Mammoth Community Water District

2015 Urban Water Management Plan

January 2017

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ES.1 Scope and Purpose of the 2015 Urban Water Management Plan

This Executive Summary presents an overview of the Mammoth Community Water District's (MCWD or District) 2015 Urban Water Management Plan (2015 UWMP). The 2015 UMWP is an important long term planning document for the District and the community it serves, which is primarily the incorporated area of the Town of Mammoth Lakes (Town). The conclusions and recommendations from the 2015 UWMP will determine key aspects of long-term capital investment by the District for water supply and treatment, and influence future land use planning and development levels within the Town, to the extent these are influenced by the practical and regulatory requirements linking water supply reliability and land use decisions.

The 2015 UWMP's planning horizon is 20 years, through 2035. This 20-year timeline was used as the approximate horizon for buildout of the Town. The 2015 UWMP has been prepared to comply with California Water Code, Section 10610 - 10657, the Urban Water Management Planning Act (UWMPA, or Act), and the Water Conservation Bill of 2009. The Act requires all urban water suppliers providing water for municipal purposes to more than 3,000 customers, or supplying more than 3,000 acre-feet of water annually, to prepare and submit to the Department of Water Resources (DWR) an urban water management plan every five years. The purpose of the Act is to ensure water resources are managed efficiently to provide a reliable supply to residents and business in the state of California. The District's last UWMP was updated in 2010. This new 2015 UWMP serves as a complete, independent document from the 2010 UWMP. The Water Conservation Bill of 2009 requires a statewide 20 percent reduction in urban per capita water use by December 31, 2020. To meet this goal, all 2010 UWMPs included a baseline daily per capita water use, a 2015 interim target and a 2020 compliance daily per capita water use that would help the state achieve a 20% reduction in per capita water use by 2020.

This UWMP presents information, analysis, and conclusions regarding past, current, and projected water demand, current and future water supplies to meet projected demands, supply reliability under future demand conditions, District plans for potential water shortages, actions by the District to reduce water demand, and future potential impacts of climate change on local water supplies.

Calendar year and acre-feet are units of measure throughout the UWMP except where noted.

ES.2 Plan Preparation

The California Water Code (CWC) mandates that Urban Water Suppliers coordinate plan development with other appropriate agencies in the region. MCWD notified the Town, Mono County and the Los Angeles Department of Water and Power (LADWP) in December 2015 that the 2010 UWMP would be updated and comments would be accepted. The list of agencies and organizations that received notification is provided below in Table ES -1 Agencies/Organizations Notified of UWMP Update.

Table ES -1 Agencies/Organizations Notified of UWMP Update

Coordinating agencies	Received Notice of Preparation	Contacted for assistance
Town of Mammoth Lakes	Mailed 12/15/15	X
Mono County	Mailed 12/15/15	
LADWP	Mailed 12/15/15	
Inyo National Forest Service – Mammoth Lakes Ranger Station	Mailed 12/15/15	
Inyo – Mono Regional Water Management Group Program Office	Mailed 12/15/15	

Calendar year and acre-feet are used as units of measure in this UWMP unless noted otherwise.

ES.3 System Description

Service Area

The District's service area lies entirely within the 24 sq. mi. Town of Mammoth Lakes' incorporated boundary. Most of the 3,640-acre (5.7 sq. mi.) service area is within the much smaller, approximately 4 square miles, Town's Urban Growth Boundary. There are approximately 2,500 acres of private lands within the service area. Most of the lands outside of the Town urban growth boundary are publicly owned federal lands managed by the USFS's Inyo National Forest, see Figure ES-1 MCWD Service Area and the Town of Mammoth Lakes.

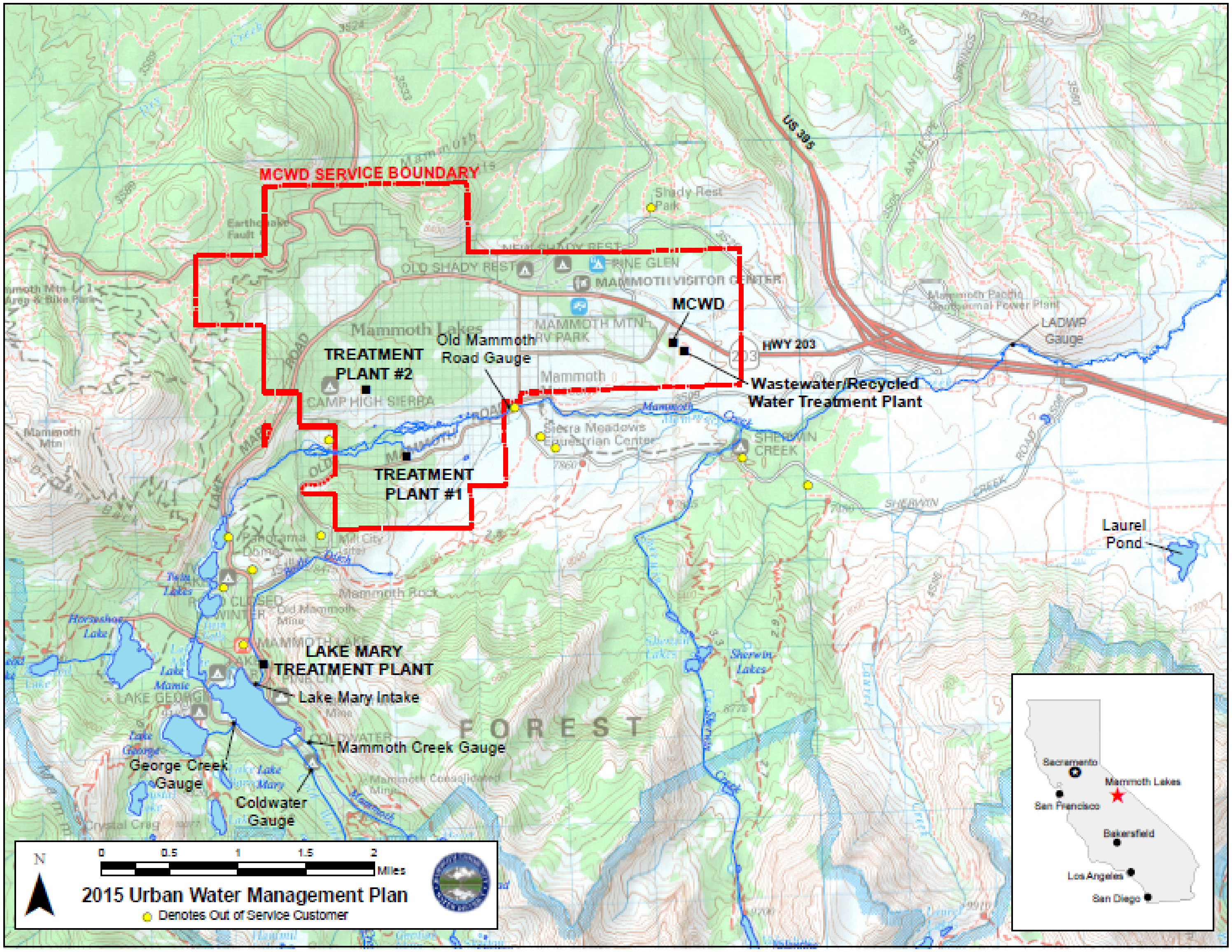
Geography and Climate

The Mammoth Creek watershed (or Basin) is located just east of the crest of the Sierra Nevada mountain range. Winter season snowfall is the source of most precipitation, accumulating through the winter and running off through the spring and summer. The April 1 snowpack water content, measured at Mammoth Pass, is a key metric for the resulting water supply year type (dry, normal, wet). The Basin has a wide range of elevation-influenced precipitation extremes, with average annual precipitation ranging from about 42.5 inches at Mammoth Pass (9,300 ft.) at the western boundary of the Basin to 10 inches at the Crowley Lake dam at the eastern boundary. Average annual precipitation for the Town of Mammoth Lakes is approximately 23 inches. The winter season is characterized by periodic storms off the Pacific, with mostly sunny skies between storms. Winter high temperatures average 40°F and low temperatures average 16°F. Summers are mild with temperatures averaging 75°F for a high and 44°F for a low.

Climate Change Impacts to Local Water Supplies

Federal and state resource agencies have begun to evaluate and plan for potential water supply and demand impacts expected to result from global and regional climate shifts. These shifts and associated impacts to hydrologic systems are modeled using a group of common climate models. These models have a range of greenhouse gas (GHG) emission scenarios and inherent uncertainties and variability in their projection results. However, a consistent result for California and the Sierra Nevada specifically is for increased average temperatures, reduced precipitation as snowfall (with increase in precipitation as rain), and increased intensity of extreme weather events. For the Mammoth Basin area, the State's most recent forecasts show a range of average temperature increases of 4.3 °F to 7.4 °F for the low and high GHG emissions scenarios, respectively, and a decrease in annual snowpack water content of between 49% (high emissions) to 33% (low emissions). These changes in long-term climate patterns and regional hydrology are forecast to occur over the next approximately 80 years

Figure ES-1 MCWD Service Area and the Town of Mammoth Lakes



Adapting to climate change will require that MCWD continue to implement water efficiency programs, update and enforce water regulations, engage in activities to protect the ecosystem, improve the understanding of Mammoth Basin hydrogeology, and monitor the surface and groundwater resources.

Service Area Population

Water demand from the District's service area population comes from the permanent population (resident population) and an ongoing transient population comprised of visitors and seasonal employees. To capture the significant ongoing influence of the transient population on water demands, an "effective annual population" term was developed using historical data and future estimates for resident population, peak populations, and annual average transient housing and lodging occupancy rates. Estimates of the current and future effective population is provided in Table ES-2 Current and Projected Service Area Population.

The resident population for 2015, 8,410, is an estimate made by the Department of Finance. This population is a 2% increase since 2010. Peak population estimates relied on data provided by the Town. In 2015, the Town Community and Economic Development (CED) staff provided drafts of data updated since the 2010 UWMP regarding peak population estimates calculated by using average occupancy and housing capacity for permanent residents, visitors and seasonal workers. Previously other methods were used by the Town to estimate "People at One Time." Current estimates of the peak population at buildout is 53,980 according to Town staff. The Effective Annual Population is calculated by adding 30% of the transient population (Peak Visitor Population minus the Resident Population) to the Resident Population. The 30% transient population assumption is based on average annual occupancy rates of transient housing.

Table ES-2 Current and Projected Service Area Population

	2015	2020	2025	2030	2035
Resident Population	8,410	8,578	8,750	8,925	9,103
Peak Visitor Population	33,482	38,607	43,731	48,856	53,980
Effective Annual Population	15,932	17,587	19,244	20,904	22,566

Seasonal water demand is lowest during the winter. Winter water demand is driven by the number of visitors, mainly skiers, and seasonal workers in town. The size of the winter population is influenced by winter snowpack conditions. The summer months have the highest water demand due to irrigation. Landscaped areas in developments serving transient populations such as condominiums and second homes are irrigated regardless of occupancy. The per capita water demand for the District's service area in this UWMP is based on the effective annual population. The effective population increases by approximately 42% between 2015 and buildout in 2035.

ES.4 System Water Use

Customer Demand – Current and Future

Retail customer water demand is defined as water delivered to customers based on meter readings. All District water service connections are metered. In 2010, customer water demand was 2,169 acre-feet. In 2015, under Level 3 Water Shortage Restrictions, this demand dropped to 1,546 acre-feet. The difference in annual water demand between 2010 and 2015 was 623 acre-feet or 203 million gallons less than five years ago.

Estimates of future water demand were developed using buildout land use projections from the Town CED staff and projected water demand was developed by MCWD, see Table ES-3 Demand for Potable and Raw Water - Projected.

Water Shortage Level Restrictions have been in effect since August 2012. MCWD's Board of Directors implemented Level 1 Water Shortage Restrictions in August of 2012 and updated and strengthened restrictions and enforcement in 2014. In February of 2015, the Board of Directors increased the Water Shortage Conditions to Level 2. When the April 1, 2015 measurement of the snowpack water content demonstrated 2% of normal conditions, the Board of Directors increased the Water Shortage Restrictions to Level 3. MCWD customers responded to the increased Water Shortage Restrictions and reduced water use, especially for landscape irrigation.

MCWD expects using average water consumption during years with water restrictions to project future customer demand will capture increasing water efficiencies expected through legislation, state mandates, and improved technologies. In addition, the Town's General Plan (TOML 2007) recognizes development regulations will likely reduce planned overall density from the General Plan projections. The General Plan states, "Because of superseding development regulations, site conditions, design review and market conditions, not all sites will be able to meet these standards at maximum density and overall density will be reduced." An economic study conducted by the Town confirmed future developments were unlikely to reach buildout projections in the General Plan (EPS 2011). However, based on current Town General Plan land use designations, the change in retail water demand between 2015 and 2035 is projected to increase by 90%.

Table ES-3 Demand for Potable and Raw Water - Projected

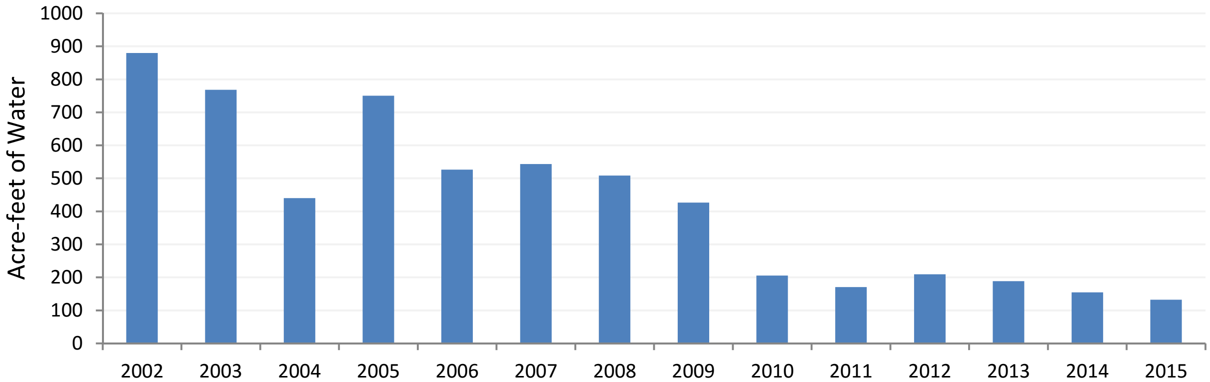
	2020	2025	2030	2035
Single Family	385	439	493	547
Multi-Family	810	992	1,175	1,358
Commercial	432	492	552	613
Institutional/Governmental	6	10	13	17
Landscape	151	164	177	189
Raw water to golf courses	76	76	220	220
TOTAL	1,860	2,173	2,630	2,944

Future water demand projections were developed by averaging customer usage data over the past four drought years, 2012-2015. Water demand during those years represents a period during which MCWD implemented Water Shortage Restrictions that resulted in significant demand reductions. Applying these lower than normal average water demands to projected future demand will capture anticipated water efficiencies that will result from legislation, state mandates, and improved technologies. As new regulatory requirements are implemented and enforced, the ability to conserve water during shortages will be more challenging as discretionary uses decrease. Past, current and future annual water demand, potable, raw and recycled is provided in the table below.

Distribution System Water Losses

MCWD conducts monthly evaluations of water loss between the water treatment plants and customer meters. This frequent check on the distribution system allows staff to take action on leaks or meter problems on a regular basis. Distribution system losses can also occur through unauthorized use (theft), meter inaccuracies, and errors in meter reading and billing. The US EPA estimates that the average water lost in public water systems is 16% (EPA 2013). In comparison, MCWD distribution losses are about 7- 10%. MCWD completed a project in 2013 to reduce distribution losses by replacing the aging steel distribution water mains and is currently replacing old water laterals. The 2015 UWMP is required to use the American Water Works Association (AWWA) Water Audit Manual and software to determine water loss or non-revenue water. The audit results for non-revenue water in 2015 was 140 acre-feet. Figure ES-2, below, graphically displays decreasing annual water losses.

Figure ES-2 Annual Non-Revenue Water



ES.5 SB X7-7 Baselines and Targets

In compliance with the 2009 Water Conservation Act, the 2015 UWMP also reviews specific water use metrics to support the State's target of a 20% reduction in average per capita daily water demand by 2020. Key water use metrics for meeting the Act's requirements include the *base gallons per capita daily water use (shown as "Avg. Baseline GPCD" in Table ES-4),* the *compliance gallons per capita daily use (shown as "Confirmed 2020 Target in Table ES-4),* and the *interim gallon per capita daily water use target (shown as "2015 Interim Target in Table ES-4)*. The base daily per capita water use was established from actual total and per capita water use from 2001 to 2010. In accordance with DWR guidelines, the 2020 compliance daily per capita use target of 145 GPCD was calculated as 80% of the 181 GPCD 10-year average per capita use (Average Baseline GPCD). The 2015 interim per capita water use target is 163 GPCD, which is calculated at 90% of Average Baseline GPCD, or half way to the 80% compliance target. The District's base daily per capita water use is 181 GPCD. The compliance daily per capita use is 145 GPCD. The interim per capita use target, to be met no later than 2015, is 163 GPCD.

The ten-year baseline demonstrated a steadily declining per capita water demand. Per capita water use has declined approximately 33% over the baseline period due to a combination of a 70% decrease in water distribution system losses and demand management (conservation) measures. Between 2010 and 2015, per capita water demand dropped 29%. Based on the compliance methodology established by DWR, the District met the interim daily per capita water use target with 96 GPCD and will meet the 2020 compliance target required under the 2009 Water Conservation Act.

Table ES-4 Baseline and Compliance Targets

Baseline Period	Start Year	End Year	Avg. Baseline GPCD[1]	2015 Interim Target	2015 Actual GPCD	Confirmed 2020 Target
10 year	2001	2010	181	163	94	145
5 Year	2006	2010	163			

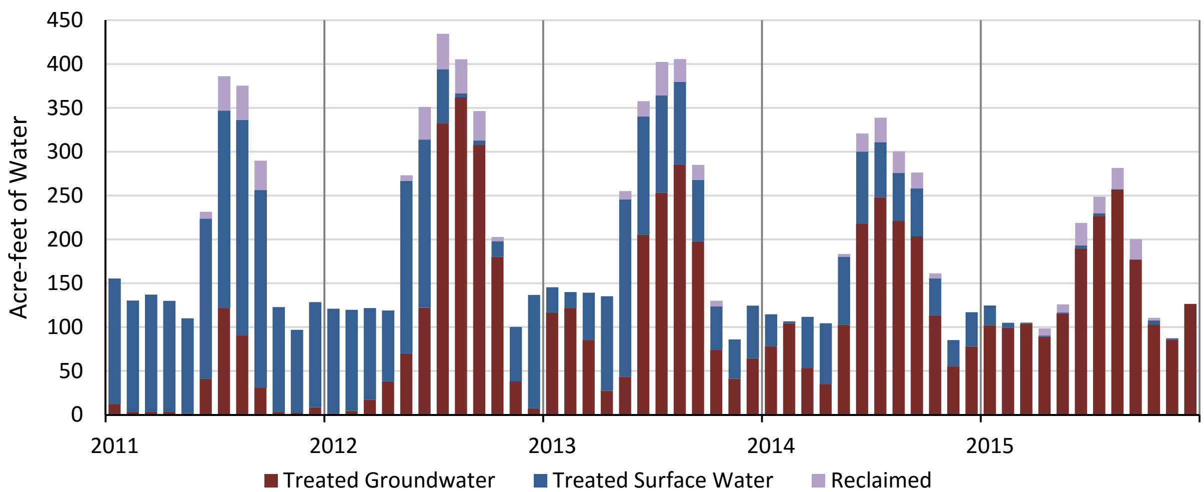
(DWR Table 5-1 and 5-2, revised)

1. The average baselines reported in this UWMP are higher than reported in the 2010 UWMP because effective population was revised downward based on the Town's reevaluation of calculating peak population estimates.

ES.6 System Supplies

The District's existing sources of water include surface water, groundwater, recycled water, and savings from water conservation (demand management) measures. The District stores and diverts Mammoth Creek surface water at Lake Mary. Groundwater supply comes from nine production wells within the Mammoth groundwater basin. Delivery of recycled water meeting Title 22 water standards for unrestricted irrigation use began in 2010. Figure ES-3 displays the water supply mix from each source and the affect low runoff has on increasing dependency on groundwater production.

Figure ES-3 Monthly Mix of Water Supplies Utilized 2011 - 2015



<u>Groundwater</u>

The District utilizes groundwater from nine production wells in the Mammoth Basin. During the past five years, the District pumped an average of 1,507 acre-feet per year. Pumped volumes ranged from 407 acre-feet in 2011 and 1,883 acre-feet in 2015. Annual groundwater production is the difference between annual service area demands and each year's surface water supply. Surface water resources serve as the primary water supply because it is the least expensive to treat and deliver. Groundwater supply is limited by the capacity of the nine wells, groundwater level drawdown impacts on well production, and the ability of the two GWTP's to effectively treat and remove naturally occurring drinking water contaminants such as arsenic, iron, and manganese. Groundwater modeling results indicate the District's current and future groundwater production is sustainable, under conjunctive management of both surface, groundwater and recycled water supplies.

MCWD's groundwater production wells are not located in a basin identified as overdrafted by DWR. Wells are managed under a State-approved Groundwater Management Plan in compliance with AB-

3030. MCWD groundwater monitoring data is provided to Mono County's California Sustainable Groundwater Elevation Monitoring program.

