Truckee Water System
Water Master Plan Update

Adopted
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Board of Directors
Joseph R. Aguera
Jeff Bender
J. Ron Hemig
Tony Laliotis
Vacant Position

General Manager
Michael D. Holley

Prepared by:
Neil Kaufman
Water System Engineer

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SECTION 1

INTRODUCTION

SECTION 1
INTRODUCTION

The Truckee Donner Public Utility District (District) provides water service to portions of the Town of Truckee, California, along with adjacent unincorporated areas of Nevada and Placer Counties. The District operates two separate water systems in the Truckee area: the Hirschdale System and the Truckee System. The general location of the District is given in **Figure 1-1** and the boundaries of the District's water system service areas are shown in **Figure 1-2**.

The Truckee area currently has a permanent population of about 16,280. The Town of Truckee's current ***General Plan*** was prepared in 2006. The General Plan projected population growth to occur at about two percent per year, eventually reaching a buildout population of 28,300 permanent residents. With this expected and ongoing growth, the District desires to develop an orderly planned improvement program to replace aging infrastructure and ensure that water of suitable quantity and quality is available for the projected future population.

The Hirschdale System is rather small, consisting of:

- One pressure zone
- One well
- One storage tank
- About 3,100 feet of pipeline

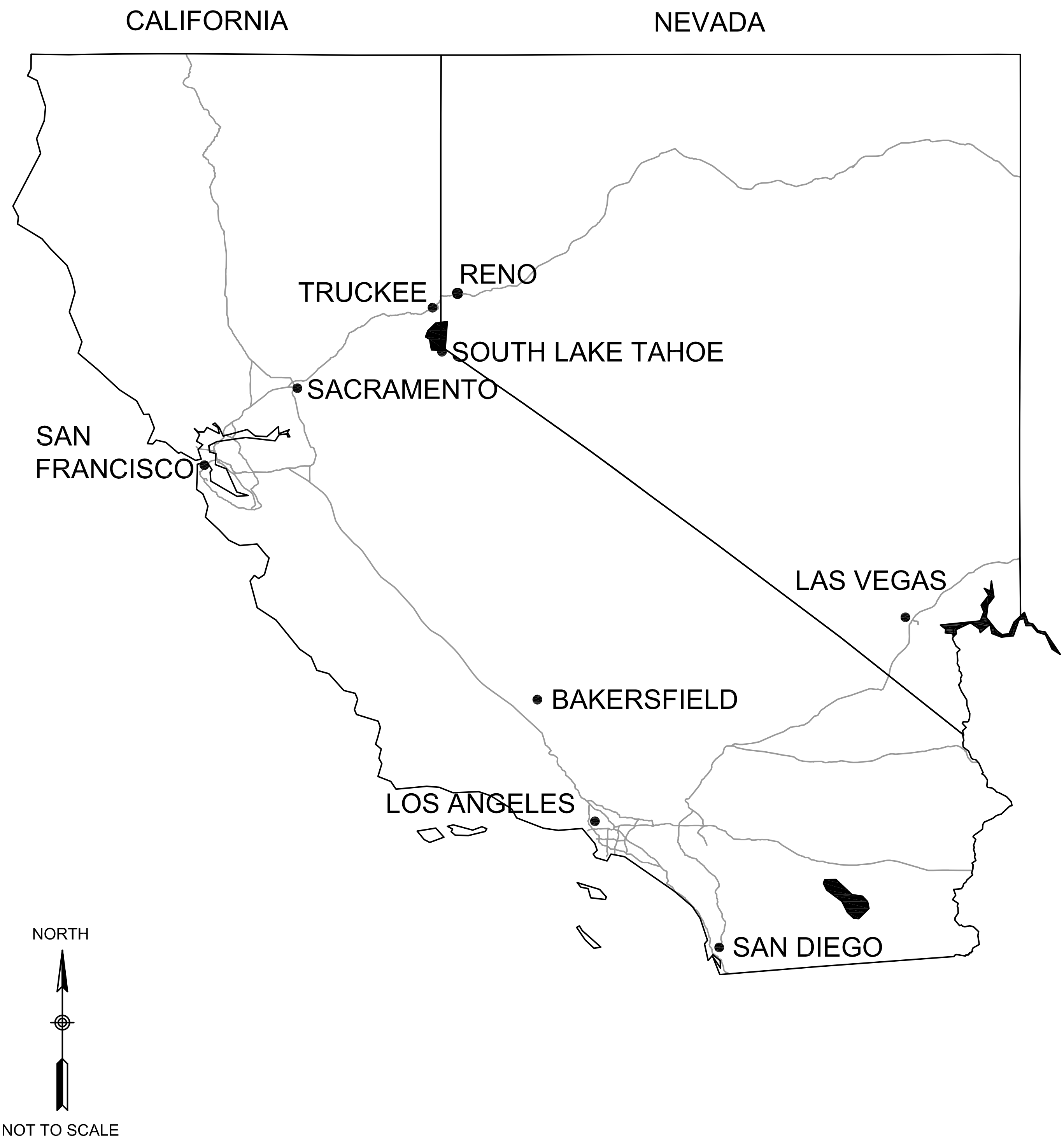
In contrast, the Truckee System is a reasonably complicated system, consisting of:

- 46 pressure zones
- 12 active and 3 inactive potable water wells
- 3 active non-potable wells
- 32 active and three inactive storage tanks
- 25 pumping stations
- About 216 miles of pipeline ranging from 2-inches to 24-inches in diameter
- 40 control valve stations

DISTRICT HISTORY AND BACKGROUND

Public water service in the Truckee area began in 1880, when the Schaeffer Lumber Company developed the Tonini Spring to serve what is now downtown Truckee. In 1883, the McGlashan infiltration gallery was constructed, along with a transmission system to convey water to the downtown area. In 1885, the adjacent McGlashan Spring was developed.

In 1927, the Truckee Donner Public Utility District was formed to provide electrical service to the Truckee area. In 1935, the District began providing water service with the purchase of the McGlashan water system. In 1943, the Southside Spring was acquired by the District and in 1953, the Tonini Spring water system was obtained by the District.



TRUCKEE DONNER
Public Utility District

Figure 1-1
Location Map

Originally, the District's water system provided service to only the downtown area. The system was expanded to serve the Gateway and Meadow Park areas in the late 1940s. Significant expansion of the District's service area occurred in the 1960s as new residential subdivisions were constructed in the area.

Service was extended to the Olympic Heights area in the early 1960s, and the Sierra Meadows area in the mid-1960s. The Tahoe-Donner, Prosser Lakeview and Ponderosa Palisades areas were developed in the late 1960s, and the Armstrong area in the late 1970s.

In 1988, the Hirschdale Water System was constructed by the District at the request of the California Department of Health Services. In the Summer of 2000, an 8-inch pipeline was constructed to provide irrigation water service to the Coyote Moon Golf Course from the Donner Creek Well. Connections from this pipeline to the irrigation systems at Meadow Park and the School District campus are also planned, but have not yet been constructed.

Prior to 2001, there were two other water purveyors in the Truckee area. In the Summer of 2001, the District took possession of the Donner Lake Water System. In February of 2002, the District took possession of the Glenshire Mutual Water Company's system.

Significant development occurred during the 2000s. New residential developments included Gray's Crossing, Old Greenwood, Spring Creek and Winter Creek. Non-residential development included the Alder Creek Middle School, Pioneer Commerce Center and the Sierra College campus. A large number of infill homes were also constructed on vacant lots in the older subdivisions.

SCOPE OF THIS STUDY

This Master Plan study deals with the existing and future water system in the Truckee Service Area as defined in **Figure 1-2**. It is expected that a pipeline will be constructed to connect the Hirschdale Water System to the Truckee Water System at some point. As such, discussions of the Hirschdale Water System are included in this document with the expectation that it will be integrated to form a single water system in the future.

The technical analyses that form the basis of this document were performed during the Summer and Fall of 2011. Consequently, data regarding existing population, existing water demands, rates and fees and other issues is current as of December 31, 2010, and the existing system configuration is current as of the Spring of 2011. New projects and modifications to the water system that have occurred since that time are not described as "Existing" and will be discussed in future Master Plan updates.

DATA SOURCES

Many reports, studies, and other sources of information were utilized in the preparation of this Master Plan. Material was obtained from the following sources:

- Truckee Fire Protection District
- Town of Truckee
- California Department of Health Services

- California Department of Finance

PREVIOUS STUDIES

This Water Master Plan Update represents the next step of an ongoing process of planning and upgrading the water system to ensure that customer demands can be met with sufficient volumes of high quality water supplies. Previous Water Master Plan Updates have been developed and were adopted by the Board. They are listed below:

- *Report on Truckee Public Utility District Water Works*. Prepared for the Truckee Public Utility District by L. Cedric MacAbee. Palo Alto, California. July 1949.

- *Preliminary Feasibility Report on Truckee Water Systems*. Prepared for the Truckee Public Utility District by T.H. McGuire & Son. Grass Valley, California. May 1960.

- *Water Master Plan*. Prepared for the Truckee Public Utility District by Walters, Ball, Hibdon and Shaw. Reno, Nevada. November 1968.

- *Water System Analysis Report*. Prepared for the Truckee Donner Public Utility District by Cook Associates. Oroville, California. October 1976.

- *Composite Water System Analysis*. Prepared for the Truckee Donner Public Utility District by Cook Associates. Oroville, California. 1981.

- *Water System Master Plan*. Prepared for the Truckee Donner Public Utility District by Sauers Engineering, Inc. Nevada City, California. December 1990.

- *Water System Master Plan, 1995 - 2015*. Prepared for the Truckee Donner Public Utility District by Sauers Engineering, Inc. Nevada City, California. March 1997.

- *Water Master Plan Update, March 2001*. Prepared for the Truckee Donner Public Utility District by District Staff. Truckee, California. March 2001.

- *Water Master Plan Update, June 2004*. Prepared for the Truckee Donner Public Utility District by District Staff. Truckee, California. June 2004.

Other relevant studies used in the development of this Master Plan Update are:

- *Availability of Ground Water*. Prepared for the Truckee Donner Public Utility District by Hydro-Search Inc. Reno, Nevada. February 1974.

- *Truckee and Vicinity Ground-Water Resource Evaluation*. Prepared for Dart Resorts by Hydro-Search Inc. Reno, Nevada. April 1980.

- *Ground-Water Management Plan, Phase 1, Martis Valley Ground-Water Basin, Basin No. 6-67, Nevada and Placer Counties, California*. Prepared for the Truckee Donner Public Utility District by Hydro-Search Inc. Reno, Nevada. January 1995.

- *Ground Water Resource Evaluation*. Prepared for the Truckee Donner Public Utility District by Nimbus Engineers. Reno, Nevada. October 2000.

- *Ground Water Availability in the Martis Valley Ground Water Basin, Nevada and Placer Counties, California*. Prepared for the Truckee Donner Public Utility District, Placer County Water Agency and Northstar Community Services District by Nimbus Engineers. Reno, Nevada. March 2001.

- *Technical Review Report for State Revolving Fund Application for Donner Lake Water Company, A Subsidiary of Del Oro Water Company*. Prepared by the California Department of Health Services. Sacramento, California. August 1999.

- *Glenshire Mutual Water Company Water System Master Plan, 2001*. Prepared for the Glenshire Mutual Water Company by Lumos and Associates. Carson City, Nevada. April 2001.

- *Town of Truckee 2025 General Plan*. Prepared for the Town of Truckee by Design, Community and Environment. Berkeley, California. November 2006.

ABBREVIATIONS

To conserve space and improve readability, abbreviations have been used in this report. Each abbreviation has been spelled out in the text the first time it is used. Subsequent usage of the term is usually identified by its abbreviation.

SECTION 2

SYSTEM PLANNING CRITERIA

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SYSTEM PLANNING CRITERIA

This section provides a discussion of the system criteria developed for evaluating master planning scenarios. It also includes cost estimating criteria used in developing cost estimates and determining the financial impact of the recommended improvements.

METHOD OF EVALUATION

A number of analyses were performed during the preparation of this Master Plan document. These analyses include both computer model simulations and desktop analysis. These analyses identified a number of projects that need to be constructed to improve system performance based on the criteria described in this Section.

The computer model simulation and other analyses identify current system performance. These analyses, in conjunction with the current planning criteria, identify the need for system improvements. This current planning criteria that is applied to the design of new facilities has changed over time due to changes in customer behavior and revisions to the Uniform Fire Code, the Uniform Plumbing Code and water industry standard operating practices. The new planning criteria would apply to new construction. It would also apply to new construction within existing areas. This could result in two very similar adjacent projects having significantly different planning criteria if they were constructed 30 years apart.

In a few cases, the need for additional infrastructure was identified in previous Master Plan studies. In many other cases, the need for improvements resulted from growth that occurred since the previous studies were prepared. These previous studies may have identified recommended improvements that would, if constructed, improve system performance. However, previously recommended improvements may not have been constructed due to changing District priorities or limited available funds. However, that fact that the facilities have not yet been constructed does not invalidate the fact that the facilities are needed because of the impact of growth.

PLANNING CRITERIA

To properly evaluate a water system, it is necessary to first define the planning criteria to be used in determining what improvements are needed for proper system performance today, and in the future. The planning criteria presented here are compiled based on typical criteria used by similar water purveyors, the California Department of Health Services, the California Public Utility Commission requirements, and commonly accepted industry standards. The “industry standards” are typical ranges of acceptable values for the criteria and are utilized more as a check to confirm that the values being developed are reasonable.

Several evaluation criteria are important for this study, including adequacy of water sources, system pressures, maximum pipeline velocities, water storage volumes, fire fighting capabilities, and back-up power and equipment for emergency purposes. Each of these criteria is discussed in more detail below and a summary of the recommendations for system criteria to be used is presented in **Table 2-1**.

Table 2-1. System Planning Criteria

Description	Criteria
Water Sources	Meet maximum day demand with the largest well out of service
Minimum System Pressure	
Average Day Demand	40 psi
Maximum Day Demand	40 psi
Maximum Day Demand plus Fire	20 psi
Peak Hour Demand	30 psi
Maximum Pipeline Velocity	
Normal Conditions	5 fps
Fire Flow and Emergency Conditions	10 fps

psi = pounds per square inch
fps = feet per second

Water Sources

According to the California Department of Health Services, a water system is required to have adequate source water to supply the maximum day demand for the distribution system with the single largest source out of service. Demands in excess of the average on the maximum day should be supplied either from tank storage or from groundwater storage via additional groundwater well pumping capacity. This recommended operational plan typically is also good economic practice. The District's planning criteria requires that source water capacity meet the maximum day demand with the largest single groundwater well out of service.

Water Quality

A primary concern of all water purveyors is providing water to customers that is of adequate quality to meet health, safety, and aesthetic standards. The water obtained by District is of good quality. Water quality issues are discussed in detail in Section 5.

System Pressures

Acceptable system pressures are typically determined by several criteria, including what has been acceptable to customers in the past and the District's goals for the system in general. System pressures are evaluated under four scenarios: peak hour, maximum day, average day, and maximum day plus fire. Pressures are recommended to be acceptable if they are at least 20 pounds per square inch (psi) during the average hour of the maximum day with a fire occurring, if they are at least 40 psi during average day and maximum day conditions, and if they are at least 30 psi during peak hour conditions.

Areas that cannot meet these criteria are identified and recommendations for improvements regarding these areas are made. Only locations within the service area for a given pressure zone are evaluated, areas of low pressures adjacent to storage tanks, wells, and pump stations are not considered for pressure evaluation purposes.

Most water systems attempt to maintain a maximum pressure of 100 psi. However, CPUC Standards and the Uniform Plumbing Code allow pressures up to 125 psi. There are numerous locations in the District's water system where pressures exceed 125 psi currently. Modifications to the system to limit system pressures below 100 psi would require the abandonment and reconstruction of almost every storage tank and pumping station in the system, along with the construction of additional facilities. Such a massive reconstruction of the water system is not considered economically feasible, or even desirable. However, there are small areas of the system where pressures can be reduced by piping modifications or constructing pressure reducing stations. In areas of new construction, every effort will be made to limit pressures to at most 100 psi.

Pipeline Velocities

Distribution system pipelines are evaluated based on meeting maximum day plus fire flows and peak hour flows. In addition, other factors are considered when developing recommendations for improvements to existing pipelines. These factors include the amount of leaks historically experienced, system reliability, and the phasing of scheduled improvements for other facilities such as pumps, tanks, and control valves and the need to expand the distribution system into areas not currently served.

Two criteria are typically evaluated with respect to analyzing the adequacy of pipelines; headloss and velocity. Headloss is measured in feet of headloss per 1,000 feet of pipeline and velocity is measured in feet per second (fps). One of these criteria is typically selected as the governing criteria, based on economics and typical industry practices. For this Master Plan, a maximum allowable velocity of 5 fps is used for normal operating conditions. Velocities of up to 10 fps are considered acceptable for fire flow and emergency conditions.

As described above for pressure criteria, staying within the accepted pipeline velocity goals is desirable, but marginally high velocities are not reason enough to recommend that pipelines be improved. Areas that exceed the listed criteria will be identified and improvements will be recommended for areas that are unacceptably out of tolerance. Recommended improvements will be sized for buildout conditions and not to just address velocity issues.

Storage Volumes

The total required volume of storage in a water system consists of water for operational, emergency, and fire protection uses. Original water sources, such as water from groundwater wells, and storage sources, such as water tanks throughout the system, can be utilized simultaneously in determining quantities of water available to meet customer demands.

Operational Storage. Operational storage is the quantity of water required to moderate daily fluctuations in demand beyond the capabilities of the production facilities. The production rates of the water sources and the available storage capacity are coordinated to provide a continuous treated water supply. Based on economic considerations, water source production systems are often designed to produce the average flow on the day of maximum demand. Water must be stored to supply the difference between the peak demands and the capacity of the water sources. Operational storage is then replenished during off-peak hours when the demand is less than production. Water for operational requirements can be supplied by storage tanks, by additional standby groundwater pumping capacity, or by a combination of the two. Typically, a volume equal to between one-quarter (25%) and one-third (33%) of the demand experienced during one maximum day is used. A value of one-third of the maximum day demand is assumed for operational storage for all pressure zones.

Fire Protection Storage. According to the Insurance Services Office (ISO), required fire flows may be met by any combination of pumping and storage. However, there is typically minimal excess pumping capacity available during maximum day conditions and it is recommended that storage volume be provided such that fire flow demands can be supplied entirely from storage. If excess pumping capacity is available, the installation of backup generators is often prudent to ensure that the pumps can function in the event of a power failure.

As an example, a 1,500 gallon per minute (gpm) fire flow demand with an expected duration of two hours would require a storage volume of 180,000 gallons. Similarly, a 2,000 gpm fire flow demand with an expected duration of four hours would require a storage volume of 480,000 gallons. More detailed information regarding fire flow demands is given in Section 3.

Emergency Storage. The volume of water allocated for emergency uses is typically determined based on the historical record of emergencies experienced and on the amount of time expected to lapse before an anticipated emergency can be corrected. Possible emergency situations include events such as water contamination, earthquakes, loss of electrical power, several simultaneous fires, and other unplanned events. Because the occurrence and magnitude of an emergency situation is not subject to accurate evaluation, the volume of emergency storage is generally based upon engineering judgment and/or utility policy. For the purposes of calculating storage requirements, the required emergency storage volume is assumed to be equal to the average day's demand.

Other Storage Requirements. It should also be noted that the criteria given above are somewhat simplified. There are situations where the required storage volume at a given site may be larger due to system constraints. This situation actually occurs at the Northside Tank site, and is discussed in detail in Section 6.

Fire Protection

There are two characteristics of a water system that must be evaluated in considering whether adequate fire protection capabilities exist. The first issue is whether the necessary flow of water can be delivered to the subject location at pressure of 20 psi or greater. The second assumes that adequate storage volume must exist in order to provide the required flow for a given duration. The evaluation criteria used in examining the existing water system is based on the required fire flow demands at the time a given subdivision or project was constructed. Future facilities will be designed to the fire flow requirements in effect at the time the facility is constructed.

COST ESTIMATING CRITERIA

Project cost is defined as the total capital investment necessary to complete a project. This includes expenditures for construction, engineering services, contingencies and overhead items such as legal and administrative services and financing. For this study, total capital cost includes planning level estimates of construction cost, plus construction contingencies of 20 percent. Added to this is an allowance for other costs such as engineering, legal and administration totaling an additional 20 percent. The various components of project costs are discussed in the following sections.

Land Acquisition

In most cases, proposed construction of distribution system improvements does not require significant purchases of privately owned land. Pipeline routes typically follow public streets and roads. For this reason, no attempt was made to estimate the cost of land purchases in connection with distribution system improvements.

In cases where sites for storage tanks, pumping stations or wells are required, the estimated cost of land should be ascertained by a competent local land appraiser prior to design. Land acquisition costs are a function of several variables and market economy conditions. For these reasons, land cost has not been considered in estimating facility costs.

