection / Shutdown test
- 14 lift stations
- 5 Pressure Reg Stations

Buildings and Grounds Maintenance

provided by Washoe County Public Works
- 50,000 ft² of building space
- 15 diesel/propane emergency generators

OPERATIONS TEAM
TMWA AND WCDWR OPERATIONS FUNCTIONS AND STAFF MEMBERS

FIGURE 1

PRELIMINARY ASSESSMENT REPORT
DWR-TMWA INTEGRATION STUDY

- Water Treatment Operations
- Water Quality/Laboratory Operations
- Treatment Operations Maintenance
- Distribution (Field Piping) Maintenance
- Customer (Field and Meter) Services
- Facilities Location
- Backflow
- Field Inspection Services/Construction Management/Inspection
- Hydroelectric Operations
- Buildings and Grounds Maintenance, Fleet Maintenance, and Materials Management
- Wastewater and Reclaimed Water Operations

Summary:
The Truckee Meadows Water Authority (TMWA) and Washoe County Department of Water Resources are the two largest water purveyors in Washoe County. Each utility owns and operates water treatment and distribution facilities; serving water to approximately 122,500 service connections combined. In addition to drinking water, TMWA operates hydroelectric facilities along the Truckee River and Washoe County operates regional wastewater treatment plants and reclaimed water systems.

Following an analysis of facilities, resources, and staffing, the Operations Team concluded that potential operating efficiency/synergy/benefits could be gained through integration of staffs and joint operations in the following areas as shown on Figure 1:

- Water Treatment Operations
- Distribution Maintenance
- Water Quality/Laboratory Operations
- Treatment Operations Maintenance
- Customer (Field and Meter) Services
- Facilities Location
- Backflow
- Field Inspection Services/Construction Management/Inspection
- Buildings and Grounds Maintenance, Fleet Maintenance, and Materials Management

Additionally, potential efficiency/synergy/benefits could be gained to some degree, but less than anticipated in the areas identified above, by joining staffs in the following existing work areas:

- Hydroelectric Operations
- Wastewater/Reclaimed Water Operations

PRELIMINARY ASSESSMENT REPORT
DWR-TMWA INTEGRATION STUDY

The following is a discussion of each of the Operations Teams' individual functions with an accompanying opportunity score card.

Water Treatment Operations

TMWA and Washoe County drinking water treatment operations includes operating surface water treatment plants, groundwater treatment plants, wells, pump stations, tanks, and pressure regulating stations, across each entities service territories to both treat and distribute water to customers.

The following is an overview of the drinking water treatment and supply facilities operated by each utility:

Facility Summary

TMWA	Washoe County
2 fully staffed surface water treatment plants	1 fully staffed surface water treatment plant
3 satellite PCE treatment plants	2 satellite arsenic treatment plants
	1 satellite uranium treatment plant
34 wells	56 wells
43 tanks	51 tanks
2 lined and covered reservoirs	
200 pressure regulating stations	177 pressure regulating stations
105 pump stations	16 pump stations
92,000 water meters (99,088 services)	23,000 water meters (23,500 services)
1,315 miles of water mains	250 miles of water mains

One Treatment Operations team could be assembled to operate both utilities treatment and distribution facilities. It is the Operations Team opinion that this one team could operate more effectively than two separate teams and provide benefits to service reliability. Operating costs can typically be categorized under labor, chemicals and power costs. In general, if operated as one integrated team, the opportunities to operate more efficiently in each of these areas could be greater, than if each entity continued to be operated as an individual system.

For much of the combined service territories during the winter (low demand period (5 to 6 months)) water supply could be provided from just one treatment plant (Chalk Bluff). Utilizing surface water to a greater degree in the winter season throughout the combined service territories provides benefits by limiting groundwater use to summer peaking and emergency supply (thus conserving this resource), and allows many wells to potentially undergo aquifer storage and recharge (ASR) which can both augment groundwater supplies and improve local aquifer water quality. This concept is more fully developed, discussed and assessed in the Engineering and Planning, and Water Resource Preliminary Assessment Reports.

PRELIMINARY ASSESSMENT REPORT
DWR-TMWA INTEGRATION STUDY

Treatment Operations Maintenance

Maintenance activities at treatment plants were grouped into 8 general categories. The following area identifies the categories and opportunities for improved service/increased system reliability:

Opportunity to improve service or system reliability	**Yes**	**Some**	**No**
Repair pumps and motors	X		
Maintain and repair pressure regulators	X		
Maintain and treatment plant equipment	X		
Well equipment maintenance and repair	X		
Visit sites weekly – site check all remote facilities	X		
Repair pneumatic equipment	X		
Preventative maintenance	X		
Pressure checks	X		

Control Systems

Both utilities operate water treatment and distribution equipment from a remote location by high-tech control systems. These are known as Supervisory Control and Data Acquisition systems (SCADA). The two organizations utilize similar low-voltage SCADA instruments; however, TMWA utilizes a telephone based communication system while Washoe County utilizes VHF radio and internet based systems. The main process control software programs are similar, but not interchangeable.