Surface Water

The District utilizes surface water as the primary water source when it is available because less energy and chemicals are required to divert, treat, and deliver water from the Lake Mary Water Treatment Plant. The surface water quality is excellent, requiring minimal treatment, and the supply is gravity-fed to almost the entire service area. The District has two water right licenses and one permit issued by the State Water Resources Control Board (SWRCB) that entitle the District to both store and divert Mammoth Creek surface water at Lake Mary. The District's licenses and permit allow up to a maximum annual surface water diversion of 2,760 acre-feet. However, actual diversions are typically significantly lower due to the combined influence of natural variability in snowpack runoff quantity and timing, limited storage to manage the variable runoff, mismatch between the seasonal trends in supply availability and community water demands, and compliance with the monthly minimum Mammoth Creek fishery bypass-flow requirements. For example, between 2011 and 2015, of which the last four years were below average runoff years, the District diverted an average of 914 acre-feet per year, even though total service area demands were substantially higher, with the difference made up by groundwater supply. In 2011, the snowpack water content was 153% of average and MCWD used 1,850 acre-feet of surface water. In 2015, a 4% of average year, MCWD used 47 acre-feet of surface water. Between 2005 and 2010, the average annual surface water supply was 1,444 acre-feet.

Wastewater and Recycled Water

MCWD is the sole collection and treatment facility for wastewater in the Mammoth Creek Basin. This includes wastewater generated in the Town of Mammoth Lakes, USFS campgrounds and USFS permittees in the Mammoth Lakes Basin with the exception of 10 private cabins on the south end of Lake George. No other sources of wastewater are available for reclamation.

The District has made significant progress on implementing a recycled water program in the last ten years. The wastewater treatment plant was upgraded in 2009 to produce treated water that meets the state's Title 22 standards. In 2010, the District began delivering recycled water to the Sierra Star Golf Course in newly completed recycled water distribution lines. Snowcreek Golf Course began using recycled water in 2016. An expansion of the Snowcreek Golf Course and resort is expected to use a maximum of 320 acre-feet of recycled water provided in an agreement between the District and the developer.

Future Water Projects

The District's newest production well was put online in 2013. This well serves as a redundant well for rotational pumping management schemes. In 2015, rotational pumping was critical when surface water supplies were unavailable during the drought and there were temporary mechanical failures or other problems with existing wells.

The District will be drilling a test hole in the Mammoth Basin near the Snowcreek Golf Course in 2017. Information from the test hole will determine whether the District will pursue developing a production well at the test well location. A new production well will increase the reliability of water supplies by expanding the number of wells for rotational pumping management.

Summary of Existing and Planned Sources of Water

The District supplies water for municipal purposes only. Existing sources of water include surface water, groundwater, recycled water, and savings from water conservation (demand management) measures. The District stores and diverts Mammoth Creek surface water at Lake Mary. Groundwater supply comes from nine production wells within the Mammoth groundwater basin. Recycled water meeting Title 22 water standards for unrestricted irrigation is produced by MCWD. Delivery of recycled water use began in 2010. Table ES-5 displays the water supply from the three sources utilized in 2015.

Table ES-5 Source and Volume of Water Supplies in 2015

Water Source	Acre-Feet Used	% of Total Volume
Groundwater	1,673	91
Surface water	47	3
Recycled water	110	6

(DWR Table 6-8, revised)

The Mammoth Basin Groundwater Model (WEI 2009) was used to determine whether the projected groundwater supply would be sustainable for updated projected future water demands. Surface water projections were based on Mammoth Pass snow water content measurements on April 1st and historical surface water diversions by MCWD from Mammoth Creek. Assumptions in the sustainability conclusions are:

- Climate change could adversely affect the availability of water resources. Timing of precipitation events and runoff patterns may be altered and the annual water content of the snowpack may decrease, but there is uncertainty about how these changes may or may not affect water supply.
- The current array of groundwater production wells maintain their production capacity.

Table ES-6 Projected Water Supplies

Water Source	2020	2025	2030	2035
Surface Water	1,181	1,314	1,507	1,742
Groundwater	844	1,068	1,231	1,353
Recycled Water	198	198	448	448
Raw Water	76	76	220	220
Total	2,299	2,656	3,406	3,762

The higher amount of supply in future years reflected in Table ES-6 result from increasing demand, i.e. as the water demand increases in the future, MCWD will increase supplies to meet demand.

ES.7 Water Supply Reliability Assessment

The 2015 UWMP compares projected water supplies and service area demands over the 20-year planning horizon. It assesses the reliability of future supplies, including limitations to supplies and the impacts of drought. Water supply reliability is considered under an Average Year, a Severe One-year Drought and a sustained Multiple-year Drought. In addition, a projection of supplies for three years following the driest three-year historical sequence is provided.

Surface and groundwater supplies are directly linked to the amount of precipitation received in the Mammoth Basin. In addition to the environmental conditions, the District diverts surface water supplies under licenses and permit issued by the State Water Resources Control Board (SWRCB). These licenses and permit include a requirement to cease diversions when Mammoth Creek flows are below specified daily mean levels in addition to other specifications. The terms of diversion constraints contained in

MCWD's water right licenses and permit are described Chapter 7. In addition, MCWD must comply with a Settlement Agreement regarding water rights between LADWP and MCWD setting forth a limit on surface water diversions, groundwater extractions and recycled water deliveries.

Groundwater production can also be constrained by factors other than local recharge of the groundwater basin. For example, water-quality treatment methods may reduce production to allow for proper treatment and pumps are vulnerable to mechanical failures.

Data presented in Table ES – 7 through ES – 10 utilized historical hydrologic conditions and MCWD's current and historical management practices to develop the projected water supply scenarios. Projections for future water demand were reduced under the Severe One-year and Multiple-year drought scenarios. For the Severe One-year Drought, Level 2 Water Shortage Restriction targets were assumed. The Level 2 Restrictions were also assumed for years 2 and 3 of the Multiple-year Drought scenario. Level 2 restrictions impose a 20% reduction of potable water demand and a 10% demand reduction from recycled/raw water customers. This level of conservation is more moderate than the Level 3, 30% reduction target that was actually implemented in 2015. These comparisons between projected supply and demand are used to assess supply reliability.

Table ES-7 Supply and Total Demand Comparison - Average Year

Planning Horizon Year	2020	2025	2030	2035
Supply Total	2,299	2,656	3,406	3,762
Demand Total	2,264	2,611	3,370	3,719
Difference	35	45	36	43

(DWR Table 7-2)

Table ES-8 Supply and Demand Comparison – Single-Dry Year

Planning Horizon Year	2020	2025	2030	2035
Supply totals	2,299	2,656	3,406	3,762
Demand totals	1,831	2,109	2,741	3,020
Difference	468	547	665	742

(DWR Table 7-3)

Table ES-9 Supply and Demand Comparison – Multiple-Dry Year Drought

Planning Horizon Year		2020	2025	2030	2035
First year supply	Supply totals	2,299	2,656	3,406	3,762
	Demand totals	2,264	2,611	3,370	3,719
	Difference	35	45	36	43
Second year supply	Supply totals	2,299	2,656	3,406	3,762
	Demand totals	1,831	2,109	2,741	3,020
	Difference	468	547	665	742
Third year supply	Supply totals	2,299	2,656	3,406	3,762
	Demand totals	1,831	2,109	2,741	3,020
	Difference	468	547	665	742

(DWR Table 7-4)

Water supplies were also projected for a six-year drought based on the continuation of the driest three-year sequence in the hydrological records. The years 2013 through 2015 were used for driest three-year sequence the analysis. The results of this analysis are presented in Table ES- 10, below. The increase in supply through 2018 represents an assumed increase in water demand associated with increased population and development likely to occur over the three-year period.

Table ES-10 Minimum Supply Next Three Years

	2016	2017	2018
Available Water Supply	1,732	1,813	1,893

(DWR Table 8-4)

Regional Supply Reliability

The water supply reliability analyses shown above support the following general conclusions. Under current conditions (2015), MCWD has adequate water supply to meet community needs under the full range of water year types, including both the severe one-year and sustained multi-year droughts. This is primarily due to the availability of local groundwater resources, the development of recycled water supplies and conservation. Groundwater supplied 91% and recycled water supplied 6% of total delivered water during the severe 2015 drought. In addition, during the six-month irrigation season when water demand is highest, demand decreased by 34% in comparison to 2013 usage.

During the intermediate planning horizons and through 2035 (Town buildout), the combined use of Mammoth Creek surface water, local groundwater, and recycled water results in a supply mix that can reliably meet the community needs under the full range of water year types. However, this long-range projection could be significantly impacted by future changes to both demands and supply. On the demand side, this analysis is largely dependent on the Town's current and future land use policies regarding the type and density of development that occurs between now and buildout and the implementation and enforcement of the water-efficient landscape ordinance. Future demand projections incorporated demand reductions based on indoor and outdoor water-conservation practices implemented by customers during the 2012-2015 drought. On the supply side, the District's surface water supply could be impacted by climate change impacts to snowpack water content and watershed runoff patterns. If this were to occur, it would require significant increases in surface water and groundwater storage. A prolonged drought as indicated in Table ES – 10 would significantly reduce water resources. Similarly, local groundwater supplies could be impacted by the major expansion of geothermal energy production planned at the Casa Diablo power plant complex as pressure changes in the geothermal fluid reservoir below the coldwater aquifer occur, or natural changes from seismic or volcanic activity causing changes to the local hydrogeologic characteristics. In addition, groundwater production wells decrease production as they age so existing well infrastructure will need to be replaced and renewed to maintain groundwater production. Finally, the timing for the planned expansion of recycled water use for Snowcreek golf course and its related future development remains a major variable for recycled water demand, since recycled water will make up about 14% of future supply. Each of these potential influences on future water supply and demand will need to be re-evaluated in the 2020 UWMP update to confirm the conclusions presented in this UWMP update.

ES.8 Water Shortage Contingency Planning

The District is prepared for water shortages resulting from short-term emergencies or naturally occurring drought shortage conditions. Determining whether a water shortage condition may be expected is based on multiple factors such as the water content of the snowpack, declining groundwater levels, Lake Mary storage capacity, creek flows and the water availability of prior runoff years. Water shortages may also result from unplanned emergencies such as mechanical breakdown of treatment/production facilities or natural or human caused disasters.

Water supply shortages have been categorized into four levels of mandatory prohibitions by MCWD based on estimates of water supply and forecasted water demand. Each level of water restrictions is intended to address estimates of water supply shortages. The Board of Directors (Board) may declare a Water Supply Shortage when there is a projected imbalance of water supply and peak demand. Once a declaration of a Water Supply Shortage resolution has been adopted, the Board can implement any of the four levels of shortage deemed necessary. Each shortage level corresponds to the estimated imbalance between supply and demand: Level 1 shortage is 10%, Level 2 is 20%, Level 3 is 30%, and at Level 4 the imbalance is 50% or greater.

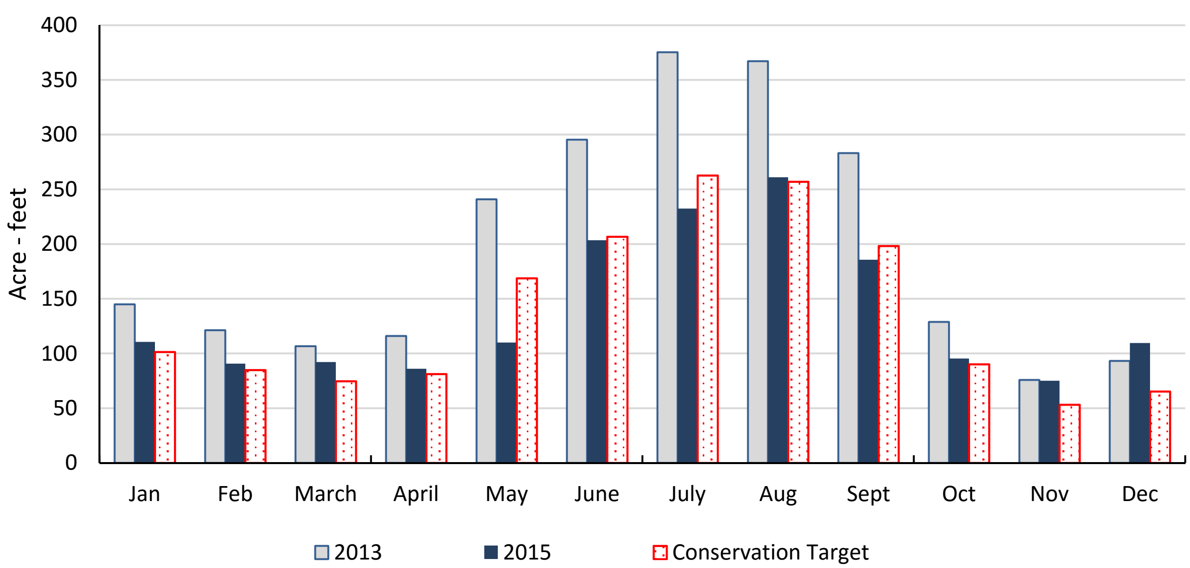
The recommendation for the appropriate level of the shortage is determined by the General Manager based on a written analysis of the existing facts and circumstances. When appropriate, the General Manager will recommend to the Board of Directors either increasing or decreasing the water shortage level or termination of the water-shortage level restrictions. A copy of the ordinance describing this process and the Water Shortage Levels is provided in Appendix E.

Determining Effectiveness of Water Shortage Reductions

Monthly consumption is used to evaluate the effectiveness of water shortage regulations and consumption reduction programs. All MCWD customers are metered and billed monthly. It is not possible to correlate any single program to reduced demand, although MCWD has focused conservation efforts on landscape irrigation as discussed previously in this report.

In April 2015, MCWD implemented Level 3 Water Shortage Conditions targeting a 30% reduction in consumption. Variations in the timing of when irrigation starts and ends, monthly temperature variations and summer precipitation can have a complicating effect on total irrigation water demand. Overall consumption was reduced by 32% during the irrigation season and a 28% cumulative reduction was achieved between June and December 2015. Water demand reductions and the 30% reduction target are displayed in Figure ES-4 Actual Demand 2013 (comparison year), 2015 and MCWD 30% Reduction Target.

Figure ES-4 Actual Demand 2013 (comparison year), 2015 and MCWD 30% Reduction Target



Revenue and Expenditure Impacts of Water Conservation

District revenue from water consumption normally provides approximately 14% of total District revenue. The District's water rate structure minimizes the fluctuations in total revenue associated with fluctuations in water use revenue. Each 10% reduction in water use results in a total revenue loss of about 1.4%, about $200,000. The District maintains cash reserves to minimize the financial risk associated with reduced revenue or unexpected capital asset repairs or replacement. The reserve set for water operations is equal to six months of operating expenses, approximately $1,630,000. One year with a 50% reduction in water supply would result in revenue loss of approximately $1,000,000. Three years with 30% reduction in water supply would result in a cumulative revenue loss of $1,800,000.

During the four-year drought period from 2012 to 2015, the surface water supply was depleted and the District's sole source in 2015 was ground water. The additional cost of pumping and treating groundwater is estimated at $125,000 per year at 30% supply reduction. The District's cash reserves minimize the risk that a loss of revenue from reduced water supply and increased cost associated with groundwater delivery would cause the District to be unable to meet ongoing operating expenses.

Catastrophic Supply Interruption

To respond to emergency shortage situations, MCWD maintains an Emergency Response Plan that contains actions to maintain service or restore service in instances of disruption. The Plan includes estimates of water requirements for various types of emergencies and the capability for the system to meet these requirements.

1.1 Background and Purpose

The Mammoth Community Water District's (MCWD or District) 2015 Urban Water Management Plan (UWMP) has been prepared to comply with the Urban Water Management Planning Act (UWMPA, or Act). The purpose of the Act is to ensure water suppliers assess resources and plan for current and future water demands to avoid future emergency shortfalls of water supplies. Information is presented in five-year planning intervals for the next 20 years, 2035. Local water purveyors are tasked with developing the plan as they are considered to have the most knowledge about resource planning for their unique location and circumstances.

MCWD's 2015 UMWP will serve as a guide for District strategic planning to ensure long-term water supply reliability for the Town of Mammoth Lakes (Town). The UWMP's outlook is 20 years (through 2035), and is divided into 5-year increments. This plan is an update of the District's 2010 UWMP and serves as an independent and complete document.

In 2009, the Act was modified by the Water Conservation Bill of 2009. The Water Conservation Bill requires a statewide 20 percent reduction in urban per capita water use by December 31, 2020. To meet this goal, every urban retail water supplier must establish and report a baseline daily per capita water use and establish 2015 and 2020 targets. State grants and loans are not available to water purveyors that do not comply with the requirements of SBX7-7.

For ease of reading and clarification, Appendix A contains a list of definitions and abbreviations used in this document.

1.2 UWMP and the California Water Code

The Urban Water Management Planning Act was enacted by the California legislature in 1983 (AB 797; Water Code, Division 6, Part 2.6, §10610-10656). Lawmakers recognized state waters as a limited and renewable resource that was continuously subject to increasing demands. To ensure a reliable, long-term and safe water supply for California, the UWMPA requires water suppliers providing water for municipal purposes to more than 3,000 customers, or supplying more than 3,000 acre-feet of water annually to pursue efficient use of water for urban water demands through policies and management planning.

The Plan is required to include a description of the various components that affect the water supply and demands in a supplier's service area. For example, information about the available and potential future water resources; climate, legal and environmental supply restrictions; plans for water shortages; and implementation of measures to reduce water demand are required for inclusion in UWMPs. Urban water suppliers must prepare and submit to the Department of Water Resources (DWR) an updated UWMP every five years.

1.2.1 Water Conservation Act of 2009 (SB X7-7)

In November 2009, Senate Bill SB X7-7 was adopted requiring a 20% statewide average reduction of per capita water use by December 31, 2020. To achieve this mandate, water suppliers were required to report on baseline water use and develop an interim 2015 target and 2020 target. MCWD has met the 2015 interim target as reported in Chapter 5. Standardized reports and methods have been developed by DWR to demonstrate baseline per capita use and report progress toward meeting the interim and final targets. Urban water suppliers that do not meet the provisions of the Water Conservation Act of 2009 will not be eligible for state water grants or loans, effective in 2016. Chapter 5 of this UWMP contains information on the baseline per capita use and the interim and final targets pertaining to SB X7-7.

1.2.2 Applicable Changes to the CWC since 2010 UWMPs

Several changes to the CWC have been enacted since the 2010 UWMP. Changes that affect 2015 UWMPs are summarized below:

1. Requirement to include descriptions of the extent and nature of each demand management measure implemented over the past five years and descriptions of demand management measures that will be implemented to achieve the compliance water use target described in Chapter 5.
2. The plan must include a standardized report to quantify and report on distribution system water loss.
3. Allows development of future water savings in water use projections based on adopted codes, standards, ordinances, or transportation and land use plans.
4. Requires water purveyor to define water features that are artificially supplied with water for describing water shortage planning actions that may identify water features.
5. Submittal date for the 2015 plan is July 1, 2016.
6. The plan must be submitted electronically to the Department of Water Resources and include standardized forms, tables or displays specified by the DWR.
7. Allows for inclusion of information related to energy required to provide treated water and other information as deemed appropriate by the supplier.

1.3 Urban Water Management Plans in Relation to Other Planning Efforts

Development of the UWMP required close collaboration with the Town of Mammoth Lakes to estimate future water demand based on buildout scenarios and policies that affect water efficiency. In addition to oral and e-mail communication with Town CED staff, the following Town documents were relied on:

- Development Impact Fee Study, TischlerBise 2015
- Town of Mammoth Lakes Housing Element 2014 – 2019, TOML 2014
- Mammoth Lakes Economic Forecast and Revitalization Strategies, Economic & Planning Systems, Inc. 2011
- Final Program Environmental Impact Report, Town of Mammoth Lakes 2005 General Plan Update, TOML 2007
- Town of Mammoth Lakes General Plan 2007, TOML 2007
- Town Code section 17.40 Water Efficient Landscape Regulations

The reliability of local water supply resources includes consideration of the expansion of the Casa Diablo Geothermal Plant. MCWD is working closely with the U.S. Bureau of Land Management and the plant owner, Ormat Technologies, Inc., to develop a Monitoring and Response Plan that will protect MCWD's water resources from potential geothermal production and injection impacts.

1.4 UWMPs and Grant or Loan Eligibility

Acceptance of a completed UWMP by DWR is required for eligibility of water management grants and loans administered by DWR. MCWD did not met the required submission deadline for the updated 2015 UWMP of July 1, 2016 and will not be eligible until DWR receives the updated 2015 plan. Urban water suppliers must also maintain a current, DWR approved, UWMP throughout the term of any grant or loan administered by DWR. The Water Code has provisions for Urban Suppliers that do not meet the SB X7-7 required per capita reductions and desire to receive DWR administered grants and loans. These provisions are specified in CWC 10608.56 (a) – (f) and require the urban water supplier submit a schedule, financing plan, and budget for achieving the per capita reductions; or demonstrate that the service area qualifies as a disadvantaged community or meets both criteria.

2.1 Basis for Preparing a Plan

The CWC requires every urban water supplier to adopt an Urban Water Management Plan and to update the plan every five years. An Urban Water Supplier is defined as "a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually" (CWC §10617). MCWD serves approximately 3,508 customers and supplies about 2,500 acre-feet of water annually.

2.2 Public Water Systems

The state defines a Public Water System as a "system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days of the year." These systems are regulated by the State Water Resources Control Board (SWRCB), Division of Drinking Water. The SWRCB utilizes Public Water System data to determine whether a supplier meets the Urban Water Supplier criteria and requirement to adopt and submit an UWMP to DWR. MCWD's PWS data provided to DWR for 2015 is shown in Table 2-1 Public Water Systems below.

Table 2-1 Public Water Systems

Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015
2610001	Mammoth CWD	3,508	1,643

(DWR Table 2-1)

2.3 Individual or Regional Planning and Compliance

MCWD's 2015 UWMP is an individual rather than a Regional Urban Water Supplier report. Agencies may choose to develop a Regional UWMP in cooperation other groups, wholesalers or other regional entity.

2.4 Fiscal or Calendar Year and Units of Measure

Calendar year and acre-feet are used as units of measurement in this UWMP unless noted otherwise.