Construction Costs

Construction costs cover the materials, labor and services necessary to build the proposed project. The cost criteria listed below is based on construction projects previously undertaken by the District and has been adjusted for inflation to the year 2011. However, the cost estimates given for future projects (such as a well recommended for the year 2016) are also given in current costs and are not adjusted for inflation.

Pipelines. Unit costs for the construction of new water mains are given in **Table 2-2**. These costs are based upon cement-lined ductile iron pipe for all mains. These pipeline cost figures cover preparation of right-of-way, trenching, installing and joining of pipe, installing fittings and valves, imported backfill and repaving after construction.

Table 2-2. Pipeline Construction Cost Criteria

Pipe Diameter, inches	Cost Per Linear Foot, dollars
4-inch	155
6-inch	165
8-inch	175
10-inch	190
12-inch	215
14-inch	230
16-inch	240
20-inch	270
24-inch	300

Fire Hydrants. Fire hydrant installation, including a 6-inch tee, 6-inch lateral, valve, valve box, hydrant and construction is assumed to have an average cost of about $6,000. Costs for hydrant installations on large diameter mains are somewhat higher.

Storage Reservoirs. Costs for ground-level steel tanks are estimated at $1.25 per gallon. This cost includes foundations; site preparation and grading; minimal site piping and reservoir overflow and drain lines.

Pumping Stations. Pumping station costs mainly vary with the size of the pumps and their associated switchgear and piping. Certain elements do not change significantly with pump size such as sitework, building construction and electrical service to the site. Considering these issues, there is a certain minimum cost involved in constructing a pump station. Cost estimates are developed with a base cost of $350,000 and an incremental cost of $600 per installed horsepower. Installed horsepower is calculated from the formula below with actual pumps based on standard motor sizes.

$$HP = \frac{Q * H}{3960 * E}$$

Q = flow in gallons per minute
H = Head in feet
E = Pump Efficiency (assumed to be 75%)

These estimates include the cost of the pump station structure along with pumps, motors, piping and appurtenances, architectural treatment, instrumentation and controls.

Wells. In developing cost estimates for well installations, wells are assumed to be sized to produce 850 gpm. Well construction consists of drilling, installing casing, developing the well and installing the necessary building, piping, pumping equipment and control equipment. A typical well is assumed to have a 14-inch casing and screen extending to a depth of approximately 1,000 feet. Estimated construction cost for a complete well, including the well building and equipment is $1,750,000. Additional costs such as bringing transmission piping and electrical service to the well site are not included in the total.

Pressure Reducing Stations. Pressure reducing stations are assumed to consist of two valve trains - a 2-inch valve to handle smaller flow with a 6-inch or 8-inch valve to handle larger flows. Station construction consists of a traffic rated precast concrete vault, pressure reducing valves, isolation valves and associated piping. Estimated construction cost for a complete station is $40,000. This total is based upon hydraulically operated valves. Additional costs would be incurred to provide electrical service and install instrumentation, if the valve station is to be integrated into the District's SCADA system.

Contingencies

A contingency allowance covers uncertainties associated with preliminary planning. Factors such as unusual foundation or soil conditions, special construction methods, variation in final lengths or average depths of pipeline, and construction adjacent to existing facilities are just a few of many items which may increase project costs and for which some allowance must be made in the preliminary design cost estimates. An allowance of 20 percent of total construction cost has been assumed to cover such contingencies.

Engineering and Administration

The cost of engineering services for construction projects includes some or all of the following: special investigations, pre-design reports, surveys, foundation explorations, location of interfering utilities, detailed design, preparation of contract drawings, construction inspection, materials testing, final inspection and start-up of the completed project. Depending on the size and type of project, total engineering, legal and administrative costs can range from 7 to 40 percent of the construction cost. The lower percentage applies to relatively large, simple projects not requiring large amounts of preliminary investigation. The higher percentage applies to smaller projects requiring a great deal of engineering effort, or those which require a relatively large amount of preliminary work. A value of 15 percent is assumed for this study.

Administration charges cover items such as legal fees, financing expenses and administrative costs. The cost of these items can vary, but for the purpose of this study, administration charges are assumed to equal five percent of construction cost.

The average total cost of all necessary engineering services plus administrative costs is estimated to be 20 percent of the construction cost for each project.

SECTION 3

EXISTING WATER SYSTEM

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EXISTING WATER SYSTEM

This section provides a description of the existing water system facilities. Facilities owned and operated by the District include groundwater wells, pumping stations, storage tanks, pressure reducing stations and pipelines. Each set of facilities is discussed in detail below. This discussion covers both the Truckee and Hirschdale water systems.

The District's water system is reasonably complicated with 46 pressure zones, 25 pumping stations, 16 active wells and 33 storage tanks. All water demands are served by groundwater wells, although natural springs and surface water supplies have been used in the past.

PRESSURE ZONES

There are currently 46 pressure zones in the service area, with service elevations ranging from 5535 feet in Hirschdale to 7370 feet at the highest point in Tahoe Donner. Static service pressures ranges from a high of about 200 psi to a low of about 20 psi.

The existing pressure zone configuration is shown schematically on **Figure 3-1**. **Figure 3-2** depicts the distribution system with piping color-coded by pressure zone. Approximate minimum and maximum ground elevations and static service pressures in the pressure zones are given in **Table 3-1**.

GROUNDWATER WELLS

The District currently has 13 active wells that are used to supply potable water to customers. The total production capacity of the active potable water wells is about 9,740 gpm (14.0 mgd). The wells are located at various locations throughout the distribution system. The locations of the wells are shown in **Figure 3-3** and selected well characteristics are shown in **Table 3-2**.

Three additional wells are used to serve non-potable water demands. The Donner Creek Well is connected to a separate piping system that is used to provide irrigation water to the Coyote Moon Golf Course. The Fibreboard Well is connected to a separate piping system that is used to provide irrigation water to the Gray's Crossing and Old Greenwood golf courses. The Southside No. 1 well is used to supply construction water for contractor use during the Summer construction season.

There are three other wells that are not currently used by the District. They are the B well, Biltz well and Bingham Place well. All three of these wells are low in capacity and the District does not intend to use these wells in the future. However, they have not been abandoned in accordance with California State requirements and are therefore considered inactive.

WATER TREATMENT FACILITIES

All of the District's active potable water wells are equipped with disinfection systems utilizing liquid chlorine. There are additional treatment systems at the Northside and Hirschdale wells. The treatment system at Northside removes excess levels of arsenic. The treatment system at Hirschdale removes excess levels of arsenic, iron and manganese.

Table 3-1. Summary of Pressure Zone Data

Pressure Zone	Target HGL, feet	Lowest Service Elevation, feet	Highest Static Service Pressure, psi	Highest Service Elevation, feet	Lowest Static Service Pressure, psi
6040	6040	5838	87	5927	49
6170	6170	5880	125	6050	52
Alder Creek	6610	6300	134	6440	74
Armstrong	6334	5959	162	6200	58
Bennett Flat	6352	6196	68	6225	55
Chez	6262	6150	48	6150	48
DL-6124	6124	5940	80	6050	32
DL-6323	6323	5950	161	6245	34
DL-Northeast	6085	5940	63	5975	48
DL-Red Mountain	6200	6100	43	6110	39
DL-Wolfe	6220	6035	80	6140	35
Donner Trails	6160	5932	99	6005	67
Donner View	6894	6612	122	6806	38
Donner View Hydro	6990	6820	74	6890	43
Gateway	6040	5825	93	5990	22
Glacier	7500	7210	126	7370	56
Glenshire 1	6341	5880	200	6203	60
Glenshire 2	6163	5823	147	6038	54
Heidi Way	6815	6595	95	6645	74
Heights Hydro	6415	6183	100	6325	40
Hillside	6660	6357	131	6526	58
Hirschdale	5626	5495	58	5535	39
Icknield	6058	5840	94	5850	90
Innsbruck	6493	6157	145	6455	16
Lower Lakeview	6130	5820	134	6040	40
Lower Ski Run	7088	6850	103	6954	58
Lower Skislope	7015	6752	114	6830	80
Martiswoods	6360	6210	65	6255	45
Middle Skislope	7172	6800	161	7010	70
Palisades Hydro	6390	6180	91	6220	74
Pinnacle	6843	6588	110	6756	38
Pinnacle Hydro	6950	6752	86	6820	56
Ponderosa Palisades	6298	6025	118	6220	34
Prosser Heights	6338	6000	146	6180	68
Riverview	6020	5790	100	5875	63
Roundhill Hydro	6790	6618	74	6660	56
Sierra Meadows	6146	5880	115	6030	50
Sitzmark Hydro	6580	6435	63	6440	61
Soma Sierra	6286	6000	124	6200	37
Stockholm	6708	6395	135	6641	29
Town	6024	5745	121	5950	32
Trout Creek 6550	6550	6375	76	6420	56
Upper Lakeview	6230	5975	110	6100	56
Upper Skislope	7366	7010	154	7274	40
Waterloo	6071	5825	106	5876	84
West Palisades Hydro	6250	6100	65	6210	17

HGL = Hydraulic Grade Line

Table 3-2. Summary of Data for Potable Wells

Name	Current Capacity, gpm
A Well	160
Airport	2,140
Glenshire Drive	1,725
Hirschdale	35
Martis Valley Well No. 1	1,585
Northside	575
Old Greenwood	870
Prosser Annex	460
Prosser Heights	360
Prosser Village	800
Sanders	290
Southside No. 2	200
Well No. 20	540
Total	9,740

Note: Current capacity given is based on most recent data

OTHER WATER SUPPLY SOURCES

In the past, the District has used natural springs as water supply source. There are three springs – McGlashen, Southside and Tonini – at which the District has facilities. These springs are not currently used due to their low capacity and the need to treat the water supply in accordance with the Surface Water Treatment Rule. In addition, the District owns water rights to the Sheepherder Springs and Hofert Springs, although no facilities exist to utilize these supplies. **Figure 3-3** shows the locations of these springs.

PUMPING STATIONS

The Truckee System currently has 25 pumping stations located throughout the distribution system. These pumping stations move water from lower pressure zones to higher pressure zones to serve demands in higher elevations of the service area.

The different pumping stations have a variety of configurations, with some facilities taking suction directly from distribution system pipelines, while others are located at reservoir sites and use the reservoir as a forebay. Similarly, there is a variety of vertical turbine, end suction and horizontal split case pumps. All of the pumps are driven by electric motors. Some of the pumping stations are equipped with diesel powered generators as a backup power supply.

The locations of the pumping stations are shown in **Figure 3-4**, and selected pump characteristics are shown in **Table 3-3**. The distribution system schematic given **Figure 3-1** shows the relationships between the pumping stations and the pressure zones served by a given station.

Table 3-3. Summary of Pumping Station Data

Name	Suction Pressure Zone	Discharge Pressure Zone	Number of Pumps	Total Power, hp
Airport	---	6170	4	400
Alder Creek	Stockholm	Donner View	2	60
Chez	6170	Chez	3	90
China Camp	6170	Prosser Heights	3	90
Donner Trails	Gateway	Soma Sierra	4	600
Donner View Hydro	Donner View	Donner View Hydro	2	30
Falcon Point	Innsbruck	Stockholm	3	225
Herringbone	Stockholm	Donner View	3	150
Innsbruck	Innsbruck	Stockholm	4	200
Martiswoods	Ponderosa Palisades	Martiswoods	2	15
Pinnacle Hydro	Pinnacle	Pinnacle Hydro	2	27.5
Palisades Hydro	Ponderosa Palisades	Palisades Hydro	3	60
Prosser Heights Hydro	Prosser Heights	Prosser Heights Hydro	2	70
Red Mountain Hydro	DL-6124	Red Mountain	2	30
Richards Boulevard	Gateway	Armstrong/DL-6323	3	300
Roundhill Hydro	Stockholm	Roundhill Hydro	2	30
Sierra Meadows	6170/Sierra Meadows	Ponderosa Palisades	3	90
Sitzmark Hydro	Innsbruck	Sitzmark Hydro	2	30
Ski Lodge	Donner View	Upper Ski Run	2	80
Ski Run	Upper Ski Run	Upper Glacier	2	50
Soma Sierra	Soma Sierra	Innsbruck	4	600
Stockholm	Stockholm	Pinnacle	3	150
Strand	6170/Glenshire 2	Glenshire 1	3	120
West Palisades Hydro	Ponderosa Palisades	West Palisades Hydro	1	3
Wolfe Hydro	DL-6124	Wolfe	2	45

STORAGE TANKS

The Truckee System has 36 storage tanks – 33 active and 3 inactive. Most of the tanks provide gravity pressure to a portion of the distribution system. Some also function as a forebay for a pumping station. The total storage capacity of the active water tanks is about 9.5 mg. Storage tank locations are shown in **Figure 3-5** and their characteristics are given in **Table 3-4**.

PRESSURE REGULATING STATIONS

There are 40 control valve stations located throughout the Truckee System – 34 active and 6 inactive. These stations provide service to small pressure zones, allow a means to relieve pressure in zones not directly served by a reservoir and provide additional water for fire flow demands. The locations of the stations are shown on **Figure 3-5** and selected data on the stations is given in **Table 3-5**.

Table 3-4. Summary of Storage Tank Data

Storage Tank	Volume, mg	Diameter, feet	Floor Elevation	Shell Height, feet	Overflow Elevation	Year Built
Airport	0.60	70	5886	20	5906	1979
Armstrong	0.10	27	6310	24	6334	1979
Biltz [a]	0.085	25	6350	24	6374	1985
Bridge Street 6170	1.50	90	6139	32	6171	2002
Donner Trails 1	0.15	36	6022	20	6042	1973
Donner Trails 2	0.15	36	6022	20	6042	1990
Donner Lake 6323	0.30	40	6291	32	6323	2005
Donner View	0.35	40	6861	32	6893	1973
Falcon Point	0.20	39	6469	24	6493	1974
Gateway	0.45	60	6021	24	6045	1995
Glacier	0.15	36	7476	24	7500	1972
Herringbone	0.30	40	6676	32	6708	1973
Hirschdale	0.10	33.5	5611	16	5627	1988
Innsbruck	0.20	39	6469	24	6493	1972
Lower Glenshire 1	0.42	55	6139	24	6163	1993
Lower Glenshire 2	0.32	48	6139	24	6163	1972
Martiswoods	0.20	40	6276	22	6298	1982
Martiswoods Tower	0.10	20	6338	22	6360	1982
Northside	0.40	55	6003	24	6027	1974
Old Greenwood 5988 [a]	0.36	44	5956	32	5988	2002
Pinnacle	0.18	31.5	6811	32	6843	1973
Ponderosa Palisades	0.20	40	6276	22	6298	1972
Prosser Annex	0.215	40	6314	24	6338	1994
Prosser Heights	0.215	40	6314	24	6338	1963
Prosser Lakeview	0.25	40	6102	28	6130	1971
Red Mountain [a]	0.21	39	6100	24	6124	1963
Roundhill	0.30	40	6676	32	6708	1974
Sierra Meadows	0.25	34	6110	36	6146	1971
Sitzmark	0.20	39	6469	24	6493	1973
Ski Lodge	0.35	50	6870	24	6894	1971
Ski Run	0.10	26	7163	30	7193	1972
Soma Sierra	0.20	40	6262	24	6286	1972
Stockholm	0.32	42	6676	32	6708	1972
Upper Glenshire 1	0.28	45	6315	24	6339	1991
Upper Glenshire 2	0.21	39	6315	24	6339	1989
Wolfe	0.23	42	6100	24	6124	1993
Total	10.15					

[a] The Biltz, Old Greenwood 5988 and Red Mountain storage tanks are currently inactive

Table 3-5. Summary of Control Valve Station Data

Name	Upstream Pressure Zone	Downstream Pressure Zone	Notes
13330 Skislope	Middle Skislope	Lower Skislope	
13770 Skislope	Upper Skislope	Middle Skislope	
14526 Skislope	Glacier	Upper Skislope	
16133 Skislope	Upper Ski Run	Lower Ski Run	
Alder Creek	Stockholm	Alder Creek	
Biltz	Biltz Tank	Armstrong	Inactive
Coldstream 6080	DL-6323	Coldstream 6080	
College	6170	Gateway	
Donner Trails	Soma Sierra	Donner Trails	
Donnington	Glenshire 1	Glenshire 2	
East Hillside	Stockholm	Hillside	
East Northside	6170	Town	
Estates	6170	Riverview	
Gateway	6170	Gateway	
Ghirard	6170	Lower Lakeview	
Glenshire Drive	6170	6040	
Heidi Way	Stockholm	Innsbruck	
Icknield	Glenshire 2	Icknield	
Laurelwood	Upper Lakeview	Lower Lakeview	Inactive
Loch Leven	DL-6323	DL-Northeast	
Martis Valley Road	Ponderosa Palisades	Sierra Meadows	
Moraine Road	Armstrong	DL-Northeast	Inactive
North Bennett Flat	Innsbruck	Bennett Flat	
Old Greenwood No. 1	6170	6040	Inactive
Old Greenwood No. 2	6170	6040	Inactive
Old Greenwood No. 3	6170	6040	
Old Greenwood No. 4	6170	6040	
Prosser	Prosser Heights	Upper Lakeview	Inactive
Rainbow	Upper Lakeview	Lower Lakeview	
Reynold	6170	Riverview	
Snowshoe	Upper Lakeview	Lower Lakeview	
South Bennett Flat	Innsbruck	Bennett Flat	
Summit Drive	DL-6323	DL-Northeast	
Trout Creek 6550	Stockholm	Trout Creek 6550	
Tudor	Glenshire 2	Icknield	
Waterloo	Glenshire 2	Waterloo	
Wellington	Glenshire 2	Waterloo	
West Hillside	Stockholm	Hillside	
West Northside	6170	Gateway	
West Reed	DL-6323	DL-6124	

PIPELINES

The existing distribution system consists of about 218 miles of pipeline ranging from 2-inches to 24 inches in diameter. The majority of the pipelines are 6-inch and 8-inch in diameter. **Table 3-6** gives a breakdown of the total lineal footage of pipelines by diameter. **Figure 3-6** gives the distribution system with piping color-coded by diameter.

The oldest piping in the system dates to the 1940s, with the great majority of the system having been installed since 1960. **Table 3-7** gives a breakdown of the total lineal footage of pipelines by year installed. **Figure 3-7** gives the distribution system with piping color-coded by year installed.

There are a number of different pipeline materials throughout the system. The majority of the distribution pipelines are steel, with large portions of ductile iron pipe as well. **Table 3-8** gives a breakdown of the total lineal footage of pipelines by year installed. **Figure 3-8** gives the distribution system with piping color-coded by year installed.

Table 3-6. Summary of Pipelines by Diameter

Diameter, inches	Length, feet	Length, miles
2	11,083	2.1
3	726	0.1
4	34,731	6.6
6	378,390	71.7
8	440,692	83.4
10	60,973	11.5
12	107,481	20.4
14	30,203	5.7
16	48,466	9.2
18	2,775	0.5
20	4,350	0.8
24	29,997	5.7
Grand Total	1,149,867	217.7

Table 3-7. Summary of Pipelines by Year Installed

Decade	Length, feet	Length, miles
1940 – 1949	7,015	1.3
1950 – 1959	9,507	1.8
1960 – 1969	107,603	20.4
1970 – 1979	362,092	68.6
1980 – 1989	94,758	17.9
1990 – 1999	169,548	32.1
2000 – 2009	378,783	71.7
2010 – Present	10,344	2.0
Date Unknown	10,217	1.9
Grand Total	1,149,867	217.7

Table 3-8. Summary of Pipelines by Pipe Material

Material	Length, feet	Length, miles
Asbestos-Cement	108,754	20.6
Ductile Iron	377,605	71.5
Galvanized Iron	518	0.1
High-density Polyethylene	12,193	2.3
Polyvinyl Chloride (PVC)	255,204	48.3
Steel	391,860	74.2
Material Unknown	3,733	0.7
Grand Total	1,149,867	217.7

SECTION 4

POPULATION AND WATER DEMAND

SECTION 4
POPULATION AND WATER DEMAND

Growth projections are critical to the development and planning of the future water system. This Section documents historic growth and estimates future growth within the service area up to and including build-out.

POPULATION

The Town of Truckee and surrounding areas have been experiencing slow to moderate growth over the past 50 years. Population within the town has increased from 2,528 in 1970 to a current population of 16,280.

The Town of Truckee's current ***General Plan*** was adopted in 2006. The ***General Plan*** projects population growth in the area to occur at a rate of two percent per year, eventually reaching a buildout population of about 28,300 permanent residents. Based upon the projected growth rate in the ***General Plan***, historic and projected population totals are given in **Figure 4-1**, with the buildout population occurring in 2038.

The economy of Truckee and the surrounding area relies upon tourism as the main industry. There are a significant number of residential units used as vacation homes that are not occupied on a full-time basis with estimates ranging as high as 75 to 80 percent for certain portions of the service area. The ***General Plan*** cites an estimate that 54 percent of all housing units are occupied full-time on a town-wide basis. However, the District is not aware of any other studies that have confirmed these estimates. This part time occupancy is reflected in the ***General Plan***, showing a total of 19,901 dwelling units at buildout with a corresponding population of only 28,300 for a density of 1.42 persons per dwelling unit.

