Northern Nevada
Water Planning Commission

STAFF REPORT

DATE: August 31, 2016

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

FROM: Jim Smitherman, NNWPC Water Resources Program Manager

SUBJECT: Presentation of comments received on the "Population Forecast and Projections of Water Demand, Peak Day Requirements and Wastewater Flow" chapter for the 2016 Regional Water Management Plan ("RWMP") update; discussion and possible direction to staff.

SUMMARY

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

6.1 Comparison of the Consensus Population Forecast and the Estimated Population that can be Supported by the Sustainable Water Resources in the Planning Area; and
6.2 Projections of Water Demand, Peak Day Requirements and Wastewater Flow for Service Areas.

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

RECOMMENDATION

Staff recommends that the NNWPC accept the report on comments received and proposed revisions to the "Population Forecast and Projections of Water Demand, Peak Day Requirements and Wastewater Flow" chapter for the 2016 RWMP update, and, if acceptable, approve the changes and provide direction to staff as appropriate.

JS:df

Attachment: Introduction, Section 6.1, Section 6.2

Introduction

This chapter presents a summary of the process that was followed to determine whether the forecasted population for the year 2036~~5~~ can be supported by the sustainable water resources potentially available within Washoe County. Furthermore, more detailed projections of future water demands including peak day capacity requirements, wastewater flow and wastewater treatment plant capacity needs have been compiled for the primary service areas within the region.

An analysis as to whether the forecasted population can be supported by the sustainable water resources was done in response to 2008 Washoe County Ballot Question No. 3 ("WC-3") and January 2010 amendments to the *Truckee Meadows Regional Plan* ("Regional Plan"). The amendments, adopted in response to WC-3, provide for a comparison between the draft Consensus Forecast and the estimated population that can be supported by the sustainable water resources as identified in this Plan. As discussed in more detail in Section 2.2.1.1, amendments to the Regional Planning Governing Board ("RPGB") Regulations on Procedure identify the Northern Nevada Water Planning Commission ("NNWPC") and the WRWC as the entities to perform the comparison, and the WRWC as the body to make a determination and finding as to the results of the comparison. Section 6.1 deals exclusively with the comparison described in the 2010 Regional Plan amendments.

The remainder of the chapter focuses on estimates of future water demands and wastewater flows at the treatment plants consistent with the Consensus Forecast population projection for the primary service areas within the planning area. ~~The service areas are consistent with the planning areas established for the *City of Reno and Washoe County TMSA/FSA Water Wastewater and Flood Management Facility Plan* (ECO:LOGIC, 2007) and the *City of Sparks TMSA/FSA Conceptual Facility Master Plan* (Stantec, 2008), which are based primarily on wastewater service areas and political boundaries.~~ The planning areas are identified as Cold Springs, Stead/Lemmon Valley, the Washoe County portion of Spanish Springs, Sparks, Sun Valley General Improvement District ("SVGID"), Truckee Meadows and South Truckee Meadows. A Regional Water Balance ~~Flow~~ Diagram has also been developed, which is a graphical representation of possible future conditions for ~~the~~ water supply, wastewater treatment, reclaimed water and wastewater disposal requirements. The Regional Water Balance Flow Diagram is useful to answer the following questions:

- How much potable water will be used in the future, and in what locations?
- From which sources will the potable water originate, and once used, where will it go for wastewater treatment?
- Following treatment, how much of the water will be reused, and where will the balance be disposed?
- Are there future imbalances in water supply, wastewater disposal or reclaimed water usage, and if so, in which planning areas?
- Are there planning areas with adequate capacity to address imbalances?

6.1 Comparison of the Consensus Population Forecast and the Estimated Population that can be Supported by the Sustainable Water Resources in the Planning Area

As described in Section 2.2.1.1, the RPGB identified the NNWPC and the WRWC as the entities to perform a comparison of the draft Consensus Forecast with the estimated population that can be supported by the sustainable water resources as set forth in this Plan prior to the adoption of the Consensus Forecast.

6.1.1 Consensus Population Forecast

TMRPA compiles the Washoe County Consensus Forecast every two years using data from the Truckee Meadows Water Authority ("TMWA"), Global Insight, Woods and Poole, and the State Demographer. In 2010, the Consensus Forecast projected a population of approximately 590,500 for the year 2030, ~~and~~ the 2012 version projected a 2032 population of 560,772 and the 2014 version projected a 2034 population of 563,779. The most recent version, the 201~~4~~6 Consensus Forecast, project~~sed~~ that the total population in Washoe County will grow from 450,747~~442,123~~ in 201~~64~~ to 548,159~~563,779~~ in 203~~64~~.

