CITY OF BRENTWOOD
2035 URBAN WATER MANAGEMENT PLAN

FINAL

Prepared for

Department of Public Works
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TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF TABLES
(Continued)

LIST OF FIGURES

LIST OF APPENDICES

SECTION 1.0

INTRODUCTION

This chapter provides the background for this report and an overview of the Urban Water Management Plan, previous reports, public participation, and agency coordination.

1.1 Purpose

The purpose of this Urban Water Management Plan (Plan) is to ensure efficient use and promote conservation of urban water supplies within the City of Brentwood (City). The Plan describes the availability of water and discusses water use, reclamation, and water conservation activities. The Plan concludes that the water supplies available to the City's water transmission system, and to its customers, are adequate over the next 20-year planning period.

1.2 Urban Water Management Planning Act

The City's Plan has been prepared by Brown and Caldwell on behalf of the City as required by the Urban Water Management Planning Act (Act) (California Water Code Division 6, Part 2.6, Sections 10610 through 10657). According to the California Department of Water Resources (DWR), the Act states that any urban water supplier that provides water to 3,000 or more customers, or that provides over 3,000 acre-feet of water annually, should make every effort to assure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry years. The Act describes the contents of the Plan as well as how urban water suppliers should adopt and implement the Plan. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

1.3 Previous Reports

Several reports have been prepared in the past decade, which address water supply and demand for the City. An understanding of the results of these previous studies provides a broader context for preparing an updated water supply plan for the future.

1.4 Public Participation

The Act requires the encouragement of public participation and a public hearing regarding the Water Management Plan. This hearing provides an opportunity for the City's residents and employees to learn about the water supply situation and the plans for providing a reliable, safe, high-quality water supply for the future. The hearing also allows the public to ask questions regarding the current situation and the viability of future plans.

1.5 Agency Coordination

Table 1-1 summarizes the efforts the City has taken to include additional agencies and citizens in its planning and preparation process. Copies of the draft UWMP 2005 were available for public review and comment at City offices. Legal public notices for Board and City Council adoption hearings were published in local newspapers and posted at Agency and City facilities. Copies of the public hearing notices are included in Appendix C.

Table 1-1. Coordination with Appropriate Agencies (DWR Table 1)

Check at least one box on each row	Participated in developing the plan	Commented on the draft	Attended public meetings	Was contacted for assistance	Was sent a copy of the draft plan	Was sent a notice of intention to adopt	Not Involved / No Information
Contra Costa Water District					X		
East Contra Costa Irrigation District					X		
Brentwood Wastewater Treatment Plant	X			X			
General Public		X	X				
Other							

SECTION 2.0

DESCRIPTION OF EXISTING WATER SYSTEM

This chapter describes the City's water system. It contains a description of the service area and its climate, and the water supply facilities, including groundwater wells, surface water supply facilities, reservoirs, and piping system.

2.1 Description of Service Area

The Brentwood Water System serves about 13,000 connections. The City lies in eastern Contra Costa County. Figure 2-1 shows the service area and its surroundings. The service area is bounded by Sellers Avenue to the east, Briones Valley Road, Concord Avenue, Creek Road and the East Contra Costa Irrigation District (ECCID) Main Canal to the south, Heidorn Ranch Road to the west, and Lone Tree Way (Antioch), Neroly Road (Oakley) and Delta Road (Knightsen) to the north. The service area is primarily residential, with small areas of commercial, office, and light industrial land use. The City land use plan has numerous parks, large areas of agriculture conservation, and special planning areas that are undeveloped. Historical and projected population is addressed in detail in Chapter 5.