2.5 Coordination and Outreach

The CWC mandates that Urban Water Suppliers coordinate plan development with other appropriate agencies in the region. MCWD notified the Town of Mammoth Lakes, Mono County, the local USFS offices, and the Los Angeles Department of Water and Power (LADWP) in December 2015 that the 2010 UWMP would be updated and comments would be accepted. The list of agencies and organizations that received notification is included in Table 2-2 Agencies/Organizations Notified of UWMP Update and a copy of the notification letter is provided in Appendix B.

Table 2-2 Agencies/Organizations Notified of UWMP Update

Coordinating agencies	Received Notice of Preparation	Contacted for assistance
Town of Mammoth Lakes	Mailed 12/15/15	X
Mono County	Mailed 12/15/15	
LADWP	Mailed 12/15/15	
Inyo National Forest Service – Mammoth Lakes Ranger Station	Mailed 12/15/15	
Inyo – Mono Regional Water Management Group Program Office	Mailed 12/15/15	

The development of the UWMP relies heavily on the Town to supply development data and population estimates. Estimates of future water demand are based on future buildout scenarios contained in Town planning documents. MCWD staff collaborated with Town CED staff to ensure buildout scenarios were interpreted correctly for use in estimating future water demand.

3.1 General Description

The Mammoth Community Water District was formed in 1958 to provide water and wastewater services to the community of Mammoth Lakes in Mono County, California. The Town of Mammoth Lakes has a resident population of 8,410 people (CA DOF 2015) and a population of approximately 35,000 during peak transient visitor periods (Town of Mammoth Lakes 2007a). MCWD is a public agency formed under the County Water District Law (CWC §§ 30000 et seq.), and is governed by a publically elected five member Board of Directors.

MCWD has 3,508-metered connections and relies on a mix of water supplies from Mammoth Creek (Lake Mary), the Mammoth groundwater basin, and reclaimed water. The District has four water treatment facilities; one plant receives surface water from Lake Mary and the remaining three treat water from the nine groundwater production wells. Treated water is stored in ten distribution system storage reservoirs with a total storage capacity of 8.2 million gallons (MG) or 25.2 acre-feet. The water distribution system also includes 81 miles of pipelines, seven booster pump stations, five pressure zones within an elevation range between 7,520 and 8,620 feet, and 21 monitoring wells in the Mammoth Basin. MCWD also provides wastewater collection, treatment and wastewater recycling for irrigation within its service area.

The Town is located in a vast scenic natural landscape that attracts large numbers of visitors. At an elevation of approximately 7,800 feet, the Town is just east of the 12,500-foot peaks on the Sierra Nevada crest. Further east, the elevation drops to the 7,000-foot terrain of the Great Basin region. In 1993, the Town adopted an Urban Growth Boundary (UGB) within the 25 square mile Municipal Boundary to delineate the urban landscape from the surrounding natural landscape. The UGB encompasses approximately 4 square miles (TOML 2007a). There are 2,500 acres of privately owned land in the developed portion of the Town's Municipal Boundary, with the remaining lands publicly owned and managed by the Inyo National Forest unit of the United States Forest Service. Approximately 606 acres or 4% of the developable land in the UGB remains vacant (pers. comm., Town of Mammoth Lakes CED).

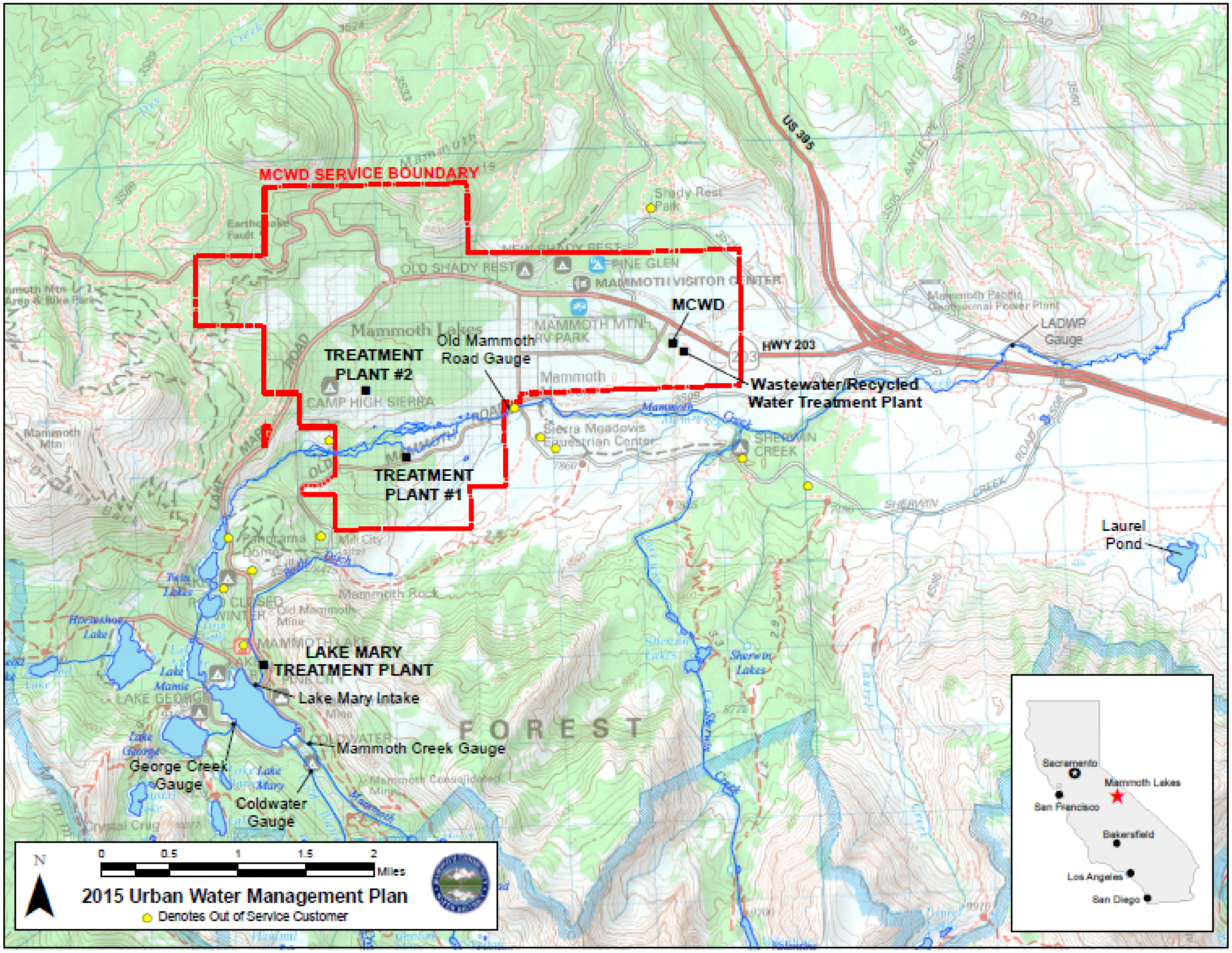
3.2 Service Area

MCWD's service area is approximately 3,640 acres and aligns closely with the Town's UGB, Figure 3-1 MCWD Service Area, Out of Service Area Customers, and MCWD Facilities. No changes to the service area boundary have been made since the 2010 UWMP. MCWD also supplies water to several small entities outside the service area by agreement. These entities are USFS Twin Lakes Campgrounds and Cabins, USFS Sherwin Creek Campground, YMCA Campground, Mammoth Lakes Pack Station, USFS Pack Station, Sierra Meadows Ranch, Tamarack Lodge and Resort, Twin Lakes Art Gallery, Mill City Cabins, a private parcel, Shady Rest Park, and Mammoth Creek Park. MCWD relies on a mix of locally obtained surface water, groundwater and recycled water to serve its customers.

3.3 Service Area Climate

Mammoth Lakes is located in the rain shadow of the Sierra Nevada mountain range; however, Mammoth Pass provides a low spot in the crest that allows some moisture from the west to flow into the region, helping to mitigate the rain shadow effect. Mammoth Mountain Ski Area, located just east

Figure 3-1 MCWD Service Area, Out of Service Area Customers, and MCWD Facilities



of the crest, captures a significant amount of snowfall each winter. Annual precipitation varies considerably within the service area, depending on elevation and distance from Mammoth Pass. To demonstrate the elevation gradient of precipitation extremes, average annual precipitation ranges from about 42.5 inches at Mammoth Pass (9,300 ft.) at the western boundary of the Mammoth basin watershed to 10 inches at the Crowley Lake Dam (CDEC, LADWP records) in the easternmost part of the basin. Average annual precipitation in the Town is approximately 23 inches. See Table 3-1 Average Temperature and Precipitation for average monthly climate data. In Town, the winter season, December through February, is characterized with mostly sunny skies and high temperatures averaging about 40°F and low temperatures averaging about 16°F. In contrast, summers are mild with average temperatures about 75°F for a high and 44°F for a minimum.

Table 3-1 Average Temperature and Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Max. Temperature (F)	40.5	39.2	44.9	49.3	60.2	69.7	78.1	77.1	70.7	60.0	48.2	41.1	56.6
Avg. Min. Temperature (F)	16.3	15.9	20.7	24.8	33.1	40.4	46.5	45.0	37.9	28.5	21.8	15.9	28.9
Avg. Total Precipitation (in.)	4.60	3.77	2.40	1.54	1.17	0.56	0.51	0.31	0.37	1.51	2.09	4.13	22.95
Avg. Total Snowfall (in.)	43.1	44.0	30.2	17.0	4.4	0.5	0.0	0.0	0.0	6.7	14.9	45.3	206.0
Avg. Snow Depth (in.)	21	26	22	8	0	0	0	0	0	1	2	11	7

Period of Record from USFS Station in Mammoth Lakes 12/1/1993 to 1/20/2015. Data source: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca5280. Accessed 12/21/2015.

The District's water supply in any given year is heavily dependent on winter season precipitation, primarily snowfall, and the subsequent amount and rate of surface water runoff from snowpack within the watershed. Groundwater resources also respond to the precipitation received through recharge of the basin; however, the response time can take one to two years.

The timing of the highest transient populations, water demand and supply availability create unique challenges for MCWD. Peak wastewater flows, used for Title 22 reclaimed water, occur during the winter when the Town's population reaches its highest numbers as winter recreation peaks during the holidays and weekends. During the season with the greatest opportunity to offset water demand with recycled water, no irrigation is occurring. The irrigation season is the highest period of demand and runs from around June through September. The four-month irrigation season represents about 42% of MCWD's total annual water demand, not including recycled water delivered to the golf course. During the irrigation season, precipitation is minimal, surface water supplies are limited by regulatory requirements and wastewater flows, i.e. reclaimed water, drop as the transient population decreases. About 14% of the summer water demand is met with recycled water to one of the two golf courses in town. MCWD does not have a large enough storage facility to store treated water produced during the winter to offset summer irrigation demands.

3.4 Climate Change

The state and federal governments have begun to evaluate and plan for potential water supply and demand impacts that would result from global and regional climate change. These entities encourage water utilities to develop strategies to manage the combined impacts of increasing population, increased water demands for both municipal and irrigation use, and changes to the quantity and seasonal distribution of precipitation.

MCWD's surface water resource is replenished annually by the snowpack in the Sierra Nevada Mountains. In California, this snowpack is considered "the most important reservoir of water" with the ability to store and slowly release about 15 million acre-feet of winter season precipitation during the dry months of the year when urban and agricultural water demands are the greatest. However, climate change induced temperature increases will accelerate the timing of snowpack melting and runoff, and increase water demands due to longer irrigation seasons, higher temperatures and increasing population. In addition, MCWD's water supplies may be vulnerable to greater sediment loads from flood events and higher temperatures that may degrade water quality.

In the United States, climate change impacts are evidenced by several large-scale trends including record-breaking droughts and increased extreme weather patterns. Six to twelve global climate models are commonly used to simulate long-term climate patterns and develop climate change predictions. These models are run with two greenhouse gas emission scenarios, mid- to high and low. Model projections have inherent uncertainties and demonstrate large variability in future climate shifts. One consistent result from multiple global climate model simulations is increases in average temperatures for California and the Eastern Sierra (LADWP 2010). California is also expected to experience reduced precipitation as snowfall and increased precipitation as rain, increases in the intensity of extreme weather events, and rising sea levels. The initial climate change impacts are expected to be extreme weather events such as heat waves, greater intensity of wildfires, more severe droughts, and floods (Drechsler D. M. et. al. 2006 as cited in CNRA 2009).

In 2008, the State of California moved to become better informed about climate change impacts and to prepare for the resulting impacts. State agencies were asked to develop strategies to identify and plan for expected impacts of climate change. The result of these efforts is the 2009 California Climate Adaptation Strategy report (CNRA 2009). This document describes the impacts, vulnerabilities and potential measures for implementation to prepare for climate change impacts. Water management concerns identified in the 2009 California Climate Adaptation Strategy are:

- Higher temperatures resulting in earlier melting of snowpack, higher snowline, and overall reduction of snowpack water content. More precipitation will occur as rain instead of snow.
- Increase of intense rainfall events will occur with more frequent and/or more extensive flooding.
- Droughts are likely to become more frequent and persistent.
- Streams may experience longer low-flow conditions with higher temperatures and higher concentrations of contaminants.
- Higher temperatures in summer and over a longer growing season will increase evapotranspiration rates from plants, soils and open water surfaces.
- Non-irrigated agriculture and landscaped areas will suffer moisture deficits and irrigation will need to be increased. Even with conservation and efficiency measures, urban water use is expected to increase.
- Storms and snowmelt may coincide and produce higher winter runoff.

The report recommended the State develop a website to "synthesize existing climate change scenarios and climate impact research and to encourage its use in a way that is beneficial for local decision-makers." This website, www.Cal-Adapt.org, is available to the public. Two maps from the Cal-Adapt website demonstrate the types of information provided. Figure 3-2 Modeled Temperature Changes for the Mono County Area from the Cal-Adapt website shows modeled changes to average temperatures in the Mono County region. The temperature model for Mono County shows a range of temperature increases, from +4.3 °F to +7.4 °F for the low and high emissions scenarios, respectively. Figure 3-3 Modeled Snow Water Content Changes for the Mono County Area shows the Mammoth Lakes area with an overlay of modeled results for snowpack changes. The model indicates a decrease in snowpack water content of 95% under both high and low emission scenarios. This decrease is the projected change between a baseline period, 1961 to 1990, to an end of the century period 2070-2090.

Figure 3-2 Modeled Temperature Changes for the Mono County Area

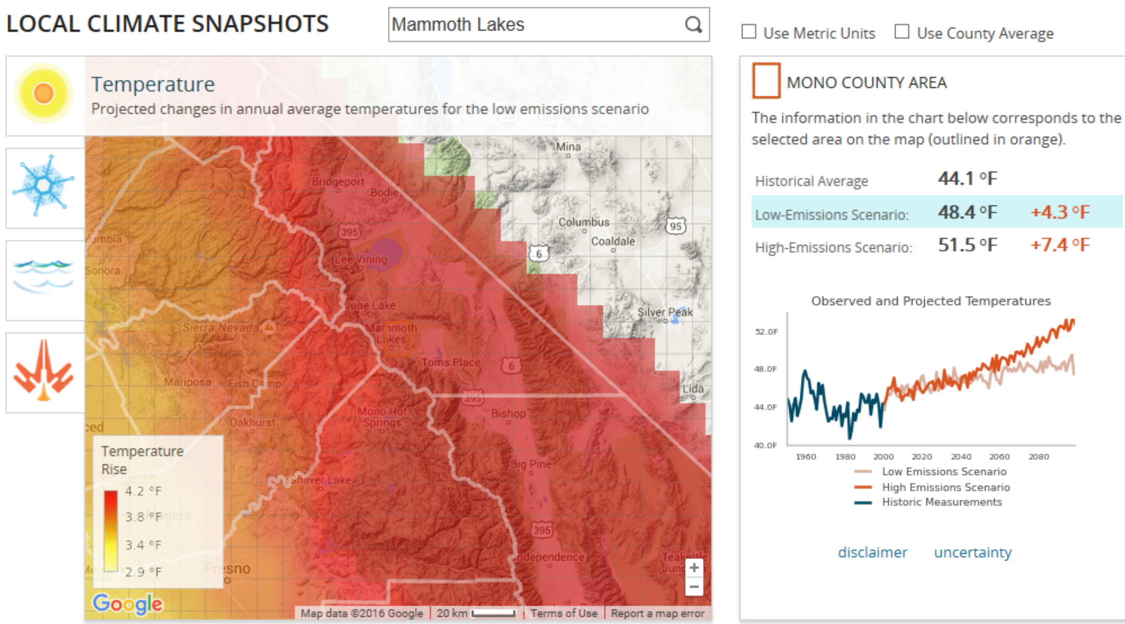
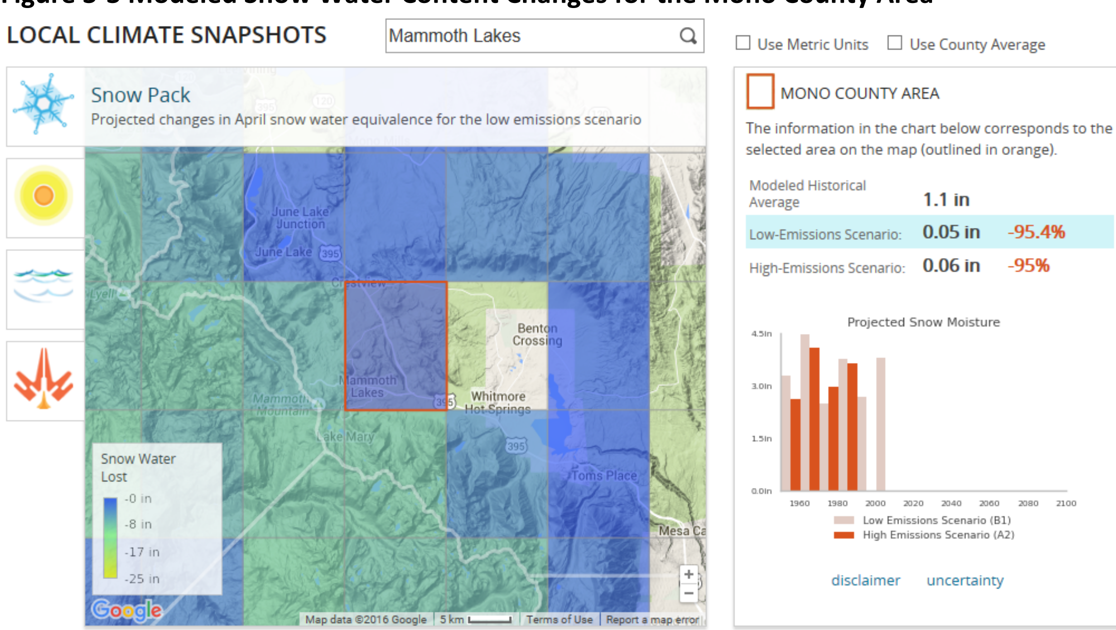


Figure 3-3 Modeled Snow Water Content Changes for the Mono County Area



To encourage planning for climate change, DWR recommends water agencies complete the IRWM Climate Change Vulnerability Assessment contained in the Climate Change Handbook for Regional Water Planning (USEPA and DWR 2011). A portion of the assessment follows.

Water Demand

Are there major industries that require cooling/process water in your planning region?

No.

Does water use vary by more than 50% seasonally in parts of your region?

Yes. In Mammoth Lakes, the summer irrigation season increases water demand about 66% over winter or early spring demand.

Do groundwater supplies in your region lack resiliency after drought events?

MCWD has not had a failure of groundwater supplies to recover after drought events. However, the 2015 drought was the lowest precipitation event on record and MCWD will be evaluating the recovery of the water levels in the groundwater production wells in the coming years.

Are water use curtailment measures effective in your region?

Yes. MCWD customers were very responsive to water shortage restriction during 2015. Cumulative savings from June to December 2015 was 28% compared to the same months in 2013.

Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?

MCWD limits surface water diversions based on stream by-pass flow requirements. It is unknown whether there are any instream flow requirements for Mammoth Creek downstream from MCWD's operations.

Water Supply

Does a portion of the water supply in your region come from snowmelt?

Yes. The water content of the winter snowpack is directly related to the available annual surface water supplies and longer-term groundwater supplies.

Would your region have difficulty in storing carryover supply surpluses from year to year?

Yes. Lake Mary serves as MCWD's sole long-term water storage reservoir. It's relatively small capacity is inadequate for storing carryover supply from year to year.

Has your region faced a drought in the past during which it failed to meet local water demands?

No.

Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?

MCWD does not have invasive species management issues at or along our facilities or local habitat areas.

Water Quality

Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?

Yes. MCWD's service area and facilities are located predominantly within a Jeffrey pine forest. Erosion resulting from a major wildfire event could cause water quality treatment concerns for surface water supplies.

Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or alga blooms? Are there other water quality constituents potentially exacerbated by climate change?

MCWD's surface water supply may experience occasional turbidity when the lake turns over. However, the ability to treat water has not been affected by the increased turbidity.

Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?

Over the last four years of drought, low flows were experienced in Mammoth Creek, the source of MCWD surface water supplies. It is unknown whether these low flows are affecting the local waterbodies assimilative capacity.

Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?

No.

Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?

No.

Flooding

Does critical infrastructure in your region lie within the 200-year floodplain?

No.

Does aging critical flood protection infrastructure exist in your region?

No. There is no flood protection infrastructure near MCWD facilities.

Have flood control facilities (such as impoundment structures) been insufficient in the past?

NA. The Mammoth watershed does not have flood control facilities.

Are wildfires a concern in parts of your region?

Yes. MCWD coordinated with the USFS Mammoth Lakes Ranger District to conduct a hazardous fuel reduction project about the Lake Mary Water Treatment Plant in 2011. In addition, MCWD support USFS fuel reduction projects in the Lakes Basin and near all MCWD facilities.

3.4.1 MCWD's Adaptation Strategies for Climate Change

Water Use Efficiency – Increasing water efficiency will remain an ongoing program at MCWD. Efficiency projects consist of infrastructure improvements, maximizing recycled water production and delivery for irrigation, leak detection and repair, and customer based programs. See Chapter 9 for a detailed discussion and descriptions of demand management measures implemented by MCWD.