These high-tech control systems require periodic repair, maintenance, calibration, and upgrade. The following summarizes Control/SCADA system opportunities:

Control Systems

Opportunity to improve service or system reliability	**Yes**	**Some**	**No**
Repair high voltage motor controllers/drives	X		
Repair and maintain low voltage control systems	X		
Repair and maintain motor operated valves	X		
Repair, maintain, calibrate sensors/gauges	X		
Write and modify all control programs	X		
Repair and maintain equipment for emergency electrical generation	X		
General electrical repairs	X		
General communications equipment	X		

PRELIMINARY ASSESSMENT REPORT
DWR-TMWA INTEGRATION STUDY

Chemical Systems

Both TMWA and Washoe County utilize water treatment chemicals. Chemicals consist of coagulants, polymers, acids, bases, and carbon based adsorbents. These chemicals are delivered to facilities as gasses, liquids, or solids. Each of these products requires specialized storage facilities and chemical feed systems. Chemical concentrations are closely monitored by treatment staff, process equipment, probes and gauges. The following table identifies opportunities for utility cooperation:

Chemical Systems

Opportunity to improve service or system reliability	**Yes**	**Some**	**No**
Chemical Ordering	X		
Repair and maintenance of all chemical systems	X		
Repair and maintain sampling equipment	X		
Repair and calibrate treatment instruments	X		
Respond to chemical problems and alarms	X		

Distribution Maintenance

TMWA's and Washoe County's Distribution Maintenance groups are responsible for maintaining service connections, water mains, valves, lateral lines, and repairing water leaks. These crews respond around the clock as necessary to keep customers in water. These groups provide support to many other utility departments.

Distribution Maintenance

Opportunity to improve service or system reliability	**Yes**	**Some**	**No**
Water leaks (mains and services)	X		
Water main taps	X		
Water service line replacements	X		
Flushing	X		
Leak detection	X		
Valve maintenance	X		
Regulatory permit maintenance	X		
Hydrant maintenance & repair	X		
Utility location	X		
Welding	X		

Customer (Field and Meter) Services

Both TMWA and Washoe County rely on water meters to account for water usage. TMWA has almost completed system-wide meter retrofits and Washoe County has 97% of it's customers on a water meter. Combined, the two utilities Customer Services groups respond

to approximately 88,000 non-routine calls for service each year. These include final meter reads, turn-on/off, leak investigation, and water wasting issues.

Both utilities maintain a backflow program per NAC 445A to ensure each service connection is protected from backflow and cross connections.

PRELIMINARY ASSESSMENT REPORT
DWR-TMWA INTEGRATION STUDY

Meter Service & Cross Connection Control

Opportunity to improve service or system reliability	**Yes**	**Some**	**No**
Meter read routes	X		
Field and bench testing meters	X		
Maintain meter & parts inventory	X		
Meter turn-offs & pressure complaints	X		
Install/retrofit Flex-Net auto read meters	X		
Inspect new meter installations	X		
Field service requests	X		
Tracking and testing backflow assemblies	X		
Cross connection shut-down testing	X		

Water Quality/Laboratory Operations

DWR and TMWA Water Quality programs ensure compliance with all regulatory requirements and the safety of drinking water supply. An essential part of the program is the water quality staff and water quality laboratory.

Both utilities remain forward looking in terms of EPA regulations and water quality issues. There are more than 20 EPA existing drinking water regulations in place to protect the quality of drinking water. Both utilities have water quality staff devoted to compliance with existing and proposed drinking water regulations.

The TMWA Water Quality Laboratory is located at the Glendale Water Treatment Plant. Both the chemistry and microbiology sections are certified by the State of Nevada, Department of Conservation and Natural Resources, Division of Environmental Protection for over 56 parameters for Drinking Water Methods and Waste Water Methods. The Laboratory also analyzes both treated and untreated water samples for *Giardia lamblia* cysts and *Cryptosporidium parvum* oocysts and is one of less than 60 laboratories across the county that are certified by the EPA in this sampling and analysis method. Maintenance of certifications requires semi-annual proficiency testing for renewal.

Washoe County DWR operates and maintains a certified microbiology laboratory. The lab processes more than 1,000 samples annually and is capable of detection of coliforms in drinking water. The laboratory performs quality control tests and maintains lab certification, similar to TMWA.