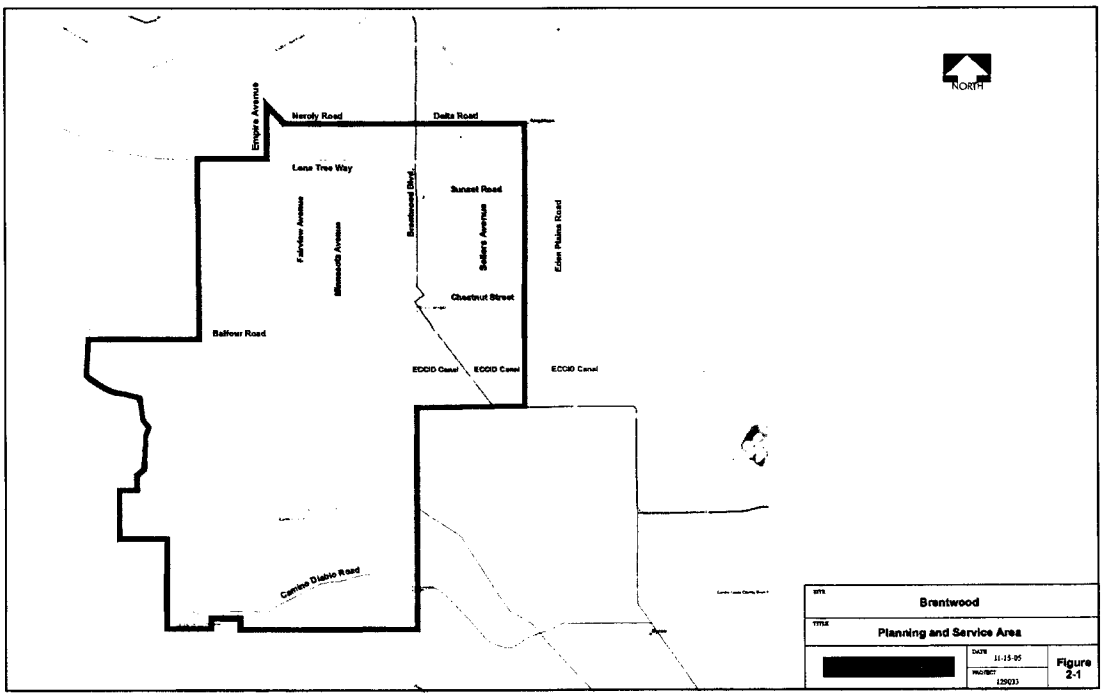

Figure 2-1. Brentwood Planning and Service Area

2.2 Environmental Setting

A description of the City's environmental setting follows and includes geography, climate, and hydrology.

2.2.1 Geography

The area extends from steep, hilly terrain in the south and west portions of the service area to flat with a gentle slope in the northeast portion of the service area. Elevations range from approximately 30 feet to almost 500 feet.

2.2.2 Climate

The City has cool and humid winters, and hot and dry summers. The City's weather is similar to that of Antioch because the two cities are adjacent. Based on the historical data obtained from the Western Regional Climate Center website (Western Regional Climate Center, 1999), Antioch's average daily temperature ranges from 37 to 91 degrees Fahrenheit, but the extreme low and high temperatures have been 18 and 117 degrees Fahrenheit, respectively. The historical monthly average precipitation is shown in Table 2-1 and the annual average is shown in Figure 2-2. The rainy season begins in November and ends in March. Average monthly precipitation during the winter months is about 2 to 3 inches, but records show that the monthly winter precipitation has been as high as 9 inches and as low as 0 inches. Water demands during the winter are relatively low. Low humidity usually occurs in the summer months, from May to September. The combination of hot and dry weather during the summer results in high water demands during these periods. Landscape irrigation, including turf irrigation in the summer, significantly contributes to the higher summer demands.

Table 2-1. Climate (DWR Table 3)

	Standard Average ET (in.)[1]	Average Rainfall (in.)[2]	Average Temperature (F)
January	0.95	2.80	45.3
February	1.75	2.43	50.55
March	3.48	1.93	54.4
April	5.37	0.88	58.8
May	6.88	0.38	64.85
June	7.79	0.10	71.05
July	8.29	0.02	74.1
August	7.24	0.05	73.35
September	5.33	0.21	70.7
October	3.63	0.70	63.85
November	1.76	1.66	53.45
December	1.01	2.12	45.9

[1] http://www.cimis.water.ca.gov/cimis/monthlyEToReport.do
[2] http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?caanti+nca

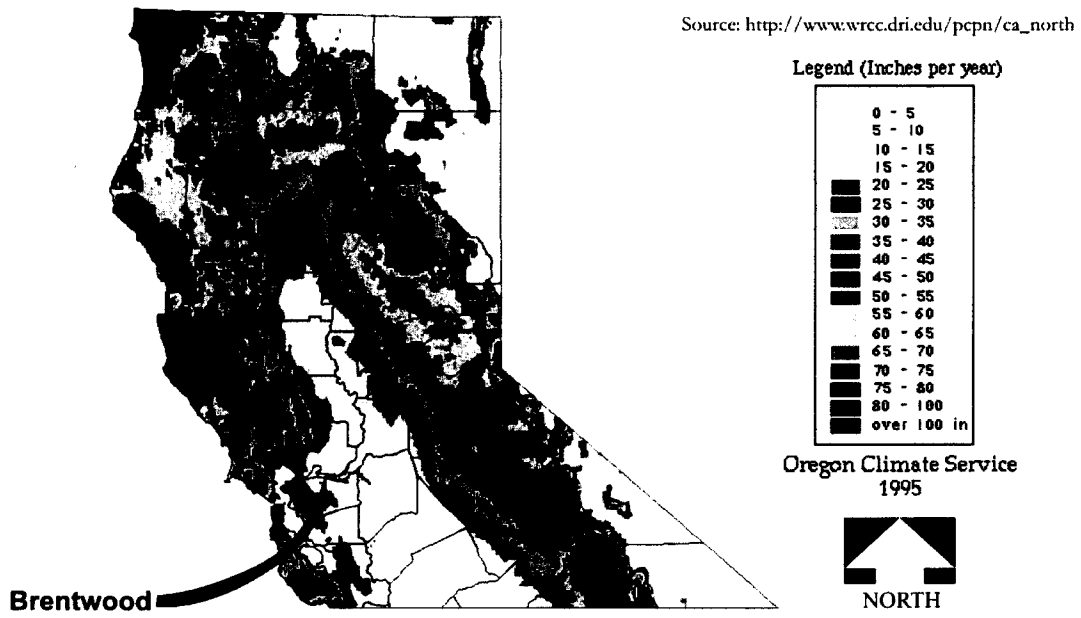

Figure 2-2. Northern California Annual Average Precipitation in Inches, 1961-1990

2.3 Water Supply Facilities and Sources

Groundwater from eight active wells provides approximately 67 percent of the water supply for the City. The remaining water comes from the Randall-Bold Water Treatment Plant located in Oakley, which is jointly owned by Contra Costa Water District (CCWD) and Diablo Water District (DWD). The water from Randall-Bold also provides an emergency source of water supply. Figure 2-3 depicts the locations of the key water system facilities.