Integrated Regional Water Management – The District has been an active participant in the Inyo-Mono Integrated Regional Water Management Group since its inception in early 2008. District staff serves on committees and participates in stakeholder meetings; in addition, the District has provided financial support for the group's program office staff to update plans as required by DWR and to apply for group planning and implementation grants. The District intends to remain actively involved with the Inyo-Mono group.

Ecosystem Enhancement/Protection – The integrity of the Mammoth Basin ecosystem is important to MCWD because a well-managed ecosystem has a higher capacity to absorb precipitation and flood events, maintain higher water quality, and draw visitors to the region. To support ecosystem sustainability, the District has 26 monitoring wells to protect groundwater resources. In addition, MCWD is collaborating with the US BLM and the local geothermal plant owner regarding plans to double the capacity of the plant. The intent of the collaboration is to develop a Monitoring and Response Plan that will protect MCWD aquifers and the local environment.

Expanded Storage and Conjunctive Water Management – Increasing surface water storage by raising the dam at Lake Mary or recharging the aquifer at the District's production wells using aquifer storage and recovery (ASR) would increase water supply reliability in the face of changing hydrologic patterns in the Mammoth Basin. However, no current plan is in place to implement these projects. MCWD conjunctively manages surface and groundwater supplies now; and both are directly linked to the primary water source of natural precipitation within the Basin.

Resource Monitoring and Data Collection – Stream flows, lake levels and groundwater aquifers are monitored intensively by MCWD. Inflows to Lake Mary are measured daily between April 1 and November 1 and weekly during the remaining calendar year. The level of Lake Mary, Mammoth Creek flows and the groundwater monitoring wells are monitored continuously through SCADA or data loggers. Mammoth Creek near the crossing of Highway 395 is measured daily. Data collected is used to ensure MCWD is managing water resources according to SWRCB water right licenses and permit, monitor potential impacts to local springs, and to improve water supply models.

MCWD has implemented efforts to reduce the potential for wildfire damage to facilities. Fuel reduction around MCWD offices and facilities is an ongoing program.

3.5 Service Area Population and Demographics

The tourism-based economy of Mammoth Lakes has resulted in a large portion of the service area being developed to serve visitors, second homeowners, and seasonal workers. For example, about 52 percent of the housing units in Mammoth Lakes are dedicated to second homes, seasonal use or rental lodging (TOML 2014). These properties are irrigated all summer regardless of occupancy. The 2007 General Plan for Mammoth Lakes shows that development to house visitors and transient employees comprises 90 percent of the buildout land area, while commercial and light industry uses fill the remaining 10 percent. There is no agriculture or large industrial developments in the Urban Growth Boundary (Town of Mammoth Lakes 2007a).

The UWMP is required to include an estimate of the current and future population of the service area. Population estimates for 2015 relied on the 2015 CA Department of Finance (DOF) estimate of a resident population of 8,410 people in Mammoth Lakes. However, for the purposes of evaluating impacts of Mammoth Lakes' population on water and wastewater services, consideration of the transient population is essential. In addition, the CA Dept. of Public Health defines a resident as "a person who physically occupies, whether by ownership, rental, lease, or other means, the same dwelling for at least 60 days of the year" (CA DPH 2012). Therefore, in addition to the DOF estimate of the resident population, MCWD added an estimate of the ongoing transient population present in Mammoth Lakes based on Town staff estimates of dwelling units and average occupancy. This combination of transient and resident population is referred to as the "effective annual population" for the purposes of this UWMP. An example of the transient population effect on water demand is demonstrated for one month in Table 3-2 Visitor Occupancy Effect on December Water Demand. The table shows higher occupancy rates result in higher water demand. In addition, occupancy rates can be highly influenced by the quality and quantity of snow.

Table 3-2 Visitor Occupancy Effect on December Water Demand

Year	Consumption	Occupancy[1]	Snowfall (in.)[2]
2015	110	51%	71.0
2014	101	46%	63.5
2013	93	44%	24.5

1. Occupancy data from Mammoth Lakes Tourism. Data does not have a consistent number of businesses reporting.
2. Snowfall data from Mammoth Mountain Ski Area

Future effective annual population estimates were developed using the resident population growth rate (2%) from US Census data in 2010 and DOF estimates for 2015. Peak population estimates (visitors and seasonal employees) were based on projected buildout dwelling units and average occupancy rates as described in the Town's General Plan (Mammoth Lakes 2007a) and updated by Town CED staff. Both the current and future estimates of effective annual population assume 30% of the peak non-resident population uses overnight accommodations on a continuous basis. Current and projected population estimates are presented below in Table 3-3. Future population estimates may be overstated because the recession reduced the rate of new construction projects. The Town's General Plan buildout projections for 2025 have been drawn out to 2035 in the UWMP.

Table 3-3 Current and Projected Service Area Population

	2015	2020	2025	2030	2035
Resident Population	8,410[1]	8,578	8,750	8,925	9,103
Peak Visitor Population[2]	33,482	38,607	43,731	48,856	53,980
Effective Annual Population[3]	15,932	17,587	19,244	20,904	22,566

(DWR Table 3-1, Revised)

1. Data from State of Calif. Dept. of Finance, Table E-4
2. Peak population for the Town is based on estimates of average # of occupants and number of housing units.
3. The effective population is calculated by subtracting the resident population from the peak visitor figure. Thirty percent of this transient population is then added back to the resident population figure to determine the Effective Annual Population.

This chapter describes and quantifies current water use and water use projections in five-year increments through the year 2035. Accurately tracking and reporting current water demands provides sound resource planning to avoid potential future shortfalls in water supply. In addition, future demands provide a background for planning necessary infrastructure to support future Town buildout. Developed in coordination with local planning agencies to support demand projections, this information is also used by other agencies that rely on water supply projections. Because these items are not applicable, MCWD does not have a program for saline water intrusion barriers, managed groundwater recharge, nor does it supply water for agricultural use.

4.1 Recycled versus Potable and Raw Water Demand

This chapter addresses potable and raw (untreated) water demand except for Table 4-2 Total Annual Water Demand – Past, Current and Projected, which includes recycled water demand. Detailed information regarding recycled water can be found Chapter 6.

4.2 Water Use by Sector

Descriptions of past and current water use and estimates of future demands, divided into five-year increments, are required elements in the UWMP. Customer water demands are further divided into customer use "sectors" as described in CWC §10631(e)(1) and (2) and shown below in Table 4-1.

4.2.1 Customer Water Demand – Current and Future

Customer water demand in this UWMP is defined as water delivered to customers based on meter readings. All MCWD water service connections are metered. In 2010, customer water demand was 2,169 acre-feet. In 2015, a 29% reduction in demand from 2010 usage occurred under Level 3 Water Shortage restrictions. The 2015 customer water demand of 1,546 acre-feet was 623 acre-feet or 203 million gallons less than 2010 usage.

Table 4-1 Water Demand for Potable and Raw Water - Actual 2015

Water use category	Actual	Projected			
	2015	2020	2025	2030	2035
Single-family residential (SFR)	331	385	439	493	547
Multi-family residential (MFR)	628	810	992	1,175	1,358
Commercial	370	432	492	552	613
Institutional	2	6	10	13	17
Landscape[1]	138	151	164	177	189
Raw water for golf courses	77	76	76	220	220
Losses	140	207	241	292	327
Total	1,686	2,066	2,413	2,922	3,271

(DWR Table 4-1 and 4-2, Revised)

1. The irrigation category includes potable water use on irrigation only metered accounts. Many large landscapes in the service area do not have separate irrigation meters. Recycled water used to irrigate golf courses is not included in this table.

Future Town buildout land projections were developed by working with the Town's CED staff and by reviewing the 2007 General Plan (Town of Mammoth Lakes 2007b). The Town's buildout projections may be overestimated. The 2007 General Plan reports that development regulations are likely to reduce the overall density from that provided in the General Plan. In addition, a reduced buildout scenario was predicted for the Town based on economic study conducted by EPS in 2011 (EPS 2011). MCWD has revised its customer database to reflect the Town's land use categories more closely.

Future water demand projections were developed by averaging customer usage data over the past four drought years, 2012-2015. Water demand during those years represents a period during which MCWD implemented Water Shortage Restrictions that resulted in significant demand reductions. Applying these lower than normal average water demands to estimated future demand will capture anticipated water efficiencies that will result from legislation, state mandates, and improved technologies. As new regulatory requirements are implemented and enforced, the ability to conserve water during shortages will be more challenging as discretionary uses decrease. Past, current and future annual water demand, potable, raw and recycled is provided in the table below.

Table 4-2 Total Annual Water Demand – Past, Current and Projected

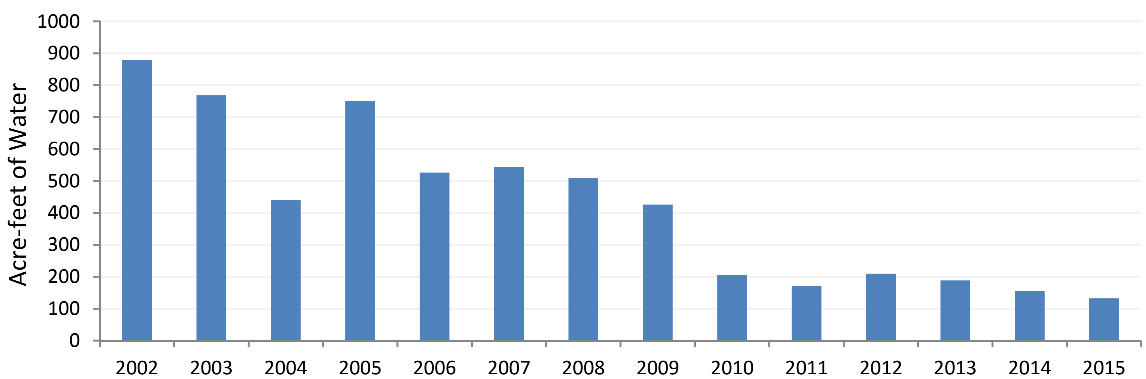
	2015	2020	2025	2030	2035
Potable and raw water	1,686	2,066	2,413	2,922	3,271
Recycled water demand	110	198	198	448	448
Total Water Demand	1,796	2,264	2,611	3,370	3,719

(DWR Table 4-3)

4.3 Distribution System Water Losses (Non-revenue Water)

MCWD conducts monthly evaluations of the discrepancy between water leaving the water treatment plants and water flowing through customer meters. This frequent check on the distribution system allows staff to act on leaks or meter problems on a regular basis. Distribution system losses can also occur through unauthorized use (theft), meter inaccuracies, and errors in meter reading and billing. The US EPA estimates that the average water lost in public water systems is 16% (EPA 2013). In comparison, MCWD distribution losses are about 10%. MCWD completed a project in 2013 to reduce distribution losses by replacing the aging steel distribution water mains and is currently replacing aging water laterals. The results of this effort are described displayed in Figure 4-1 and described further in Chapter 9.

Figure 4-1 Annual Non-revenue Water



1. Totals displayed are different from AWWA water audit results. This data does not count authorized non-revenue water as a loss.

The 2015 UWMP is required to use the AWWA Water Audit Manual and Software to determine water loss and to provide the results of the audit in the UWMP. The audit results for non-revenue water in 2015 was 140 acre-feet as reported in Table 4-3.

Table 4-3 Water Loss Reporting for 2015

Reporting Period Start Date	Volume of Water Loss
01/2015	140

(DWR Table 4-4)

4.4 Estimating Future Water Savings

Water consumption data during the years MCWD implemented Water Shortage Restrictions were used to project future water demand. These lower than normal usage data are anticipated to capture future water savings as described in Section 4.2.1 above.

MCWD's Water Shortage Restrictions were updated in 2014 to increase water conservation and streamline enforcement. A copy of the pertinent sections of the Code Book can be found in Appendix E. Water conservation has also been increased by the leak detection and fixture rebate program described in Chapter 9, Demand Management Measures. Improvements to the Town's landscape ordinances are also contributing to higher efficiency of water use in MCWD's service area.

4.5 Water Use for Lower Income Households

The CWC §10631(a) requires water suppliers to project lower income household water demand for single-family and multifamily residential housing as identified in the housing element of any city or county in the service area of the supplier. The Town of Mammoth Lakes' Housing Element Report 2014-2019 (TOML 2014) and the 2005 General Plan Update EIR (TOML 2007a) were used to estimate low-income housing development for 2016-2035.

The Town's Housing Element Report bases low-income housing needs on information provided by the California Department of Housing and Community Development's Regional Housing Need Allocation Plan. Based on the plan, the Town has a net remaining deficit of 29 units for low and lower income levels for the planning horizon of 2014 to 2019.

The Housing Element report does not project beyond 2019, however, new construction has slowed significantly in Mammoth Lakes in the last 10 years. Since the 2010 UWMP only one low-income housing project was completed, a remodeled building that provided four new low-income units. Therefore, the Town's five-year projection for low-income housing was spread over 10 years, approximately 40 new units every five years. This assumption was approved by Town's CED staff prior to insertion in the 2015 UWMP.

Water projections for low-income housing applied 2012-2015 average consumption per dwelling unit for multi-family residences to the projected new units. The results are shown below, Table 4-4 Projected Water Demand for Low-Income Housing. Water demand for low-income housing is included in future water demand projections at Town buildout.

Table 4-4 Projected Water Demand for Low-Income Housing

	2020	2025	2030	2035
Number of new units - cumulative	40	80	120	159
Water demand - cumulative	3.2	6.5	9.7	12.9

4.6 Climate Change

Winters with decreasing snowpack or increasing rain on snow events and longer and warmer growing season months will challenge the water supply reliability for Mammoth Lakes. An in-depth discussion on climate change is included in Chapter 3, 3.4 Climate Change.

A prolonged drought in California during 2007-2009 resulted in a statewide proclamation of drought emergency and the Water Conservation Act of 2009, SB X7-7. This Act required a statewide 20% reduction in urban per capita water use by December 31, 2020. UWMPs were identified as a vehicle to assist the state in achieving this goal by providing an urban water supplier's baseline daily per capita water use and 20% reduction targets. This chapter reviews data provided in the 2010 UWMP and checks whether MCWD is on track to meet the 2020 20% reduction in water demand.

5.1 Baseline Periods - Interim, and Compliance Daily Per Capita Water Use

This 2015 UWMP reviews specific water use metrics reported in MCWD's 2010 UWMP to support the State's target of a 20% reduction in average per capita daily water demand by 2020. Key water use metrics for meeting the Act's requirements include the *base daily per capita water use,* the *compliance daily per capita use,* and the *interim per capita water use target*.

The base daily per capita water use was developed using a 10- and 5- year continuous record of water demand (MCWD records) and service area population (US Census data and DOF estimates) and is shown in Table 5-1. This data was then used to determine a base daily per capita water use, measured in gallons per capita per day (GPCD). Several methods were available to determine the compliance daily per capita use, or 2020 target. In the 2010 and the 2015 UWMP, MCWD chose to apply Method 1, a 20% reduction of the 10-year average GPCD or a 5% reduction from the 5-year record, whichever is lowest. The result for MCWD's base daily per capita water use is 181 GPCD. This result is higher than reported in the 2010 UWMP. Baseline population numbers used to develop the compliance target in the 2010 UWMP were decreased based on updated peak population estimates from the Town. Changes to the base daily per capita water use resulted in developing new compliance targets. The 2015 interim per capita water use target is 163 GPCD and the 2020 compliance daily per capita water use is 145 GPCD, see Table 5-2. MCWD met the 2015 interim per capita water use target with a GPCD use of 96.

Table 5-1 Base Daily Per Capita Water Use

	Year	Effective annual population	Average daily system gross water use (mgd)	Annual average daily per capita water use (GPCD)
1	2001	15,010	3.0	203
2	2002	15,200	3.2	209
3	2003	15,391	3.1	200
4	2004	15,479	2.9	189
5	2005	15,566	3.1	196
6	2006	15,591	2.8	177
7	2007	15,695	2.9	185
8	2008	15,706	2.7	170
9	2009	15,720	2.3	148
10	2010	15,808	2.1	136
10-year average annual daily per capita water use				181
Compliance Use Target - 80% of average annual daily per capita water use (target GPCD for 2020)				145
5- year average annual daily per capita water use				163

The ten-year baseline demonstrates a steadily declining per capita water demand. Per capita water use declined approximately 33% over the baseline period due to a combination of a 70% decrease in water distribution system losses and demand management (conservation) measures. Between 2010 and 2015, per capita water demand dropped 29%. Based on the compliance methodology established by DWR, the District has met the 2015 interim daily per capita water use target and will meet the 2020 compliance target required under the 2009 Water Conservation Act.

The baseline data applies gross water use as all treated and raw water delivered to customers and water losses in the distribution system. Water treatment plant process water losses (such as filter backwash) and recycled water used for irrigation are excluded from gross water use. Gross water production and use data was developed from effluent meters at the District's four water treatment facilities, meters on production wells supplying raw water for direct distribution to irrigation users, and customer meter billing data.

Population data for this analysis relied on federal census data and estimates developed by the State of California Department of Finance for non-census years, Town peak population estimates, and transient occupancy rates. A detailed discussion of population is provided in Section 3.5, Service Area Population and Demographics.

Table 5-2 Baseline and Compliance Targets

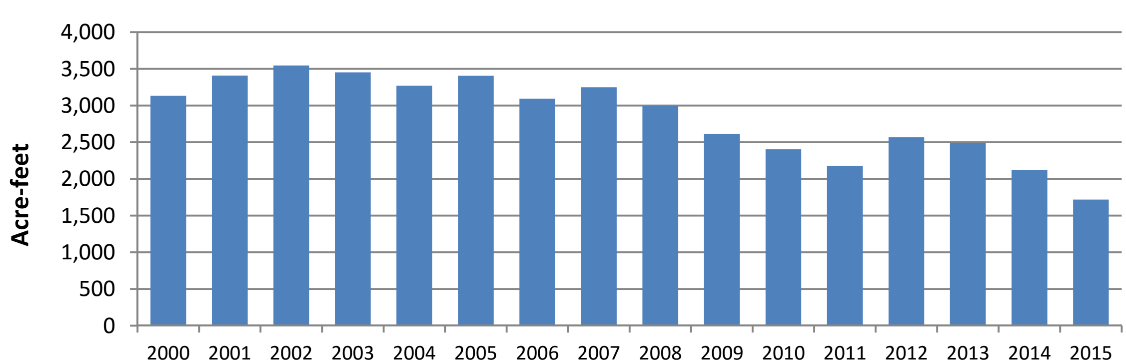
Baseline Period	Start Year	End Year	Avg. Baseline GPCD[1]	2015 Interim Target	2015 Actual GPCD	Confirmed 2020 Target
10 year	2001	2010	181	163	94	145
5 Year	2006	2010	163			

(DWR Table 5-1 and 5-2, revised)
1. The average baselines reported in this UWMP are higher than reported in the 2010 UWMP because effective population was revised downward based on the Town's reevaluation of calculating peak population estimates.

5.2 Compliance with 2015 Target

MCWD met the 163 GPCD interim compliance target for 2015 with a GPCD use of 96. Figure 5-1 shows the significant downward trend in daily per capita water use over the past 10 years. Based on the 10-year demand trend, the District has already met the requirements of the Water Conservation Act of 2009. The District will continue its demand management and conservation efforts as an integral part of its water supply strategy, to ensure future per capita water use remains below the compliance daily per capita use of 145 GPCD.

Figure 5-1 Gross Water Use 2000 – 2015



This chapter describes and quantifies the existing sources of water available to MCWD. It describes each water source, source limitations, and water quality issues associated with those sources. In addition, there is a discussion of future water development opportunities. Available water quantities described in this chapter reflect average year conditions. Chapter 7 includes discussions on water supply reliability under a Single-Dry and Multiple-Dry Year scenarios. Planning for water shortage conditions is described in Chapter 8.

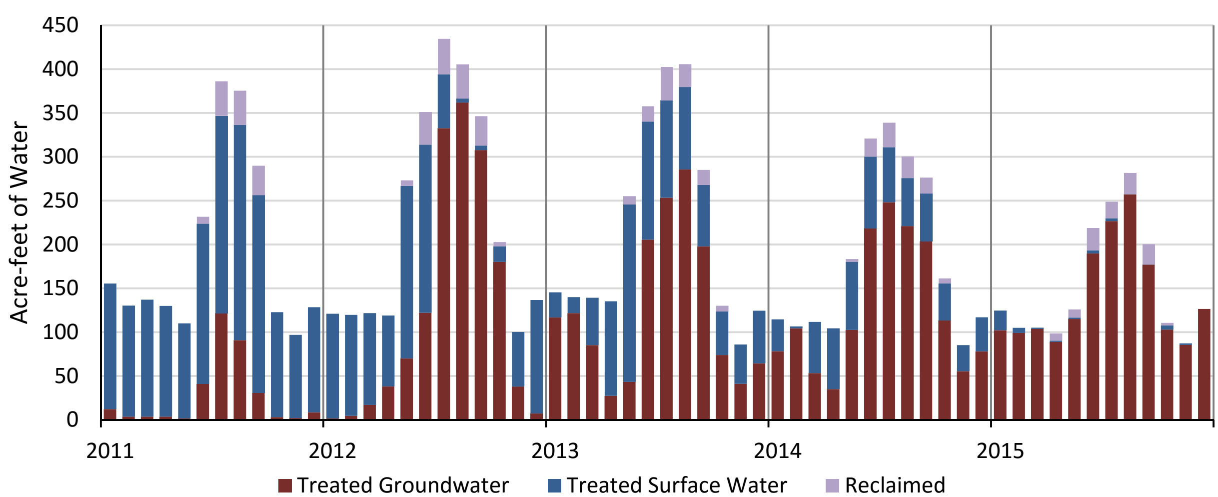
6.1 Water Sources Summary

The District supplies water for municipal purposes only. All of MCWD's water resources are located in the Mammoth Basin. Existing sources of water include surface water, groundwater, recycled water, and savings from water conservation (demand management) measures. Each year, winter precipitation received and stored as snow in the Lakes Basin feeds MCWD's surface water resources as the weather warms. Surface water supply is stored and diverted from Mammoth Creek at Lake Mary. Lake Mary is relatively small with a capacity of about 606 acre-feet. Because of this storage limitation, high spring runoff flows typically cannot be fully utilized as allowed under MCWD's water right permit and licenses because runoff generally occurs prior to the irrigation season when demand is relatively low. The groundwater aquifer pumped by MCWD wells is used to augment surface water supplies. These wells can take one to two years to respond to recharge from previous years' runoff conditions.