It should be noted that the District's water system service area extends outside the Town of Truckee limits encompassing small adjoining areas of unincorporated Nevada and Placer Counties. There are also small developed areas within the Town of Truckee that utilize private wells and are not supplied water by the District.

EXISTING AND HISTORIC POTABLE WATER DEMAND

The term water demand refers to the amount of water used within a water distribution system. Total system-wide water demand should equal the total water production into the system from all sources. Water demand is comprised of two components: water consumed (billed as sales) and unaccounted-for water. The information below describes these components in more detail.

Potable water production for the year 2010 averaged 4.53 million gallons per day (mgd) with a peak of 9.53 mgd that occurred on July 6, 2010. **Figure 4-2** shows the historical trend of water demand for the Truckee System. **Table 4-1** gives this information in tabular form.

The large increase in demand that occurred in 2002 was a result of the District's acquisition of the Donner Lake and Glenshire water systems. From 2004 through 2010, there was an overall decrease in average day demand of about 2.1 mgd. The peak water production occurred in 2007 with an average day demand of 6.67 mgd and a maximum day demand of 14.84 mgd. Over this time period, the number of water system connections increased from 11,503 to 12,525.

Figure 4-1. Historic and Projected Population, 1980-2030

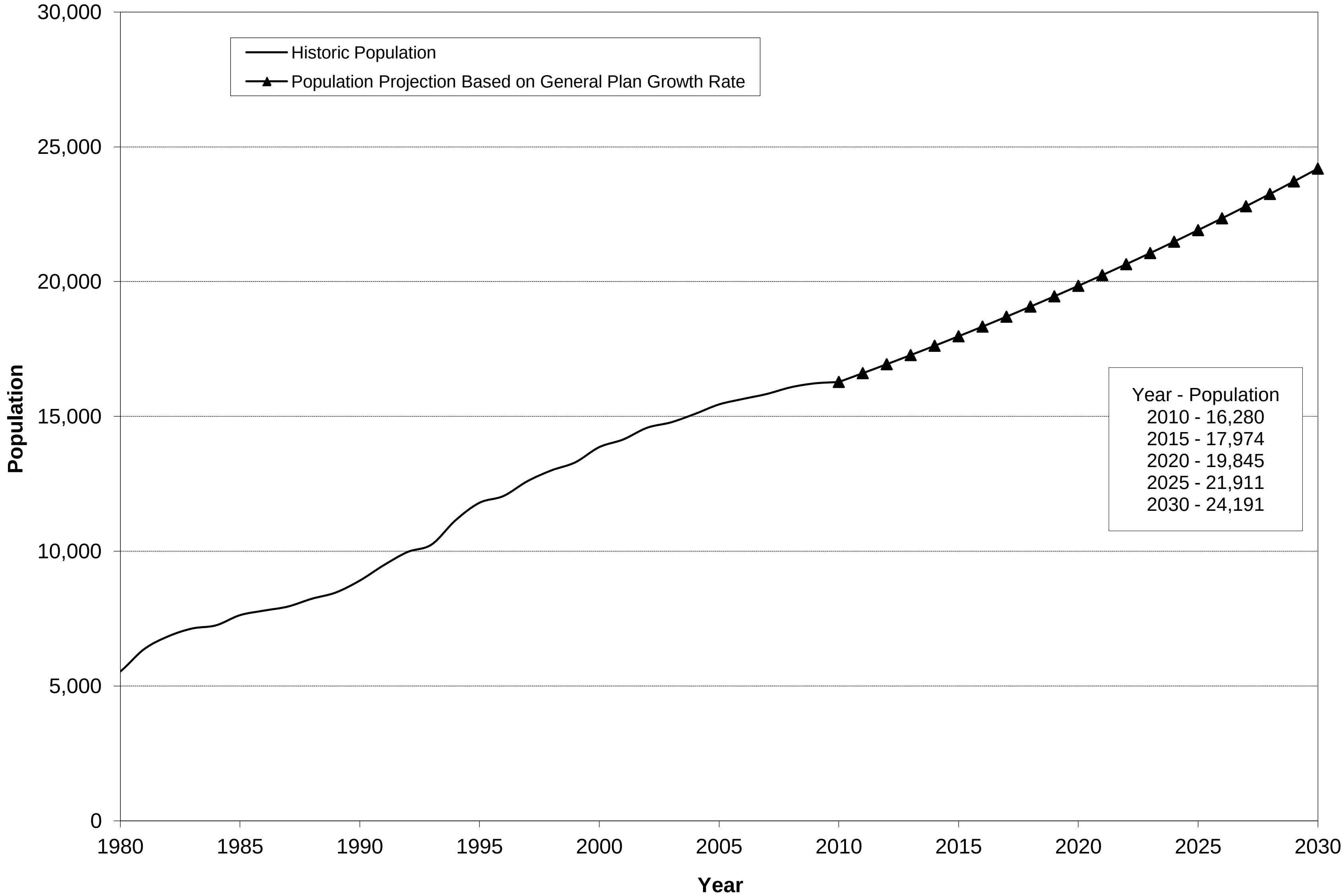


Figure 4-2. Historic Potable Water Demands, 1965 - 2010

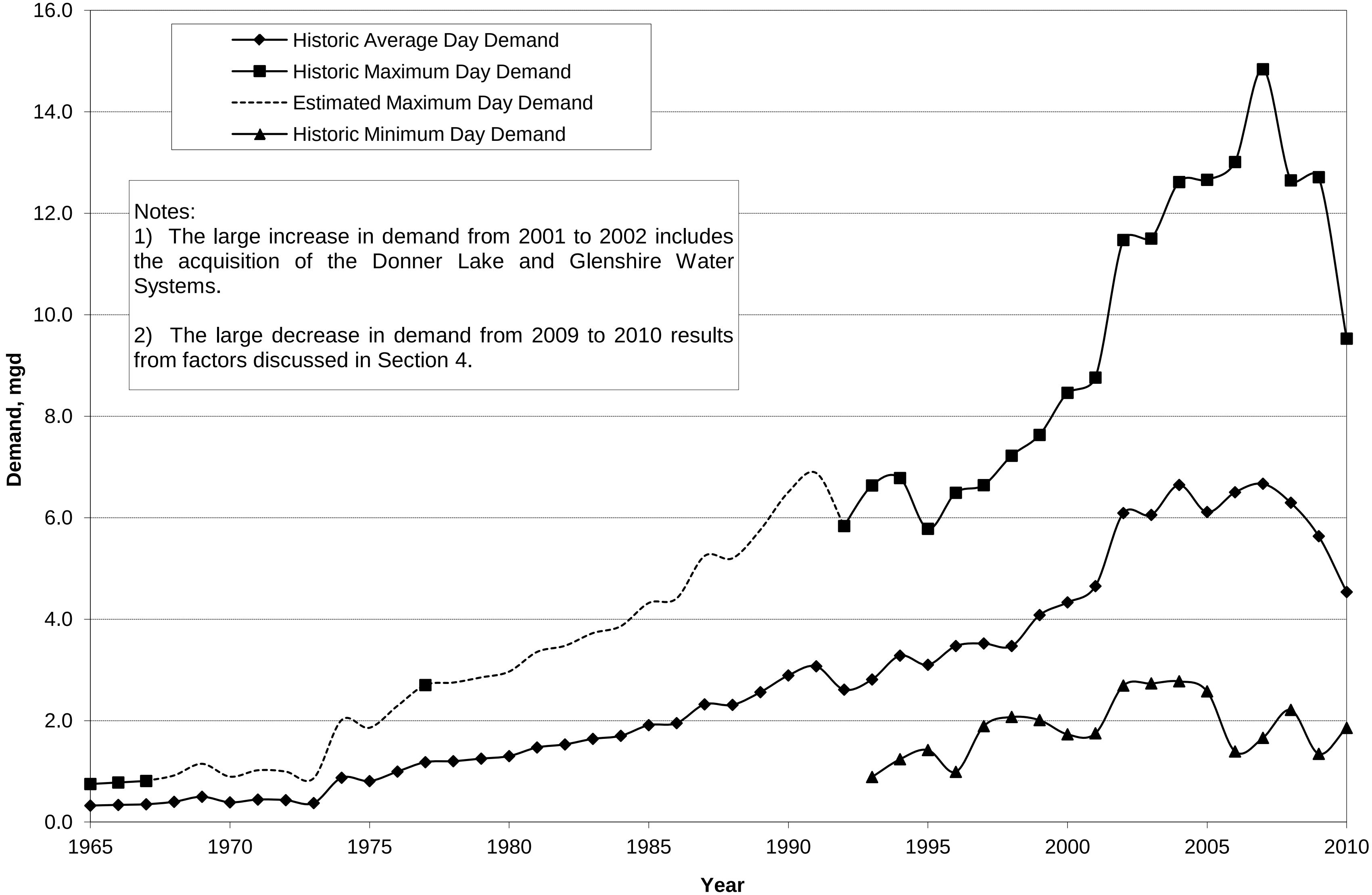


Table 4-1. Historic Potable Water Production

Year	Average Day		Maximum Day		Peaking Factor
	mgd	gpm	mgd	gpm	
1977	1.18	819	2.70	1,875	2.29
1978	1.20	830	NA	NA	NA
1979	1.25	869	NA	NA	NA
1980	1.30	901	NA	NA	NA
1981	1.47	1,021	NA	NA	NA
1982	1.53	1,060	NA	NA	NA
1983	1.64	1,138	NA	NA	NA
1984	1.70	1,182	NA	NA	NA
1985	1.91	1,328	NA	NA	NA
1986	1.95	1,353	NA	NA	NA
1987	2.32	1,611	NA	NA	NA
1988	2.31	1,606	NA	NA	NA
1989	2.56	1,775	NA	NA	NA
1990	2.89	2,005	NA	NA	NA
1991	3.07	2,131	NA	NA	NA
1992	2.61	1,810	NA	NA	NA
1993	2.81	1,954	NA	NA	NA
1994	3.28	2,277	6.78	4,708	2.07
1995	3.10	2,150	5.78	4,016	1.86
1996	3.47	2,407	6.49	4,505	1.87
1997	3.52	2,445	6.64	4,611	1.89
1998	3.47	2,413	7.22	5,014	2.08
1999	4.08	2,833	7.63	5,299	1.87
2000	4.33	3,004	8.46	5,877	1.96
2001	4.65	3,228	8.76	6,085	1.88
2002	6.09[a]	4,229	11.47[a]	7.965	1.88
2003	6.05	4,204	11.50	7,986	1.90
2004	6.64	4,614	12.61	8,759	1.90
2005	6.11	4,244	12.66	8,790	2.07
2006	6.50	4,514	13.01	9,034	2.00
2007	6.67	4,631	14.84	10,304	2.23
2008	6.29	4,371	12.65	8,783	2.01
2009	5.63	3,913	12.71	8,826	2.26
2010	4.53	3,149	9.53	6,616	2.10

[a] Large increase in production for 2002 results from acquisition of Donner Lake and Glenshire Water Systems

There are four main factors that contribute to the reduction in potable water demand.

1) Beginning in 2007, the District markedly expanded its pipeline replacement program in an effort to reduce the volume of water being lost due to leakage from District-owned pipes. In 2010 the District exhausted its available pipeline replacement funding and it will be suspending its pipeline replacement activities for a few years until an alternative funding source can be identified. The District was able to replace about 54,500 feet of pipeline during this four year period.

2) The Fibreboard Well was placed into service in the Fall of 2009. This well supplies non-potable irrigation water to two golf courses that were previously supplied from the District's potable water system. Without this well, potable water production in 2010 would have averaged 4.89 mgd with a peak of 10.9 mgd.

3) Beginning in 2010, the District has implemented volume-based billing in order to comply with California AB 2572. Prior to 2010, the District did not read meters that were installed on its residential customers and billed residential customers a flat unmetered rate for service.

   The District has also begun installation of a new automated meter reading (AMR) system. With this AMR system, the District discovered that about 10 percent of its customer base had a leak on the customer-owned piping. A few of these leaks were as large as 10 gallons per minute. Some of these customer-side leaks had been occurring for a significant period of time prior to the installation of the meter, however the District had no method to detect the leak and then inform the customer. With the new AMR system, the District has developed procedures for informing customers of leaks in a timely manner in order to reduce the amount of water lost to leakage and to minimize any property damage that may be caused by these customer-side leaks.

4) The Spring of 2010 was noticeably colder than the prior few years with significant precipitation occurring. This led to a later snowmelt and reduced Summer irrigation demands. This reduced demand can be seen by comparing water usage by some large irrigators during May 2009 with May 2010. This comparison is shown in **Table 4-2**. Although three of these four customers actually utilize non-potable water, they demonstrate the difference in irrigation usage between the two years.

Table 4-2. Comparison of May 2009 and May 2010 Usage by Selected Large Irrigators

Customer	May 2009 Usage, gallons	May 2010 Usage, gallons
Coyote Moon Golf Course	2,053,600	3,800
Gray's Crossing Golf Course	10,525,200	29,320
Old Greenwood Golf Course	13,598,800	5,229,370
Riverview Sports Park	1,028,200	166,200

It is believed that the 1.0 mgd average day reduction in water production from 2007 to 2009 is related to the pipeline replacement program. It is also believed that the additional 1.1 mgd average day in reduction water production from 2009 to 2010 can be attributed equally to the three other factors noted above.

Table 4-3 gives a breakdown of sales by customer class for the period of 1995-2010. The District has only two customer classifications for billing purposes - residential and commercial. In the past, all single-family residential customers were charged a flat rate for monthly service. Individual meters were not read for single-family residential accounts and not all single-family residential accounts were equipped with a meter. In contrast, most of the commercial accounts were billed monthly based on actual meter readings. The total residential consumption was determined by subtracting metered commercial sales from total production. Multi-family residential accounts such as duplexes, four-plexes and apartments were billed monthly based on actual meter readings and were considered as commercial accounts.

Table 4-3. Breakdown of Potable Water Sales by Customer Class, 1995-2010

Year	Total Average Sales, mgd	Commercial Sales, mgd	Commercial Sales, percentage	Residential Sales, mgd	Residential Sales, percentage
1995	3.10	0.58	18.7	2.52	81.3
1996	3.47	0.56	16.1	2.91	83.9
1997	3.52	0.59	16.8	2.93	83.2
1998	3.47	0.54	15.6	2.93	84.4
1999	4.08	0.60	14.7	3.48	85.3
2000	4.33	0.71	16.4	3.62	83.6
2001	4.65	0.76	16.3	3.89	83.6
2002	6.09[a]	0.98	16.1	5.11	83.9
2003	6.05	0.95	15.7	5.10	84.3
2004	6.64	1.14	17.2	5.50	82.8
2005	6.11	1.31	21.4	4.80	78.6
2006	6.50	1.34	20.6	5.16	79.4
2007	6.67	1.64	24.6	5.03	75.4
2008	6.29	1.44	22.9	4.85	77.1
2009	5.63	1.35	24.0	4.28	76.0
2010	4.53[b]	0.80	17.7	3.73	82.3

[a] Large increase in sales for 2002 results from acquisition of Donner Lake and Glenshire Water Systems

[b] Large decrease in sales for 2010 results from the four factors noted on Pages 4-1 & 4-3

In actuality, total residential usage is less than the values given in **Table 4-3**. Typically, a percentage of water introduced into the system from supply sources is not recovered through sales. This water not recovered through sales is designated as "unaccounted-for water." The most common reasons for discrepancies between production and sales are meter recording errors from uncalibrated or worn meters, system leakage, and water uses such as fire fighting, construction water, illegal connections to the water system and water used by the District for maintenance purposes such as main flushing. Industry literature has cited unaccounted-for water percentages as high as 36 percent in older systems with high leakage rates. An unaccounted-for water rate below 10 percent is a typical water agency goal. However, due to the lack of metering data for residential connections, the historic volume of unaccounted-for water cannot be determined.

Beginning in 2010, the District is reading all of its existing meters as required by AB 2572. As of January 1, 2010, about 44 percent of the residential accounts were equipped with a meter. Based upon direction from its Board of Directors, the District has accelerated the installation of water meters on its older properties and as of January 1, 2011, about 87 percent of the residential accounts were equipped with a meter. The District currently anticipates that all of its water system customers will be equipped with a meter by December 2014. Therefore, more accurate data regarding residential water sales and "unaccounted-for water" will be available in the future.

Table 4-4 gives a breakdown of existing connections by pressure zone. **Tables 4-5** and **4-6** give a breakdown of demand by pressure zone for existing average day and maximum day conditions. It should be noted that the values given in **Tables 4-5** and **4-6** are based upon a system-wide average use per residential connection. Once meters are installed on all of the customers, the District will be able to provide a more accurate breakdown of usage for each pressure zone.

NON-POTABLE WATER PRODUCTION

In the Summer of 2000, an 8-inch pipeline was constructed to provide irrigation water service to the Coyote Moon Golf Course from the Donner Creek Well. Connections from this pipeline to the irrigation systems at Meadow Park and the Truckee High School campus are also planned, but have not yet been constructed.

During the Summer of 2004, the District constructed a filling station at the Southside No. 1 Well to provide a central location where contractors may draw non-potable construction water. This well was not equipped with a meter until 2010 and the District estimates that the amount of water pumped has varied from about 0.5 to 6.6 million gallons per year depending on how much construction was occurring locally.

During the Summer of 2009, the Fibreboard Well was constructed to provide irrigation water to the Gray’s Crossing and Old Greenwood golf courses. This well was placed into service in the Fall of 2009 and resulted in a corresponding reduction in demand on the potable water system. The arsenic level in this well is about 30 parts per billion and the District does not intend to use this well as a potable water source. **Table 4-7** summarizes non-potable water production for all three sources.

HIRSCHDALE SYSTEM WATER PRODUCTION

The Hirschdale Water System (HWS) is an isolated water system currently serving 20 single-family residences. The system was constructed in 1988 and has been owned and operated by the District since that time. **Table 4-8** gives the historic production data for the HWS. Examination of this data does not indicate an increase water consumption since the 20th connection was constructed in 2004. The minor variability in water consumption is likely due to climatic conditions for a given calendar year. Maximum day demand for the year of 1993 is considered abnormally high due to some well pump testing that was performed during that time. Demand for the years of 2000 and 2001 was also unusually high because a construction contractor working on Interstate 80 was drawing significant amounts of water from the HWS with District permission. An estimate for this volume of construction water usage is not available.

BUILDOUT WATER DEMAND

Water demand projections for buildout conditions have been calculated base upon anticipated development of all currently vacant parcels. Currently developed parcels were assumed to continue into the future with no changes in either land use or water demand. A projected buildout demand was then calculated for each vacant parcel based on the anticipated land use and the size of the parcel. This analysis resulted in a buildout average day potable water demand of 10.17 mgd and a buildout maximum day potable water demand of 21.88 mgd. Detailed information regarding these buildout projections is given in the report entitled ***Buildout Water Demand Projections***, September 2010.