2.3.1 Surface Water

The City has a contract with CCWD to treat the City's surface water supply at the Randall-Bold Water Treatment Plant (WTP). The Randall-Bold Inter-tie and connection is at the intersection of Neroly Road and Empire Road. An 18-inch-diameter main pipeline transports the treated water to Lone Tree Way, where it ties in with the City distribution system. The Randall-Bold WTP has a current capacity of 40 million gallons per day (mgd). The WTP receives water from Rock Slough, Old River, and Los Vaqueros Reservoir. Treatment facilities include a grit basin, influent mixing basin, pre- and post-ozone contact basin, flocculation basin, deep bed filtration (granular activated carbon over sand), filtered water reservoir, and distribution pumps. The contract between CCWD and the City does not limit the amount of treated water that the City can purchase. At this time there is an interim pipeline directly from the Randall-Bold WTP to the City's water system. The City's new booster pump station located at Randall-Bold WTP is scheduled to come online in spring 2006. There is no more need to contract with DWD. The City is in the design state of a 12-mgd water treatment plant expandable to 30-mgd.

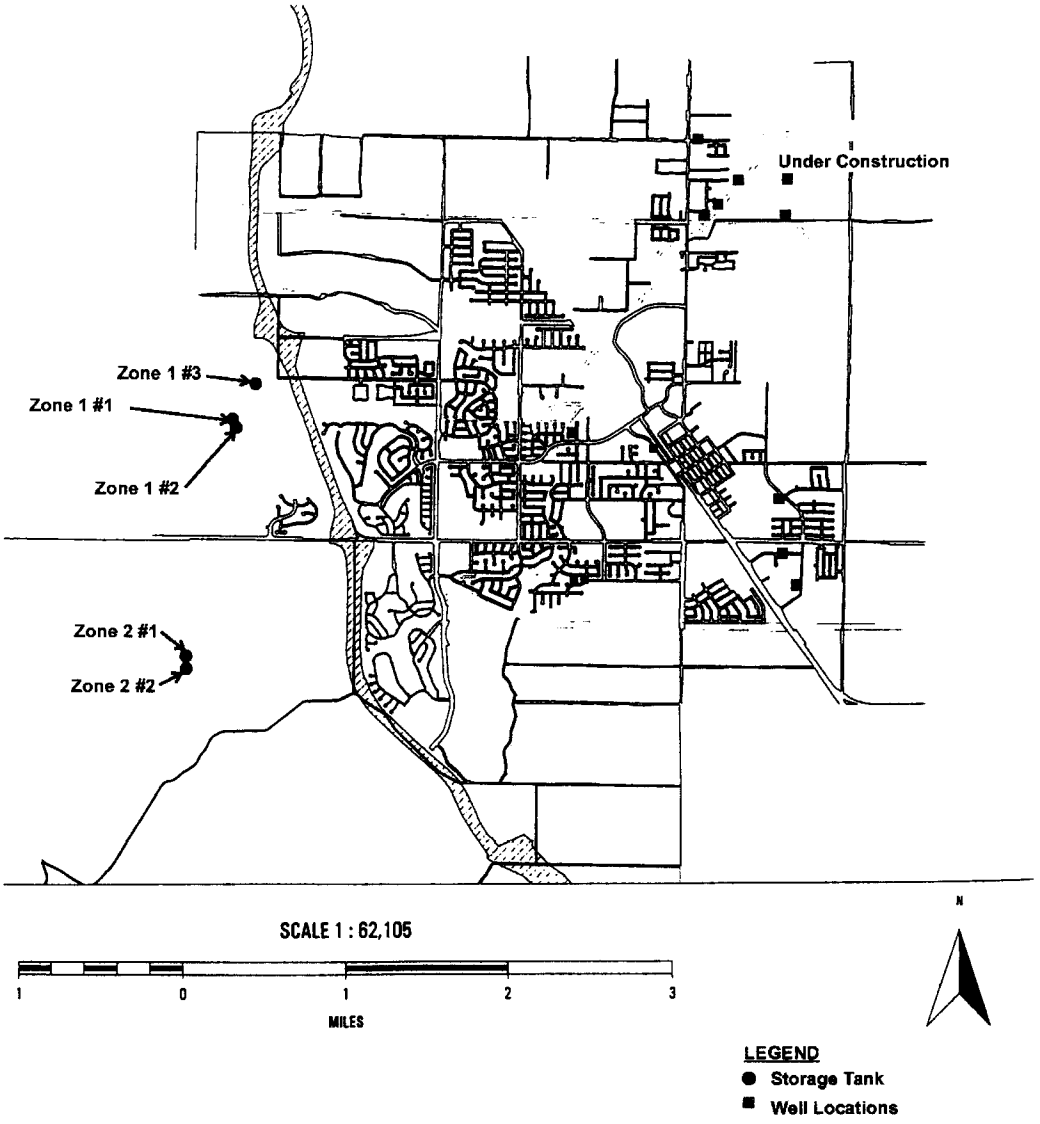

Figure 2-3 Key Water System Facilities

2.3.2 Wells

Eight wells with a combined capacity of 5,600 gpm or 8.064 mgd provide approximately 67 percent of the City's annual water production. The City has one other well that is rarely used due to poor water quality; however, it is available if needed in an emergency. The City has two main well fields (1) Wells 6, 7, 8, 9, 15 and 14 located in the northeast part of town and (2) Well 11, 12, and 13 to the south. The water is treated with sodium hypochlorite at the well heads and pumped to the distribution system directly. Table 2-2 summarizes the characteristics of the existing wells.

Table 2-2. City of Brentwood Wells

Well	Well capacity, gpm
Well No. 6	800
Well No. 7	750
Well No. 8	1,000
Well No. 11	600
Well No. 12	250
Well No. 13	300
Well No. 14	1000
Well No. 15	450
Total Well Water Supply	5,600 (8.064 mgd)

2.3.3 Water Rights

Contra Costa County does not regulate groundwater pumping with water rights. The City has first rights to 14,800 acre-feet per year of the surface water rights owned by ECCID under a pre-1914 water right.

2.3.4 Transfers and Exchanges

The City does not participate in any transfer or exchange programs.

2.4 Distribution System