MCWD also utilizes reclaimed water treated to Title 22 requirements water for golf course irrigation. Recycled water for irrigation began in 2010. The recycled water program directly replaces raw water demand that would be used for irrigation. Sierra Star, an 18-hole golf course began irrigating with recycled water in late 2010. Snowcreek, a 9-hole golf course, started irrigating with recycled water in 2016.

Figure 6-1 illustrates the conjunctive management of water resources practiced by MCWD to balance supplies under varying hydrologic conditions. Surface water supply is normally maximized first due to its high quality and low production costs. Groundwater supply is then used to meet the remaining demands. Recycled water supplies a large portion of the golf course irrigation.

Figure 6-1 Monthly Mix of Water Supplies Utilized 2011-2015



6.2 Groundwater

MCWD utilizes groundwater from nine production wells in the Mammoth Basin to supplement its primary surface water supply. Thus, annual groundwater production is based on the difference between annual service area demands and surface water availability. Groundwater supply can be limited by the capacity of the District's nine wells, groundwater level drawdown impacts on well production and the ability of the two GWTPs to effectively treat and remove naturally occurring drinking water contaminants such as arsenic, iron and manganese.

Over the past five years, as the drought increased in severity and surface water became less available, MCWD relied on groundwater production to provide an increasing percentage of the community's water supply (see Figure 6-1). The District pumped 7,537 acre-feet of groundwater between 2011 and 2015, averaging 1,507 acre-feet per year. In 2011, when April 1st runoff was 150% of normal, MCWD pumped 405 acre-feet of water. In 2015, with an April 1st snowpack water content 2% of normal, 1,883 acre-feet of water was pumped to meet demand.

6.2.1 Groundwater Basin Description

The Mammoth Basin (or watershed) and local groundwater basin are shown in Figure 6-2. The Mammoth Basin is formed by elevated areas on the north and west that are comprised largely of extrusive igneous rocks; a central trough filled with alluvial and glacial debris; and an abrupt southern flank of igneous intrusive and metamorphic rocks. The central trough area opens and drains to the east to the Owens River and Lake Crowley. Mammoth Basin is the watershed of Mammoth Creek and is bounded on the south by the drainage divide of Convict Creek; on the west, by Mammoth Crest; on the north by the drainage divide of Dry Creek; and on the east extending along the watershed of Hot Creek.

The Mammoth Basin has not been adjudicated nor has it been identified by DWR as being overdrafted. The District is the primary user of groundwater for municipal and domestic purposes. There are a few private wells serving specific users such as the Mammoth-Yosemite Airport, which are outside of the District service area. By far the largest quantity of groundwater pumped in the Mammoth Basin is for geothermal power generation by Ormat Corporation at the Casa Diablo geothermal power plant complex. Ormat does not release data to the public on its groundwater (geothermal brine) pumping, brine re-injection operations, or related monitoring well data.

The complex geology, hydrology, and hydrogeology of the area appear to have developed multiple groundwater systems in the Mammoth groundwater basin (WEI 2003). Wildermuth describes the presence of two distinct aquifer systems in the area where the District produces water. District production wells tap the deep system, consisting of fractured basalts and other water yielding rock, which is highly responsive to District groundwater production but can respond slowly to recharge.

A shallow and generally highly transmissive system of glacial till and alluvium with interbedded volcanics lies over the deep system and seems to range from less than 100 feet to 200 feet in total thickness. This hydrostratigraphic layer consists of four distinct geologic units identified as: quaternary alluvial deposits comprised of clay, silts, sand, and cobbles; quaternary lake (lacustrine) deposits comprised mostly of unconsolidated fine-grained sediments that are of low permeability; quaternary glacial deposits within the Mammoth Basin tend to be slightly to moderately consolidated and consist of clay to boulder size glacial debris; and Quaternary and Tertiary igneous rock consist of lava flows, breccias, and tuffs interbedded with glacial debris. The District's groundwater studies, modeling, and monitoring do not address the deeper geothermal aquifer layer where Ormat's pumping and reinjection operations occur.

Ormat does not provide information to the public on its modeling for independent, public resource agency review.

Ormat's proposed Casa Diablo IV geothermal expansion project would extend geothermal extraction wells in closer proximity to the District's ground water production wells and extract upwards of 29,000 acre-feet of geothermal water annually. The District is concerned about potential threats to its ground water wells from this project. Preliminary water quality data provided by USGS indicate some degree of intermingling of ground water and geothermal water. The District is working with BLM to put in place geothermal monitoring wells and a monitoring and response plan to protect the District's groundwater.

6.2.2 Groundwater Management

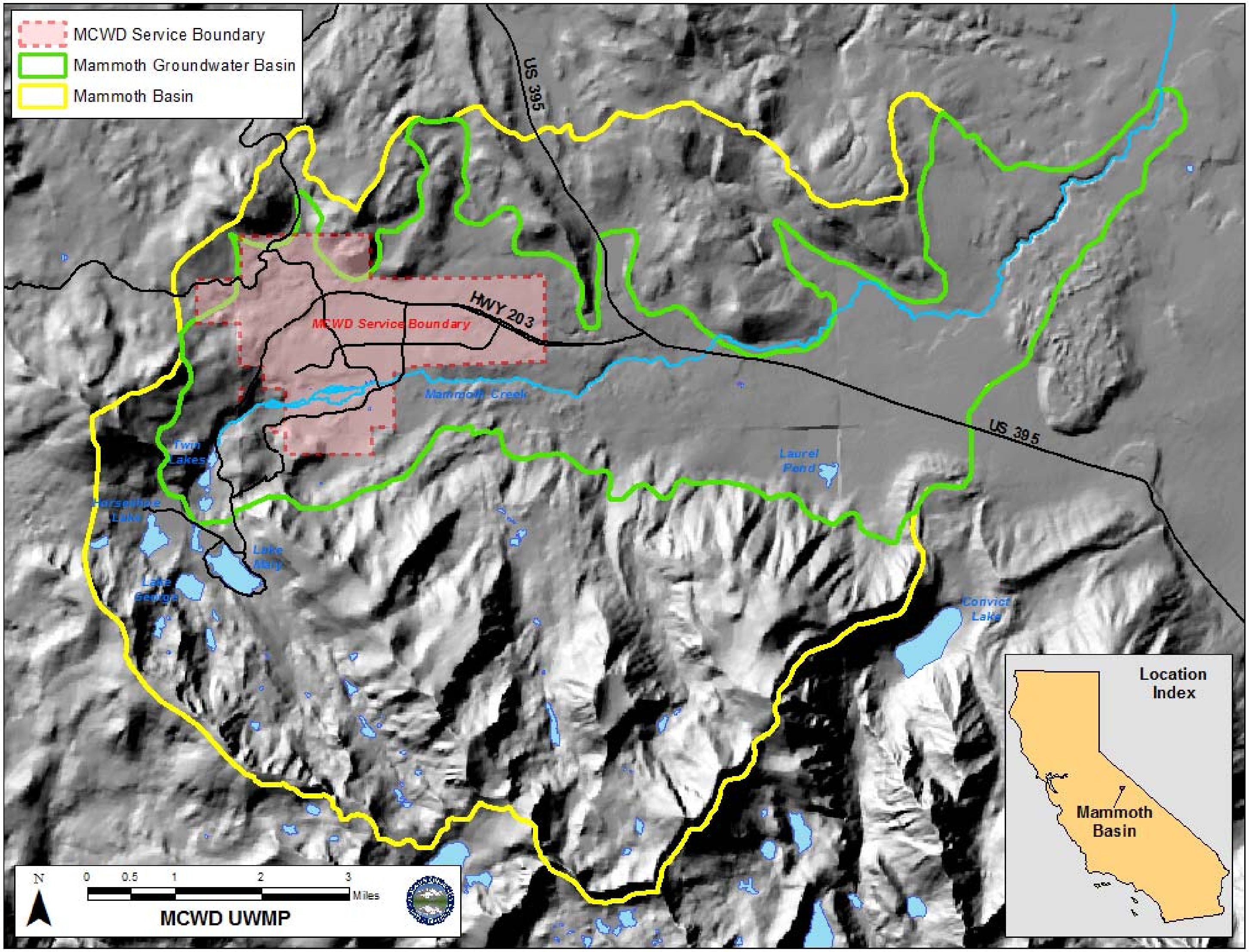
The District maintains an extensive groundwater and surface water monitoring system to ensure sustainable management of the basin's water resources. The monitoring wells and production wells are shown in Figure 6-3. Groundwater levels are monitored in nine production wells and 21 shallow and deep monitoring wells. These data are used to produce an annual groundwater monitoring report that provides an evaluation of groundwater use, groundwater level trends, surface flows, and water quality. These annual reports have concluded that groundwater pumping has not had a detectable impact on surface water features such as Mammoth Creek or the springs at the U.C. Valentine Reserve. Annual reports from 1993 to present can be accessed and downloaded from the District's website: www.mcwd.dst.ca.us/groundwater.html. In addition, the District provides groundwater data to Mono County under the State's California Statewide Groundwater Elevation Monitoring (CASGEM) program.

The District adopted a Groundwater Management Plan (GWMP) in 2005, available to download at www.mcwd.dst.ca.us/groundwater.html. The GWMP was intended to inform future water resource planning and management efforts in the Mammoth Basin and met the requirements of AB-3030. Development of the GWMP involved numerous local government agencies and private entities. The GWMP includes a monitoring and operation plan for the long-term use of local groundwater resources. A Local Groundwater Assistance grant from the California Department of Water Resources in 2004 provided funding to complete the GWMP, expand the groundwater monitoring program, and assist in the development of a groundwater model.

In 2009, the District developed a groundwater simulation model for the Mammoth Basin (WEI 2009). The model incorporates the primary hydrologic and hydrogeologic features of the Mammoth Basin and District groundwater infrastructure and operations. It is used to simulate and evaluate current and future groundwater pumping scenarios, for determining sustainable groundwater use levels. The model development, calibration, and initial long-term projections are presented in the 2009 study. The model's hydrology was extended through December 2015 for analysis conducted for the 2015 UWMP.

Groundwater modeling results based on the historical record of Mammoth Pass snow water content indicate the District's current and future groundwater production is generally sustainable, under conjunctive management of both surface, groundwater and recycled water supplies. In years with average and higher than average surface water supplies, groundwater production is reduced and natural recharge is increased, leading to replenishment of the groundwater basin. A discussion regarding the reliability of the water supply under a Single-Dry Year and Multiple-Dry Years can be found in Chapter 7.

Figure 6-2 Map of the Mammoth Basin and Mammoth Groundwater Basin



6.2.3 Historical Groundwater Pumping

As described previously, groundwater resources are utilized when surface supplies are not available to meet demand. The variability of groundwater production can be seen in Table 6-1. In 2011, the snowpack water content was 150% of normal and groundwater production was 405 acre-feet. The April 1st snow water content (SWC) at Mammoth Pass during drought conditions from 2012 through 2015 was 48%, 83%, 42%, and 2% of normal, respectively. Figure 7-1 Water Content of Snowpack at Mammoth Pass 1931 - 2015, displays 85 years of snowpack water content. During the 2012-2015 drought, pumping ranged from 1,707 acre-feet to 1,883 acre-feet. The largest pumping volume occurred in 2015 when the absence of SWC in the Mammoth Basin on April 1st, resulted in virtually no surface water supplies in the subsequent months. In April 2015, the MCWD Board of Directors voted to implement Level 3 Water Shortage Restrictions with the goal of reducing demand by 30%. The ability to rotate pumping between the nine production wells and implementing Level 3 Water Shortage regulations were essential management actions that allowed MCWD to maintain adequate water supplies through the year.

Table 6-1 Mammoth Basin Groundwater Acre-Feet Pumped

Groundwater Type	Location or Basin Name	2011	2012	2013	2014	2015
Fractured Rock	Mammoth Basin	405	1,767	1,707	1,775	1,673
NOTES: Total annual pumped groundwater is the total metered flow from all groundwater pumps. Water samples, water line flushing, backwashing water treatment filters, and water for water quality studies are included in totals.						

(DWR Table 6-1)

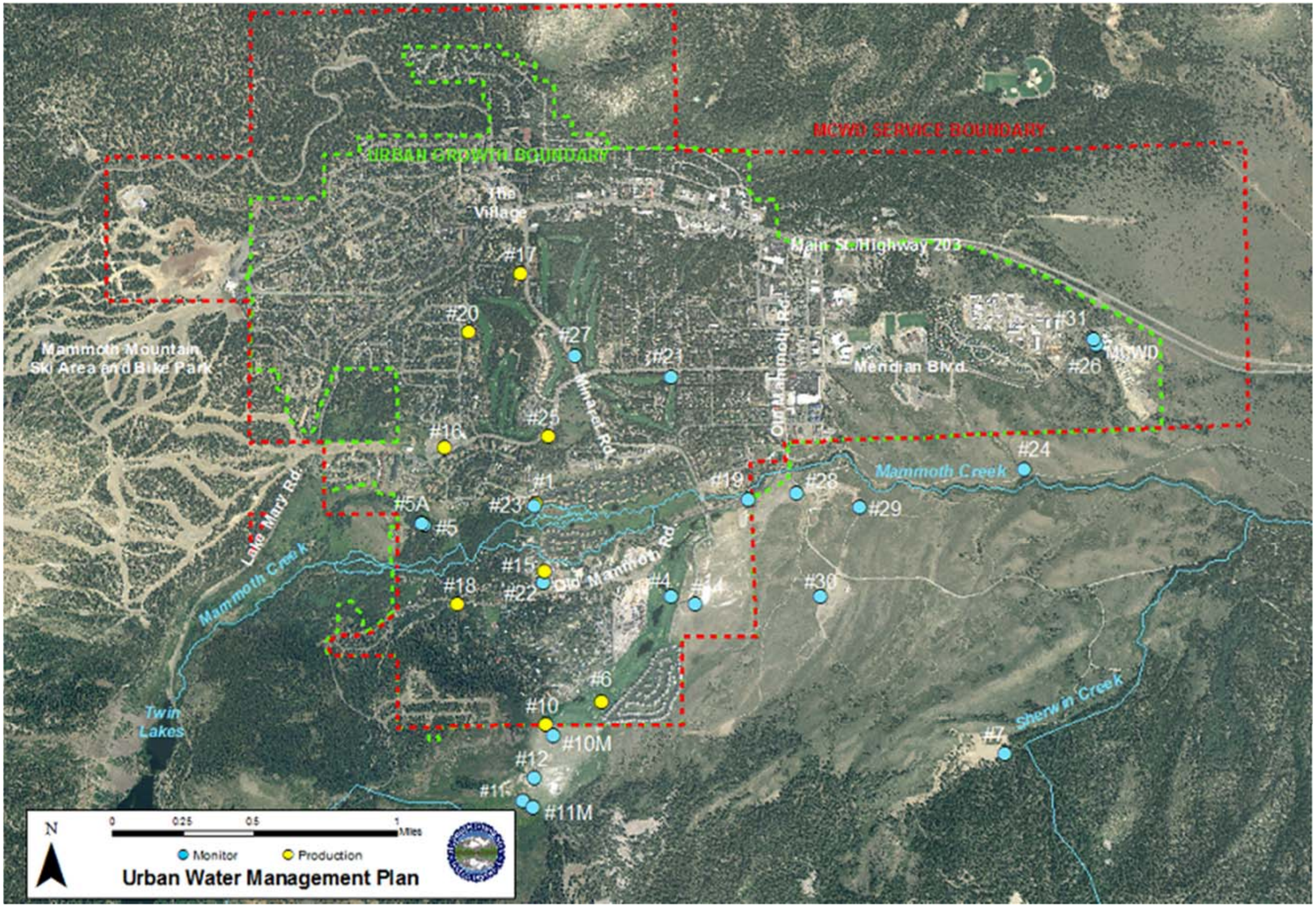
6.3 Surface Water

The District utilizes surface water as the primary water source when available because it requires less energy to divert and deliver and requires less chemical treatment. The elevation at the Lake Mary Water Treatment Plant allows water to flow by gravity to almost the entire distribution system. The treatment plant is located about 1,000 feet higher in elevation and about 3 miles west of town. Lake surface water levels and stream flow rates are monitored at twelve locations throughout the Mammoth Basin watershed. These monitoring data are provided monthly to the SWRCB as a compliance measure contained in the District's water permit and licenses.

The District has two water right licenses and one permit issued by the SWRCB that entitle the District to both store and divert Mammoth Creek surface water at Lake Mary. The licenses and permit specify limits and conditions on the storage and diversion of surface water that are intended to sustain a healthy Mammoth Creek fishery and support recreational uses at Lake Mary. These include a maximum diversion rate, a maximum storage quantity and timing of diversions to storage, maximum seasonal drawdown levels at Lake Mary, and fishery bypass flow requirements for Mammoth Creek.

MCWD's licenses and permit allow an annual maximum of 2,760 acre-feet of surface water diversion. However, actual diversions are typically significantly lower due to the combined influence of natural variability in snowpack runoff quantity and timing, limited storage to manage the variable runoff, mismatch between the seasonal trends in supply availability and community water demands, and compliance with the monthly minimum Mammoth Creek fishery bypass-flow requirements. For example, between 2011 and 2015, of which the last four years were below average runoff years, the

Figure 6-3 MCWD Production and Monitoring Wells



District diverted an average of 914 acre-feet per year, even though total service area demands were substantially higher, with the difference made up by groundwater supply. In 2011, the snowpack water content was 153% of average and MCWD used 1,850 acre-feet of surface water. In 2015, a 4% of average year, MCWD used 47 acre-feet of surface water. Between 2005 and 2010, the average annual surface water supply was 1,444 acre-feet. Figure 6-1 Monthly Mix of Water Supplies Utilized 2011-2015 demonstrates the conjunctive management of water resources as surface water supplies diminished under drought conditions between 2012 and 2015.

6.4 Surface and Groundwater Quality

Mammoth Creek surface water quality is generally excellent, and requires minimal treatment (anthracite media filtration, chlorination, and corrosion control).

Groundwater quality issues include naturally occurring high levels of minerals such as iron, manganese, and arsenic. Recent improvements at all MCWD groundwater treatment plants allow full production (based on raw water supply from wells) that meets all water quality standards. Secondary water quality issues based on color, odor, and elevated temperature occur with several infrequently used wells, and are minimized by treating and blending with the higher quality groundwater from the remaining wells. These water quality issues are due to naturally occurring conditions related to the volcanic geology in portions of the Mammoth Groundwater Basin.

Starting in 2007, the District embarked on an $8 million capital improvement project for corrosion control to raise the pH of both surface water and groundwater supplies. The program has been operational since 2015 and working as designed. Low pH water can corrode a customer’s internal plumbing when no water use occurs for several days.

6.5 Stormwater

MCWD does not have a program to collect stormwater to meet local water supply demands. The Town is responsible for stormwater management.

6.6 Wastewater and Recycled Water

6.6.1 Wastewater

MCWD is the sole collection and treatment facility for wastewater in the Mammoth Basin. This includes wastewater generated in the Town of Mammoth Lakes, USFS campgrounds and USFS permittees in the Mammoth Lakes Basin with the exception of 10 private cabins on the south end of Lake George. No other sources of wastewater are available for reclamation in the Mammoth Basin.

Wastewater is collected at the MCWD Wastewater Treatment Plant (WWTP) located at the MCWD main facility. The plant uses an activated sludge process and the tertiary treated wastewater not used as reclaimed irrigation water is discharged to Laurel Pond, located approximately 5 ½ miles southeast of Mammoth Lakes on USFS land. Laurel Pond is a terminal surface water feature that, prior to initiation of treated effluent discharge, dried up during sustained drought periods. MCWD has an obligation to maintain a minimum of 18 acres of water surface area at Laurel Pond as a mitigation measure for the recycled water project. Improvements at the wastewater treatment plant and installation of the recycled water distribution system allowed the first delivery of recycled water to begin in 2010. Treated wastewater is also utilized for construction water, and is provided at no charge via a filling station at the wastewater treatment plant. Table 6-2 shows 1,083 acre-feet of wastewater was treated by MCWD in 2015. The slight mismatch between the total wastewater treated and the sum of discharged treated wastewater and recycled water used in the service area is caused by the timing of treatment between two different calendar years (Christmas/New Year's holidays) when holding basins are used to even out flows to the WWTP. Golf Course irrigation and construction uses utilized 106 acre-feet and 977 acre-feet of tertiary treated wastewater was discharged to Laurel Pond.

Table 6-2 Wastewater (WW) Treatment and Discharge 2015

Treatment Level	WW Treated	Discharged Treated WW	Recycled w/in Service Area
Tertiary	1,087	977	110

(DWR Table 6-3)

6.6.2 Recycled Water Development and Beneficial Uses

The MCWD recycled water facility is designed to treat about 1.55 million gallons per day of effluent. To deliver recycled water for irrigation, the plant has a 1.5 million gallon on-site storage reservoir, a pump station to deliver water, and two, 2-mile long, recycled water distribution lines.