Table 4-4. Existing Potable Water Connections by Pressure Zone

Pressure Zone	Residential Connections	Commercial Connections	Total
6040	275	1	276
6170	179	101	280
Alder Creek	22	1	23
Armstrong	225	5	230
Bennett Flat	76	0	76
Chez	1	0	1
Coldstream 6080	0	7	7
DL-6124	782	31	813
DL-6323	323	6	329
DL-Northeast	136	30	166
DL-Red Mountain	25	0	25
DL-Wolfe	18	0	18
Donner Trails	22	1	23
Donner View	965	11	976
Donner View Hydro	50	0	50
Gateway	349	177	526
Glacier	47	1	48
Glenshire 1	324	2	326
Glenshire 2	1,072	7	1,079
Heidi Way	162	0	162
Heights Hydro	33	0	33
Hillside	278	0	278
Icknield	29	0	29
Innsbruck	1,431	20	1,451
Lower Lakeview	396	0	396
Lower Ski Run	24	1	25
Lower Skislope	25	0	25
Martiswoods	40	0	40
Middle Skislope	23	0	23
Palisades Hydro	37	0	37
Pinnacle	213	1	214
Pinnacle Hydro	109	0	109
Ponderosa Palisades	385	0	385
Prosser Heights	99	0	99
Riverview	188	32	220
Roundhill Hydro	7	0	7
Sierra Meadows	873	74	947
Sitzmark Hydro	28	0	28
Soma Sierra	36	0	36
Stockholm	2,006	25	2,031
Town	158	162	320
Trout Creek 6550	19	0	19
Upper Lakeview	213	0	213
Upper Skislope	44	0	44
Waterloo	49	0	49
West Palisades Hydro	7	0	7
Total	11,803	696	12,499

Table 4-5. Existing Average Day Potable Water Demand by Pressure Zone

Pressure Zone	Residential Demand, mgd	Commercial Demand, mgd	Total, mgd
6040	0.087	0	0.087
6170	0.057	0.144	0.201
Alder Creek	0.007	0.0004	0.007
Armstrong	0.071	0.001	0.072
Bennett Flat	0.024	0	0.024
Chez	0.0003	0	0.0003
Coldstream 6080	0	0.018	0.018
DL-6124	0.247	0.015	0.262
DL-6323	0.102	0.001	0.103
DL-Northeast	0.043	0.012	0.055
DL-Red Mountain	0.008	0	0.008
DL-Wolfe	0.006	0	0.006
Donner Trails	0.007	0.0001	0.007
Donner View	0.305	0.008	0.313
Donner View Hydro	0.016	0	0.016
Gateway	0.110	0.256	0.366
Glacier	0.015	0	0.015
Glenshire 1	0.102	0.0009	0.103
Glenshire 2	0.339	0.012	0.351
Heidi Way	0.051	0	0.051
Heights Hydro	0.010	0	0.010
Hillside	0.088	0	0.088
Icknield	0.009	0	0.009
Innsbruck	0.453	0.012	0.465
Lower Lakeview	0.125	0	0.125
Lower Ski Run	0.008	0	0.008
Lower Skislope	0.008	0	0.008
Martiswoods	0.013	0	0.013
Middle Skislope	0.007	0	0.007
Palisades Hydro	0.012	0	0.012
Pinnacle	0.067	0.011	0.078
Pinnacle Hydro	0.034	0	0.034
Ponderosa Palisades	0.122	0	0.122
Prosser Heights	0.031	0	0.031
Riverview	0.059	0.038	0.097
Roundhill Hydro	0.002	0	0.002
Sierra Meadows	0.276	0.116	0.392
Sitzmark Hydro	0.009	0	0.009
Soma Sierra	0.011	0	0.011
Stockholm	0.635	0.074	0.709
Town	0.050	0.077	0.127
Trout Creek 6550	0.006	0	0.006
Upper Lakeview	0.067	0	0.067
Upper Skislope	0.014	0	0.014
Waterloo	0.015	0	0.015
West Palisades Hydro	0.002	0	0.002
Total	3.730	0.7964	4.526

Table 4-6. Existing Maximum Day Potable Water Demand by Pressure Zone

Pressure Zone	Residential Demand, mgd	Commercial Demand, mgd	Total, mgd
6040	0.185	0.0002	0.185
6170	0.120	0.316	0.436
Alder Creek	0.015	0.001	0.016
Armstrong	0.151	0.001	0.152
Bennett Flat	0.051	0	0.051
Chez	0.001	0	0.001
Coldstream 6080	0	0.033	0.033
DL-6124	0.525	0.029	0.554
DL-6323	0.217	0.002	0.219
DL-Northeast	0.091	0.020	0.111
DL-Red Mountain	0.017	0	0.017
DL-Wolfe	0.012	0	0.012
Donner Trails	0.015	0.0001	0.015
Donner View	0.648	0.014	0.662
Donner View Hydro	0.034	0	0.034
Gateway	0.234	0.447	0.681
Glacier	0.032	0	0.032
Glenshire 1	0.217	0.002	0.219
Glenshire 2	0.719	0.033	0.752
Heidi Way	0.109	0	0.109
Heights Hydro	0.022	0	0.022
Hillside	0.187	0	0.187
Icknield	0.019	0	0.019
Innsbruck	0.960	0.028	0.988
Lower Lakeview	0.266	0	0.266
Lower Ski Run	0.016	0	0.016
Lower Skislope	0.017	0	0.017
Martiswoods	0.027	0	0.027
Middle Skislope	0.015	0	0.015
Palisades Hydro	0.025	0	0.025
Pinnacle	0.143	0.019	0.162
Pinnacle Hydro	0.073	0	0.073
Ponderosa Palisades	0.258	0	0.258
Prosser Heights	0.066	0	0.066
Riverview	0.126	0.075	0.201
Roundhill Hydro	0.005	0	0.005
Sierra Meadows	0.586	0.246	0.831
Sitzmark Hydro	0.019	0	0.019
Soma Sierra	0.024	0	0.024
Stockholm	1.346	0.238	1.584
Town	0.106	0.107	0.213
Trout Creek 6550	0.013	0	0.013
Upper Lakeview	0.143	0	0.143
Upper Skislope	0.030	0	0.030
Waterloo	0.033	0	0.033
West Palisades Hydro	0.005	0	0.005
Total	7.923	1.611	9.533

Table 4-7. Historic Non-Potable Water Production

Year	Donner Creek Well, millions of gallons	Fibreboard Well, millions of gallons	Southside Well No. 1, millions of gallons
2001	84.0	NA	NA
2002	61.5	NA	NA
2003	72.7	NA	NA
2004	83.4	NA	6.6 [a]
2005	65.1	NA	6.0 [a]
2006	77.7	NA	6.0 [a]
2007	88.3	NA	4.0 [a]
2008	89.5	NA	2.0 [a]
2009	78.2	25.9	1.5 [a]
2010	64.1	131.2	1.3

[a] Data for 2004 - 2009 is estimated. Southside Well No. 1 was not equipped with a meter until 2010

Table 4-8. Historic Water Production for Hirschdale Water System

Year	Number of Connections	Total Annual Production, gals	Maximum Monthly Production, gallons
1990	17	1,850,700	282,400
1991	19	2,471,500	417,800
1992	20	2,330,600	353,900
1993	20	3,324,700	1,107,600
1994	20	3,453,600	651,500
1995	20	2,383,700	548,300
1996	19	2,769,300	491,700
1997	19	3,768,200	659,100
1998	19	3,297,800	727,300
1999	19	4,384,100	811,900
2000	19	6,748,800	1,189,200
2001	19	6,277,900	956,700
2002	19	4,455,200	713,000
2003	19	2,972,100	540,800
2004	20	3,455,200	554,300
2005	20	3,323,800	606,300
2006	20	3,139,900	534,900
2007	20	3,061,000	541,800
2008	20	3,717,400	665,300
2009	20	3,486,100	516,000
2010	20	3,683,200	633,300

In 2009, the Water Conservation Act of 2009 (as known as SB 7X-7) was adopted. This legislation requires water utilities to reduce water demand by 20 percent from a recent ten-year baseline period. Compliance with SB 7X-7 reduces the project buildout average day potable water demand to 10.10 mgd and the projected buildout maximum day potable water demand to 20.30 mgd. **Tables 4-9** and **4-10** give the projected buildout water demands under average day and maximum day conditions.

Table 4-9. Buildout Average Day Water Demand by Planning Area

Planning Area	Residential Demand, mgd	Commercial Demand, mgd	Total, mgd
Donner Lake	0.73	0.04	0.77
Downtown/Airport	0.27	1.94	2.21
Gateway	0.39	0.67	1.06
Glenshire	0.81	0.02	0.83
Northeast	0.99	0.17	1.16
Southside	0.69	0.59	1.28
Tahoe Donner	2.64	0.15	2.79
Total	6.52	3.58	10.10

Table 4-10. Buildout Maximum Day Water Demand by Planning Area

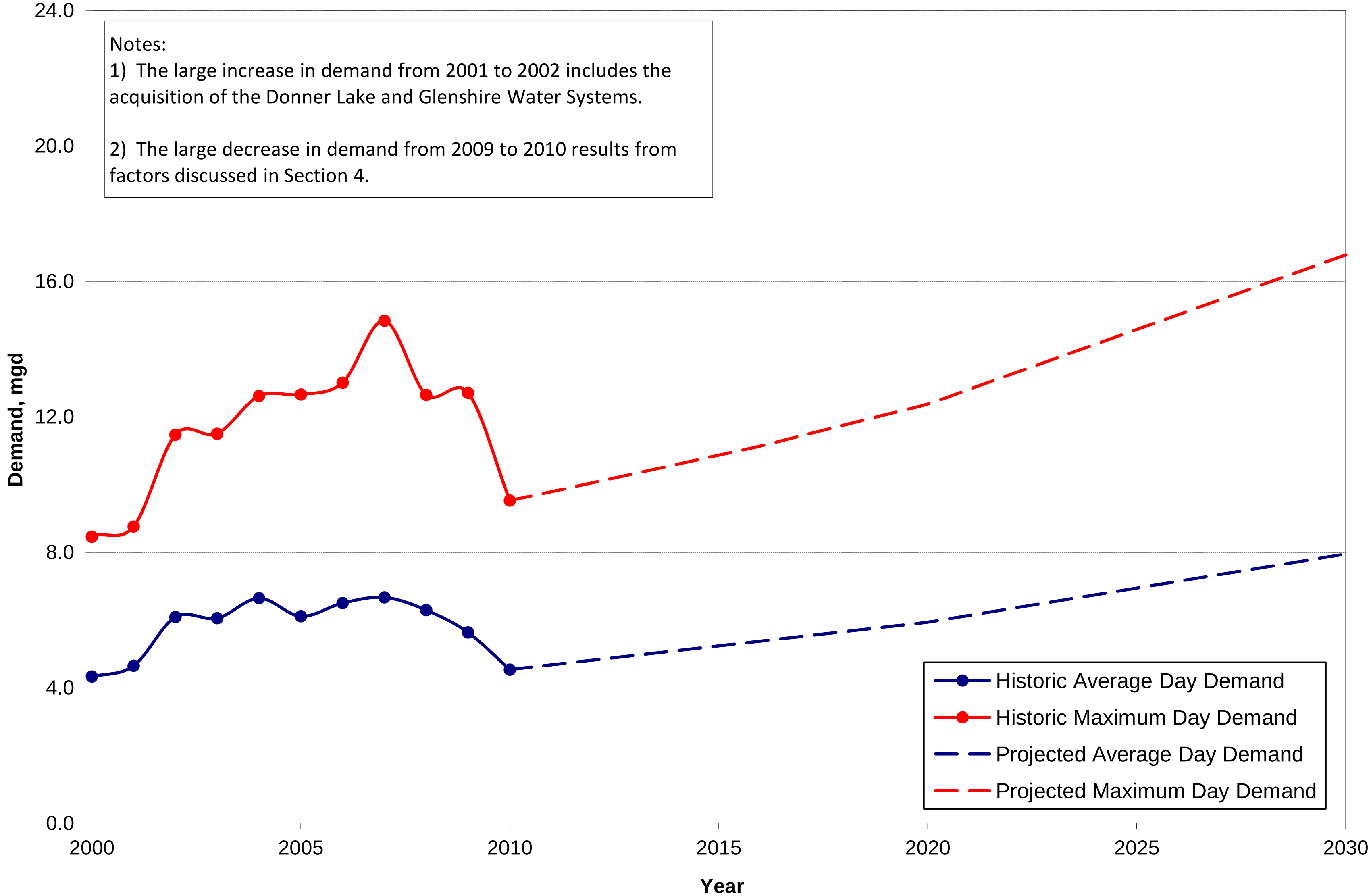
Planning Area	Residential Demand, mgd	Commercial Demand, mgd	Total, mgd
Donner Lake	1.49	0.06	1.55
Downtown/Airport	0.55	3.84	4.39
Gateway	0.78	1.30	2.08
Glenshire	1.65	0.04	1.69
Northeast	2.02	0.29	2.31
Southside	1.41	1.15	2.56
Tahoe Donner	5.35	0.37	5.72
Total	13.25	7.05	20.30

It is assumed that the Donner Creek Irrigation Well will continue to provide about 80 million gallons per year of irrigation water to the Coyote Moon Golf Course at buildout conditions. It is projected that the Fibreboard Well will supply about 160 million gallons per year of irrigation water to the Gray's Crossing and Old Greenwood golf courses at buildout conditions. It is also assumed that there will be a minimal construction water demand of 0.5 million gallons per year once buildout conditions are reached. Therefore, buildout non-potable water demand is expected to be about 240.5 million gallons annually. If the School District athletic fields and Meadow Park are connected to the Donner Creek Irrigation System, there will be a decrease in potable water demand and a corresponding increase in non-potable irrigation water demand. Total withdrawals from the groundwater basin will not change.

FUTURE POTABLE WATER DEMANDS

Average day potable water demands are projected to increase from 4.53 mgd currently to 10.10 mgd at buildout conditions. Similarly, maximum day potable water demands are projected to increase from 9.53 mgd currently to 20.30 mgd at buildout. Of significant importance is how rapidly the demand will increase from existing to buildout conditions. This projection is given in **Figure 4-3**.

Figure 4-3. Projected Increase in Potable Water Demand



FIRE FLOW DEMANDS

Due to the planning level nature of this Master Plan, it is not realistic to calculate individual fire flow demands for each parcel within the District's service area. Therefore, it is necessary to assume some generalized fire flow criteria for determining adequacy of the existing distribution system in regards to fire flow demands. It is also necessary to distinguish between the standards and requirements that were in effect at the time a development was constructed and the current requirements that are applied to new construction.

In 1997, the Uniform Fire Code was revised to increase the required fire flows for residential construction. Prior to 1997, the minimum required fire flow for single family residential construction was 750 gpm with a duration of two hours, regardless of the structure size. The 1997 code revision raised the minimum fire flow demand to 1,000 gpm for single-family residences less than 3,600 square feet in size. Single-family residences larger than 3,600 square feet now have a minimum fire flow demand of 1,500 gpm

Assumed fire flow demands are listed in **Table 4-11**. The fire flow demands given in **Table 4-11** are minimum values that must be reviewed on a case by case basis, and are subject to change due to occupancy, type of construction, property setbacks, and other issues. These minimum values were confirmed with the Truckee Fire Protection District. Based on land use, the largest required fire flow in each pressure zone was then calculated. These values are given in **Table 4-12**.

Table 4-11. Generalized Fire Flow Requirements by Land Use

Land Use	Flow Requirement, gpm	Flow Duration, hours
Single Family Residential Development Constructed prior to 1997	750	2
New Single Family Residential Up to 3,600 sq. ft per structure	1,000	2
New Single Family Residential Larger than 3,600 sq. ft per structure	1,500	2
Multi-Family Residential	1,500	2
Commercial	2,000	2
Industrial	2,000	3
Elementary School	2,500	3
Public	3,000	3
High School	3,000	4
Hospital	4,000	4

Table 4-12. Existing Maximum Fire Flow Requirements by Pressure Zone for Evaluation Purposes

Pressure Zone	Maximum Fire Flow Requirement, gpm	Fire Flow Duration, hours
6040	1,500	2
6170	2,500	3
Alder Creek	750	2
Armstrong	750	2
Bennett Flat	750	2
Chez	1,500	2
Coldstream 6080	2,200	3
DL-6124	2,200	3
DL-6323	2,000	3
DL-Northeast	2,000	3
DL-Red Mountain	750	2
DL-Wolfe	750	2
Donner Trails	750	2
Donner View	2,000	2
Donner View Hydro	750	2
Gateway	4,000	4
Glacier	750	2
Glenshire 1	750	2
Glenshire 2	2,500	2
Heidi Way	750	2
Heights Hydro	750	2
Hillside	750	2
Hirschdale	750	2
Icknield	1,500	2
Innsbruck	2,000	2
Lower Lakeview	750	2
Lower Ski Run	750	2
Lower Skislope	750	2
Martiswoods	750	2
Middle Skislope	750	2
Palisades Hydro	750	2
Pinnacle	1,500	2
Pinnacle Hydro	750	2
Ponderosa Palisades	750	2
Prosser Heights	750	2
Riverview	2,000	3
Roundhill Hydro	750	2
Sierra Meadows	2,000	2
Sitzmark Hydro	750	2
Soma Sierra	750	2
Stockholm	2,000	2
Town	3,000	4
Trout Creek 6550	1,500	2
Upper Lakeview	750	2
Upper Skislope	750	2
Waterloo	750	2
West Palisades Hydro	750	2

SECTION 5

WATER SUPPLY SOURCES

SECTION 5
WATER SUPPLY SOURCES

This section provides an evaluation of the available water supplies to meet the existing and future water demands through buildout of the District's service area. Recommendations necessary for the District to continue providing adequate water at acceptable quality are made for both existing and future conditions.

MARTIS VALLEY GROUNDWATER BASIN

The District currently obtains its drinking water through the pumping of groundwater from the Martis Valley Groundwater Basin (MVGB). The MVGB is a multiple aquifer system consisting of basin-fill sedimentary units and interlayered basin-fill volcanic units. Detailed information regarding geology of the MVGB can be found in a number of sources, including:

- Availability of Ground Water. Prepared for the Truckee Donner Public Utility District by Hydro-Search Inc. Reno, Nevada. February 1975.

- Truckee and Vicinity Ground-Water Resource Evaluation. Prepared for Dart Resorts Inc. by Hydro-Search Inc. Reno, Nevada. April 1980.

- Ground-Water Management Plan, Phase 1, Martis Valley Ground-Water Basin, Basin No. 6-67, Nevada and Placer Counties. Prepared for the Truckee Donner Public Utility District by Hydro-Search Inc. Reno, Nevada. January 1995.

- Ground Water Resource Evaluation. Prepared For The Truckee Donner Public Utility District by Nimbus Engineers. Reno, Nevada. November 2000.

- Ground Water Availability In The Martis Valley Ground Water Basin, Nevada and Placer Counties, California. Prepared for the Truckee Donner Public Utility District, Placer County Water Agency and Northstar Community Services District by Nimbus Engineers. Reno, Nevada. March 2001.

- Supplemental Report to California's Groundwater – Bulletin 118, Update 2003. Prepared by the California Department of Water Resources. Sacramento, California. October 2003.

QUANTITY OF GROUNDWATER IN THE MARTIS VALLEY BASIN

A number of studies have been conducted over the past 30 years to investigate and quantify the amount of water available in the MVGB. As knowledge regarding the geologic characteristics of the MVGB has improved over the years, the estimates of available water have been refined and therefore, the most recent studies are considered to have the best information regarding water availability.

The 1975 study by Hydro-Search estimated annual recharge to the MVGB at 18,200 AFY with a total subsurface storage volume of 1,050,000 acre-feet. The 1975 study also concluded that 13,000 AFY was available for consumptive uses. The 1980 and 1995 studies were essentially updates of the 1975 study and provided additional information regarding the MVGB. However, a new evaluation of groundwater availability was not conducted as part of those efforts.

The 2001 study represented the first reconsideration of the MVGB water availability since the 1975 study. This 2001 study concluded that total subsurface storage volume is 484,000 acre-feet, with an annual recharge of 29,165 AFY. Additional water is recharged to the upper layer of the MVGB by the Tahoe-Truckee Sanitation Agency's (TTSA's) wastewater treatment plant. This 2001 study concluded that the sustainable yield of the MVGB is 24,000 AFY.

In 2002, a study entitled ***Independent Appraisal of Martis Valley Ground Water Availability, Nevada and Placer Counties*** was conducted by Kennedy/Jenks Consultants. This study agreed with the sustainable yield estimate of 24,000 AFY by Nimbus Engineers in 2001. The Kennedy/Jenks study also concluded that the 24,000 AFY likely underestimates the amount of water available on a sustainable basis since the 2001 Nimbus study underestimated both basin recharge and ground water discharge to tributary streams.

In April 2003, a study conducted by InterFlow Hydrology and Cordilleran Hydrology entitled ***Measurement of Ground Water Discharge to Streams Tributary to the Truckee River in Martis Valley, Nevada and Placer Counties, California*** examined the issue of ground water discharge to tributary streams and concluded that about 34,000 AFY of water is available on a sustainable basis.

The California Department of Water Resources has not determined that the MVGB is being overdrafted and there are not any known instances of contamination of the MVGB. The MVGB is currently unadjudicated and none of the groundwater users has expressed a desire to have the basin adjudicated to date. Therefore, it is reasonable to assume that, at a minimum, the 24,000 AFY of water cited in the Nimbus study is available to support development in Truckee and the surrounding areas.

RELIABILITY OF WATER SUPPLY

Currently, the major producers of water in the MVGB are the District, the Northstar Community Services District, the Placer County Water Agency, Ponderosa Golf Course and Teichert Aggregates. There are numerous small wells supporting individual residences along with some other uses such as the Martis Creek Campground and the TNT Materials concrete plant.

For 2010, withdrawals from the MVGB by the District totaled 5,071 AF for potable water purposes and an additional 604 AF for irrigation and construction water purposes. It is estimated that an additional 1,500 AF was withdrawn by other users for a total withdrawal of 7,175 AFY.

As discussed in Section 4, the total buildout average day water demand for the District is projected at 10.10 mgd. Therefore, a sustainable water supply about 11,314 AFY will be required to meet this buildout condition. In February 2002, a technical memorandum entitled ***Water Demand and Net Depletion for Martis Valley Groundwater Basin*** prepared by David Antonucci estimated buildout water demand for all water producers throughout the MVGB at 20,953 AFY. This document projected a buildout demand of 13,326 AFY for areas currently served by the District, with 7,610 AFY for areas currently served by other agencies or individual wells. Assuming the 7,610 AFY estimate for other parties is correct, a total of 18,924 AFY is needed to serve the entire region at buildout.

With a total water supply of at least 24,000 AFY, there is adequate water supply to meet the projected buildout conditions. There are 484,000 acre-feet of water in storage in the MVGB. The projected total demand of 18,924 AFY at buildout is equal to about four percent of the capacity of the MVGB and there is adequate water to provide for over 20 years worth of demand even if no recharge of the basin were to occur.