The City's distribution system consists of three primary pressure zones. Water pressure is maintained between 40 and 100 pounds per square inch gauge (psig). The Pressure Zone 1 distribution system serves all developments less than an elevation of 110 feet. Pressure Zone 2 is confined to areas with elevations greater than 110 feet and less than or equal to 220 feet. Pressure Zone 3 is limited to areas with elevations greater than 220 feet and less than or equal to 330 feet. The distribution system includes two booster pump stations, four reservoirs (a fifth reservoir is under construction), and distribution piping.

2.4.1 Booster Pump Stations

Table 2-3 summarizes the design capacities of each booster pump at the two booster pump stations.

Table 2-3. Brentwood Booster Pump Stations

Name	Design flow, gpm
Zone 1 Booster Pump Station	
Pump A	2,100
Pump B	2,100[a]
Total pump capacity	4,200
Zone 2 Booster Pump Station	
Pump A	2,500
Pump B	2,500
Pump C	700
Pump D	700
Pump E	3,000
Total pump capacity	9,400
Zone 3 Booster Pump Station	
Pump A	400
Pump B	3,000
Pump C	640
Pump D	640
Pump E	3,000
Total pump capacity	7,680*

Notes:
* Capacity of two pumps operating simultaneously is less than the individual total, as indicated
[a] This pump will be abandoned upon completion of the new Randall-Bold station in the Spring of 2006.

2.4.2 Reservoirs

The five reservoirs in the City have a combined capacity of 14.7 million gallons (mg). Table 2-4 lists the reservoirs and their capacities. The reservoirs are situated above-grade and are constructed of welded-steel. These reservoirs provide equalization, emergency supply, and fire supply. A new 4.0-million gallon (mg) reservoir is complete and in service in Zone 1.

Table 2-4. Brentwood Storage Tanks

Name	Volume, mg
Zone 1 Reservoir No. 1.1	2.4
Zone 1 Reservoir No. 1.2	4.3
Zone 1 Reservoir No. 1.3	4.0
Zone 2 Reservoir No. 2.1	2.0
Zone 2 Reservoir No. 2.2	2.0
Zone 2 Reservoir No. 2.3	4.0 (new)[a]
Total capacity	18.7

[a] Tank is currently under construction and will be completed in 2006.

2.4.3 Piping System

The City distribution system consists of pipelines with various sizes. The City currently maintains 164 miles of distribution mains. The original water mains were constructed in 1940 and range in size from 4 to 10 inches in diameter. Larger-diameter water mains have been constructed more recently. A 30-inch-diameter transmission main transports treated water from the Randall-Bold WTP along Empire Road to the inter-tie and pump station and then smaller distribution lines connect to the system at Lone Tree Way. Water is transported from the Zone 1 reservoirs to the downtown system by a 24-inch-diameter water main west of Fairview Avenue, which connects to a 20-inch-diameter water main along Dainty Avenue. A 16-inch-diameter water transmission main transports water from the northern wells south along Highway 4 to the downtown pipe grid system. The City currently has an ongoing program to replace sections of the original water mains in need of repair.