The TMWA 2035 WRP sets forth its current population estimate for 203~~65~~ to be 54~~8,187~~5,000 persons, which estimate is consistent with the draft 2016 Consensus Forecast of ~~approximately~~ 548,159~~000~~ persons for the year 2036.

6.1.2 Water Resources

Table 2-1, Water Resources Baseline, provides long-range planning-level estimates for sustainable water resources using the best available information. The table identifies selected hydrographic basins within the Planning Area and quantifies surface water and groundwater in two ways. Appropriations (water rights), including decreed rights and rights permitted or certificated by the State Engineer for municipal and industrial ("M&I") use and those that may be converted to M&I use, are quantified separately from those that cannot be converted to M&I use.

The Water Resources Baseline acknowledges *TROA*'s effect on the availability and sustainability of Truckee River water. *TROA* is designed to provide long-term sustainable water operations for the multiple stakeholders on the Truckee River system through the continued use of water rights converted from irrigation to M&I use. The Truckee Meadows community benefits greatly from *TROA* implementation in that it provides for significant storage capacity in upstream reservoirs that can be integrated with other water resources to maximize the yield of the Truckee River.

The Water Resources Baseline also shows the quantity of groundwater in each basin consistent with the State Engineer's estimates of perennial yield. In basins where appropriations for M&I use (or those that may be converted to M&I use), are less than the perennial yield estimate, only those water rights actually appropriated are considered to be sustainable. The table includes basins that may provide M&I water supplies within a 20-year planning timeframe. This assumes importation of groundwater from hydrographic basins in Washoe County that are not presently providing water for M&I use.

The Water Resources Baseline in the 2011 Regional Water Plan estimated sustainable water resources potentially available in Washoe County to be approximately 183,200 AF/yr. The estimate is slightly increased in the 2016 update, to approximately 190,500 af/yr, based on a recent review of State Engineer records.

6.1.3 Water Demand and Population Projections

The TMWA~~In~~ 201~~60~~-2035 Water Resources Plan ("WRP")~~,~~ contains~~TMWA developed~~ a long-range water demand projection for TMWA's~~the~~ projected service area. Using TMWA's methodology, the NNWPC performed a water use projection for the entire County that yielded an annual demand of approximately ~~142~~116,000 af to support a population of approximately 548,159~~590,500~~ persons as projected for the year 203~~60~~ by the 201~~60~~ Consensus Forecast. ~~In response to WC-3 and the Regional Plan amendments, the projections were extended to estimate the population that could be supported by the sustainable water resources of 183,200 af/yr, yielding a build-out population of about 741,000.~~ TMWA's methodology is published in detail in its 203~~50~~ W~~ater R~~~~esource~~ P, Chapter 4~~lan, Appendix I~~.

6.1.4 Conclusions

The WRWC determined in 201~~60~~ that the draft Consensus Forecast population for 2036 can be supported by the sustainable water resources set forth in the ~~the sustainable water resources identified in the 2011~~ Regional Water Plan. ~~were adequate to serve the 2030 population estimate provided in the Consensus Forecast. In 2012 and 2014, the WRWC reasoned that the sustainable water resources identified in 2010 were adequate to serve the Consensus Forecast 20-year population projections in each of those years.~~ The downward trend in 20-year population projections while holding available resources relatively constant meets the expectations of WC-3 and the Regional Plan amendments.

6.2 Projections of Water Demand, Peak Day Requirements and Wastewater Flow for Service Areas

Given that sustainable water resources are potentially available to meet 20 years of ~~future~~ growth in the Planning Area ~~through 2035~~, more detailed projections of future water demands, including peak day capacity requirements, wastewater flow, wastewater treatment plant capacity and effluent management needs are required to estimate future infrastructure requirements and costs.

The TMWA 2035 WRP projects water demand through the year 2035 to ensure that the utility will have the necessary water resources and facilities to serve its service area population. Projected water demand is based on projected population and water service connections through the planning period. Projected water demand has four main components: (1) Residential demand, (2) Commercial demand, (3) Irrigation demand, and (4) System losses. Each of these components is projected using established historic water demand factors. The projections include estimates of land use consumption, growth in dwelling units and commercial buildings, and were developed in a four-step modeling process as follows:

- Future population is projected for Washoe County.
- The number of single-family buildings, multi-family dwelling units, and commercial buildings are projected as a function of the population projection.