The District began studying the feasibility of a recycled water system in 1987 (Brown and Caldwell 1987). The study objective was to determine the economic feasibility and financial viability of recycling wastewater and/or sub-potable groundwater. Uses of recycled water analyzed included landscape and agricultural irrigation, industrial process water, and water used for recreational purposes. The study concluded that the only feasible use of recycled water was for restricted landscape irrigation. MCWD evaluated the uses of reclaimed water again in a 1991 Feasibility Study of Alternative Sources of Water Supply and Methods of Reducing Demand (Boyle Engineering Corp 1992). It was reaffirmed that restricted landscape irrigation uses, such as golf course irrigation, were the most feasible use of recycled water. Irrigation places a major demand on water supply during the late spring and summer seasons, with peak season demands three to four times the annual average demand.

The District has pursued the recommendations from the two studies described in the preceding paragraph. During the last ten years, MCWD has made significant progress on the recycled water program. In 2007, the District's Board of Directors certified the EIR for the recycled distribution system. In 2009, WWTP improvements necessary to produce treated water that meets the State's Title 22 standards were completed and the Lahontan Regional Water Quality Control Board issued a master permit to the District for recycled water supply within the District service area. Construction of the distribution system pump stations and pipelines to serve the Sierra Star and Snowcreek golf courses were completed in 2010. Sierra Star Golf Course completed the on-site work to comply with Title 22 regulations and began using recycled water for irrigation in late summer of 2010. A recycled water service agreement between the Sierra Star Golf Course and MCWD provides for an annual maximum of 320 acre-feet of recycled water delivery during the irrigation season.

Snowcreek Golf Course, a 9-hole golf course, was anticipated to begin receiving recycled water for irrigation in 2012. However, this project fell behind schedule and is now on track to commence using recycled water for the 2016 irrigation season. MCWD provided financial incentives, in the form of a construction loan, to Snowcreek to construct a recycled water storage pond for irrigation. The recycled water agreement with Snowcreek provides up to 320 acre-feet of recycled water for the current course and a future expansion of the course to 18 holes and for the development of a resort community. The schedule to complete the additional development projects is at the landowner/developer's discretion and is beyond the authority of MCWD. The 2010 UWMP anticipated that the Snowcreek Golf Course would be ready to receive recycled water by 2012 and projected higher delivery volumes than were realized in 2015.

Table 6-3 Actual vs. Projected Recycled Water Use in 2015

Use type	2015 actual use	2015 projected use[1]
Golf course irrigation/Construction	110	480

(DWR Table 6-5)

1. Data from Table 4-8, page 4-12, MCWD 2010 UWMP

Currently, recycled water produced by MCWD is fully committed and no future customers are anticipated. Developing additional uses of recycled water is limited by the availability of seasonal storage. The highest production potential for recycled water occurs during the winter season when transient population and related wastewater generation peaks, while the highest demand for recycled water occurs during the summer irrigation season. In addition, the production of recycled water can be challenging due to extreme variations in flow from the transient population; and fats, oil, grease and industrial waste entering the WWTP.

Table 6-4 Projected Recycled Water Demand

	2020	2025	2030	2035
Golf course and resort irrigation	195	195	448	448

(DWR Table 6-6)

6.7 Desalinated Water Opportunities

The District does not have brackish or saline water resource available for potential development.

6.8 Exchanges or Transfers

The District conducted a feasibility study of alternative sources of water supply in 1992 that included an analysis of several exchange or transfer opportunities (Boyle Engineering Corp 1992). The study analyzed the use of reclaimed wastewater for irrigation in the Laurel Creek and lower Mammoth Creek areas in exchange for local surface water supply, groundwater acquisition in adjacent watersheds and exchange/transfer options, and Central Valley supply acquisition/transfer/exchange opportunities. The study determined that no feasible transfer opportunities existed. The geographic isolation of the Mammoth Basin is a significant limitation on feasible water transfer opportunities.

6.9 Future Water Projects

The District's newest production well, Well 25, was put online in 2013. This well serves as a redundant well for rotational pumping management schemes. In 2015, rotational pumping was critical when surface water supplies were unavailable and heavy pumping contributed to temporary mechanical failures.

The District will be drilling a test hole in the Mammoth Basin near the Snowcreek Golf Course in 2017. If the test hole demonstrates favorable production capacity, MCWD will pursue developing the well into a new production well that will increase the reliability of water supplies by expanding the number of wells available for rotational pumping management.

6.10 Summary of Existing and Planned Sources of Water

The District supplies water for municipal purposes only. Existing sources of water include surface water, groundwater, recycled water, and savings from water conservation (demand management) measures. The District stores and diverts Mammoth Creek surface water at Lake Mary. Groundwater supply comes from nine production wells within the Mammoth groundwater basin. Recycled water meeting Title 22 requirements for unrestricted irrigation is produced by MCWD. Delivery of recycled water use began in 2010. Figure 6-1 Monthly Mix of Water Supplies Utilized 2011-2015, and Table 6-5, below, present the water supply sources utilized by MCWD.

Table 6-5 Source and Volume of Water Supplies in 2015

Water Source	Acre-Feet Used	% of Total Volume
Groundwater	1,673	91
Surface water	47	3
Recycled water	110	6

(DWR Table 6-8, revised)

The surface water supply estimates in Table 6-6 are based on the 75-year history of snow water content at Mammoth Pass on April 1st and eight years of MCWD diversion records (WEI 2016). When surface water is available, MCWD's annual surface water diversions are typically less than permitted and licensed by the SWRCB because of the mismatch between the height of runoff in early spring and the height of customer demand in mid-summer. Surface water supply projections, included in this UWMP, assume that early spring demand will increase as the Town's population increases. This higher spring demand will allow higher annual utilization of surface water supplies.

The Mammoth Basin Groundwater Model developed in 2009 (WEI 2009) was used to determine whether the groundwater supply would be sustainable for the UWMP 20-year planning horizon. WEI (2016) extended the hydrology contained in the model to December 2015 to provide updated estimates of initial conditions for groundwater model projections. The groundwater production estimates are the difference between projected surface and recycled water supplies and projected demand. All groundwater supplies will continue to be produced from the Mammoth Groundwater Basin.

The recycled water quantities in Table 6-6 reflect the existing and planned increased use at the Sierra Star and Snowcreek golf courses. All recycled water supplies will be produced from MCWD's WWTP.

Assumptions in the supply conclusions are:

- Climate change could adversely affect the availability of water resources. Timing of precipitation events and runoff patterns may be altered and the annual water content of the snowpack may decrease, but there is uncertainty about how these changes may or may not affect water supply.
- The current array of groundwater production wells maintain their production capacity.
- Increases in water demand will occur during the period of high creek flows allowing higher utilization of surface water supplies.

Table 6-6 Projected Water Supplies

Water Source	2020	2025	2030	2035
Surface Water	1,181	1,314	1,507	1,743
Groundwater	844	1,068	1,231	1,353
Recycled Water	198	198	448	448
Raw Water[1]	76	76	220	220
Total	2,299	2,656	3,406388	3,763

(DWR Table 6-9, revised)

1. Raw water is untreated water used for irrigation

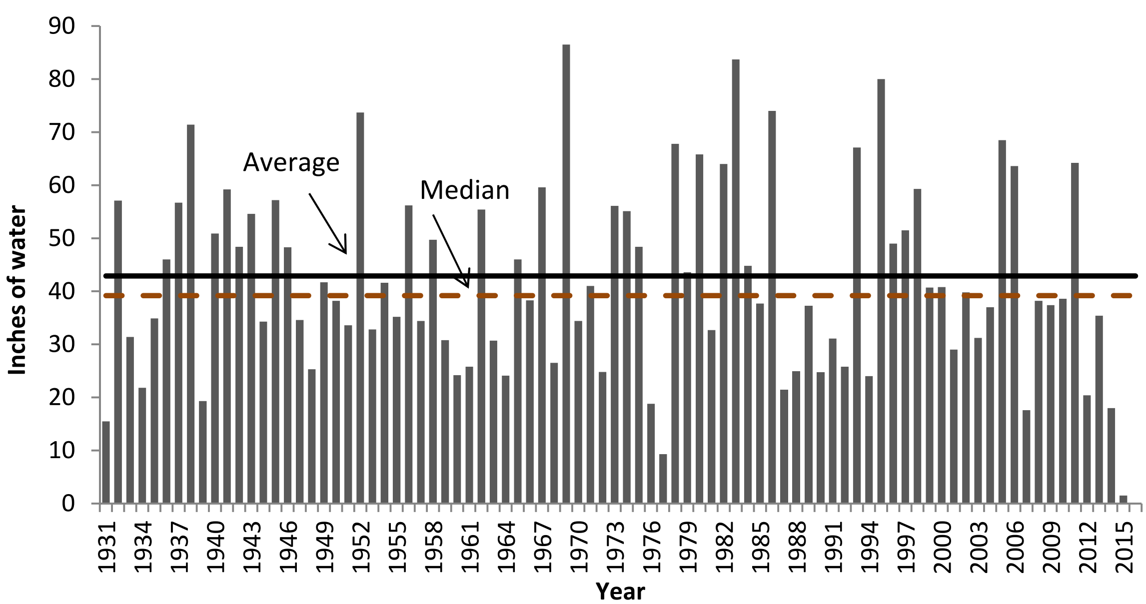
This chapter compares projected water supplies and service area demands over the 20-year planning horizon of the UWMP. It assesses the overall reliability of future supplies, including limitations to supplies and the impacts of drought and/or emergency conditions that severely curtail supply. Drought conditions considered include both a Severe One-year drought and a sustained Multiple-year drought, based on hydrologic records for the Mammoth Basin.

7.1 Constraints on Water Sources

Water Supply Reliability- Factors Limiting Sources

The quantity of MCWD's surface and groundwater supplies are limited by a number of factors. The most significant is the annual water content of the snowpack in the Mammoth Basin and the timing of the resulting surface water runoff. The District utilizes surface water as the primary water source when it is available because less energy and chemicals are required to divert, treat, and deliver water from the Lake Mary Water Treatment Plant, which can gravity feed to almost the entire District distribution system. As shown in Figure 7-1, the annual snowpack water content conditions are highly variable. The median water content at Mammoth Pass is about 3.5 inches below the average.

Figure 7-1 Water Content of Snowpack at Mammoth Pass 1931 - 2015



1. Source: CDEC Mammoth Pass USBR Gauge

In addition to environmental constraints on water supply, MCWD operates under water right restrictions contained in licenses and permit from the State Water Resources Control Board (SWRCB) and total usage is limited by a Settlement Agreement with the Los Angeles Department of Water and Power. In May 2011, the District completed and certified an environmental impact report (EIR) on fishery bypass flows for Mammoth Creek. Approval of this project and acceptance of the project terms by the SWRCB established, on a long-term basis, the fishery bypass flows and various other surface-water management requirements. The terms of diversion constraints contained in MCWD's water right licenses and permit are described in Table 7-1. In addition, completion of the EIR required a Settlement Agreement between LADWP and MCWD setting forth a limit on surface water diversions, groundwater extractions and recycled water deliveries.

Table 7-1 Constraints on Water Supply

Water supply source	Limitation quantification	Issue – Legal, Environmental, Water Quality, Climatic
Mammoth Creek Surface Water	Minimum diversion of 337 acre-feet under 1977 drought conditions. Maximum diversion of 2,670 ac-ft. under permit and license terms.	SWRCB water right permit 17332 and licenses 5715 and 12593: Requirements include ceasing diversions when creek flows are at or below specified mean daily fishery bypass flow rates that vary by month; diversion to Lake Mary storage limited to April 1 through July 1; seasonal storage drawdown is limited to 3 feet prior to September 15 without state and federal permission: maximum diversion to storage is limited to 606 acre-feet between April 1 – July 1 and 54 acre-feet between September 1 – September 30: maximum diversion rate limited to 5.0 cfs; total annual diversions are limited to maximum of 2,760 acre-feet. Climate – Annual surface water supply is dependent on annual snowpack water content. Precipitation as rain and above normal temperatures can cause earlier and larger runoff rates that cannot be captured in Lake Mary's minor storage pool (606 acre-feet).
Groundwater Wells	Limitations on annual yield are variable and based on reaching specified depths to water for each well. No quantity restrictions are identified.	Groundwater production can be limited by decreases in pumping levels due to inter-annual hydrologic conditions; total pumping and treatment capacity; poor water quality; and mechanical failures. Decreased groundwater levels lower yield from each well. The nine wells and two treatment plants have a maximum capacity based on facility size and features. Poor water quality limits production from some wells due to high arsenic levels. Measures to maximize the groundwater supply within these constraints include use of variable speed drive motors, GWTP improvements for arsenic removal, rotational pumping and conjunctive management of surface and groundwater supplies to minimize demands on the local aquifer.
Recycled water	640 acre-feet	The District has two recycled water agreements to deliver a total maximum of 640 acre-feet/year. Half of this amount depends on the future completion of a reservoir at the Snowcreek golf course to receive recycled water (expected to be completed in 2016), and construction of the Snowcreek Phase VIII development (golf course expansion, hotel, and housing). Production of the RW supply is constrained by mismatch of highest wastewater flows in winter and highest demand in summer; highly fluctuating inflows over weekends and holidays; composition of the wastewater; and limited storage capacity.
Surface, ground and recycled water	4,387 acre-feet	An Agreement between LADWP and MCWD in 2010 to end litigation over water rights requires that surface water diversions, groundwater extractions and deliveries of recycled water to be limited to 4,387 acre-feet. This limit was considered adequate to meet the Town's projected buildout demand, water treatment plant processing water needs, and distribution losses using the best available data and information during negotiations.

Annual groundwater production is variable, depending on the current water year type (wet, dry, normal) and availability of the resource depends on the preceding one to two water years, which influence recharge trends and groundwater basin levels. Groundwater production can also be limited by water quality (ability to treat raw water to required standards), declining depth to water and mechanical failures of pumps and motors. MCWD will be drilling a test well to investigate the feasibility of developing a new production well in 2017. A new well would provide additional redundancy in the system during mechanical failures and during periods of reduced production resulting from water quality concerns. In addition to a potential new well, MCWD will continue to improve and enforce water conservation measures contained in its Code Book and to promote water efficiency through MCWD sponsored programs and collaboration with the Town's CED Department.

7.2 Supply and Demand Assessment

This section presents an assessment of MCWD's water supply and demand balance under three standard water supply conditions, an Average Year, a Severe One-year Drought, and a sustained Multiple-Year drought for each of the five-year increments of the 20-year planning horizon. Service area demands and water supply are based on information presented in Chapters 4 and 6, respectively. The groundwater and surface water modeling tools and methods used to estimate these supplies are discussed in Chapter 6.

For this supply analysis, the Average Year is represented by averaging Mammoth Pass hydrologic conditions from 1940 through 2015, the Severe One-year Drought is represented by 2015 supply data, and the Multiple-year Drought is represented by data from 2013 through 2015, see Table 7-2. The volume of available water is influenced by the demand for the base years listed, except the Average Year used potable demand volumes from 2015 and the averaged raw and recycled demand from 1988 and 2015 (WEI 2016).

Table 7-2 Base Years Used for Reliability Assessment

Water Year Type	Base Year	Volume Available	% of Average Supply
Average	1940-2015	2,068[1]	100
Single Dry Year	2015	1,955	95
Multiple Dry Years			
Year 1	2013	1,989	96
Year 2	2014	1,959	95
Year 3	2015	1,955	95

(DWR Table 7-1)

1. Historical hydrology from Mammoth Pass. Water demand from 2015 potable demand and 1988 -2015 averaged raw and recycled water demand.

The following tables, 7-3 through 7-5, estimate water supply reliability for the UWMP 20-year planning horizon based on historical hydrology and demand presented in Table 7-2 under the three water supply conditions. Projections for future water demand were reduced under the Severe One-year and Multiple-year drought scenarios. For the Severe One-year Drought, Level 2 Water Shortage Restriction targets were assumed. The Level 2 Restrictions were also assumed for years 2 and 3 of the Multiple-year Drought scenario. Level 2 restrictions impose a 20% reduction of potable water demand and a 10% demand reduction from recycled/raw water customers. This level of conservation is more moderate than the Level 3, 30% reduction target that was actually implemented in 2015.

The water supply projections presented assume that higher surface water supplies will be available as demand increases during months that frequently underutilize supply due to low demand.

Table 7-3 Supply and Total Demand Comparison - Average Year

Planning Horizon Year	2020	2025	2030	2035
Supply Total	2,299	2,656	3,406	3,763
Demand Total	2,264	2,611	3,370	3,719
Difference	35	45	36	43

(DWR Table 7-2)

Table 7-4 Supply and Demand Comparison – Severe One-year Drought

Planning Horizon Year	2020	2025	2030	2035
Supply totals	2,299	2,656	3,406	3,763
Demand totals	1,831	2,109	2,741	3,020
Difference	468	547	665	743

(DWR Table 7-3)

Table 7-5 Supply and Demand Comparison – Multiple-year Drought

Planning Horizon Year		2020	2025	2030	2035
First year supply	Supply totals	2,299	2,656	3,406	3,763
	Demand totals	2,264	2,611	3,370	3,719
	Difference	35	45	36	44
Second year supply	Supply totals	2,299	2,656	3,406	3,763
	Demand totals	1,831	2,109	2,741	3,020
	Difference	468	547	665	743
Third year supply	Supply totals	2,299	2,656	3,406	3,763
	Demand totals	1,831	2,109	2,741	3,020
	Difference	468	547	665	743

(DWR Table 7-4)

Modeling results provided in the tables above indicate a sustainable supply of water during the Severe One-year and Multiple-year Drought scenarios based the hydrologic record. However, these results relied on a sequence of hydrological events that may not be repeated if warmer and drier conditions increase in frequency. Model projections for sustainability that reordered the sequence of hydrologic conditions to start with a long dry period, 1999 through 2015, followed by the 1957 through 1998 hydrology, resulted in some wells declining below sustainable production capacities during the Multiple-year Drought. Under this reordered scenario, in 2035, it should be expected that five of the wells would not be sustainable for 67%, 17% 11%, 6% and 1% of the year (WEI 2016).

MCWD management decisions to ensure a reliable water supply may affect the supply volumes presented in any given year. Every year, MCWD staff reviews water supply conditions and potential operational constraints that may limit water production. Water Shortage Restrictions may be implemented to reduce the pressure on mechanical equipment when relying on high groundwater production, to enhance aquifer recovery, and to avoid the necessity of implementing more severe water restrictions in the near future.

7.3 Minimum Supply Next Three Years

The CWC requires the UWMP include an estimate of the water supply for a six-year drought based on a three-year continuation (2016 – 2018) of the driest three-year sequence in the hydrologic records.

Hydrology data used for this projection are based on the years 2013 – 2015. The water supply estimated to be available in 2018 after six years of drought is 84% of the water demand projections for 2020, 2,264 acre-feet. The increase in supply through 2018 represents an assumed increase in water demand associated with increased population and development likely to occur over the three-year period. The supply projections were developed using the same methods described in the previous section.

Table 7-6 Minimum Supply Next Three Years

	2016	2017	2018
Available Water Supply	1,732	1,813	1,893

(DWR Table 8-4)

Summary Conclusions from Analysis of Buildout Water Supply Reliability

The water supply reliability analyses described in sections 7.2 and 7.3 support the following general conclusions. Based on the historical record, MCWD has adequate water supply to meet community needs under the full range of water year types, including both the Severe One-year and Multiple-year droughts. This is primarily due to the availability of local groundwater resources, the development of recycled water supplies and conservation. Groundwater supplied 91% and recycled water supplied 6% of total delivered water during the severe 2015 drought. In addition, during the 2015 six-month irrigation season when water demand is highest, demand decreased by 34% in comparison to 2013 usage.

During the intermediate planning horizons and through 2035 (Town buildout), the combined use of Mammoth Creek surface water, local groundwater, and recycled water results in a supply mix that can reliably meet the community needs under the full range of water year types. However, this long-range projection could be significantly impacted by future changes to both demands and supply. On the demand side, this analysis is largely influenced by the Town's land use policies on development type, density, and enforcement of their water-efficient landscape ordinance in addition to MCWD's implementation of water conservation regulations. Future demand projections incorporated demand reductions based water consumption during the 2012-2015 drought. Climate change will increase demand by lengthening and intensifying the irrigation season.

On the supply side, surface water could be adversely impacted by climate change reductions to snowpack water content and altered watershed runoff patterns, which cannot be adapted to without significantly increased surface water storage. Similarly, climate change could reduce local groundwater supplies by decreased recharge to the aquifer. Similarly, local groundwater supplies could be impacted by the major expansion of geothermal energy production planned at the Casa Diablo power plant complex as pressure changes in the geothermal fluid reservoir below the coldwater aquifer occur, or natural changes from seismic or volcanic activity causing changes to the local hydrogeologic characteristics. In addition, groundwater production wells decrease production as they age, so existing well infrastructure will need to be replaced and renewed to maintain groundwater production. Finally, the ability of MCWD to produce recycled water consistently is critical, as recycled water will make up about 14% of future supply when the expansion of the Snowcreek golf course and its related future resort development is completed. Each of these potential influences on future water supply and demand will need to be re-evaluated in the 2020 UWMP update to confirm the conclusions presented in this UWMP update.

7.4 Regional Supply Reliability

The Mammoth Lakes community relies solely on local water resources for its water supply. The town is located in a rural and remote setting that would not allow easy access to other water agencies or groundwater basins for supplemental water. To ensure a reliable supply to the community, MCWD uses a mix of surface, groundwater and recycled water resources. To increase rotational pumping flexibility and potentially augment supplies for buildout, MCWD is pursuing a new groundwater well. In the last five years, MCWD has made significant progress in strengthening and enforcing water conservation regulations and improving infrastructure to reduce water demand. MCWD places a high priority on maximizing the effectiveness of the available water resources to ensure a sustainable long-term water supply for the community.

This chapter discusses MCWD's plans for responding to a water shortage. Preparation is essential to maintain reliable supplies and reduce impacts of a supply interruption. CWC §10632 (a) requires an UWMP to include an urban water shortage contingency analysis. This chapter is designed to provide the required analysis.