SECTION 3.0

WATER SUPPLY QUANTITY AND QUALITY

Currently, the City of Brentwood (City) uses groundwater as its primary source of water supply. This source of supply is supplemented by surface water. This chapter describes the surface water and groundwater sources, quantities, supply constraints, and the water quality of the water supply sources. In addition, this chapter describes current and projected water supplies, water supply reliability and vulnerability, water shortage expectations, and water shortage revenue and expenditure impacts.

3.1 Surface Water

Surface water from the Sacramento-San Joaquin Delta (Delta) is treated at the Randall-Bold Water Treatment Plant (WTP) and supplements the groundwater supply. This section describes the surface water supply and its physical and legal constraints.

3.1.1 Description

Water rights in the supply area are owned by the East Contra Costa Irrigation District (ECCID). In 1999, the City obtained first rights to 14,800 acre-feet per year from ECCID. The City contracts with the Contra Costa Water District (CCWD) to treat the City water supply at the Randall-Bold WTP. The WTP is jointly owned by CCWD and the Diablo Water District (DWD) in Oakley. The WTP takes water from the Contra Costa Canal, which is the CCWD's principal raw water conveyance facility. CCWD delivers water not only to the City but also to areas in Contra Costa County including unincorporated areas surrounding Concord, Clayton, Clyde, Pleasant Hill, Martinez, Port Costa, Antioch, Bay Point, Martinez, Pittsburg, and Veale Tract. Since 1997, the City has obtained its surface water supply from the Randall-Bold WTP via an inter-tie at Empire Road and Neroly Road.

3.1.2 Physical Constraints

The principal physical constraints to the surface water supply are the capacity of the Randall-Bold WTP and the capacity of the pumps in the booster station at the City inter-tie. The Randall-Bold WTP has a treatment capacity of approximately 40 mgd and an expansion capacity of 80 mgd. There is an interim pipeline in use at this time conveying water from the Randall-Bold WTP to the City's water system. Pumping constraints no longer exist. Once the new pump station comes online in the spring of 2006, pumping supply will not be an issue. The City and CCWD are jointly working on a new surface water treatment plant that will be located north of Brentwood and immediately east of the Randall-Bold WTP. The plant will treat surface water supply from the ECCID. The first phase of the treatment plant construction will be completed in early 2008 with a capacity of 12 mgd.

3.1.3 Legal Constraints

The City's surface water supply is purchased from ECCID. ECCID is a pre-1914 water-right and is, therefore, not subject to delivery reductions during water shortages including regulatory restricted and drought years.

3.2 Groundwater

This section describes the groundwater supply and its physical and legal constraints. Groundwater is used as an economical supply to help offset the higher cost of surface water.

3.2.1 Description

The geologic setting of Contra Costa County is comprised of surficial (Quaternary) deposits overlying fault-bounded bedrock assemblages. East Contra Costa County has four groundwater regions. The City occupies the largest region, in which groundwater occurs in material deposited by streams originating from the coast ranges to the west. The extent of aquifer materials capable of yielding quantities of water suitable for municipal and/or agricultural purposes is present to depths of 600 feet below ground surface. Water level hydrographs reflect seasonal fluctuations and, in some areas, climatic influences (such as drought periods) on groundwater. In general, conditions since the late 1950s compared to present indicate that there is no apparent overdraft of the groundwater system, suggesting that historical extraction patterns have not exceeded the safe yield of the basin. Additionally, there have been no significant changes in movement of groundwater within the City since the late 1950s.

Water quality (discussed in more detail later in this chapter) in the City aquifer is adequate, but does have relatively high levels of total dissolved solids (TDS), chlorides, and nitrate. TDS in the groundwater is naturally high, up to 798 milligrams per liter (mg/L). This is below the California maximum contaminant level of 1,000 mg/L. The occurrence of nitrate in groundwater in this area has generally been attributed to agricultural influences. The occurrence is limited to the upper sequences of aquifer materials. The nitrate concentrations decline appreciably for wells completed below 200 feet of ground surface. Seven of the Cities wells are below 20 ppm, with one well above 20, but still below 45 ppm limit. Chloride and TDS concentrations also decline with depth, but less notably than the nitrate. The decline suggests local anthropogenic influences on TDS, chloride, and other constituents in addition to nitrate.

Table 3-1. Groundwater Pumping Rights – AF Year (DWR Table 5)

Basin Name	Pumping Right – AFY
San Joaquin	No rights to ground water supply in Contra Costa County
Total	Not applicable

Table 3-2. Amount of Groundwater Pumped – AFY (DWR Table 6)

Basin Name (s)	2000	2001	2002	2003	2004
San Joaquin	6,290	6,426	6,615	7,095	9,043
% of Total Water Supply	48	49	49	51	57

Table 3-3. Amount of Groundwater Projected to be Pumped - AFY (DWR Table 7)

Basin Name(s)	2010	2015	2020	2025
San Joaquin Basin	7,662	7,662	7,662	7,662
% of Total Water Supply	38	38	38	38

3.2.2 Physical Constraints

Existing wells in the City supply between 250 to 1,000 gallons per minute (gpm). Static water levels in the City's two main well fields (Wells 6, 7, 8, 14, and 15 located in the northeast part of town and Well 11, 12, and 13 to the south) are deeper than the shallower levels reflected in most of the East Contra Costa County groundwater region. Static water level readings from the City's wells indicate that the water level difference may be 20 to 200 feet and is most likely caused by the municipal pumping. The City's pumping, however, has not affected the larger regional system as previously discussed. The City is taking precautions and is monitoring to determine whether the water level difference between the deeper completion zones of its newer municipal wells and the shallow zones might cause degradation of water quality by inducing downward movement of water quality constituents, including nitrates.