- A relationship between active water services and buildings is developed to project the number of new active water services, including water use coefficients which are estimated for each customer class using historic billed water use.
- ~~Combine t~~The building projections are combined with the water services and water use coefficients to create the total water demand projection.

The total demand for water is dependent on three general demands or uses: (1) residential consumption of water for internal household purposes; (2) commercial consumption of water as an input to producing goods and services in the local economy (i.e., each business has a demand for water that is dependent of the type of business and the building that it occupies); and (3) residential and commercial consumption of water for irrigation purposes. TMWA's population forecast and water demand projection methodologies are described in Chapter 4 of its 2035 WRP.

~~*6.2.1 Projections by Planning Area*~~

~~TMWA's County-wide projection is disaggregated into the sub-areas listed below.~~

~~Utility Service Areas~~

~~ID Code~~	~~Name~~
~~TR~~	~~TMWA Retail Area~~
~~SV~~	~~TMWA Wholesale (Sun Valley)~~
~~WC~~	~~Washoe County (Non-TMWA)~~

~~Hydrographic Basins~~

~~ID Code~~	~~Name~~
~~083~~	~~Tracy Segment~~
~~085~~	~~Spanish Springs~~
~~086~~	~~Sun Valley~~
~~087~~	~~Truckee Meadows~~
~~088E~~	~~Pleasant Valley East~~
~~088W~~	~~Pleasant Valley West~~
~~089~~	~~Washoe Valley~~
~~091~~	~~Truckee Canyon~~
~~092~~	~~Lemon Valley~~
~~000~~	~~All Other Basins in County~~

~~(Add reference map)~~

~~Sub-area projections are derived from the County total projection using a ratio share analysis ensuring that in any projection year the sum of the sub-areas will always equal the County total.~~

6.2.~~1~~2 Water Demand Projections

Following this methodology, projected 2015 through 2035 average day water demands ~~for each of the planning areas~~ were developed, which are presented in Table 6-1. The 2035 total TMWA wholesale and retail potable water demand projection is 94,843 af, including the Truckee Resource Area ("TRA") and the non-Truckee Resource Area ("non-TRA"), which are defined in the TMWA 2035 WRP and described in Chapter 3. ~~This~~ The Regional Water Plan considers the area where municipal services are to be provided within the Truckee Meadows Services Area, which is a subset of the larger area of Washoe County, but extends beyond TMWA's wholesale and retail areas to include parts of Washoe County served by private water purveyors and domestic wells (see Chapter 3).

Table 6-1 presents the projected water ~~production~~use within the TRA, ~~and~~ non-TRA and non-TMWA areas ~~by hydrographic basin~~. ~~The s~~System loss is included, calculated using an estimate

of 6 percent of the total demand. TMWA's projections for peak day production requirements appear in Table 6-2.

Table 6-1. Projected Water Use Through 2035 (AF per year) ~~by Hydrographic Basin~~

Year	TMWA			nonTMWA	
	TRA	nonTRA	subtotal		total
2015	76,567	217	76,784	4,951	81,735
2020	82,628	238	82,866	5,388	88,254
2025	87,340	254	87,594	5,789	93,383
2030	91,260	268	91,528	6,175	97,703
2035	94,563	280	94,843	6,555	101,398

Table 6-2 TMWA Peak Day Production Requirements

Year	Estimated Production	Non-Drought Year Peak Day Consumption	Drought Year, Peak Day Consumption
	Acre-Feet	MGD	MGD
2020	82,866	133.2	119.9
2025	87,594	140.8	126.7
2030	91,528	147.1	131.2
2035	94,843	152.4	137.2

6.2.~~2~~3 Wastewater Flow Projections

Similar to the previous section, a projection of future wastewater flows for each major wastewater service area was developed to estimate 2035 wastewater treatment capacity and effluent management needs. The wastewater flow estimates were developed by TMRPA using a parcel-based spatial allocation of the Consensus Forecast for population and employment. The process is summarized below.