MANAGEMENT OF THE MARTIS VALLEY GROUNDWATER BASIN

As noted on Page 5-1, a management plan for the Martis Valley Groundwater Basin was prepared in 1995. An updated groundwater basin management plan is currently under preparation and should be completed in 2012.

EXISTING WATER SUPPLY QUALITY

As noted in the District's ***2010 Water Quality Report***, all water supplied to potable water customers is in compliance with State and Federal regulations. The District does operate treatment systems at the Northside and Hirschdale wells. The treatment system at Northside removes excess levels of arsenic. The treatment system at Hirschdale removes excess levels of arsenic, iron and manganese. The quality of the existing sources has been consistent and the District does not anticipate any future changes in the quality of its existing sources.

EXISTING PRODUCTION CAPACITY IN RELATION TO PROJECTED DEMANDS

Current maximum day potable water demand is 9.53 mgd. It is anticipated that this maximum day demand will increase to 10.9 mgd and 12.4 mgd by the years 2015 and 2020, respectively. Average day potable water demand will increase from 4.53 mgd currently to 5.11 mgd in the year 2015 and 5.81 mgd in the year 2020. The anticipated growth in potable water demand shown graphically in **Figure 5-1.**

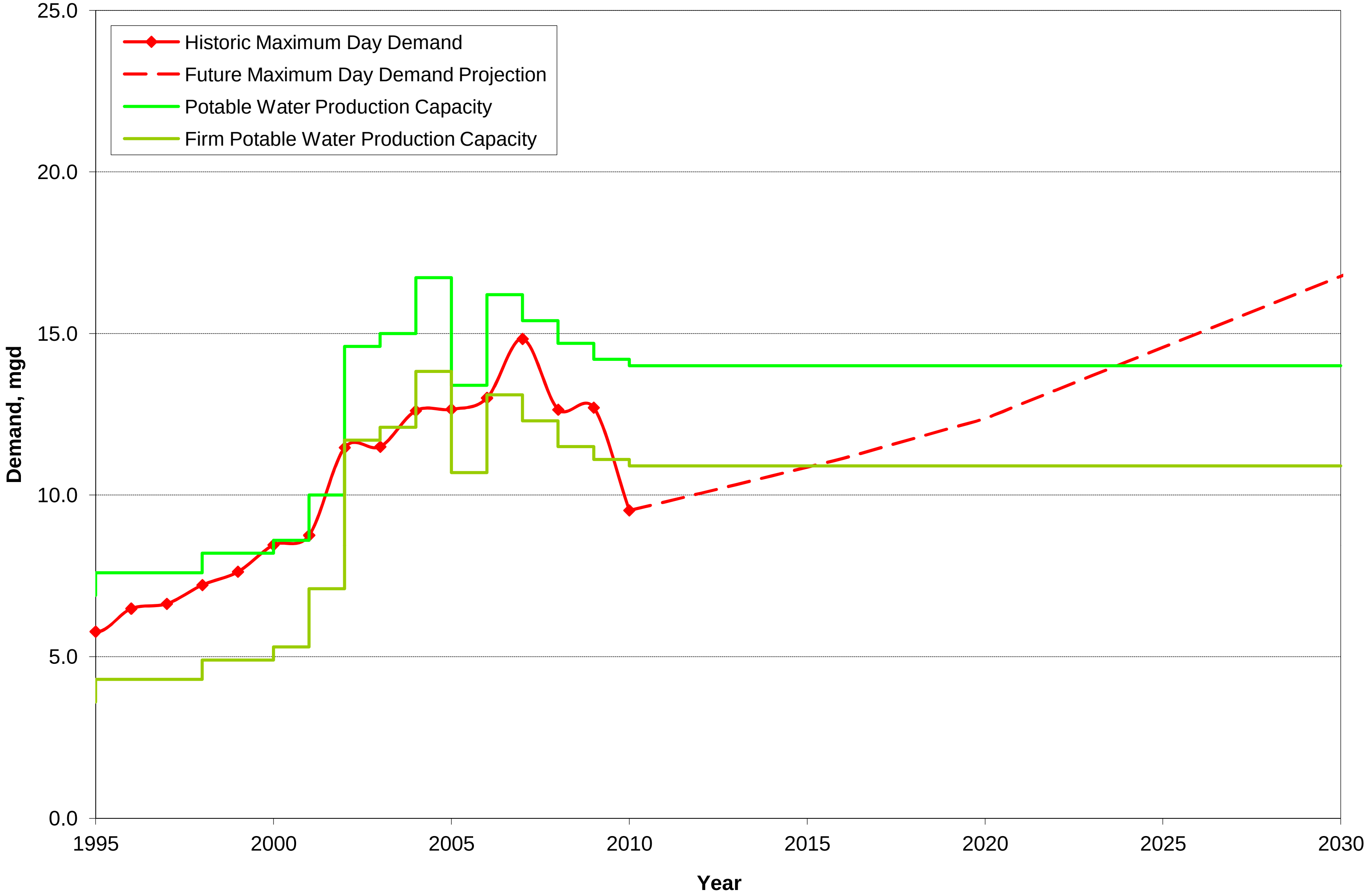
The District currently operates 12 potable water wells in the Truckee area and one in the Hirschdale area. The total capacity of these wells is about 9,740 gpm (14.0 mgd). The overall system potable water production capacity is adequate to serve projected demands through the year 2023. However, the firm capacity of these existing facilities will be exceeded in the year 2015, since a failure of Airport Well would leave a production capacity of only 10.9 mgd.

IMPACT OF UPCOMING WATER QUALITY REGULATIONS

The Environmental Protection Agency (EPA) has been discussing additional regulations regarding radon levels in drinking water for a number of years. Currently, radon is present in the existing wells at levels below the existing maximums.

Preliminary announcements from USEPA have indicated that the maximum allowable radon level will likely be reduced from 4,000 picocuries per liter (pCi/L) to 300 pCi/L. According to the District's ***2010 Water Quality Report***, radon levels in its wells range from 293 to 1,600 pCi/L. The proposed radon level limit is under review and may be set at a level higher than 300 pCi/L. Two methods have been identified to address the proposed reduction in the allowable radon level.

Figure 5-1. Projected Potable Water Demand vs. Existing Production Capacity, 1995-2030



One method involves the removal of radon in the water by aeration. Treatment by aeration would require the installation of separate aeration tanks and booster pumping stations at each well site. This method would require a significant capital investment, along with incurring higher operations and maintenance costs. Capital costs range from $100,000 to $150,000 for each well site. Operation and maintenance costs are estimated at $0.05 per thousand gallons.

The second method is a Multimedia Mitigation Program proposed by the USEPA. The Multimedia Mitigation Program addresses both water and air quality at the point of use. This program has a limited involvement by the water provider and is focused mainly on air quality. No cost estimates are available at this time, but it is anticipated that the Multimedia Mitigation Program costs will be substantially lower than the cost of treatment by aeration. Therefore, it is expected that the forthcoming radon regulations will have a minimal impact on the District's water supply.

ADDITIONAL POTABLE WATER PRODUCTION CAPACITY

The available production capacity is sufficient to meet current demands. Based upon the projected growth, the potable water production facilities will be unable to meet projected maximum day demands in the year 2024. With the projected buildout maximum day potable water demand of 20.3 mgd, an additional 9.4 mgd of potable water production capacity is needed to meet buildout demands and to provide adequate firm capacity to the system.

Based on the 14.0 mgd of total available capacity, an additional 2.8 mgd of production capacity is needed over the next 20 years to meet projected demands. Furthermore, an additional 3.0 mgd of capacity will be necessary to ensure that the system has adequate firm capacity. There are three alternatives available to the District for additional water supply to meet this need:

- Construct additional wells not requiring filtration
- Construct additional wells requiring filtration
- Construct a surface water treatment facility

Historically, the District has used groundwater as its sole source of supply. Construction of a surface water treatment plant to utilize surface water from Donner Lake was undertaken by a developer in the early 1970s, but was halted due to political issues and questions regarding the status of water rights. It is recommended that groundwater continue to be the main source of supply.

Based on the studies cited at the beginning of this Section, the additional groundwater wells can be constructed without exceeding the sustainable yield of the groundwater basin. Construction of new wells is expected to be the near-term solution to increasing water supply. As further development occurs in adjoining areas of the Martis Valley, the overall withdrawals from the basin will need to be balanced with the sustainable yield. The other two water supply options require additional investigations of technical, legal and regulatory issues.

RECOMMENDED IMPROVEMENTS

Based on the expected increase in water demand, a number of water production improvements are recommended. These improvements are listed in **Table 5-1**. In the short-term, construction of new wells not requiring filtration is the most reasonable alternative to pursue. For the purposes of water supply planning, it is assumed that new wells will have a capacity of 850 gpm each. If the capacity of new wells differs significantly from this 850 gpm value, the recommendations given herein should be adjusted accordingly.

The proposed phasing given in **Table 5-1** is based on anticipated growth in demand throughout the service area. An additional eight wells will be needed to serve buildout conditions with adequate firm capacity. These wells should be constructed as growth and increases in water demand dictate. **Figure 5-2** gives the relationship of projected demand to the recommended water production improvements.

Table 5-1. Recommended Potable Water Production Improvements

Year	Maximum Day Demand, mgd	Total Production Capacity, mgd	Firm Production Capacity, mgd	Notes
2010	9.53	14.0	10.9	
2011	9.79	14.0	10.9	
2012	10.06	14.0	10.9	
2013	10.33	14.0	10.9	
2014	10.60	14.0	10.9	
2015	10.87	14.0	10.9	
2016	11.14	15.2	12.2	New 850 gpm Well Constructed
2017	11.45	15.2	12.2	
2018	11.76	15.2	12.2	
2019	12.07	15.2	12.2	
2020	12.38	16.5	13.4	New 850 gpm Well Constructed
2021	12.82	16.5	13.4	
2022	13.26	16.5	13.4	
2023	13.70	17.7	14.6	New 850 gpm Well Constructed
2024	14.14	17.7	14.6	
2025	14.58	17.7	14.6	
2026	15.02	18.9	15.8	New 850 gpm Well Constructed
2027	15.46	18.9	15.8	
2028	15.90	20.1	17.1	New 850 gpm Well Constructed
2029	16.34	20.1	17.1	
2030	16.78	20.1	17.1	
Buildout	20.30	23.8	20.7	

In 2002 and 2003, the District drilled a number of exploration wells in order to identify locations for future groundwater wells. As a result of this exploration well program, the District acquired four well sites. The Prosser Village Well was constructed in 2004 and the Old Greenwood Well was constructed in 2006 at two of these sites.

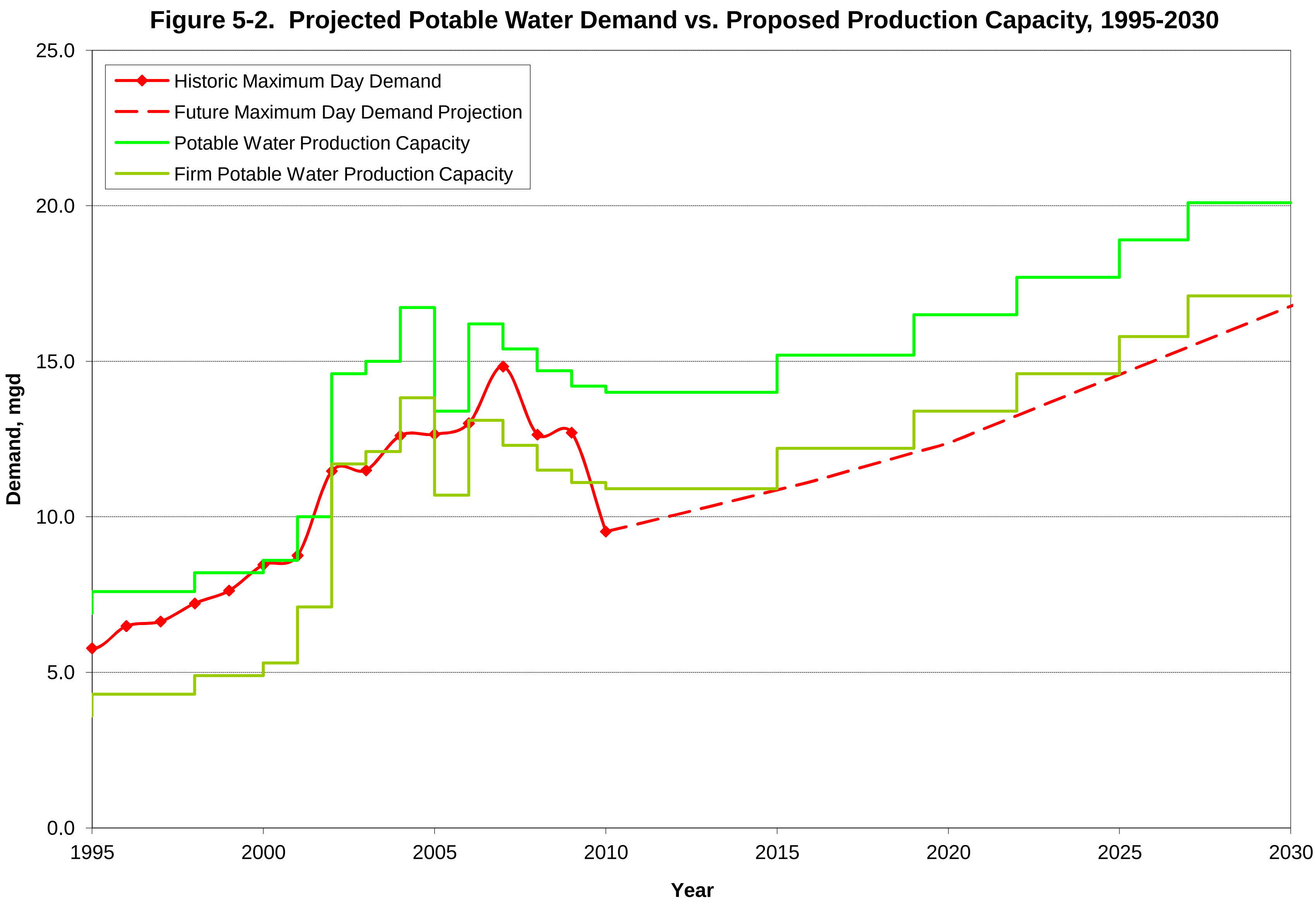


Figure 5-2. Projected Potable Water Demand vs. Proposed Production Capacity, 1995-2030
Historic Maximum Day Demand
Future Maximum Day Demand Projection
Potable Water Production Capacity
Firm Potable Water Production Capacity
Demand, mgd
25.0
20.0
15.0
10.0
5.0
0.0
1995
2000
2005
2010
2015
2020
2025
2030
Year

The Fibreboard Well was constructed in 2009 at the third site. The water produced by this well exceeds the MCL for arsenic and is considered non-potable water. However, this water is perfectly suited for irrigation purposes and supplies water to the Gray's Crossing and Old Greenwood golf courses. This well allowed for the removal of about 1.3 mgd of maximum day demand from the potable water system.

There is one remaining well site where property rights have been secured by the District. It is expected that the new finite element model under development by Brown and Caldwell will provide information regarding behavior of the groundwater basin. Once this model and the accompanying study are completed, the District should have sufficient information to identify additional well sites and can investigate the drilling of additional test wells.

It should also be noted that some of the existing wells may be reaching the end of their useful lives towards the year 2025. Production from the wells should be monitored over time and redevelopment of existing wells may be necessary to maintain an adequate water supply. Of particular concern is the long-term viability of the existing Airport Well. The existing wellhole and casing are not completely vertical and there is a significant offset in the casing. As a result of this offset, the well shaft experiences accelerated wear and requires replacement every four years.

The use of surface water, either through a treatment plant or wells with filtration, requires that a number of technical, legal and environmental issues be investigated and addressed. Surface water should be considered a long-term water supply option and may prove to be more cost-effective than new wells as demand approaches buildout conditions.

SECTION 6

EXISTING SYSTEM EVALUATION

SECTION 6
EXISTING SYSTEM EVALUATION

This section provides detailed descriptions and summaries of the evaluation of the existing water system. Analyses were conducted for required source water quantities, storage requirements, water transfers both within and between zones, and ability of the system to adequately provide sufficient water under both maximum day plus fire and peak hour conditions. This section first describes the methodology used in the analyses, followed by descriptions of the results and recommendations.

METHODOLOGY

Analyses for source water, storage requirement quantities, and inter-zone water transfer capabilities are conducted using desktop and spreadsheet methods. The total source water requirements are determined based on anticipated maximum day demands. As described earlier, adequate source water must be available to provide maximum day demands with the largest source of water (groundwater well) out of service. Therefore, maximum day demand projections are evaluated with respect to existing source water capacity and additional capacity is recommended as needed.

Storage water requirements, or requirements for storage tank volumes, are evaluated on a system-wide as well as on a per pressure zone basis. Criteria described in Section 2 are used to determine existing system performance and to project future system storage needs. The storage requirements are compared with existing and anticipated storage volumes to develop recommendations for any additional tank facilities.

A computer hydraulic model of the piping system is used to evaluate the existing and future water systems after the completion of the analyses described above. The hydraulic model analyses include recommended facilities such as additional groundwater wells, storage tanks, booster pumps, and pressure reducing stations. Model analyses are made for both maximum day plus fire and peak hour flows to evaluate anticipated pipeline velocities and system pressures. Recommendations are made for any additional pipelines necessary due to system hydraulics and the adequacy of pipelines with respect to system redundancy is also evaluated.

INTER-ZONE WATER TRANSFERS

The movement of water through the system from the wells to consumers was examined to ensure that adequate pumping capacity exists. This analysis is illustrated in **Figure 6-1**. As shown in this figure, all of the facilities have sufficient capacity to meet current demands.

DISTRIBUTION SYSTEM ANALYSIS RESULTS

The existing system was evaluated under the following four demand conditions:

- Average day conditions
- Maximum day conditions
- Peak hour conditions
- Maximum day conditions with fire flow demands

Pump operations were modeled based on actual settings used in the District's SCADA system. The on/off control settings for well and booster stations are usually based on the minimum and maximum allowable water levels of storage tanks. Due to a significant difference in water demand, system operations are quite different between Summer and Winter. The Summer operational settings were assumed for average day conditions. Analyses were conducted using a 24-hour simulation to evaluate the need for storage from the standpoint of pump operations. It also should be noted that the pressures calculated by the hydraulic model are taken at the ground surface at the pipeline location. There are numerous locations within the system where a house is located on a slope above the pipeline providing service. In some cases, the elevation difference between the District's pipeline and a sink or shower within the customer's home is large enough to result in a significant pressure drop and corresponding customer complaints.

Existing Average Day Conditions
Under existing average day conditions, the expected demand is 4.5 mgd. Using the design criteria outlined in Section 2, 11 areas with pressures below 40 psi were identified. These areas are shown on **Figure 6-2**. Also shown on **Figure 6-2** are pipelines with excessive velocity, excessive headloss, or both. Review of this figure shows low-pressure areas in the Donner Lake, Meadow Lake Park, Ponderosa Palisades and Tahoe Donner areas. High pressures occur in the Armstrong, Donner Lake, Glenshire, Prosser Heights, Prosser Lakeview and Tahoe Donner areas. One pipeline with excessive velocity was identified. This pipe conveys water from the Prosser Village well.

Existing Maximum Day Conditions
The maximum day peaking conditions were applied and the model was run for a 24-hour simulation. The hour from 5:00 to 6:00 PM most closely corresponds to the average demand for the maximum day. The demand for this hour is 9.5 mgd. Thirteen areas with pressures below 40 psi were identified, and are shown on **Figure 6-3**. Also shown on **Figure 6-3** are pipelines with excessive velocity, excessive headloss, or both.

Review of **Figure 6-3** shows low-pressures in essentially the same locations as those identified under average day conditions. Most of these low pressures are the result of service locations located too high in elevation in relation to the storage tank providing service. In most cases, the proper solution to the problem is extending piping from a higher pressure zone and reconnecting the customers to the new piping.

A number of pipelines experience excessive velocity and headloss under maximum day conditions. Most of these pipelines are considered major transmission lines. As described in Section 4, about 61 percent of the overall system demand is located in the Donner Lake, Gateway and Tahoe Donner areas. However, only two percent (A Well at 160 gpm) of the water supply is located in that area. Almost all of the water provided to the western end of the service area must be pumped from other parts of the water system.

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The high velocities and headloss along Brockway Road, Donner Pass Road and Northwoods Boulevard are an indication that these transmission pipelines are not performing to standards. The existing system is able to function and supply water adequately, but excess energy consumption and more severe hydraulic transients result from operating at these higher velocities

Existing Peak Hour Conditions

The peak hour corresponds to the hour from 8:00 to 9:00 AM on the Maximum Day. The demand for this hour is a rate of 13.3 mgd. Eight areas with pressures between 18 psi and 30 psi were identified, and are shown on **Figure 6-4**. The high pressure and low pressure areas of the system under peak hour conditions are very similar to those under maximum day conditions. A few additional pipelines with high headloss are identified.