3.2.3 Legal Constraints

Groundwater pumping is not currently regulated by water rights within Contra Costa County. Therefore, it is assumed that there are no legal constraints to pumping groundwater.

3.3 Desalination

Because the distance to the Pacific Ocean or the San Francisco Bay is a limiting factor, there are no opportunities for the development of desalinated water within the District's service area as a future supply source.

Table 3-4. Opportunities for Desalinated Water (DWR Table 18)

Sources of Water	Yield AFY	Start Date	Type of Use	Other
Water purchased from:				
Ocean Water	0	0	0	0
Brackish Ocean Water	0	0	0	0
Brackish Groundwater	0	0	0	0
Other (such as impaired groundwater)	0	0	0	0
Total	0	0	0	0

3.4 Transfer and Exchange Opportunities

The City does not participate in any transfer or exchange programs.

Table 3-5. Transfer and Exchange Opportunities - AF Year (DWR Table 11)

Transfer Agency	Transfer or Exchange	Short term	Proposed Quantities	Long term	Proposed Quantities
Company	0	0	0	0	0
Company	0	0	0	0	0
Company	0	0	0	0	0
Total	0	0	0	0	0

3.5 Water Rights

Section 3.1.1 and 3.1.3 previously discussed the rights for the drinking water used in the City of Brentwood.

3.6 Current and Projected Water Supplies

Table 3-8 summarized the projected annual water supply for normal climate. Recycled water is addressed further in Chapter 4. As shown in Table 3-8, the supply is adequate to meet projected demands during normal climate years.

Table 3-6. Future Water Supply Projects (DWR Table 17)

Project Name	Projected Start Date	Projected Completion Date	Normal-year AF to agency	Single-dry year yield AF	Multiple-Dry-Year 1 AF	Multiple-Dry-Year 2 AF	Multiple-Dry-Year 3 AF
Surface water treatment plant	Underway	2008	13,442	13,442	13,442	13,442	13,442
TOTAL			13,442	13,442	13,442	13,442	13,442

Table 3-7. Current and Planned Water Supplies - AFY (DWR Table 4)

Water Supply Sources	2005	2010	2015	2020	2025
Water purchased from:					
Contra Costa Water District	6,720	20,162	20,162	20,162	20,162
Supplier produced groundwater	0	0	0	0	0
Supplier surface diversions	0	0	0	0	0
Transfers in or out	0	0	0	0	0
Exchanges in or out	0	0	0	0	0
Recycled water (projected use)	323	2,230	2,646	3,142	3,733
Desalination	0	0	0	0	0
Other					
TOTAL	7,044	22,392	22,808	23,304	23,895

Table 3-8. Projected Normal Water Supply - AF Year (DWR Table 40)

Supply	2010	2015	2020	2025
Groundwater	9,033	9,033	9,033	9,033
Recycled water from Brentwood WWTP	2,190	2,646	3,442	3,733
Surface water[a]	20,162	20,162	20,162	20,162
Total	31,425	31,841	32,337	32,928
% of year 2005*	427	433	440	448

[a] Assumes buildout to reach max capacity of 36 mgd

3.7 Water Supply Reliability and Vulnerability

The surface water supply to the City is a pre-1914 water-right purchased from ECCID that is not subject to water shortages during drought years. Groundwater is assumed to be unaffected by drought conditions. Table 3-9 summarizes the projected year 2025 water supply for normal, single, and multiple dry water years. No reductions from normal year supply are expected in single or multiple dry years.

Table 3-9. Supply Reliability[a] - AF (DWR Table 8)

		Multiple Dry Water Years			
Average / Normal Water Year	Single Dry Water Year	Year 1	Year 2	Year 3	Year 4
31,557	31,557	31,557	31,557	31,557	31,557
% of Normal	100	100	100	100	100

[a]Supply reliability included in table includes both surface and groundwater sources.

Table 3-10. Basis of Water Year Data (DWR Table 9)

Water Year Type	Base Year(s)
Average Water Year	N/A
Single Dry Water Year	N/A
Multiple Dry Water Years	N/A

Table 3-11. Description of Factors Resulting in Inconsistency of Supply (DWR Table 10)

Name of supply	Legal	Environmental	Water Quality	Climatic
Groundwater	None	None	High TDS levels could compromise supply	None
Surface Water	None	Catastrophic levee breach could compromise surface water supply	None	None

3.7.1 Wholesaler (Agency) Water Supply Projections

Table 3-12 summarizes the projected water supply for the Contra Costa Water District. The CCWD currently sells 6 mgd to the City. The City of Brentwood owns first right of refusal to 6 mgd of capacity in the Randall-Bold WTP. The supply is through pre-1914 water rights, and is not expected to be affected in drought years. In 2008 the CCWD will complete the first phase of the new WTP, and will have a capacity of 12 mgd, in addition to the 6 mgd they are currently utilizing.