- Translate time-series population projections to spatial allocation of housing units and employment
- Aggregate to sub-areas, i.e. hydrographic basins and wastewater service areas
- Select appropriate TMWA water use coefficients to estimate indoor water use for residential and non-residential customer classes
- Develop residential and non-residential average water use factors
- Calculate wastewater flows by wastewater service area, compare to 2015 average day annual flows observed at each water reclamation facility and develop weighted factors for best fit
- Calculate 2035 wastewater flow projections for wastewater service areas and facilities

TMRPA ~~staff~~ used indoor water usage coefficients provided by TMWA to estimate wastewater generation by parcel for the Truckee Meadows Service Area. The coefficients were based on the averages for each service as shown in Table 6-3. MMWS is categorized as multi-family units, while RMWS represents single family residential units and GMWS represents non-residential. Residential calculations were relatively straightforward since TMRPA's parcel level data projects annual housing units. The MMWS and RMWS factors can be applied directly to those annual housing unit estimates to calculate wastewater generation over the 20-year planning horizon. However, non-residential wastewater projections were not as straightforward because TMRPA's parcel level data projects employees, while TMWA's coefficient for non-residential (indoor) water use is based on each metered service (GMWS). To apply TMRPA projections to the GMWS coefficient it was necessary to create a relationship between employees and metered service.

Since TMRPA has GMWS data by parcel number and business point data for 2015, it was possible to find the number of existing meters per parcel and the number of businesses per parcel and calculate a ratio of meters per business. Furthermore, business point data reveals the number of employees per business allowing the creation of a second ratio. Both ratios were applied to the GMWS coefficient using a weighted average of businesses per employee and meters per business, giving more weight to a parcel with more businesses and more meters. ~~Table 6-3 shows the weighted wastewater generation factors.~~

Table 6-3 TMWA Indoor Water Use Coefficients

Indoor Water Usage (1,000 gal)							
Hydro-basin	**Annual Indoor Usage**						
	GMWS	**GMWS Meters**	**MMWS (per customer)**	**MMWS (per unit)***	**Multi-Family Units**	**RMWS**	**Single-Family Units**
83	170.4	-	-	-	3		213
85	265.8	206	325.1	32.5	944	51.5	17407
86	201.9	19	193.5	19.4	234	64.4	6079
87	481.5	5646	356.5	35.7	49501	55.4	78137
088E	-	-	-	-	8	36.0	2093
088W	116.2	-	-	-	8	30.5	2093
89	101.6	-	-	-	33	24.0	1898
92	397.5	270	415.8	41.6	1231	55.3	11710
Average	247.8	-	322.7	32.3	-	45.3	-
Weighted Average	469.67	-	-	35.7	-	54.0	-

*Assumes an average of 10 units per service

The equation that converts employee projections by parcel to meters per parcel ~~looks like~~ is: $(Employees)\times(Businesses/Employee)\times(Meters/Businesses)=Meters$. With an estimated number of meters per parcel TMRPA applied the 469.67 GMWS weighted usage coefficient and estimated wastewater generation by parcel. ~~These parcel level data were then summed by year out to 2035.~~ Weighted wastewater generation factors for single family dwelling units, multifamily dwelling units and non-residential units are shown in Table 6-4.

~~**Weighted Average Factors**~~

~~Businesses Per Employee 0.074965649~~

~~Meters Per Business 0.48623348~~

~~**Straight Average Factors**~~

~~Businesses Per Employee 0.060556052~~

~~Meters Per Business 0.357863569~~

Table 6-4 Weighted Wastewater Generation Factors

Dwelling Unit Type	Unit	(Units×Coefficient×Gallons)÷365days	Total Wastewater Generation (GPD)
Single Family (weighted)	1 Dwelling Unit	(1×53.992×1000)÷365 =	148
Multi-Family (weighted)	1 Dwelling Unit	(1×35.661×1000)÷365 =	98
Non-Residential (employee- weighted)	1 Employee	(1employee×0.075×0.49)(469.67×1000) ÷365 =	47 Gallons Per Employee

Parcel-level data were used to estimate 2015 residential and non-residential wastewater generation, summed for each wastewater service area and compared to 2015 average day annual flows ("ADAF") observed at the water reclamation facilities. Table 6-5 shows that the total calculated wastewater flows for the region is within 2.6 percent of the observed data. This methodology very slightly over-estimates regional wastewater flows compared to 2015 observed flows.