8.1 Stages of Action

MCWD maintains regulations prohibiting water waste at all times. In addition to normal water condition regulations, the District is prepared for water shortages resulting from short-term emergencies or naturally occurring drought shortage conditions. The District closely monitors surface water supplies and water levels in production wells. Determining whether a water shortage condition may be expected is based on multiple factors such as the water content of the snowpack, declining groundwater levels, Lake Mary storage capacity, creek flows and the water availability of prior runoff years. Water shortages may also result from unplanned emergencies such as mechanical breakdown of treatment/production facilities or natural or human caused disasters.

Table 8-1 shows MCWD's categorization of water shortage conditions into four levels (Shortage Conditions) based on water supply and demand imbalances. Each level of Shortage Conditions is intended to reduce demand to continue providing a reliable water supply to customers. The Board of Directors (Board) may declare a Water Supply Shortage when there is a projected imbalance of water supply and peak demand. Once a declaration of a Water Supply Shortage resolution has been adopted, the Board may implement any of the four levels of shortage deemed necessary. Each shortage level corresponds to the estimated imbalance between supply and demand: Level 1 shortage is 10%, Level 2 is 20%, Level 3 is 30%, and at Level 4 the imbalance is 50% or greater.

Table 8-1 Water Shortage Levels and Associated Target Reductions

Stage	Percent Supply Reduction	Water Supply Condition
1	10%	A projected imbalance in available water supply and projected peak demand of 10% is likely.
2	20%	A projected imbalance in available water supply and projected peak demand of 20% is likely.
3	30%	A projected imbalance in available water supply and projected peak demand of 30% is likely.
4	50%	A projected imbalance in available water supply and projected peak demand of 50% or more is likely.

(DWR Table 8-1)

The recommendation for the appropriate level of the shortage shall be provided to the MCWD Board of Directors by the General Manager along with a written explanation of the facts and circumstances. The Board may vote by motion to implement any of the four levels of Shortage Conditions. During the Shortage Conditions, MCWD staff will continuously monitor the projected supply and demand. When supply conditions warrant, the General Manager will recommend to the Board that it either increase or decrease the water shortage level or terminate the restrictions. A copy of the ordinance describing this process and details of the Water Shortage Levels is provided in Appendix E, Water Code.

8.2 Prohibitions on End Uses

The four levels of Shortage Conditions that may be implemented by MCWD's Board of Directors contain restrictions to achieve the targeted percentage reduction necessary to balance supply and demand and maintain a reliable water supply to customers (see Table 8-2). The targeted level of reduction uses monthly 2013 consumption as a means of comparison. The restrictions contained under each shortage level are reviewed regularly and currently are deemed appropriate for achieving water conservation as required under the four levels of water shortage conditions.

Table 8-2 MCWD Water Shortage Levels and Restrictions

Stage	Restrictions (in effect 9-3-15)
	Hours/Day of Week of allowed irrigation (except golf courses, public parks and school playing fields)
Level 1	After 7 pm to 10 am / 3 days a week
Level 2	After 8 pm to 9 am / 3 days a week
Level 3	After 4 am to 7 am / 2 days a week
Level 4	All irrigation except golf courses, public parks, and school playing fields is prohibited
	Irrigation exemptions for hand-watering
Levels 1 & 2	Allowed Sun, Mon, Tues, Wed, Thurs, and Saturday between 5 pm to 10 am
Levels 3 & 4	Allowed Sun, Wed, Thurs, and Sat between 5 pm to 9 am.
	Repair of leaks after notification by MCWD or discovery by customer
Level 1	Within 5 days.
Level 2	Within 3 days.
Level 3	Within 3 days.
Level 4	Within 24 hours; rental units have 72 hours to correct.
	Water for construction
Level 2 - 4	Source limited to reclaimed water.
	Golf course, public park and school playing fields
Level 1	Owners shall submit a water conservation plan to reduce water by up to 10 percent. Until plan is approved, these fields are subject to Level 1 restrictions unless reclaimed water is used for irrigation.
Level 2	Owners shall submit a water conservation plan to reduce water by up to 20 percent. Until plan is approved, these fields are subject to Level 2 restrictions unless reclaimed water is used for irrigation.
Level 3	Owners shall submit a water conservation plan to reduce water by up to 30 percent. Until plan is approved, these fields are subject to Level 3 restrictions unless reclaimed water is used for irrigation.
Level 4	Owners shall submit a water conservation plan to reduce water by up to 50 percent. Until plan is approved, these fields are subject to Level 4 restrictions unless reclaimed water is used for irrigation.
	Ornamental ponds
Levels 1 & 2	Under state restriction as of July 2014: Potable water in a fountain or decorative water feature that is not part of a recirculating system is prohibited.
Levels 3 & 4	MCWD regulations: No refilling of ornamental ponds. Requests for exemptions may be made to MCWD.
	New lawns
Levels 1-4	No new lawns using potable water.
	Reseeding/replacing turf
Level 1-4	No more than 5% of turf may be rehabilitated. Must provide notice to the MCWD and receive approval.
Levels 2-4	No turf areas may be replaced or reseeded.

Stage	Restrictions (in effect 9-3-15)
Levels 1 - 3	**Vehicle washing** Must use a shut-off nozzle on hose.
Level 4	No vehicle washing is allowed.
Levels 1-4	**Washing down hard surfaces** Not allowed unless for health and safety requirements.
Level 1	**Irrigation account reductions based on MAWA:** Monthly consumption may not exceed 150% of MAWA.
Level 2	Monthly consumption may not exceed 125% of MAWA.
Level 3	Monthly consumption may not exceed 80% of MAWA.
Level 4	No landscape irrigation. Irrigation of parks, school playing fields and golf courses, see provision above.

(DWR Table 8-2)

8.2.1 Landscape Irrigation

Focusing Shortage Condition restrictions on inefficient and non-essential outdoor water use can result in significant water demand reductions. The irrigation season begins around May and runs through September in Mammoth Lakes. Irrigation water use accounts for about 40% of total annual water demand. Prior to 2013, inefficient irrigation practices were common. Conservation staff started meeting one-on-one with property managers and holding water-efficiency irrigation landscape classes in 2012. Enforcement of regulations targeting irrigation management were stepped up after giving property managers a reasonable time to adjust management practices to meet MCWD's water restrictions. Under Level 3 Shortage Conditions, MCWD customers reduced water consumption by 225 acre-feet during the four-month irrigation season, a 32% reduction, June through September 2015. Under Level 4 Shortage Conditions, the District would impose a total ban on all outdoor irrigation.

8.2.2 Commercial, Industrial, and Institutional (CII)

Water restrictions have not been targeted at reducing CII usage although restaurants may only serve water on request and lodging establishments must inform visitors that linen service is optional. MCWD CII customers are most likely to reduce consumption through more general water restrictions requiring efficient irrigation practices and leak repairs in a designated amount of time.

8.2.3 Water Features and Swimming Pools

New to the 2015 UWMP is a requirement to address definitions of water features and swimming pools for implementing water conservation measures (CWC § 10632(b)). MCWD follows the Health and Safety Code Section 11592 (a) as a definition of swimming pools and spas.

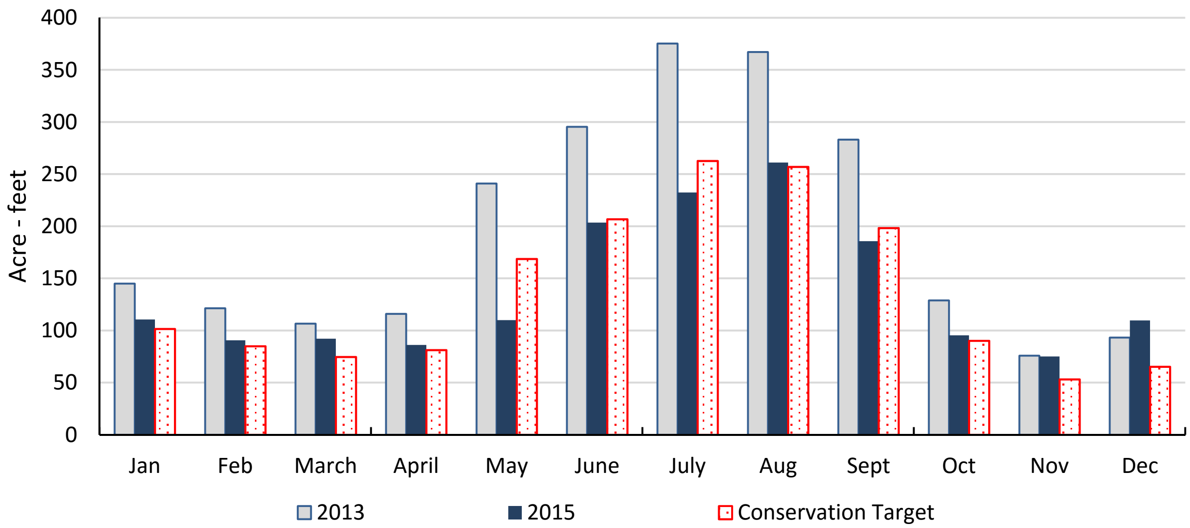
Health and Safety Code Section 11592 (a) "Swimming pool" or "pool" means any structure intended for swimming or recreational bathing that contains water over 18 inches deep. "Swimming pool: includes in-ground and above ground structures and includes, but is not limited to, hot tubs, spas, portable spas, and non-portable wading pools.

Water features have been defined by MCWD conservation staff as ponded or running water structures designed to receive potable, raw, or recycled water from MCWD and used for ornamental purposes.

Table 8-3 Enforcement of Water Restrictions, describes MCWD's regulations for ornamental water features and swimming pools. The most prominent water features in MCWD's service area are golf course ponds. Ponds that are used to hold irrigation water are allowed under conditions specified in MCWD's Code. Figure 8-1 shows actual water demand reductions during Level 3 Water Shortage

Restrictions implemented in April 2015. In November 2015, MCWD added a new customer with significant water demand and winter transient occupancy was higher than in 2013.

Figure 8-1 Actual Demand 2013 (comparison year), 2015 and MCWD 30% Reduction Target



8.3 Penalties, Charges, Other Enforcement of Prohibitions

MCWD has adopted an ordinance regarding the enforcement of the District water restrictions as summarized in Table 8-3, below. Accumulations of violations do not continue from year to year. MCWD's ordinance provides details on customer notification and fines, the Ordinance sections pertaining to water conservation, shortages, and enforcement is provided in Appendix E.

Table 8-3 Enforcement of Water Restrictions

Penalties or charges	Stage when implemented
Personal contact is made in addition to a written notice of violation. Customer has 48 hours to correct the violation when personally contacted or 7 days to correct if personal contact was unsuccessful and notification was through the mail.	First and second violation.
A written notice of violation is sent to customer. Customer has 7 days to correct. If no correction after 7 days, a $50/day fine is imposed until the violation is corrected, the meter is disconnected, or flow to the service line is restricted.	Third violation.
Customer receives a disconnect notice if continuation of the violation can be prevented by shutting off an irrigation only meter. If violation is related to domestic use or customer's meter is mixed-use, a flow-restrictor will be installed. A 48-hour notice is provided prior to shutting off a meter or installing a flow restrictor.	Fourth violation

When a customer's service is disconnected and/or reduced, the customer may request reconnection and/or removal of the flow restrictor upon payment of the sum of $100.00 per meter that is disconnected and $200 per meter for which a flow restrictor is installed to recover MCWD's cost to reconnect or restore normal water flow. In addition, payment of a $500 fine is required. A monthly $20 fee is imposed on each customer whose service has been reduced through the installation of a flow restrictor for each month or part thereof that the flow restrictor is in operation. The purpose of the fee is to reimburse MCWD for its cost in administering and processing flow restrictors and in monitoring the customer's water use.

8.4 Consumption Reduction Methods

Supplemental to the water conservation regulations, MCWD runs water conservation programs to reduce water demand. These programs are:

- Public Information Campaigns
- Water Use Surveys
- Rebates or Giveaways of Plumbing Fixtures and Devices
- Rebates for Landscape Irrigation Efficiency
- Reduce System Water Loss (MCWD system)
- Increase Water Waste Patrols

Details and descriptions of these programs are provided in Chapter 9, Demand Management Measures.

8.5 Determining Effectiveness of Water Shortage Reductions

Customer water usage is used to evaluate the effectiveness of water shortage regulations and consumption reduction programs. Since early 2015, customer hourly usage can be viewed the following day. Hourly usage allows MCWD staff to evaluate customer compliance with District regulations and alert customers about leaks. Prior to 2015, MCWD relied on monthly usage data to assess reductions. All MCWD customers are metered and billed monthly.

Emphasizing irrigation efficiency has been the most effective demand reduction program implemented by MCWD. However, variations in the timing of the beginning and end of the irrigation season, monthly temperature variations and summer precipitation can have a complicating effect on determining saving from landscape management regulations. A severe drought in 2015 resulted in the MCWD Board implementing Level 3 Shortage Restrictions in April 2015. MCWD's Level 3 Water Shortage Restrictions has a goal of reducing consumption by 30% in comparison with the same month in 2013. In addition to raising the water shortage level, the Board amended the water conservation ordinance to increase the effectiveness of the restrictions and improve enforcement provisions. In addition, in June 2015, the State set a cumulative reduction level of 20% for MCWD with 2013 as the baseline year. MCWD met the State requirements with a 28.2% cumulative reduction in December 2015. Significant water savings were obtained in 2015 during the irrigation season under Level 3 Water Shortage Restrictions in 2015 as demonstrated in Table 8-2 MCWD Water Shortage Levels and Restrictions. Implementing and enforcing water conservation has been effective at reducing demands such that State and MCWD goals are being met.

8.6 Revenue and Expenditure Impacts

During periods of plentiful water supply when no water conservation measures are in effect, District revenue from water consumption charges provides approximately 14% of total District revenue. The District's water rate structure minimizes the fluctuations in total revenue associated with fluctuations in water use revenue. Each 10% reduction in water use results in a total revenue loss of about 1.4%, about $200,000. Costs for delivering water during droughts increase compared to normal years. The ratio of groundwater to surface water increases as surface water availability decreases. Groundwater is more expensive to pump, treat and distribute than surface water.

The District maintains cash reserves to minimize the financial risk associated with reduced revenue or unexpected capital asset repairs or replacements. The reserve requirement set for water operations is equal to six months of operating expenses, approximately $1,630,000. One year with a 50% reduction in water supply would result in revenue loss of approximately $1,000,000. Three years with a 30% reduction in water supply would result in a cumulative revenue loss of $1,800,000.

In 2015, the District conducted a water rate study. The rate structure resulting from that study includes a provision for a water shortage surcharge. The surcharge is a fixed monthly amount per customer calculated to offset the revenue lost when conservation requirements reduce water use. The District Board of Directors has the option, at each level of water conservation, to implement the corresponding level of water shortage surcharge, a lower level of water shortage surcharge, or no water shortage surcharge. The Board adopted the surcharge on January 21, 2016.

The District has two sources of water – surface water from Lake Mary and groundwater. Surface water is the least expensive source: treatment costs are lower and the water flows by gravity to District customers. During the four-year drought period from 2012 to 2015, the surface water supply was depleted and the District's sole source in 2015 was groundwater. The additional cost of pumping and treating groundwater is estimated at $125,000 per year at a 30% supply reduction.
The District's cash reserves, in combination with the option of implementing a water shortage surcharge, minimize the risk that a loss of revenue from reduced water supply and increased cost associated with groundwater delivery would cause the District to be unable to meet ongoing operating expenses.

Table 8-4 shows the fiscal impacts of reduced water revenue, increased operating costs associated with groundwater delivery, and the potential offset of the water shortage surcharge.

Table 8-4 Fiscal Impacts of Water Restrictions on Revenue

Reduction	10%	20%	30%	40%	50%
Revenue loss from conservation	$(200,000)	$(400,000)	$(600,000)	$ (800,000)	$(1,000,000)
Additional groundwater costs			$(125,000)	$(112,000)	$(100,000)
Water shortage surcharge	$170,000	$340,000	$510,000	$850,000	$850,000
Net	$(30,000)	$(60,000)	$(215,000)	$(62,500)	$(250,000)

Impacts to revenues and expenditures resulting from catastrophic events can vary widely in extent and duration. The greatest natural threats come from fire or earthquake. Fire could damage or destroy the District's above-ground assets; earthquakes could damage or destroy both above-ground and below-ground assets. Contamination of the groundwater supply from geothermal power generation is an additional threat. The District would make every effort and financial commitment to maintain and repair services as quickly as possible as its first priority.

In addition to operating reserve funds, the District maintains capital reserves to provide for emergency capital expenditures. The fiscal impacts to water operations, to the extent they exceed existing operating reserves, would be addressed through some combination of fund transfers and deferral of planned capital expenditures. MCWD currently has over $12M in combined operations and capital available reserve fund balances.

8.7 Water Shortage Ordinance

The water conservation restrictions and means of enforcement are updated regularly to increase the effectiveness of restrictions and to address customer feedback. Provisions of the Ordinance are described under Section 8.1 and a copy of the pertinent Ordinance sections are provided in Appendix E.

8.8 Catastrophic Supply Interruption

To respond to emergency shortage situations, MCWD regularly updates its Emergency Response Plan (Plan) that contains actions to maintain service or restore service in instances of disruption. The Plan is summarized below in Table 8-5. In addition to response actions, the Plan includes estimates of water requirements for various types of emergencies and the capability for the system to meet these requirements.

Table 8-5 MCWD Emergency Response Plan Actions Regarding Water Supply

Emergency	Response
Loss of power at the surface water treatment plant	Stop flow to the treatment plant and place both groundwater treatment plants (GWTP) into service. Set appropriate booster pumps to deliver water from the GWTPs to zones and storage tanks normally served by the surface water treatment plant.
Loss of power at the groundwater treatment plant(s)	Shut down main electrical service breaker. Use surface water treatment plant and/or other groundwater treatment plant to supply storage tanks and service zones as needed.
Loss of access and power to Lakes Basin facilities: surface water treatment plant and wastewater (ww) lift stations.	Emergency standby power used to operate the water treatment plant. SCADA used to monitor the status of the treatment plant and all ww lift stations. Notify businesses in the Basin to minimize ww until electricity is functioning. Maintain contact with the Town Road Dept. for safe access into the Lakes Basin to conduct inspection of District facilities. Have necessary equipment available for immediate dispatch on notice of safe access.
Loss of power and access in Old Mammoth area: GWTP No. 1, 4 production wells and 1 sewer lift station impacted.	Monitor status of water storage tanks, water pressure in impacted service zone. Maintain contact with the Town Road Dept. for safe access to area to conduct inspection of District facilities. Have necessary equipment available for immediate dispatch on notice of safe access.
Chlorine gas leak at water treatment or wastewater plant.	Inspect the affected plant to determine risks and perform emergency repairs if possible. If gas plume present, evacuate immediate area. Notify Town police and fire department to assist in evacuation notification procedures. Evacuate additional areas according to wind direction.
Major earthquake and/or volcanic eruption: loss of power, treatment facilities, water storage tanks, underground pipe breakage, and release of hazardous chemicals.	Investigate operational status of all water and ww facilities through SCADA or physical inspection unless hazards exist. Staff to report to District headquarters and follow assigned procedures to perform inspections as safety allows. Inspection to follow prioritized list contained in plan. If necessary, isolate sections of the water distribution system to prevent loss of water and conserve supplies. Notify the public to conserve water. If present, volcanic ash may contaminate the surface water supply and foul air filters disabling vehicles and other motorized equipment.
Wildfire consideration	Fire-fighting would require up to 2,000 gallons of water per minute. If mains are damaged, fire-fighting supply may not be available. District storage tanks have a total capacity of 7,500,000 gallons. The order of priority for water supply will be fire safety, potable water for customers, sanitary needs for customers, and irrigation use.

This chapter describes MCWD's water conservation programs developed to ensure a reliable water supply to the community and to meet State conservation targets. The requirements for describing demand management measures has been modified since the 2010 UWMP. The previous fourteen measures that were included in the 2010 UWMP have been streamlined into six water conservation measures along with an "other" category. The following section describes the nature of each measure and the extent that each measure has been implemented by MCWD over the past five years.

9.1 Demand Management Measures for Retail Agencies

9.1.1 Water waste prevention ordinances

MCWD has enacted ordinances and enforcement procedures to prevent the waste of water. The water waste prevention ordinance is located in Chapter 12, Division XII, Section 12.01 C of the District Code. The District's mandatory permanent water conservation requirements are in effect at all times and are summarized below. In addition to the permanent conservation requirements, the conservation ordinance contains provisions for additional restrictions, Levels 1-4, based on the estimated shortfall between supply and demand. The District will continue to annually review its water waste prevention ordinance and amend it as necessary to incorporate advances in technology (e.g. hourly meter readings), support local ordinances and state laws intended to achieve water conservation, and to ensure that local and state conservation goals are met. Conservation ordinances and increased enforcement have been an effective tool for decreasing water waste. A copy of the Water Conservation Regulations is provided in Appendix E.

Permanent Water Conservation Requirements:

1. Runoff and Ponding –District supplied water may not flow from any hose, pipe, valve, faucet, sprinkler, or irrigation device for a distance of 50 feet or greater if such flow can reasonably be prevented and water may not pond to a depth greater than 0.25 inch in a street, parking area, or on other impervious surfaces.
2. No Overfilling of Swimming Pools and Spas – Overfilling of swimming pools and spas such that overflow water is discharged onto an adjoining sidewalk, driveway, street, alley, gutter or ditch is prohibited.
3. Leaks – No person shall permit leaks of water that he/she has the authority to eliminate.
4. Washing Hard Surface Areas – Washing down hard or paved surfaces, including but not limited to sidewalks, walkways, driveways, parking areas, tennis courts, patios or garages, is prohibited unless the hose is equipped with functioning automatic shut-off device.
5. Vehicle Washing – A hose used to wash commercial and noncommercial vehicles, boats, trailers and other types of vehicles is required to have a functioning automatic shut-off device.
6. Hose equipped with irrigation device - A hose connected to an irrigation device, e.g. landscape sprinkler, must be equipped with a timer that will automatically shut-off the water supply after a set amount of time.
7. Landscape Irrigation: Permitted Hours and Permitted Days of Week - The watering of vegetation outside of any building is permitted between the hours of 5:00 p.m. to 10:00 a.m. Customers with even numbered addresses are permitted to water outside vegetation only on Monday, Wednesday and Saturday. Customers with odd numbered addresses are permitted to water outside vegetation

only on Tuesday, Thursday and Sunday. For those customers who do not have a numbered address, the address is deemed an odd number. Provided that the customer has a District approved irrigation plan, a customer with an irrigation meter who does not exceed 150% of the District Maximum Applied Water Allowance (MAWA) shall not be subject to the even and odd day of week requirements, but shall comply with the time of day prohibitions.