PRELIMINARY ASSESSMENT REPORT
DWR-TMWA INTEGRATION STUDY

Water Quality/Laboratory Operations

Opportunity to improve service or system reliability	**Yes**	**Some**	**No**
Regulatory planning	X		
Work with regulatory agencies	X		
Source water monitoring	X		
Analytical	X		
Maintain lab certification	X		
Resolve water quality issues	X		
On-going environmental permit maintenance	X		

Water Utility Facility Summary

TMWA and Washoe County each separately own and maintain several buildings and facilities that comprise over 100,000 square-feet of office/warehouse space combined. Maintenance of office and warehouse space has historically been a utility operations division responsibility. TMWA has in-house facility maintenance staff while Washoe County contracts with the Washoe County Facilities Management Division. The following identifies potential opportunities to improve service:

Water Utility Facility Summary

Opportunity to improve service or system reliability	**Yes**	**Some**	**No**
HVAC	X		
Janitorial	X		
Landscaping/weed control	X		
Building maintenance	X		

Field Inspection Services/Construction Management

Both TMWA and WCDWR employ staff members that inspect all developer and utility capital and O&M projects. TMWA and Washoe County conduct both field inspection and construction management activities from the engineering area. The following identifies potential opportunities to improve service:

Field Inspection Services/Construction Management

Opportunity to improve service or system reliability	**Yes**	**Some**	**No**
Inspect developer installed facilities	X		
Inspect TMWA construction projects	X		
Inspect County construction projects	X		
Assist with change orders	X		
Review submittals	X		
Authorize payment	X		

PRELIMINARY ASSESSMENT REPORT
DWR-TMWA INTEGRATION STUDY

Hydroelectric Operations

This area of Operations is limited to TMWA. The Truckee Meadows Water Authority operates and maintains three hydroelectric plants on the Truckee River, the Fleish Hydro Plant, Verdi Hydro Plant and the Washoe Hydro Plant.

This group's work though very specific to TMWA may be able to provide diesel maintenance and repair service to WCDWR standby generators located at several sites across the Truckee Meadows.

Hydroelectric Operations

Opportunity to improve service	**Yes**	**Some**	**No**
Operation of hydro facilities			X
Adjusting river diversions			X
Flume surveillance		X	
Monthly generator runs	X		
Diesel generator repair	X		

Wastewater and Reclaimed Water Operations

This area of Operations is limited to WCDWR. Washoe County DWR wastewater treatment service areas include portions of Reno/Sparks, South Truckee Meadows, Sun Valley, Cold Springs, and Lemmon Valley. There are 3 County-owned wastewater treatment plants which are contract operated.

Wastewater and Reclaimed Water Operations

Opportunity to improve service	**Yes**	**Some**	**No**
Operation of wastewater plants			X
SCADA and Controls	X		
Mechanical Maintenance		X	
Facilities Maintenance		X	
Chemical Supplies	X		
Maintenance of collection facilities			X
Reclaimed water pumping stations		X	
Reclaimed water distribution system	X		

Discussion of reclaimed water operation resulted in an observation that reclaimed water system operation is more closely related to water system operation than wastewater collection operation. Equipment that is in contact with reclaimed water needs to be kept separate from water system equipment (i.e.: pressure gauges, flowmeters, sample dippers, etc.) but some equipment can be used in both areas (shovels, dewatering pumps, pipe wrenches, etc.). Therefore, it is the opinion of this Operations Team that some benefits/synergy/efficiency could also be gained through integration of TMWA and WCDWR staffs in this area.

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Fleet and Materials Management

Both utilities operate a fleet of utility vehicles and subcontract vehicle maintenance. Although there are few opportunities to reduce vehicle maintenance costs, there are opportunities to improve service through vehicle and equipment sharing. The following is a description of each of the utility fleets:

Fleet Summary

TMWA	Washoe County
125 vehicles (including the following)	48 vehicles
4 10-wheel dump trucks	2 10-wheel dump trucks
4 backhoes	2 backhoes
10 Medium size service trucks (450 – 550)	1 front end loader
2 vacuum trucks (water)	1 vacuum truck (sewer)
4 heavy crew trucks	1 flush truck (sewer)
1 front end loader	600 KW mobile generator

Materials Management

The operations groups identified several other areas for improved service. These include:

- Utilization/supply of type 2 base and sand.
- Warehousing and parts
- Chemical/parts bidding

It is the opinion of this Operations Team that efficiency/synergy/benefits can be gained through integration of facilities that are maintained by one Buildings and Grounds Maintenance, Fleet Management, and Materials Management system and personnel.

Additional Opportunities

Artificial Recharge

Historically TMWA has utilized aquifer storage in winter months. Aquifer storage and recovery provides benefits by limiting groundwater use to summer peaking and emergency supply (thus conserving this resource). Washoe County has undertaken pilot recharge projects and is currently in the planning stages for full scale recharge projects. TMWA operations staff could provide technical and operations support for this planned Washoe County project. This concept is more fully developed, discussed and assessed in the Engineering and Planning, and Water Resource Preliminary Assessment Reports.

Conclusion

The Operations Team asked the question from an operational perspective “are there any barriers that exist that we could identify that prevent us from integrating” and the answer was no. And we concluded that from a customer perspective there was a lot to be gained from integration.

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This Preliminary Assessment Report did not include consideration of the Sun Valley GID or South Truckee Meadows GID. Each utility meets existing contractual requirements with these GID's and a combined utility would also meet these same requirements.