Existing Fire Flow Analysis

Fire flow analyses were conducted using the generalized fire flow criteria given in Section 2. No effort was made to determine whether a given location had a higher demand than that given in Section 2. These fire flows were input to the hydraulic model and the model was run with the fire flow demands imposed on existing maximum day conditions. A number of areas that cannot provide the required fire flow demand with a residual pressure of 20 psi were identified. These areas are shown on **Figure 6-5**. The residual pressure and fire flow demand given on this figure indicate the worst case condition for a given area and other locations within that area may have significantly different fire flow demands and higher residual pressures.

WATER STORAGE ANALYSIS

The existing distribution system has 33 active storage tanks with a total storage volume of about 9.5 million gallons. More detailed information of the storage tanks is given in Section 3. As discussed in Section 2, the two critical values for determining storage requirements are the maximum day demand and the fire flow requirements within each pressure zone.

Based on data in Section 4, the minimum storage requirements and additional storage volume needed to serve existing demands have been calculated. These values are given in **Table 6-1**. Review of this table shows a need for approximately 4.7 million gallons of additional storage. Seven of the pressure zones (Armstrong, DL-6124, DL-6323, Donner View, Innsbruck, Pinnacle and Stockholm) are in need of additional storage volume, ranging from 0.12 to 0.82 million gallons. Additional storage volume is recommended for these pressure zones with a total volume of about 2.9 million gallons.

Another five zones are considered marginal, with additional storage needs ranging from 0.01 to 0.09 million gallons. Additional storage is not recommended for these zones at this time.

Table 6-1 also indicates storage deficiencies in the Gateway, Glenshire and Town zones. All three of these zones are receive water supply from the 6170 zone through control valves. Operation of these control valves is based upon the water level in the storage tank serving the respective zone. Should one of the pressure zones receiving water experience an unusual demand for water due to a large fire or emergency condition, the storage volume in the 6170 zone is available. Therefore, additional storage volume is not recommended in these zones to serve existing needs.

Table 6-1. Existing System Storage Analysis

Zone	Existing Maximum Day Demand, mgd	Regulatory Storage, mg	Maximum Fire Flow			Emergency Storage, mg	Required Storage, mg	Available Storage, mg	Additional Storage Needed, mgd
			Flow, gpm	Duration, hours	Volume, mg				
6170	1.654	0.551	3,000	4	0.72	0.827	2.10	2.35	0.00
Armstrong	0.152	0.051	750	2	0.09	0.076	0.22	0.10	0.12
DL-6124	0.583	0.194	2,200	3	0.40	0.292	0.88	0.23	0.65
DL-6323	0.363	0.121	2,000	3	0.36	0.182	0.66	0.30	0.36
Donner View	0.805	0.268	2,000	2	0.24	0.403	0.91	0.70	0.21
Gateway	0.681	0.227	4,000	4	0.96	0.341	1.53	0.75	0.78
Glacier	0.094	0.031	750	2	0.09	0.047	0.17	0.15	0.02
Glenshire 1	0.219	0.073	1,000	2	0.12	0.110	0.30	0.49	0.00
Glenshire 2	0.804	0.268	2,500	3	0.45	0.402	1.12	0.74	0.38
Hirschdale	0.021	0.007	750	2	0.09	0.011	0.11	0.10	0.01
Innsbruck	1.058	0.353	2,000	2	0.24	0.529	1.12	0.60	0.52
Lower Lakeview	0.266	0.089	750	2	0.09	0.133	0.31	0.25	0.06
Martiswoods	0.027	0.009	750	2	0.09	0.014	0.11	0.10	0.01
Pinnacle	0.235	0.078	1,500	2	0.18	0.118	0.38	0.18	0.20
Ponderosa Palisades	0.288	0.096	750	2	0.09	0.144	0.33	0.40	0.00
Prosser Heights	0.231	0.077	750	2	0.09	0.116	0.28	0.43	0.00
Soma Sierra	0.039	0.013	750	2	0.09	0.020	0.12	0.20	0.00
Stockholm	1.805	0.602	2,000	2	0.24	0.903	1.74	0.92	0.82
Town	0.213	0.071	3,000	4	0.72	0.107	0.90	0.40	0.50
Upper Ski Run	0.016	0.005	1,500	2	0.18	0.008	0.19	0.10	0.09
	9.55						13.49	9.49	4.73

PIPELINE LEAKAGE ANALYSIS

The Truckee Water System has experienced significant problems with leaking and failing water lines in the Tahoe Donner area. The District undertook a large main replacement project in 1991 and replaced additional pipelines in 1996, 1998, 1999 and every year from 2002 through 2010. There are other areas in Tahoe Donner in need of replacement. In addition, many other portions of the system are between 40 and 50 years old, and are beginning to experience leakage problems as well. Detailed records regarding leak repairs are available from 1989 to the present and are summarized in **Table 6-2**.

Table 6-2. Number of Leaks, 1989 - 2010

Year	Number of Leaks
1989	105
1990	237
1991	248
1992	176
1993	121
1994	124
1995	116
1996	95
1997	109
1998	76
1999	126
2000	141
2001	161
2002	172
2003	166
2004	136
2005	145
2006	129
2007	133
2008	99
2009	80
2010	74

Review of **Table 6-3** shows that the number of leak repairs has decreased markedly over the past ten years. This reduction is a direct result of the pipeline replacement projects undertaken by the District during this same time period. It should be noted that the District has suspended its pipeline replacement program due to a lack of available funds. A replacement project was not undertaken in 2011 and the District does anticipate having available funds for additional pipeline replacement in the near term. Therefore, it is expected that there be an increase in the number of leak repairs performed over the next few years as more existing pipelines reach the end of their useful life.

Methodology

Initially, all leaks reported during the period of 2005-2010 were plotted on a map of the distribution system and color-coded by the year in which they occurred. Second, the distribution system was broken down into pipeline segments of about 500 to 600 feet in length and each leak was assigned to a given pipeline segment. The number of leaks for each segment was then totaled.

A pressure zone adjustment factor was developed to account for the fact that water lost due to leaks in higher pressure zones costs the District more money than water lost in lower pressure zones. This higher cost is the result of electricity consumed in pumping the water to a higher pressure zone. This factor uses the Town and Gateway zones as the base zone and adjusts for all higher pressure zones. The adjustment factors are given in **Table 6-3**.

Finally, the total number of leaks was multiplied by the adjustment factor and this product was designated as the Leak Replacement Value. A Leak Replacement Value was calculated for each pipeline segment in the system. In areas where no leaks occurred, the system was not broken down into smaller segments.

Table 6-3. Pressure Zone Adjustment Factors

Pressure Zone	Adjustment Factor	Pressure Zone	Adjustment Factor
Gateway	1.0	Palisades Hydro	1.3
Town	1.0	Upper	1.3
6124	1.1	West Palisades Hydro	1.3
6170	1.1	Bennett Flat	1.4
Berkshire	1.1	Innsbruck	1.4
Glenshire 2	1.1	Alder Creek	1.5
Icknield	1.1	Hillside	1.5
Lower Lakeview	1.1	Sitzmark Hydro	1.5
Prosser Heights	1.1	Stockholm	1.5
Sierra Meadows	1.1	Trout Creek 6550	1.5
Upper Lakeview	1.1	Donner View	1.6
Waterloo	1.1	Heidi Way	1.6
Armstrong	1.2	Pinnacle	1.6
Donner Trails	1.2	Roundhill Hydro	1.6
Glenshire 1	1.2	Donner View Hydro	1.7
Heights Hydro	1.2	Lower Ski Run	1.7
Ponderosa Palisades	1.2	Pinnacle Hydro	1.7
Red Mountain	1.2	Upper Ski Run	1.7
Soma Sierra	1.2	Lower Glacier	1.8
Wolfe	1.2	Middle Glacier	1.8
Martiswoods	1.3	Upper Glacier	1.8
Northeast	1.3		

Results

A total of 2,398 pipeline segments exist in the distribution system. Of this total, leaks occurred in 241 of the segments. The Leak Replacement Values calculated ranged from 0 to 10.5. A total of 22 sections of pipeline have a Leak Replacement Value of 5 or greater. Of these 16 segments, four are located in the Glenshire area, one is located in the Biltz tract and the remainder are located in Tahoe Donner. These 22 sections total about 14,900 feet of pipe and are designated as high priority needs.

There are an additional 67 sections of pipeline with a Leak Replacement Value between 2 and 5 that have not been replaced. These pipelines had a minimum of two leaks over the past five years. These sections total about 46,200 feet of pipe and are designated as medium priority needs. The remaining pipeline sections have either been replaced under previous projects, or suffered at most one leak over the past five years. Those sections not already replaced are considered low priority needs. **Table 6-4** gives a summary of pipeline replacement needs and **Figure 6-6** shows an overall summary of the recommended leak replacement program and also notes which pipelines have already been replaced.

Table 6-4. Summary of Pipeline Replacement Needs

Priority	Pipeline Length, feet
High Priority	14,859
Medium Priority	46,196
Low Priority/No Leaks	530,136
Previously Replaced/Installed in 1990s or 2000s	558,680
Total	1,149,871

SYSTEM OPERATIONS

There are a number of improvements needed to the existing system in order to improve system operations, address water quality concerns and improve the system's energy efficiency. These improvements include:

- Installation of flow meters at pumping stations to track actual system flows
- Installation of looping pipelines to remove dead-end mains
- Installation of standby generators to ensure pumping capabilities under emergency conditions
- Installation of a new SCADA system

WATER SUPPLY FACILITIES

As described in Section 3, the District's total existing water supply capacity is about 14.0 mgd, with a firm capacity of about 10.9 mgd. This capacity is sufficient to meet current demands. Section 5 gives a detailed discussion and analysis of existing and future water supply issues.

NECESSARY IMPROVEMENTS

The 2004 Master Plan described 53 improvement projects needed to bring the system to current performance standards at that time. Eighteen of those 53 projects have been constructed. Two other projects – installation of flow meters and installation of standby generators – involve multiple sites and are partially complete.

Based on the examination of current conditions described above, a total of 38 necessary improvement projects have been identified for the existing system. These improvements are given in **Table 6-5** and shown on **Figure 6-7**. The listing given in the table is not based on priority and the Map ID numbers are simply a convention for denoting the location of the proposed improvements. Please note that the improvements listed are only those required to address system performance with the existing system (as of January 1, 2011) and do not address any additional needs caused by future growth. The facilities actually constructed should address both existing and future needs. Implementation of any of these recommendations should consider the discussions regarding improvements needed to service future growth given in Section 7. It is also recommended that the pipeline replacement program be restarted, with a goal of replacing between two and three miles of pipe every year.

Table 6-5. Recommended Improvement Projects to Address Existing Needs

Map ID	Improvement	Justification
1	Replace 6-inch cross-country pipeline between Alder Creek Road & Wolfgang Road	System Reliability Water Quality
2	Install PRV station on Oberwald Way from Pinnacle Zone to Stockholm Zone	Fire Flow
3	Install PRV station on Pathway Avenue from Stockholm Zone to Innsbruck Zone	Fire Flow
4	Install 8-inch pipeline from Royal Way to Royal Crest Extension	Fire Flow
5	Install 8-inch pipeline from Martiswoods Tower to Kleckner Court	Fire Flow
6	Install 8-inch pipeline across UPRR Tracks from Church Street to East River Street	Fire Flow
7	Install 8-inch pipeline in Sierra Drive from Prosser Street to Richards Boulevard	Fire Flow
8	Install 8-inch pipeline across Donner Pass Road to south of Fire Station No. 92	Fire Flow
9	Relocate fire hydrant on Hansel Avenue from Innsbruck Zone to Stockholm Zone	Fire Flow
10	Relocate fire hydrant on Hansel Avenue from Innsbruck Zone to Stockholm Zone	Fire Flow
11	Change service connections from Innsbruck Zone to Stockholm Zone	Provide Adequate Service Pressure
12	Change service connections from Stockholm Zone to Roundhill Hydro Zone	Provide Adequate Service Pressure
13	Install 8-inch pipeline in Davos Drive to extend Stockholm Zone	Provide Adequate Service Pressure
14	Install 12-inch/8-inch pipeline in Skislope Way below Ski Lodge Tank Site	Fire Flow
15	Change service connections from Stockholm Zone to Donner View Zone	Provide Adequate Service Pressure
16	Install 8-inch pipeline in Sitzmark Way to extend Sitzmark Hydro Zone	Provide Adequate Service Pressure
17	Install 8-inch pipeline in Sitzmark Way to extend Sitzmark Hydro Zone	Provide Adequate Service Pressure

Map ID	Improvement	Justification
18	Install 8-inch pipeline in Aspenwood Road to extend Palisades Hydro Zone	Provide Adequate Service Pressure
19	Install 8-inch pipeline in Rocky Lane to extend Donner Trails Hydro Zone	Provide Adequate Service Pressure
20	Install 8-inch pipeline in Skislope Way to extend Donner View Hydro Zone	Provide Adequate Service Pressure
21	West Palisades Hydro PS upgrade	Fire Flow Provide Adequate Service Pressure
22	Construct 0.30 mg tank at Red Mountain Tank site	Fire Flow Storage
23	Construct 0.32 mg tank at Ski Lodge Tank site	Storage
24	Construct 0.52 mg tank at Innsbruck Tank site	Storage
25	Construct 0.80 mg tank at Herringbone Tank site	Storage
26	Construct 0.20 mg tank at Pinnacle Tank site	Storage
27	Install 8-inch pipeline in Blueberry Road and Purple Sage Road to extend Palisades Hydro Zone	Provide Adequate Service Pressure
28	Repair/replace 6-inch cross-country pipeline between Schussing Way & St. Bernard Drive	System Reliability Water Quality
29	Install 8-inch pipeline in Olympic Boulevard from East Ridge Road to Kayhoe Court	Fire Flow
30	Install 10-inch pipeline at Pine Forest Rd. & Greenwood Dr. to complete pipe loop in Lower Lakeview Zone	Water Quality
31	Install pipe connection at Glenshire Drive & Somerset Drive	System Reliability Water Quality
32	Install 12-inch pipeline in Glacier Way & Skislope Way	Fire Flow
33	Install 8-inch pipeline from Sitzmark Way to Mougle Lane to extend Sitzmark Hydro Zone	Fire Flow Provide Adequate Service Pressure
34	Install 4-inch pipeline in Northwoods Boulevard to extend Stockholm Zone	Provide Adequate Service Pressure
35	Install 8-inch pipeline in Northwoods Boulevard to extend Donner View Zone	Fire Flow Provide Adequate Service Pressure
36	Install 6-inch pipeline in McPhetres Street	Fire Flow
37	Installation of flow meters at all wells and pumping stations not currently equipped	Energy Efficiency/System Operations
38	Installation of standby generators at selected wells and pumping stations not currently equipped	System Reliability

SECTION 7

FUTURE SYSTEM EVALUATION AND LAYOUT

SECTION 7
FUTURE SYSTEM EVALUATION AND LAYOUT

This section provides detailed descriptions and summaries of the anticipated future water system. Analyses were conducted for required source water quantities, storage requirements, water transfers between pressure zones, and ability of the system to adequately provide sufficient water under anticipated maximum day plus fire and peak hour conditions.

Analyses described in Section 6 identified a number of existing needs. Section 6 also presented recommended improvements to address those needs. Some improvements described in this Section are modifications to previous recommendations that include allowances for future growth. Other recommended improvements given in Section 6 have been deleted and replaced with recommendations discussed in this Section that accomplish the same function. Implementation of any improvements should consider provisions for anticipated future growth.

FUTURE WATER SUPPLY FACILITIES

As discussed in Section 5, the current nominal capacity of all of the groundwater wells is about 14.0 mgd. The maximum day demand is expected to increase from 9.53 mgd currently, to 20.30 mgd at buildout. In order to meet this future demand, a total of seven new wells, at a capacity of 850 gpm each, is anticipated. An eighth well is also recommended in order to provide adequate firm capacity.

In 2002 and 2003, the District drilled a number of exploration wells in order to identify locations for future groundwater wells. As a result of this exploration well program, the District acquired four well sites and wells have been constructed at three of the four. There is one remaining well site where property rights have been secured by the District.

It is expected that the new finite element model under development by Brown and Caldwell will provide information regarding behavior of the groundwater basin. Once this model and the accompanying study are completed, the District should have sufficient information to identify additional well sites and can investigate the drilling of additional test wells.

Tentative locations of future wells have been identified for the purposes of distribution system layout and sizing. A future piping system has been developed based on these locations. As further studies of the groundwater basin are conducted, the piping system recommendations may need to be revised.

Some of the existing groundwater wells will be approaching the end of their useful life by the year 2020. Due to the variability of well useful life spans, no costs associated with redevelopment of existing wells have been included in this study. However, it is assumed that wells reaching the end of their useful life will be redeveloped at the same site, minimizing the need for need new piping and electrical facilities.

FUTURE DISTRIBUTION SYSTEM LAYOUT

As discussed in Section 4, future growth will be a combination of infill in existing subdivisions and development of currently vacant lands. As a basis for developing recommended improvements to serve future conditions, the existing system schematic given in **Figure 3-1** was reviewed in relation to the anticipated buildout demands. It was determined that the only Donner Trails and Soma Sierra pump stations will not have sufficient capacity to meet buildout needs.

Tahoe Donner Supply Reliability and Redundancy

Water demand in the Tahoe Donner subdivision is currently about 4.01 mgd on the maximum day and comprises about 42 percent of the systemwide total. Buildout maximum day demand in the Tahoe Donner area is projected at about 5.72 mgd or about 28 percent of the overall buildout maximum day demand. There is a single pipeline along Northwoods Boulevard that provides water to the entire subdivision and the existing pumping facilities (Donner Trails and Soma Sierra) along that pipeline have a capacity of about 5.6 mgd. A major failure of the pipeline or pump station could place a significant number of customers out of water since the only alternative facility to feed this area is the A Well with a capacity of 160 gpm.

Considering that almost half of the existing system's water demand must run through a linear series of pumps and pipelines, and that the existing system will need to serve the expected buildout maximum day demands, it would be prudent to provide a second pipeline feed into Tahoe Donner in order to provide redundancy and provide additional capacity. The proposed routing for this second pipeline is west from the intersection of Pioneer Trail and Comstock Drive along the anticipated alignment of the 3rd Access Road to Tahoe Donner. A pump station would be located along this route to pump from the 6170 pressure zone into the Innsbruck pressure zone.

Recommended Future Distribution System Layout

A proposed buildout water system layout has been developed and is given in **Figure 7-1**. The piping layout given in this figure is based upon the best available information. Development projects have been proposed for a number of currently vacant parcels. These proposed projects have been utilized where possible. It should be noted that piping layout given in **Figure 7-1** should be considered a planning level layout. The final system configuration will be subject to issues beyond the scope of this study such as final subdivision plans, right-of-way issues and soils investigations.

A total of almost 195,000 feet of pipeline is anticipated to serve future growth. **Table 7-1** gives a breakdown of the recommended piping and **Figure 7-2** shows the proposed buildout system color-coded by pressure zone. The improvements given in **Table 7-1** also include the improvements needed to address existing needs described in Section 6, but do not include any improvements related to the recommended pipeline replacement program to address leaks.

Table 7-1. Proposed Pipeline Improvements

Diameter, inches	Total Length, feet
4-inch	2,503
6-inch	202
8-inch	125,181
10-inch	17,275
12-inch	31,742
16-inch	3,626
20-inch	14,059
Total	194,588

It should be noted that not all of the pipelines listed in **Table 7-1** will be constructed by the District. It is the policy of the District that developers are responsible for constructing facilities necessary to serve their projects. The District takes lead responsibility for the development of water supply and supply related improvements with the cost of such facilities paid by developers in the form of Facility Fees. A significant portion of the total length given in **Table 7-1** will be constructed by developers. It should also be noted that the piping described in this report does not represent the entire contribution of developers, but only the backbone system. Developers will be required to construct additional piping that is internal to their projects. A more detailed discussion of this topic and a breakdown of pipelines by responsible party is given in Section 9.

In addition to the 195,000 feet of pipeline, expansions to storage tanks along with construction of new pumping stations, storage tanks and pressure reducing stations is anticipated. **Table 7-2** gives a summary of the recommended pump stations and pressure reducing station improvements. Construction of new reservoirs and reservoir expansions is discussed later in this Section.