8. Additional Irrigation Requirements – No person shall cause or permit the following:
    a. Misting of irrigation devices;
    b. Operation of a broken sprinkler head; or
    c. Operation of a sprinkler head out of adjustment and the arc of the spray head is over a street, parking area, or other impervious surface;
9. MAWA Exceedance - A customer with a separate irrigation meter shall not exceed 150% of the District MAWA.
10. Dining Establishments - shall serve water to customers only upon request.
11. Hotel or Motel Linen Laundry - The owner or operator of a hotel, motel or other establishment that offers or provides lodging or rental accommodations for compensation shall provide customers with the option of not having towels and linen laundered daily. They must prominently display notice of this option in each bathroom using clear and easily understood language.

<u>Implementation over past five years</u>
All of MCWD's customers are subject to the ordinances governing water regulations and enforcement. All 74 irrigation-only accounts have maximum applied water allowances (MAWA) tailored to their landscaped area. Monitoring irrigation allowances has had a significant impact on reducing irrigation usage. Reduced usage in 2015 was also a recognition of the severe drought conditions by our customers. Increasing enforcement, see Table 9-1, also has reduced demand in an amount that has not been quantified. The water savings resulting from this measure overlaps other programs such as leak detection and enforcing landscape water budgets. Therefore, no quantification of water savings are provided.

Table 9-1 Number of Watering Regulation Violations Issued

Year	Number of Violations issued
2011	32
2012	43
2013	0
2014	117
2015	182

<u>9.1.2 Metering</u>
Meters are required for all MCWD customers per District ordinance. Four large condominium complexes and one commercial business are sub-metered to separate irrigation water demand from domestic use. MCWD is not planning to sub-meter additional customers because the plumbing of large projects are not conducive to separating the irrigation supply from the domestic use.

<u>Implementation over past five years</u>
In early 2015, the District completed a major meter replacement project that installed an Advanced Meter Infrastructure (AMI) system. All meters were equipped with new radio communication systems. Of the District's 3,650 meters, all 3,367 meters that are 2 inches or less were replaced with Neptune T10

positive displacement meters. All T10 meters meet or exceed the latest AWWA C700 Standard. Five fixed-base AMI data collectors were installed to allow for two-way communication between all District meters and the collectors.

The completion of this project allows MCWD to receive hourly data from all meters on a 24-hour basis. Meter reading efficiency is over 99%, greatly improving water consumption and billing accuracy. Another full replacement of meters and registers is scheduled for 2034. Per standard maintenance procedures, meters are replaced as needed if a meter becomes defective, stops reading, loses accuracy or freezes. Although the hourly consumption data provides excellent enforcement capabilities, informs MCWD's leak detection program and provides valuable information to our customers, it is not feasible to separate water savings resulting from installation of the AMI from other MCWD water conservation program.

9.1.3 Conservation pricing

MCWD has tiered pricing that increases with higher consumption volumes for single-family; multifamily; combined domestic and commercial users; and irrigation customers. Customers receive a monthly water bill that includes a base water service charge based on meter size and a quantity rate charge. Quantity rate charges for domestic users and irrigation accounts are based on a tiered rate structure to encourage the reduction of water use. The tiered rate structure in effect from April 2013 through April 2016 is shown in Table 9-2. MCWD did not have a drought surcharge included in its rates for the period covered in this UWMP. However, in 2016, the MCWD Board of Directors adopted a new rate structure that includes a water shortage surcharge. The results of this new surcharge will be reported in MCWD's 2020 UWMP.

Implementation over past five years

In 2012, the District completed a rate study to ensure revenue and rate stability and to develop water and wastewater rates that are fair and equitable. With the 2012 rate study, the District added an Irrigation class. All accounts with a dedicated irrigation meter(s) are assigned a monthly allotment based on the size of their irrigated area. The customer is billed based on their usage in relation to the allotment. This price incentive made a drastic change in large irrigation customers' water usage. Table 9-2 shows the tiered rates for each of the District's customer classes. The rate structure is expected to encourage conservation and assist in managing system demand. It is not feasible to measure water conservation that resulted solely from conservation pricing.

Table 9-2 MCWD Water Commodity Rates ($/Kgal)

Customer Class	Usage – Up to (kgal)	April 2012	April 2013	April 2014	April 2015	April 2016
SFH						
Tier 1	8	$1.40	$1.43	$1.46	$1.49	$1.52
Tier 2	12	$2.34	$2.39	$2.44	$2.49	$2.54
Tier 3	20	$4.11	$4.20	$4.29	$4.38	$4.47
Tier 4	>20	$7.65	$7.81	$7.97	$8.13	$8.30
MFR						
Tier 1	4	$1.40	$1.43	$1.46	$1.49	$1.52
Tier 2	6	$2.34	$2.39	$2.44	$2.49	$2.54
Tier 3	11	$4.11	$4.20	$4.29	$4.38	$4.47
Tier 4	>11	$7.65	$7.81	$7.97	$8.13	$8.30
Commercial		$2.83	$2.89	$2.95	$3.01	$3.08
Irrigation						

Customer Class	Usage – Up to (kgal)	April 2012	April 2013	April 2014	April 2015	April 2016
Tier 1	0-100%	$3.22	$3.29	$3.36	$3.43	$3.50
Tier 2	100-200%	$4.11	$4.20	$4.29	$4.38	$4.47
Tier 3	200+%	$7.65	$7.81	$7.97	$8.13	$8.30

9.1.4 Public education and outreach

MCWD has an ongoing program to inform its customers about water supply conditions, conservation tips, landscape management practices, and other District programs. The program includes a school education program, public education workshops and tours, an advertisement campaign and actively updating the District's website, and Facebook and Twitter pages.

School Education Program

MCWD has co-sponsored the Mammoth Middle School sixth grade water and energy conservation program, LivingWise, every year since the 2006/2007 academic year. In addition, MCWD staff accommodates all requests from schools for tours or talks.

The 6th grade LivingWise program educates students about energy and water resource efficiency. The program provides each student with water efficient aerators for the kitchen and bathroom and a water efficient showerhead. To develop an understanding of water and energy use, students conduct an indoor water and energy audit and use this information to reduce those resource demands by installing the free fixtures and making other lifestyle changes in their homes. In addition to the classroom curriculum, the students learn about their local water supply and MCWD's wastewater treatment by participating in an MCWD led tour of the Mammoth Lakes basin, environmental monitoring stations, a water treatment plant, and the wastewater treatment plant and laboratory.

Implementation over past five years

The program is ongoing and reaches all 6th grade children in the Mammoth Lakes' public school system. Importantly, the program provides the information necessary for a lifetime of practicing resource conservation. According to the official program review, LivingWise stimulates annual savings of 221,841 gallons of water. Table 9-3 below, illustrates program costs and estimated water savings, but does not include staff time for classroom presentations and organizing and leading field trips.

Table 9-3 LivingWise Program - Water Savings and Program Costs

Year	2011	2012	2013	2014	2015
Program participants	100	84	116	99	91
Estimate of Annual Water Savings (gallons)	322,869	237,814	532,271	281,748	221,841
Program cost	$4,000	$4,000	$4,000	$4,000	$4,000

Public Workshops, Classes and Tours

The public is an essential component of achieving water demand reductions. MCWD reaches out to the community and businesses to enhance learning opportunities that emphasize water efficiency, provide a forum for interaction with MCWD staff, and demonstrate MCWD operation through tours and lectures. Classes targeting working community members, e.g. landscape maintenance employees and landscapers, are held during the lunch hour with lunch provided by the District to facilitate participation.

<u>Implementation over past five years</u>

In 2013, MCWD offered its first Qualified Water Efficient Landscaper (QWEL) certification course. The purpose of the workshop is to teach landscape professionals, property managers, and homeowners about numerous landscape management and local water conservation topics. The course covered 12 topics over four weeks ending with a final exam and a requirement to complete a water audit. Twenty-one people participated including members of the public not pursuing QWEL certification. Subjects covered include local water resources, irrigation system efficiencies, soil amendments, plant selection, water budgets and landscape management. Participants may receive a certification when they complete the course, pass an exam and successfully complete a water audit. The District plans to offer this course bi-annually. However, making the class available will depend on interest.

Twelve of the participants met all the course requirements and received a QWEL certificate. Water savings resulting from this course are difficult to track for several reasons: the size, existing irrigation efficiency, and landscape of each property is unique, homeowner associations have different levels of interest in incurring costs to reduce demand, and MCWD does not track all landscapes managed by certified landscapers.

MCWD regularly conducts tours of the wastewater treatment plant to educate customers on the water distribution and wastewater collection systems, energy impacts of water delivery, and promote water conservation programs. MCWD views the tours as an opportunity to engage customers and promote awareness about MCWD operations and water demand. In 2013 and 2014, the District offered the public a tour of its Wastewater Treatment Plant facilities. The District plans to offers this tour annually or biannually. Prior to touring the wastewater plant, participants are informed about our water resources, MCWD's water and wastewater infrastructure, current water conditions, and water conservation regulations.

There were 22 participants in 2013 and 8 participants in 2014. It is unknown how much water saving may result from this educational program.

MCWD's leak detection program implemented with the new AMI system called customers when leak alerts were identified. This new program demonstrated a need to show customers, property managers and plumbers how to efficiently search for leaks. In 2015, the District offered its first Leak Detection Class. The 1.5-hour Leak Detection course discussed efficient methods to find leaks on a property, handling District's meter pits and equipment, and ended with a final exam. In addition to teaching effective leak detection and protecting MCWD property, MCWD benefited by providing a forum for local contractors and District staff to discuss various rules and regulations on an informal basis. Plumbers that passed the course were listed on the MCWD website as having passed the Leak Detection course. Lunch was provided to enhance participation by workers using their lunch hour to attend.

Fifteen people took the Leak Detection Class and nine plumbers passed the test. Increasing the effectiveness of local plumbers to quickly and safely identify and correct leaks will help save water. MCWD does not have a method to estimate savings resulting from this class.

Several classes and workshops pertaining to landscape water-efficiency were offered during the past five years. Classes are held during the lunch hour and MCWD provides lunch and so workers. These learning opportunities included workshops and field visits to learn about new sprinkler and controller technologies in collaboration with the irrigation company, RainBird. A class on Water Efficient Lawn Care: how to care for short-season lawns in high altitude climates was taught by the U.C. Master

Gardener program. Two classes, Soil Amendments: How to Amend Your Soil to Maximize Water Efficiency and Effects of Mulching: Utilizing Mulch to Conserve Water in Landscapes, were taught by the local U.C. Agriculture and Natural Resource Advisor, Dustin Blakey. These classes are held during the lunch hour to enhance participation from working people.

The landscape water-efficiency courses provide District customers with information to improve their management practices. However, it is not possible to calculate a water savings for hosting these courses. Table 9-4 shows the number of participants and cost to the District. Costs do not include advertising expenses.

Table 9-4 Landscape Water Efficiency Workshops and Expenses

Course	# of Participants	Cost
Soil Amendments - 2015	18	$134.75
Effects of Mulching - 2015	16	$157.23
Water Efficient Lawn Care - 2012	38	$614.20
Water Efficient Irrigation Workshop - 2011	23	$361.16

Advertisements and Press Releases

MCWD regularly publishes advertisements and provides press releases to the local papers and radio stations. Frequency of advertisements and press releases are highest during the irrigation season to remind customers to conserve water during the peak demand season and to inform residents and visitors of MCWD's water conservation regulations. In addition, the public is informed about the location of construction projects and any potential disruptions of service. Outside the irrigation season, topics include minimizing the buildup of fats, oils and grease (FOG) in the sewer system, and the rebate program. The District does not regularly put out a newsletter, although one was distributed in late autumn of 2015.

Implementation over past five years

The District increased advertising funds in 2014 and 2015 in response to conservation directives by the State and the adoption of Level 3 Shortage Condition restrictions for MCWD customers. It is not possible to estimate savings resulting from this program. See Table 9-5 for amounts spent on advertising.

Table 9-5 Annual Advertising Expenditures

2011	2012	2013	2014	2015
$19,700	$14,700	$11,800	$15,300	$23,550

Conservation rebates and free conservation items

MCWD's ongoing rebate program includes high efficiency toilets, clothes washers, showerheads, and new pressure regulating valves on sprinkler irrigation systems. In addition, free conservation items are provided in the field, at public events, and at the District's front reception desk.

Communicating water use via water bills

MCWD water bills compare current monthly use with the previous year. A conservation message to customers is also included on the bill.

Information booths at fairs and public events

MCWD attends fairs and public events to educate the public about conservation and general MCWD services. Mammoth Lakes is a relatively small community, so there are few opportunities for fairs and community events conducive to this type of outreach.

Informative websites, online tools, or social media

MCWD utilizes its website and social media for public outreach. Messages are updated regularly. Topics include all District operations in addition to conservation information.

<u>9.1.5 Programs to assess and manage distribution system loss</u>

The District identified old leaking steel water mains as a significant source of water loss in the early 2000s. Non-revenue water represented about 16 - 25% of total produced water. MCWD has consistently implemented programs to reduce distribution losses by replacing aging steel mainlines and laterals to customer's properties and installing master meters at large properties with long laterals leading to meters. In addition, non-revenue water is evaluated monthly. The monthly auditing procedure compares effluent volume from the water treatment plants to the volume of billed water. This program has been an effective mechanism for quickly responding to water losses and for assessing inconsistent water usage that may indicate leaks or failing meters. The monthly water audits are presented to the MCWD Board of Directors and are evaluated and discussed at the staff and management level to discuss potential solutions and resolution. In 2015, MCWD begin using the AWWA Water Audit Manual and Software. The results are reported in Chapter 4 section 4.3.

<u>Implementation over past five years</u>

In 2013, MCWD completed a high priority project to replace over 110,700 feet (21 miles) of aging steel water distribution mains. This project resulted in reducing distribution water losses to about 7% and significantly reducing staff responses to emergency leak repairs. In 2014, MCWD continued with infrastructure improvements to reduce distribution losses by initiating a project to replace all lateral water lines. In addition, MCWD has invested in underground pipeline leak-detection equipment that allows routine leak detection surveys to locate leaks for repair before they appear on the surface. In 2010, MCWD began a master metering project on developments having long laterals on the customer's property before reaching the customer's meter(s). The new master meters capture water losses occurring on the customer's property but not captured in the billing usage. Master meters in parallel with sub-meters can also be used to separate irrigation from domestic use.

<u>9.1.6 Water conservation program coordination and staffing support</u>

MCWD maintains a Conservation Coordinator under the title Public Affairs/Environmental Specialist on staff. The Coordinator develops public information for the local media outlets, works with the Town to encourage water demand reduction in new developments and landscaping, and develops and implements water conservation programs for MCWD. A Project Specialist position at MCWD provides significant support to the water conservation activities and programs at MCWD. The Coordinator and the Project Specialist work with all District departments to maintain water conservation savings, achieve the conservation targets during Water Shortage conditions, and inform the public about MCWD activities that affect the community.

Implementation over past five years

Both the Coordinator and Project Specialist are permanent positions at MCWD and have been staffed for the past five years. The District does not estimate water savings resulting from maintaining these staff positions.

9.1.7 Other demand management measures

Rebate Program

MCWD has had a water efficient fixture rebate program since 2006. The MCWD Board of Directors provides for the program through an annual budgeting process. The program provides customers with a rebate on WaterSense labeled toilets and showerheads, clothes washers, and pressure reducing valves on irrigation systems.

A rebate of up to $200 per toilet for the first two toilets in a unit is available and additional toilets may receive a rebate of up to $100 per toilet. Eligible new clothes washers must have a water factor (WF) of 4.5 or less. Clothes washer rebates are $300 for single-family residence and $400 for common area machines. Eligible showerheads must be WaterSense labeled to receive a $50 rebate. No rebate is provided if a shower contains multiple showerheads. MCWD's program also rebates new Pressure Reducing Valves (PRVs) installed on irrigation systems. Eligible PRVs must be from a District approved list. Rebate amounts are based on size of the pressure reducing valve: ¾" - $150.00, 1" - $200.00, 1¼" - $300.00, 1½" - $450.00, 2" – $550.00. New construction projects governed by the Green Building Code Standards and new toilets added to a building are not eligible for the rebate program.

Implementation over past five years

The rebate program has increased in popularity over the past five years as the public and business community becomes more aware of the program. Annual spending for the program and water savings is shown below in Table 9-6.

Table 9-6 Rebate Program Summary 2011 - 2015

	2011	2012	2013	2014	2015
Toilets	106	211	211	385	661
Showerheads	N/A*	11	27	150	255
Clothes washers	23	10	14	19	21
Pressure Reducing Valves	0	4	23	8	5
Estimated Water Savings**	789,800	1,125,000	1,374,000	2,019,000	3,660,000
Total Amount Rebated	$29,735	$44,659	$48,0004	$86,958	$131,310

* Showerhead rebate not included in program
** Estimated Water Savings does not include an estimate savings for pressure reducing valves

Free water efficiency items

The District provides a variety of free water saving items to customers such as hose shut-off nozzles and timers, sink aerators, showerheads, shower timers, dish squeegees, and pre-rinse fixtures. Providing free water efficiency items to customers has boosted customer relations and demonstrated the ease of making minor changes that have little to no impact on lifestyle. Free irrigation items are carried by field crews to facilitate conversations with customers violating irrigation regulations.

<u>Implementation over past five years</u>
In 2013, the District started purchasing water efficiency items to provide to customers at no cost. Items are available for pick up at the District front desk, provided in the field, made available at workshops and tours, and provided to condominium complexes upon request. Table 9-7 shows spending incurred by MCWD to provide free water conservation items to customers.

Table 9-7 Expenses for Free Efficiency Items

Calendar Year	2011	2012	2013	2014	2015
Amount Spent on free items	*	*	$650	$780	$1,196

* Free water efficiency items were not accounted for as a separate line item

Leak Detection Program

MCWD has used monthly billing data to identify unusually high usage that may indicate leaks on a customer's premises. Since January 2015, the District is able to access customer hourly consumption data with a newly installed AMI system. Hourly data provides detailed information that allows MCWD to identify customer leaks that are unidentifiable with only monthly data. MCWD notifies customers of leaks and customers are given a specified period for repair depending on the size and duration of the leak and any water shortage condition that may be in effect. Customers are responsible for repairing leaks on their side of the meter and they may be subject to penalties if repairs are not made within designated timelines.

<u>Implementation over past five years</u>
Hourly water usage data available since 2015 is used to identify accounts with continuous consumption. These accounts are flagged and reviewed. If District staff determines that the property appears to have a leak, the customer is contacted and recommendations for finding the leak are provided by MCWD staff. The program has saved a significant amount of water and contributed to positive customer relationships. As of December 2015, 230 customers had been contacted about leaks on their property. As a result, approximately 9,000 gallons of water per hour or 242.4 acre-feet a year are being saved.

9.2 Planned Implementation to Achieve Water Use Targets

MCWD has met its interim and 2020 water use targets. However, all the demand management measures described in Section 9.1 will continue. MCWD plans to continue water conservation programs to ensure a reliable supply for the Town of Mammoth Lakes now and into the future, especially as the specific impacts of climate change remain uncertain.

The UWMPA guidelines require that, prior to adoption of the 2015 UWMP, the District must provide a draft for public review and provide notice to the public and pertinent agencies of a public hearing to accept comments. The District's Board of Directors will consider adoption of the 2015 UWMP following the public hearing. After the UWMP is adopted, a copy of the final 2015 UWMP must be filed with the Department of Water Resources (DWR) within 30 days of adoption.

10.1 Notice of Public Hearing

The draft 2015 UWMP was made available to the public for review at the Mammoth Lakes branch of the Mono County Public Libraries and the District office and was available for download from the District's website. A link to the draft 2015 UWMP and the Notice of a Public Hearing were provided to the Town Manager, the Mono County Administrative Officer, and those agencies listed in Table 2-2 Agencies/Organizations Notified of UWMP Update on December 7, 2016. A Notice of a Public Hearing on the 2015 UWMP that included information on obtaining copies of the draft plan for review and comment was published in the local paper for two successive weeks, December 16 and 22, 2016, and posted on the District's website. News releases were provided to the local radio stations. The Notice of a Public Hearing is provided in Appendix C.

10.2 Public Hearing and Adoption

The public hearing and subsequent consideration for adoption occurred on January 19, 2017. During the public hearing and subsequent Board meeting to discuss adoption, the Board discussed baseline water use and future targets, MCWD conservation programs and their economic impacts, and the methods used to determine urban water use. Resolution 01-19-17-04 adopting MCWD's 2015 UWMP was passed, with a minor revision of the text, during the regular Board meeting. The resolution is included as Appendix D.

10.3 Plan Submittal and Public Availability

DWR and the State Library will receive a copy of the final 2015 UWMP within 30 days of adoption by the District's Board of Directors. In addition, copies will be provided to the planning departments of the Town and Mono County within the same timeframe. An electronic copy will be available from MCWD's website: www.mcwd.dst.ca.us and a hardcopy can be viewed at the District's office located at 1315 Meridian Boulevard in Mammoth Lakes, California during regular office hours.

10.4 Amending an Adopted UWMP

Subsequent to adoption, any amendments or changes to the 2015 UWMP will comply with the same procedures for adoption and submittal to state and local agencies as described in this Chapter.

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