Table 3-12. Wholesaler Identified & Quantified the Existing and Planned Sources of Water-AFY (DWR Table 20)

Treated Water Source	2010	2015	2020	2025
Contra Costa Water District	20,162	20,162	20,162	20,162

Table 3-13. Wholesale Supply Reliability - % of Normal AFY, 2025 (DWR Table 21)

		Multiple Dry Water Years			
Treated Water Source	Single Dry	Year 1	Year 2	Year 3	Year 4
Contra Costa Water District	20,162	20,162	20,162	20,162	20,162
% of Normal	100	100	100	100	100

Table 3-14. Factors Resulting in Inconsistency of Wholesaler's Supply (DWR Table 22)

Name of supply	Legal	Environment	Water Quality	Climatic
N/A	None	None	None	None

3.8 Water Quality

The City receives its water supply from groundwater and surface water sources. Groundwater is treated at the wellhead prior to delivery to the drinking water distribution system. Surface water is treated at the Randall-Bold Water Treatment Plant (WTP) in Oakley and at the City of Brentwood water treatment plant.

3.8.1 Water Quality of Existing Water Supply Sources

Groundwater Quality. The groundwater quality constituents and respective issues for the City system wells can be differentiated into normally occurring constituents and man-made constituents. Historical monitoring of water from the wells has indicated some shallow groundwater impact by man-made constituents, including nitrates, chloride and total dissolved solids (TDS). Natural-occurring constituents, however, have required the system to take steps to minimize their taste and odor effects prior to the water being delivered to system customers.

Surface Water Quality. The surface water supply for the Randall-Bold WTP is supplied from the Delta and transported to the Randall-Bold WTP via the Contra Costa Canal. The Canal is operated by the CCWD and is supplied by Sacramento-San Joaquin Delta water through three intake locations. The intakes draw water from Rock Slough near Oakley, Old River near Discovery Bay, and Mallard Slough in Concord. Water can also be stored in the off-stream Los Vaqueros Reservoir from the Old River intake. Los Vaqueros Reservoir also gathers some surface runoff from its catchment.

Water quality fluctuates throughout the year and from year to year for each of the four surface water sources supplying the CCWD Canal. The variation in water quality of the canal water is partially compensated by selecting or changing the flow rates of the various intake sources. Still, the variations in raw water quality at the Randall-Bold WTP require regular attention by the treatment operators.

The Randall-Bold WTP has the ability to treat changing raw water quality on a consistent basis. The existing facilities can respond to changes in raw water turbidity or other quality changes. All current drinking water standards are being met for the treated surface water supply from the Randall-Bold WTP.

Table 3-15. Current & Projected Water Supply Changes Due to Water Quality – Percentage (DWR Table 39)

Water Source	2005	2010	2015	2020	2025
Contra Costa Water District	0	0	0	0	0
Groundwater	0	-10	-10	-10	-10
Recycled water	0	0	0	0	0

3.9 Water Shortage Contingency Plan

This section outlines the estimated three-year minimum water supply, the actions and stages described in the Draft Ordinance that will be implemented in the event of a water supply shortage, and the emergency preparedness and plans for catastrophic events.

3.9.1 Estimate of Minimum Water Supply for Next Three Years

Table 3-16 summarizes the minimum water supply that the City of Brentwood can expect over the next three years in comparison to a normal year. In the third year, the City of Brentwood new WTP will be completed, and the water supply will grow to 20,162 AF-year.

Table 3-16. Three-Year Estimated Minimum Water Supply - AF Year (DWR Table 24)

Source	Normal	Year 1	Year 2	Year 3
Contra Costa Water District	6,720	6,720	6,720	20,162
Groundwater wells	7,662	7,662	7,662	7,662
Recycled water	323	323	323	323
Total	11,705	12,667	12,667	28,147

3.9.2 Stages of Actions

This section describes the stages of action to be undertaken in response to water supply shortages. Included is an outline of specific water supply conditions that are applicable to each stage. Per California Water Code Section 10632 (a), the City has developed four stages of action to be undertaken in response to water supply shortages, including up to a 50 percent reduction in water supply and an outline of specific water supply conditions which are applicable to each stage.

Four stages of action to be taken during a water supply shortage have been developed. The stages will be implemented during water supply shortages according to shortage level, ranging from 5 percent shortage in Stage I to 50 percent shortage in Stage IV. The stage determination and declaration during a water supply shortage will be made by the Public Works Director. Table 3-17 describes the water supply shortage levels and stages.