Table 7-2. Proposed Pump Station and Pressure Reducing Station Improvements

Facility	Existing Size/Capacity	Future Size/Capacity	Notes
Bridge Street Pump Station	---	4,400 gpm	
Coldstream Hydropneumatic Pump Station	---	1,535 gpm	35 gpm domestic and 1,500 gpm fire flow capacity
Negro Canyon Pump Station	---	100 gpm	Built by Developer
West Palisades Hydropneumatic Pump Station	40 gpm	1,040 gpm	40 gpm domestic and 1,000 gpm fire flow capacity
Canyon Springs PRV Station	---	2-inch/6-inch	Provide service from Glenshire 1 Zone to Canyon Springs Subdivision
Joerger PRV Station	---	2-inch/6-inch	Provide service from 6170 Zone to areas off Joerger Drive
Hilltop PRV Station	---	2-inch/6-inch	Provide service from 6170 Zone to areas south of Truckee River
Hirschdale PRV Station	---	2-inch	Provide New Water Supply to Hirschdale Area
Oberwald PRV Station	---	6-inch	Fire Flow
Pathway PRV Station	---	6-inch	Fire Flow
Railyard PRV Station	---	2-inch/6-inch	Provide service from 6170 Zone to areas north of Truckee River

FUTURE WATER STORAGE REQUIREMENTS

As noted previously, maximum day demand is expected to increase from 9.53 mgd to 20.30 mgd at buildout. Due to projected development, it is expected that the maximum fire flow demands will increase for some pressure zones. **Table 7-3** gives the anticipated maximum fire flow demand within storage pressure zone.

Based on data in Section 4 and **Table 7-3**, the minimum storage requirements and additional storage volume needed to serve future demands have been calculated and are given in **Table 7-4**. **Table 7-5** shows the recommended improvements to develop this required storage volume.

Table 7-3. Anticipated Maximum Fire Flow Requirements by Storage Pressure Zone

Pressure Zone	Maximum Fire Flow Demand, gpm	Expected Fire Flow Duration, hours	Fire Flow Requirement, million gallons
6170	4,000	4	0.96
Armstrong	1,500	2	0.18
DL-6124	2,200	3	0.40
DL-6323	2,200	3	0.40
Donner View	2,000	2	0.24
Glacier	1,500	2	0.18
Glenshire 1	1,500	2	0.18
Hirschdale	1,000	2	0.12
Innsbruck	2,000	2	0.24
Lower Lakeview	1,500	2	0.18
Martiswoods	1,500	2	0.18
Negro Canyon	1,500	2	0.18
Pinnacle	2,000	2	0.24
Ponderosa Palisades	1,500	2	0.18
Prosser Heights	1,500	2	0.18
Soma Sierra	1,500	2	0.18
Stockholm	2,000	2	0.24
Upper Ski Run	1,500	2	0.18

Table 7-4. Buildout Storage Volume Requirements

Reservoir	Maximum Day Demand, mgd	Operational Storage Requirement, mg	Fire Storage Requirement, mg	Emergency Requirement, mg	Total Storage Requirement, mg	Total Volume Available, mg	Additional Storage Volume Required, mg
6170	10.386	3.462	0.96	5.19	9.62	4.24	**5.38**
Armstrong	0.275	0.092	0.18	0.14	0.41	0.10	**0.31**
DL-6124	0.917	0.306	0.40	0.46	1.16	0.23	**0.93**
DL-6323	0.913	0.304	0.36	0.46	1.12	0.30	**0.82**
Donner View	1.179	0.393	0.24	0.59	1.22	0.70	**0.52**
Glacier	0.191	0.064	0.18	0.10	0.34	0.15	**0.19**
Glenshire 1	0.330	0.110	0.18	0.17	0.46	0.49	**0.00**
Hirschdale	0.035	0.012	0.12	0.02	0.15	0.10	**0.05**
Innsbruck	1.692	0.564	0.24	0.85	1.65	0.60	**1.05**
Lower Lakeview	0.395	0.132	0.18	0.20	0.51	0.25	**0.26**
Martiswoods	0.040	0.013	0.18	0.02	0.21	0.10	**0.11**
Negro Canyon	0.046	0.015	0.18	0.02	0.22	---	**0.22**
Pinnacle	0.334	0.111	0.24	0.17	0.46	0.18	**0.28**
Ponderosa Palisades	0.448	0.149	0.18	0.22	0.55	0.40	**0.15**
Prosser Heights	0.434	0.145	0.18	0.18	0.54	0.43	**0.11**
Soma Sierra	0.060	0.020	0.18	0.03	0.23	0.20	**0.03**
Stockholm	2.529	0.843	0.24	1.26	2.35	0.92	**1.43**
Upper Ski Run	0.096	0.032	0.18	0.05	0.26	0.10	**0.16**
	20.3				23.13	9.49	**12.00**

Table 7-5. Proposed Reservoir Sizing and Reservoir Expansions

Facility	Existing Size/Capacity	Future Size/Capacity	Notes
Armstrong Tank Expansion	0.10 mg	1.1 mg	
Bridge Street 6170 Tank Expansion	1.5 mg	5.5 mg	Same elevation as existing Bridge Street 6170 tank
Donner Lake 6124 Tank	---	0.60 mg	Same elevation as existing Wolfe Estates Tank
Glacier Tank Expansion	0.18 mg	0.40 mg	
Herringbone Tank Expansion	0.3 mg	1.0 mg	
Innsbruck Tank Expansion	0.2 mg	0.90 mg	
Lower Glenshire Tank Expansion	0.74 mg	3.74 mg	
Martiswoods Tank Expansion	0.2 mg	0.40 mg	
Negro Canyon Tank	---	0.22 mg	Built by Developer
Pinnacle Tank Expansion	0.18 mg	0.52 mg	
Prosser Annex Tank Expansion	0.225 mg	0.595 mg	
Red Mountain Tank Replacement	0.21 mg	0.30 mg	Same elevation as existing Wolfe Estates Tank . Existing tank is out of service and requires demolition.
Sierra Meadows Tank Expansion	0.25	1.25 mg	
Sitzmark Tank Expansion	0.20 mg	0.75 mg	
Ski Lodge Tank Expansion	0.35 mg	0.87 mg	
Stockholm Tank Expansion	0.32 mg	1.02 mg	

SECTION 8

CAPITAL IMPROVEMENT PROGRAM

SECTION 8
CAPITAL IMPROVEMENT PROGRAM

This section presents the recommended Capital Improvement Program (CIP) for the District's Truckee water system with respect to the existing and anticipated future systems. This CIP addresses improvements to the existing system as well as improvements necessary to continue to provide appropriate service through anticipated buildout conditions.

METER BOX UPGRADE PROJECT

The District is in the process of installing water meters on all of its services. Currently, about 90 percent of the customers are equipped with a meter. It is expected that this project will continue until the 2017, at a cost of $550,000 each year. This cost includes allowances for administration, engineering and contingencies.

EXISTING FACILITY REPLACEMENT

The CIP described herein allocates a fixed amount of $1,000,000 annually toward the replacement of existing facilities such as failing pipelines. However, the exact facilities to be replaced are not identified. A discussion of pipelines with leakage problems is given in Section 6 and the exact pipelines to be replaced should be evaluated on an annual basis. The funding source for replacement of such pipelines is through rates.

SCADA SYSTEM REPLACEMENT

Also included in the CIP is the Supervisory Control and Data Acquisition (SCADA) system replacement. The District currently operates five separate SCADA systems.

- Sandel Avery SCADA System - This system was installed in 1992 & 1993 and covers the facilities in District's service territory prior to the acquisition of the Donner Lake and Glenshire water systems. Expansion of this system to serve additional sites is note feasible due to the closed architecture and limited availability of parts.

- Donner Lake SCADA System – This system was created by the District to serve facilities in the Donner lake area after acquisition of the Donner Lake Water System in 2001.

- Glenshire SCADA System – This system was previously operated by the Glenshire Mutual Water Company and was acquired as part of the Glenshire Water system in 2002.

- Donner Creek Well SCADA System – This system was created by the District in 2000 to provide irrigation water from the Donner Creek Well to the Coyote Moon golf course.

- Fibreboard Well SCADA System – This system was created by the District in 2009 to provide irrigation water from the Fibreboard Well to the Gray's Crossing and Old Greenwood golf courses.

In 2010, the District retained Carollo Systems to perform a needs analysis and develop design documents for a single replacement SCADA system. More detail on the project can be found in ***SCADA System Upgrade Technical Memorandum No. 1*** by Carollo Systems. Implementation of the new SCADA system has been broken into four phases. Cost estimates for each phase are given in **Table 8-1**.

Table 8-1. SCADA System Replacement Cost Estimate

Phase	Total Construction Cost
A	$ 1,500,000
B	$304,500
C	$ 624,100
D	$661,400
Total	$3,090,000

Total Cost includes allowances for administration, engineering and contingencies

CIP SUMMARY

The existing and future system analyses described in Sections 6 and 7 identified recommended improvement projects. Cost estimates were developed for each project identified in this study based on the cost criteria described in Section 2. **Table 8-2** gives a summary of the recommended District-funded CIP. A detailed listing of the improvements is given in **Table 8-4** at the end of this Section. **Table 8-4** also identifies the proposed funding source for each improvement project, including some projects that will be funded entirely by Developers. More detail on this issue is given in Section 9.

Table 8-2. Summary of Recommended District-Funded Capital Improvement Program[a]

Type of Project	Estimated Construction Costs	Total Costs
Life-Cycle Replacement	$17,000,000	$23,800,000
New Pipeline	$10,788,300	$15,103,620
New PRV Station	$120,000	$168,000
New Pump Station	$1,140,000	$1,596,000
New Storage Tank	$17,912,500	$25,077,500
New Well	$14,000,000	$19,600,000
Meter Box Upgrade	$3,300,000	$3,300,000[b]
Pipe Modification	$27,000	$37,800
Service Modification	$48,000	$67,200
SCADA System Replacement	$3,090,000	$3,090,000[c]
System Modification	$560,000	$784,000
Total	$67,985,800	$92,624,120

[a] Total Costs include the Administration, Engineering and Contingency Allowances described in Section 2.

[b] The construction costs for the Meter Box Upgrade Project already include allowances for administration, engineering and contingencies.

[c] The construction costs for the SCADA System Replacement already include allowances for administration, engineering and contingencies.

ANTICIPATED PHASING

After completion of the cost estimates, an attempt was made to determine when the proposed facilities would need to be constructed. An estimated year of construction was assigned to each project and is listed in **Table 8-4**. The main purpose of this effort was to identify priority projects and allow projection of future cash flow requirements.

Table 8-3. Breakdown of Capital Improvement Costs by Year

Year	Rate-Funded Construction Costs	Facilities Fee Funded Construction Costs	Total Const. Costs	Estimated Total Costs
2012	$2,050,000	$0	$2,050,000	$2,050,000
2013	$854,500	$0	$854,500	$854,500
2014	$1,402,900	$0	$1,402,900	$1,494,420
2015	$1,438,900	$375,000	$1,813,900	$2,054,900
2016	$2,730,100	$2,649,200	$5,379,300	$7,311,020
2017	$2,925,300	$5,000,000	$7,925,300	$10,875,420
2018	$2,046,300	$1,951,200	$3,997,500	$5,596,500
2019	$1,320,600	$1,250,000	$2,570,600	$3,598,840
2020	$1,000,000	$3,036,800	$4,036,800	$5,651,520
2021	$1,000,000	$2,886,500	$3,886,500	$5,441,100
2022	$1,000,000	$946,600	$1,946,600	$2,725,240
2023	$1,000,000	$3,121,900	$4,121,900	$5,770,660
2024	$1,000,000	$1,491,000	$2,491,000	$3,487,400
2025	$1,000,000	$437,500	$1,437,500	$2,012,500
2026	$1,000,000	$2,255,100	$3,255,100	$4,557,140
2027	$1,000,000	$1,038,700	$2,038,700	$2,854,180
2028	$1,000,000	$2,749,900	$3,749,900	$5,249,860
2029	$1,000,000	$1,937,500	$2,937,500	$4,112,500
2030	$1,000,000	$3,750,000	$4,750,000	$6,650,000
2031	$1,000,000	$1,780,100	$2,780,100	$3,892,140
2032 & Beyond	$1,000,000 (Annual)	$3,560,200	$4,560,200	$6,384,280
Total	$27,768,600	$40,217,200	$67,985,800	$92,624,120

Table 8-3 gives a summary of the estimated costs by year and **Figure 8-1** shows the recommended improvements color-coded by anticipated year of installation. The year of construction described herein is based on projected development and should not be considered absolutely rigid. The phasing should be adjusted based on actual development which may necessitate either the earlier construction or delayed construction of facilities.

TABLE 8-4. DETAILED LISTING OF PROPOSED DISTRICT FUNDED IMPROVEMENTS

FACILITY TYPE	DESCRIPTION	LENGTH, FT	DIAM, IN	YEAR	RESPONSIBLE PARTY	FUNDING SOURCE	JUSTIFICATION	QUANTITY	UNITS	UNIT COST	CONSTRUCTION COST
	2012 PROJECTS										
Service Upgrade	Meter Box Upgrades - Glenshire	NA	NA	2012	TDPUD	Rates	AB 2572 Compliance	1	Year	$ 550,000	$ 550,000
SCADA Replacement	SCADA System Replacement - Phase 3A	NA	NA	2012	TDPUD	Rates	SCADA System Replacement	1	Phase	$1,500,000	$ 1,500,000
										TOTAL	**$ 2,050,000**
	2013 PROJECTS										
Service Upgrade	Meter Box Upgrades - Glenshire & Olympic Heights	NA	NA	2013	TDPUD	Rates	AB 2572 Compliance	1	Year	$ 550,000	$ 550,000
SCADA Replacement	SCADA System Replacement - Phase 3B	NA	NA	2013	TDPUD	Rates	SCADA System Replacement	1	Phase	$ 304,500	$ 304,500
										TOTAL	**$ 854,500**
	2014 PROJECTS										
New Pipeline	Oberwald PRV Site Piping	100	8	2014	TDPUD	Rates	Fire Flow	100	feet	$ 175	$ 17,500
New Pipeline	8-inch pipeline across Donner Pass Road to south of Fire Station No. 92	550	8	2014	TDPUD	Rates	Fire Flow	550	feet	$ 175	$ 96,300
New PRV Station	Oberwald PRV Station	NA	NA	2014	TDPUD	Rates	Fire Flow	1	Each	$ 40,000	$ 40,000
Pipe Modification	Relocate Fire Hydrants on Hansel Avenue	NA	NA	2014	TDPUD	Rates	Fire Flow	2	Each	$ 6,000	$ 12,000
Pipe Modification	Install Piping Connection at Greenwood Drive & Pine Forest Road	NA	NA	2014	TDPUD	Rates	Water Quality	1	Each	$ 7,500	$ 7,500
Pipe Modification	Install Piping Connection at Glenshire Drive & Somerset Drive	NA	NA	2014	TDPUD	Rates	Water Quality	1	Each	$ 7,500	$ 7,500
Service Modification	Change Pressure Zone of Services on Hansel Avenue	NA	NA	2014	TDPUD	Rates	Provide Adequate Service Pressure	6	Each	$ 3,000	$ 18,000
Service Modification	Change Pressure Zone of Services on Roundhill Drive	NA	NA	2014	TDPUD	Rates	Provide Adequate Service Pressure	7	Each	$ 3,000	$ 21,000
Service Modification	Change Pressure Zone of Services on Copenhagen Drive	NA	NA	2014	TDPUD	Rates	Provide Adequate Service Pressure	3	Each	$ 3,000	$ 9,000
Service Upgrade	Meter Box Upgrades - Prosser Heights, Prosser Lakeview & Sierra Meadows	NA	NA	2014	TDPUD	Rates	AB 2572 Compliance	1	Year	$ 550,000	$ 550,000
SCADA Replacement	SCADA System Replacement - Phase 3C	NA	NA	2014	TDPUD	Rates	SCADA System Replacement	1	Phase	$ 624,100	$ 624,100
										TOTAL	**$ 1,402,900**
	2015 PROJECTS										
New Pipeline	Pathway PRV Site Piping	100	8	2015	TDPUD	Rates	Fire Flow	100	feet	$ 175	$ 17,500
New PRV Station	Pathway PRV Station	NA	NA	2015	TDPUD	Rates	Fire Flow	1	Each	$ 40,000	$ 40,000
Service Upgrade	Meter Box Upgrades - Downtown, Gateway & Ponderosa Palisades	NA	NA	2015	TDPUD	Rates	AB 2572 Compliance	1	Year	$ 550,000	$ 550,000
SCADA Replacement	SCADA System Replacement - Phase 3D	NA	NA	2015	TDPUD	Rates	SCADA System Replacement	1	Phase	$ 661,400	$ 661,400
System Modification	Install Flow Meters at All Pump Stations Not Currently Equipped	NA	NA	2015	TDPUD	Rates	Energy Efficiency/System Operations	17	Each	$ 10,000	$ 170,000
										TOTAL	**$ 1,438,900**
New Storage Tank	Red Mountain Tank Replacement	NA	NA	2015	TDPUD	Facility Fees	Additional Capacity to Serve Growth	300,000	gallons	$ 1.25	$ 375,000
										TOTAL	**$ 375,000**
	2016 PROJECTS										
New Pipeline	8-inch pipeline in Sierra Drive from Prosser Street to Richards Boulevard	875	8	2016	TDPUD	Rates	Fire Flow	875	feet	$ 175	$ 153,100
New Pipeline	8-inch pipeline in Olympic Boulevard from East Ridge Road to Kayhoe Court	1,300	8	2016	TDPUD	Rates	Fire Flow	1,300	feet	$ 175	$ 227,500
New Pipeline	6-inch pipeline in McPhetres Street	202	6	2016	TDPUD	Rates	Fire Flow	202	feet	$ 165	$ 33,300
New Pipeline	Hirschdale Connection Pipeline	2,003	4	2016	TDPUD	Rates	Operational Efficiency	2,003	feet	$ 155	$ 310,500
New Pipeline	8-inch pipeline in Aspenwood Road to extend Palisades Hydro Zone	325	8	2016	TDPUD	Rates	Provide Adequate Service Pressure	325	feet	$ 175	$ 56,900
New Pipeline	8-inch pipeline in Rocky Lane to extend Donner Trails Hydro Zone	1,500	8	2016	TDPUD	Rates	Provide Adequate Service Pressure	1,500	feet	$ 175	$ 262,500
New Pipeline	8-inch pipeline in Blueberry Road and Purple Sage Road to extend Palisades Hydro Zone	550	8	2016	TDPUD	Rates	Provide Adequate Service Pressure	550	feet	$ 175	$ 96,300
New PRV Station	Hirschdale PRV Station	NA	NA	2016	TDPUD	Rates	Reduced Operational Costs	1	Each	$ 40,000	$ 40,000
Service Upgrade	Meter Box Upgrades - Donner Lake & Tahoe Donner	NA	NA	2016	TDPUD	Rates	AB 2572 Compliance	1	Year	$ 550,000	$ 550,000
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2016	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 2,730,100**
New Pipeline	20-inch Transmission Pipeline from New Well No. 1 to Truckee Airport Road	3,219	20	2016	TDPUD	Facility Fees	Additional Capacity to Serve Growth	3,219	feet	$ 270	$ 869,100
New Pipeline	New Well No. 1 Site Piping	140	12	2016	TDPUD	Facility Fees	Additional Capacity to Serve Growth	140	feet	$ 215	$ 30,100
New Well	New Well No. 1	NA	NA	2016	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1	each	$1,750,000	$ 1,750,000
										TOTAL	**$ 2,649,200**