Table 6-5 Comparison of Calculated Residential and Non-residential Wastewater Flows to 2015 Average Day Annual Flows Observed at Water Reclamation Facilities

Water Reclamation Facility	Residential (weighted)	Non-Residential (employee-weighted)	Calculated Total Wastewater Generation (GPD)	Observed 2015 Average Day Annual Flow (GPD)	Comparison Percentage of ADAF
TMWRF	17,308,352	9,479,288	26,787,640	26,330,000	101.74%

STMWRF	2,191,808	1,147,593	3,339,401	3,000,000	111.31%
RSWRF	1,104,804	354,498	1,459,302	1,400,000	104.24%
CSWRF	305,661	19,418	325,080	297,000	109.45%
LVWRF	123,916	59,005	182,921	260,000	70.35%
Totals	21,034,541	11,059,802	32,094,344	31,287,000	102.58%

The same methodology was used to project future wastewater generation by service area, shown in Table 6-6 in five-year increments. The 2035 wastewater flow projections are reasonable for the intended purpose of projecting future flows at each of the regional wastewater reclamation facilities. The 2035 wastewater flow projections represent the ADAF~~"average annual daily flow"~~ that can be expected at the regional wastewater reclamation facilities. Some variability should be anticipated in the actual capacity and process improvements that will be necessary in the future at each individual facility, as wastewater treatment is a complex combination of physical, biological and hydraulic processes. This is in addition to the inherent uncertainty of when and where future development will occur over the next 20 years.

~~Design of each process must take into account not only significant variations in flow, but variability in loading, or strength, of numerous constituents such as biological oxygen demand ("BOD"), suspended solids, dissolved solids and nutrients. When future improvements are required at the regional wastewater reclamation facilities, a detailed facility plan or engineering design report will be prepared that defines the specific process improvements and capacity requirements. This detailed information will take precedence over the "planning level" flow and capacity projections presented in this Plan.~~

~~Table 6-5 Regional Results~~

~~Water Reclamation Facility (method)~~	~~Total Wastewater Generation - Employee Factors Weighted (GPD)~~	~~Observed 2015 Average Day Annual Flow (ADAF) (GPD)~~
~~TMWRF~~	~~26,787,640~~	~~26,330,000~~
~~STMWRF~~	~~3,339,401~~	~~3,000,000~~
~~RSWRF~~	~~1,459,302~~	~~1,400,000~~
~~CSWRF~~	~~325,080~~	~~297,000~~
~~LVWRF~~	~~182,921~~	~~260,000~~
~~Totals~~	~~32,094,344~~	~~31,287,000~~
		~~Percentage of ADAF 102.58%~~

Table 6-6 Projected Wastewater Flow by Water Reclamation Facility in 5-year Increments

	Predicted Wastewater Generation (GPD)			
WRF	**2020**	**2025**	**2030**	**2035**
TMWRF	944,552	1,879,823	2,908,777	3,837,390
STMWRF	379,340	785,214	1,122,785	1,509,522
RSWRF	197,356	430,932	681,712	863,068
LVWRF	61,352	191,631	294,188	368,182
CSWRF	34,276	73,576	191,203	458,883
Totals	1,616,876	3,361,176	5,198,666	7,037,046

~~TMWA provided water use coefficients by hydrographic basin derived from 2009 – 2015 water use records. To estimate indoor water use, data from single-family, multi-family and general metered (commercial/industrial) customer classes for winter months (December – March) were used.~~

Design of each process must take into account not only significant variations in flow, but variability in loading, or strength, of numerous constituents such as biological oxygen demand ("BOD"), suspended solids, dissolved solids and nutrients. When future improvements are required at the regional wastewater reclamation facilities, a detailed facility plan or engineering design report will be prepared that defines the specific process improvements and capacity requirements. This detailed information will take precedence over the "planning level" flow and capacity projections presented in this Plan.

~~This methodology slightly over-estimates regional wastewater flows compared to 2015 observed flows. The 2035 wastewater flow projections are reasonable for the intended purpose of projecting future flows at each of the regional wastewater reclamation facilities.~~

~~The 2035 wastewater flow projections represent the "average annual daily flow" that can be expected at the regional wastewater reclamation facilities. Some variability should be anticipated in the actual capacity and process improvements that will be necessary in the future at each individual facility, as wastewater treatment is a complex combination of physical, biological and hydraulic processes. This is in addition to the inherent uncertainty of when and where future development will occur over the next 20 years.~~

~~Design of each process must take into account not only significant variations in flow, but variability in loading, or strength, of numerous constituents such as biological oxygen demand ("BOD"), suspended solids, dissolved solids and nutrients. When future improvements are required at the regional wastewater reclamation facilities, a detailed facility plan or engineering design report will be prepared that defines the specific process improvements and capacity requirements. This detailed information will take precedence over the "planning level" flow and capacity projections presented in this Plan.~~