TABLE 8-4. DETAILED LISTING OF PROPOSED DISTRICT FUNDED IMPROVEMENTS

FACILITY TYPE	DESCRIPTION	LENGTH, FT	DIAM, IN	YEAR	RESPONSIBLE PARTY	FUNDING SOURCE	JUSTIFICATION	QUANTITY	UNITS	UNIT COST	CONSTRUCTION COST
	2017 PROJECTS										
New Pipeline	12-inch pipeline in Skislope Way below Ski Lodge Tank Site	1,500	12	2017	TDPUD	Rates	Fire Flow	1,500	feet	$ 215	$ 322,500
New Pipeline	12-inch pipeline in Glacier Way & Skislope Way	1,750	12	2017	TDPUD	Rates	Fire Flow	1,750	feet	$ 215	$ 376,300
New Pipeline	8-inch pipeline in Skislope Way below Ski Lodge Tank Site	548	8	2017	TDPUD	Rates	Fire Flow	548	feet	$ 175	$ 95,800
New Pipeline	8-inch pipeline in Davos Drive to extend Stockholm Zone	1,100	8	2017	TDPUD	Rates	Provide Adequate Service Pressure	1,100	feet	$ 175	$ 192,500
New Pipeline	8-inch pipeline in Sitzmark Way to extend Sitzmark Hydro Zone	300	8	2017	TDPUD	Rates	Provide Adequate Service Pressure	300	feet	$ 175	$ 52,500
New Pipeline	8-inch pipeline in Sitzmark Way to extend Sitzmark Hydro Zone	300	8	2017	TDPUD	Rates	Provide Adequate Service Pressure	300	feet	$ 175	$ 52,500
New Pipeline	8-inch pipeline in Skislope Way to extend Donner View Hydro Zone	250	8	2017	TDPUD	Rates	Provide Adequate Service Pressure	250	feet	$ 175	$ 43,800
New Pipeline	8-inch pipeline from Sitzmark Way to Mougle Lane to extend Sitzmark Hydro Zone	425	8	2017	TDPUD	Rates	Provide Adequate Service Pressure	425	feet	$ 175	$ 74,400
New Pipeline	4-inch pipeline in Northwoods Boulevard to extend Stockholm Zone	500	4	2017	TDPUD	Rates	Provide Adequate Service Pressure	500	feet	$ 155	$ 77,500
New Pipeline	8-inch pipeline in Northwoods Boulevard to extend Donner View Zone	500	8	2017	TDPUD	Rates	Provide Adequate Service Pressure	500	feet	$ 175	$ 87,500
Service Upgrade	Meter Box Upgrades - Tahoe Donner	NA	NA	2017	TDPUD	Rates	AB 2572 Compliance	1	Year	$ 550,000	$ 550,000
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2017	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 2,925,300**
New Storage Tank	Bridge Street 6170 Tank Expansion	NA	NA	2017	TDPUD	Facility Fees	Additional Capacity to Serve Growth	4,000,000	gallons	$ 1.25	$ 5,000,000
										TOTAL	**$ 5,000,000**
	2018 PROJECTS										
New Pipeline	8-inch pipeline from Royal Way to Royal Crest Extension	1,500	8	2018	TDPUD	Rates	Fire Flow	1,500	feet	$ 175	$ 262,500
New Pipeline	8-inch pipeline from Martiswoods Tower to Kleckner Court	650	8	2018	TDPUD	Rates	Fire Flow	650	feet	$ 175	$ 113,800
New Pump Station	West Palisades Hydropenumatic PS Upgrade	NA	NA	2018	TDPUD	Rates	Fire Flow	1	Each	$ 430,000	$ 430,000
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2018	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
System Modification	Install Standby Generators at Airport & Martis Valley Wells	NA	NA	2018	TDPUD	Rates	System Reliability	2	Each	$ 120,000	$ 240,000
										TOTAL	**$ 2,046,300**
New Pipeline	Future PC-3 Piping	697	16	2018	JOINT	Facility Fees-J	Additional Capacity to Serve Growth - PUD Share Assumed @ 50%	697	feet	$ 240	$ 83,650
New Pipeline	Future PC-3 Piping	401	16	2018	JOINT	Facility Fees-J	Additional Capacity to Serve Growth - PUD Share Assumed @ 50%	401	feet	$ 240	$ 48,200
New Pipeline	Future PC-3 Piping	514	20	2018	JOINT	Facility Fees-J	Additional Capacity to Serve Growth - PUD Share Assumed @ 50%	514	feet	$ 270	$ 69,350
New Storage Tank	Herringbone Tank Expansion	NA	NA	2018	TDPUD	Facility Fees	Additional Capacity to Serve Growth	700,000	gallons	$ 1	$ 875,000
New Storage Tank	Innsbruck Tank Expansion	NA	NA	2018	TDPUD	Facility Fees	Additional Capacity to Serve Growth	700,000	gallons	$ 1.25	$ 875,000
										TOTAL	**$ 1,951,200**
	2019 PROJECTS										
New Pipeline	Replace cross-country pipeline between Alder Creek Road & Wolfgang Road	500	8	2019	TDPUD	Rates	Water Quality	500	feet	$ 175	$ 87,500
New Pipeline	Replace cross-country pipeline between Schussing Way & St. Bernard Drive	475	8	2019	TDPUD	Rates	Water Quality	475	feet	$ 175	$ 83,100
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2019	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
System Modification	Install Standby Generators at Donner Trails PS & Soma Sierra PS	NA	NA	2019	TDPUD	Rates	System Reliability	2	Each	$ 75,000	$ 150,000
										TOTAL	**$ 1,320,600**
New Storage Tank	Armstrong Tank Expansion	NA	NA	2019	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1,000,000	gallons	$ 1.25	$ 1,250,000
										TOTAL	**$ 1,250,000**
	2020 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2020	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Pipeline	16-inch Transmission Pipeline from New Well No. 2 to New Well No. 1	2,528	16	2020	TDPUD	Facility Fees	Additional Capacity to Serve Growth	2,528	feet	$ 240	$ 606,700
New Pipeline	New Well No. 2 Site Piping	140	12	2020	TDPUD	Facility Fees	Additional Capacity to Serve Growth	140	feet	$ 215	$ 30,100
New Storage Tank	Ski Lodge Tank Expansion	NA	NA	2020	TDPUD	Facility Fees	Additional Capacity to Serve Growth	520,000	gallons	$ 1.25	$ 650,000
New Well	New Well No. 2	NA	NA	2020	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1	each	$1,750,000	$ 1,750,000
										TOTAL	**$ 3,036,800**

TABLE 8-4. DETAILED LISTING OF PROPOSED DISTRICT FUNDED IMPROVEMENTS

FACILITY TYPE	DESCRIPTION	LENGTH, FT	DIAM, IN	YEAR	RESPONSIBLE PARTY	FUNDING SOURCE	JUSTIFICATION	QUANTITY	UNITS	UNIT COST	CONSTRUCTION COST
	2021 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2021	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Pipeline	20-inch Transmission Piping from Constock Drive to Bridge Street PS	2,520	20	2021	Joint	Facility Fees-J	Additional Capacity to Serve Growth - PUD Share Assumed @ 50%	2,520	feet	$ 270	$ 340,200
New Pipeline	20-inch Transmission Piping from Bridge Street PS to Northwoods Blvd	5,227	20	2021	TDPUD	Facility Fees	Additional Capacity to Serve Growth	5,227	feet	$ 270	$ 1,411,300
New Storage Tank	Pinnacle Tank Expansion	NA	NA	2021	TDPUD	Facility Fees	Additional Capacity to Serve Growth	340,000	gallons	$ 1.25	$ 425,000
New Pump Station	Bridge Street PS	NA	NA	2021	TDPUD	Facility Fees	Additional capacity to Serve Growth	1	Each	$ 710,000	$ 710,000
										TOTAL	**$ 2,886,500**
	2022 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2022	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Pipeline	12-inch pipeline from No Other Way to Sugar Pipe Estates	1,089	12	2022	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1,089	feet	$ 215	$ 234,100
New Storage Tank	Martiswoods Tank Expansion	NA	NA	2022	TDPUD	Facility Fees	Additional Capacity to Serve Growth	200,000	gallons	$ 1.25	$ 250,000
New Storage Tank	Prosser Annex Tank Expansion	NA	NA	2022	TDPUD	Facility Fees	Additional Capacity to Serve Growth	370,000	gallons	$ 1.25	$ 462,500
										TOTAL	**$ 946,600**
	2023 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2023	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Pipeline	12-inch Transmission Pipeline from New Well No. 3 to New Well No. 2	3,001	12	2023	TDPUD	Facility Fees	Additional Capacity to Serve Growth	3,001	feet	$ 215	$ 645,200
New Pipeline	16-inch Pipeline in Soaring Way	1,117	20	2023	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1,117	feet	$ 270	$ 301,600
New Pipeline	16-inch Pipeline in Joerger Drive	1,463	20	2023	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1,463	feet	$ 270	$ 395,000
New Pipeline	New Well No. 3 Site Piping	140	12	2023	TDPUD	Facility Fees	Additional Capacity to Serve Growth	140	feet	$ 215	$ 30,100
New Well	New Well No. 3	NA	NA	2023	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1	each	$1,750,000	$ 1,750,000
										TOTAL	**$ 3,121,900**
	2024 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2024	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Pipeline	12-inch Pipeline in Northwoods Blvd	651	12	2024	TDPUD	Facility Fees	Additional Capacity to Serve Growth	651	feet	$ 215	$ 140,000
New Pipeline	12-inch Pipeline in St. Bernard Drive	2,214	12	2024	TDPUD	Facility Fees	Additional Capacity to Serve Growth	2,214	feet	$ 215	$ 476,000
New Storage Tank	Stockholm Tank Expansion	NA	NA	2024	TDPUD	Facility Fees	Additional Capacity to Serve Growth	700,000	gallons	$ 1.25	$ 875,000
										TOTAL	**$ 1,491,000**
	2025 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2025	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Storage Tank	Glacier Tank Expansion	NA	NA	2025	TDPUD	Facility Fees	Additional Capacity to Serve Growth	190,000	gallons	$ 1.25	$ 237,500
New Storage Tank	Ski Run Tank Expansion	NA	NA	2025	TDPUD	Facility Fees	Additional Capacity to Serve Growth	160,000	gallons	$ 1.25	$ 200,000
										TOTAL	**$ 437,500**
	2026 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2026	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Pipeline	10-inch Transmission Pipeline from New Well No. 4 to New Well No. 3	2,500	10	2026	TDPUD	Facility Fees	Additional Capacity to Serve Growth	2,500	feet	$ 190	$ 475,000
New Pipeline	New Well No. 4 Site Piping	140	12	2026	TDPUD	Facility Fees	Additional Capacity to Serve Growth	140	feet	$ 215	$ 30,100
New Well	New Well No. 4	NA	NA	2026	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1	each	$1,750,000	$ 1,750,000
										TOTAL	**$ 2,255,100**

TABLE 8-4. DETAILED LISTING OF PROPOSED DISTRICT FUNDED IMPROVEMENTS

FACILITY TYPE	DESCRIPTION	LENGTH, FT	DIAM, IN	YEAR	RESPONSIBLE PARTY	FUNDING SOURCE	JUSTIFICATION	QUANTITY	UNITS	UNIT COST	CONSTRUCTION COST
	2027 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2027	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Pipeline	New Donner Lake 6124 Tank Inlet/Outlet Pipeline	1,343	12	2027	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1,343	feet	$ 215	$ 288,700
New Storage Tank	New Donner Lake 6124 Tank	NA	NA	2027	TDPUD	Facility Fees	Additional Capacity to Serve Growth	600,000	gallons	$ 1.25	$ 750,000
										TOTAL	**$ 1,038,700**
	2028 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2028	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Pipeline	10-inch Transmission Pipeline from New Well No. 5 to Joerger Drive	5,104	10	2028	TDPUD	Facility Fees	Additional Capacity to Serve Growth	5,104	feet	$ 190	$ 969,800
New Pipeline	New Well No. 5 Site Piping	140	12	2028	TDPUD	Facility Fees	Additional Capacity to Serve Growth	140	feet	$ 215	$ 30,100
New Well	New Well No. 5	NA	NA	2028	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1	each	$1,750,000	$ 1,750,000
										TOTAL	**$ 2,749,900**
	2029 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2029	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Storage Tank	Sierra Meadows Tank Expansion	NA	NA	2029	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1,000,000	gallons	$ 1.25	$ 1,250,000
New Storage Tank	Sitzmark Tank Expansion	NA	NA	2029	TDPUD	Facility Fees	Additional Capacity to Serve Growth	550,000	gallons	$ 1.25	$ 687,500
										TOTAL	**$ 1,937,500**
	2030 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2030	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Storage Tank	Lower Glenshire Tank Expansion	NA	NA	2030	TDPUD	Facility Fees	Additional Capacity to Serve Growth	3,000,000	gallons	$ 1.25	$ 3,750,000
										TOTAL	**$ 3,750,000**
	2031 PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	2031	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Pipeline	New Well No. 6 Site Piping	140	12	2031	TDPUD	Facility Fees	Additional Capacity to Serve Growth	140	feet	$ 215	$ 30,100
New Well	New Well No. 6	NA	NA	2031	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1	each	$1,750,000	$ 1,750,000
										TOTAL	**$ 1,780,100**
	2032 TO BUILDOUT PROJECTS										
Replacement Facilities	Facility Life-Cycle Replacement Program	Varies	Varies	Annual	TDPUD	Rates	Life-Cycle Replacement	1	Year	$1,000,000	$ 1,000,000
										TOTAL	**$ 1,000,000**
New Pipeline	New Well No. 7 Site Piping	140	12	TBD	TDPUD	Facility Fees	Additional Capacity to Serve Growth	140	feet	$ 215	$ 30,100
New Well	New Well No. 7	NA	NA	TBD	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1	each	$1,750,000	$ 1,750,000
New Pipeline	New Well No. 8 Site Piping	140	12	TBD	TDPUD	Facility Fees	Additional Capacity to Serve Growth	140	feet	$ 215	$ 30,100
New Well	New Well No. 8	NA	NA	TBD	TDPUD	Facility Fees	Additional Capacity to Serve Growth	1	each	$1,750,000	$ 1,750,000
										TOTAL	**$ 3,560,200**

SECTION 9

FINANCIAL IMPACTS

SECTION 9
FINANCIAL IMPACTS

This section presents the anticipated financial impact of the Capital Improvement Program given in Section 8. Recommendations regarding revised fee and rate schedules are presented.

CURRENT FEE AND RATE STRUCTURE

Water Department Revenue is currently generated from three main sources: Connection Fees, Facilities Fees and rates (monthly bills).

Connection Fees

Connection Fees are charged to new development to offset the costs incurred by the District in labor and materials to connect a new service. This is a one-time fee charged at the time that the project is constructed. In developed subdivisions such as Tahoe Donner, these costs cover the installation of meters and administrative time involved in setting up the new customer account. In undeveloped areas, surcharges to cover tapping of mains and running laterals across a roadway may apply. The current Connection Fee schedule was adopted by Ordinance 2008-01 and is given in **Table 9-1**.

Table 9-1. Current Connection Fee Structure

Meter Size	Connection Fee
5/8” x 3/4”	$1,185
3/4”	$1,220
1”	Actual Cost
1 1/2”	Actual Cost
2”	Actual Cost
3”	Actual Cost
4”	Actual Cost
6”	Actual Cost

Facilities Fees

Facilities Fees are charged to new development to pay for water system facilities that have not yet been constructed but are necessary to serve the proposed development or that have been constructed but the new development has not paid its fair share of the costs associated with the new construction. This is a one-time fee charged at the time that the project is constructed.

The current Facilities Fee structure was adopted in Ordinance 2005-03. Residential construction is charged based upon the size of the structure at a rate of $1.64 per square foot of habitable living space. The habitable square footage amount is obtained directly from the building permit application submitted to the appropriate jurisdiction. For commercial construction, the rate is based upon meter size and is given in **Table 9-2**.

Table 9-2. Current Facilities Fee Structure for Commercial Construction

Meter Size	Equivalent Dwelling Units	Facilities Fee
5/8" x 3/4"	1	$3,358
3/4"	1.5	$5,037
1	2.5	$8,395
1 1/2"	5	$16,790
2"	8	$26,864
3"	15	$50,370
4"	25	$83,950
6"	50	$167,900

Rates

Rates are charged to customers in order to cover the day-to-day operating expenses of this District. Items paid for by rates include electricity bills, employee salaries, maintenance and repair of pipelines and pumps, debt service and liability insurance. Rate monies are also used to pay for needed projects that are not related to growth. Bills are sent to customers on a monthly basis.

The existing water rate structure consists of three components and was adopted by Ordinance 2009-04. The first component is a common base charge for service. This base charge does not vary with the amount of water consumed, but does increase based upon the size of the meter serving the customer. The second component is a "Commodity Charge" which is based upon the amount of water used by the customer. The third component is a "Zone Charge" which is based upon the pressure zone in which the customer is located. The Zone Charge is greater for customers in higher pressure zones to reflect the increased electricity consumption in pumping water from the lower pressure zones where the wells are located to higher elevations.

PROPOSED FEE AND RATE STRUCTURE

Following adoption of the 2004 Water Master Plan, the Connection Fee and Facilities Fee schedules were increased based upon recommendations in that document.

Connection Fee Structure

As noted above, the current Connection Fee schedule was adopted in 2008. Since that time, there has been a cost increase associated with materials and labor covered under the Connection Fee. Therefore, a $105 increase is proposed for the 5/8" x 3/4" meters and a $110 increase is proposed for and 3/4" meters. **Table 9-3** gives the proposed Connection Fee schedule.

Table 9-3. Proposed Connection Fee Structure

Meter Size	Connection Fee
5/8" x 3/4"	$1,290
3/4"	$1,330
1"	$1,430
1 1/2"	Actual Cost
2"	Actual Cost
3"	Actual Cost
4"	Actual Cost
6"	Actual Cost

Proposed Facilities Fee Structure

As noted in Section 8, projects to be constructed by the District were categorized as to the proposed funding source – Facilities Fees or Rates. **Table 9-4** gives a summary of this breakdown for the proposed system improvements.

Table 9-4. Summary of Proposed Improvements by Funding Source

Responsible Party	Construction Costs	Total Costs
Facilities Fees	$40,217,200	$56,304,080
Rates	$27,768,600	$36,320,040
Total	$67,985,800	$92,624,120

Note: Total Costs include the Administration, Engineering and Contingency Allowances described in Section 2.

There a few projects that are currently identified to be funded jointly by the District and developers. An example is a portion of the new transmission pipeline that would provide a second source of water into the Tahoe Donner area. It is assumed that a 12-inch pipeline would be sufficient to provide for the development of the adjoining currently vacant parcels. However, the larger 20-inch pipe is needed to convey the necessary flows to Tahoe Donner. In this case, developers will be responsible for the costs associated with installation of a 12-inch pipeline and the District would pay for the additional costs necessary to upsize the pipeline to 20-inches.

As given in **Table 9-4**, the total cost of improvements to be funded by Facilities Fees is $56,304,080. The anticipated growth in maximum day demand is from 9.53 million gallons per day (mgd) to 20.30 mgd for a total future growth of 10.77 mgd. As described in Section 3, future planning efforts were originally based upon the average single-family residence using 900 gallons of water on the maximum day of demand. However, once the impact of SB7X-7 is considered, a value of 835 gallons per connection per day was used. The maximum day of demand represents the necessary sizing of pumping and storage facilities as described in Section 2.

Residential Facilities Fees

The existing Facilities Fee structure uses the concept of an equivalent dwelling unit (EDU) as the basis. As noted above, future planning is based upon the average single-family residence using 835 gallon of water on the maximum day. Therefore, one equivalent dwelling unit is equal to a maximum day usage of 835 gallons. The total projected increase in demand is equal to the construction of 12,898 single-family residences.

$$\text{EDUs} = \frac{10{,}770{,}000 \text{ gallons}}{835 \text{ gallons/EDU}} = 12{,}898 \text{ EDUs}$$

The amount to be funded by Facilities Fees is therefore $4,365.33 per EDU:

$$\text{COST} = \frac{\$56{,}304{,}080 \text{ Total}}{12{,}898 \text{ EDUs}} = \$4{,}365.33/\text{EDU}$$

The Facilities Fee charged to a customer is based upon the size of the residence to be constructed. This change was recommended based on the rationale that larger houses have the potential to utilize more water during peak demand periods. Furthermore, as noted in Section 2, large houses have larger fire flow demands (1,500 gpm instead of 1,000 gpm), which require larger pipelines to be installed in both new construction and when undertaking maintenance replacement projects.

Table 9-5 shows the current data regarding average size of new residential housing units. As shown in this table, the average living space for all 1,153 units was 2,709 square feet. Utilizing the same calculation methodology used in the previous Master Plan Update, the recommended cost per square foot is $1.61. This represents a 1.8 percent decrease from the current value of $1.64 per square foot.

$$\text{Facility Fee} = \frac{\$4{,}365.33}{2{,}709 \text{ Sq. Ft.}} = \$1.61/\text{Sq. Ft.}$$

Table 9-5. Characteristics of New Residential Housing Units, 2002 - 2010

Year	Number of Units	Living Space, Average Square Feet
2002	247	2,516
2003	152	2,702
2004	235	2,651
2005	216	2,827
2006	133	2,959
2007	117	2,922
2008	20	2,698
2009	22	2,117
2010	11	2,027
Total	1,153	
Average		2,709

It is also proposed that the applicability of Facilities Fees to the construction of residential additions be clarified. Currently, when an addition to an existing residence is constructed, the District does not collect any additional fees to offset the impact of that addition. However, larger houses will likely use more water during peak periods and will impose larger fire flow demands if the addition increases the structure size above 3,600 square feet. Collection of additional monies to offset these impacts is justified and should be considered.

Commercial Facilities Fees

It is proposed that the Facilities Fee structure for other projects remain based on meter size. The same equivalent dwelling unit values used in the existing fee structure should be maintained and the proposed fee structure is given in **Table 9-6**.

Table 9-6. Proposed Commercial Facilities Fee Structure

Meter Size	Equivalent Dwelling Units	Current Facilities Fee	Proposed Facilities Fee
5/8" x 3/4"	1	$3,358	$4,365
3/4"	1.5	$5,037	$6,547
1	2.5	$8,395	$10,912
1 1/2"	5	$16,790	$21,825
2"	8	$26,864	$34,920
3"	15	$50,370	$65,475
4"	25	$83,950	$109,125
6"	50	$167,900	$218,250

Proposed Rate Structure

A detailed rate study was conducted in 2009, culminating with the adoption of Ordinance 2009-04. A review of rates was conducted in the Fall of 2011, during preparation of the budgets for fiscal years 2012 and 2013. That review determined that changes to the rate structure were not necessary. Changes to the water rate structure are not recommended at this time.