Table 3-17. Water Supply Shortage Stages and Conditions (DWR Table 23)

Stage No.	Water Supply Conditions	% Shortage
I	Minor drought	5-10
II	Moderate drought	10-20
III	Severe drought	20-35
IV	Critical drought	35-50

Table 3-18. Consumption Reduction Methods (DWR Table 27)

Consumption Reduction Methods	Stage When Method Takes Effect	Projected Reduction (%)
Demand reduction program	All	10-50
Reduce pressure in water lines		
Flow restriction	III,IV	35-50
Restrict building permits		
Restrict for only priority uses	II,III,IV	20-50
Use prohibitions	II,III,IV	
Water shortage pricing		
Per capita allotment by customer type	III,IV	35-50
Plumbing fixture replacement	All Stages	10-50
Voluntary rationing	II	20
Mandatory rationing	III,IV	35-50
Incentives to reduce water consumption		
Excess use penalty	III,IV	35-50
Water conservation kits	All Stages	10-50
Education program	All Stages	10-50
Percentage reduction by customer type	III,IV	35-50

During Stage I, water alert conditions are declared and voluntary conservation is encouraged. The City maintains an ongoing public information campaign consisting of distribution of literature, speaking engagements, bill inserts, and conservation messages printed in local newspapers and on the City's internet web page. The drought situation is explained to public and governmental bodies. The City explains other stages and forecasts future actions. Also, the City requests voluntary water conservation. Educational programs in area schools are ongoing.

During Stage II of a water supply shortage, the shortage is moderate (10 to 20 percent) and conservation may be voluntary, consist of allotments, and/or include mandatory conservation rules. The severity of actions depends upon the percent shortage. The City aggressively continues its public information and education programs. The City asks for 10 to 20 percent voluntary or mandatory water use reductions. If necessary, the City also supports passage of drought ordinances.

During Stage III of a water supply shortage, the shortage is severe (20 to 35 percent) and conservation consists of allotments and mandatory conservation rules. This phase becomes effective upon notification by the City that water usage is to be reduced by a mandatory percentage. The City adopts drought ordinances and implements mandatory reductions. Rate changes are implemented to penalize excess usage.

Water use restriction is put into effect (i.e., prohibited uses can include restrictions on daytime hours for watering, excessive watering resulting in gutter flooding, using hoses without a shutoff device, non-recycling fountains, washing down sidewalks or patios, unrepaired leaks, etc). The City monitors production weekly for compliance with necessary reductions. As a result of a customer consistently abusing use, the City would install a flow restrictor at the water meter.

During Stage IV of a water supply shortage, the shortage is critical (35 to 50 percent). Conservation consists of allotments and mandatory conservation rules. All steps taken in prior stages are intensified and production is monitored daily for compliance with necessary reductions.

3.9.3 Prohibitions, Penalties, and Consumption Reduction Methods

California Water Code Section 10632 (d) requires mandatory prohibitions against specific water use practices that may be considered excessive during water shortages. Since 1992, the City has adopted Municipal Code 17.630, which addresses landscaping and irrigation for new construction of homes, commercial, and industrial facilities. This ordinance is included in Appendix F. It requires 90 percent of the plants selected in non-turf areas to be well suited to the climate of Brentwood and require minimal water once established. Up to 10 percent of the plants may be of a non-drought-tolerant nature but must be grouped together and irrigated separately from the drought-tolerant plants. Turf is not allowed on City median strips in areas less than 8 feet wide and on slopes greater than 4:1. Soil conditioning, irrigation systems, and sprinkler heads are all addressed in this ordinance. The landscaping shall be inspected and must be issued a certificate of substantial completion that is submitted to the City. This municipal code is a proactive means of reducing the water demand in the City.

Should drought conditions warrant mandatory reductions during Stage II of a water supply shortage, the City may adopt and implement an ordinance for mandatory conservation and water restriction plan. This ordinance may require additional tariffs for the City to enforce the plan.

The ordinance may address prohibitions on various wasteful water uses, including but not limited to the hose washing of sidewalks and driveways using potable water, cleaning or filling decorative fountains, and allowing plumbing leaks to go uncorrected for more than 72 hours. Table 3-19 identifies potential prohibitions and the stages during which the prohibition would be voluntary and mandatory.

Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply. California Water Code Section 10632 (e) requires the water supplier to provide consumption reduction methods in the most restrictive stages of a water shortage. The City will use the consumption reduction methods proposed in Table 3-18.

Section 10632 (f) of the California Water Code requires a water supplier to penalize or charge for excessive water use, where applicable. The City, after one written warning, shall install a flow-restricting device on the service line of any customer observed by City personnel to be using water for any non-essential or unauthorized use defined in a City ordinance.

An excess use penalty per 100 cubic feet of water used in excess of the applicable allocation during each billing period shall be charged by the City for all service rendered on and after the effective date of an ordinance. Repeated violations of unauthorized water use will result in discontinuance of water service. Penalties and charges and the stage during which they take effect are displayed in Table 3-20.

Table 3-19. Mandatory Prohibitions (DWR Table 26)

Examples of Prohibitions	Stage when Prohibition becomes mandatory
Cleaning of sidewalks/streets/walkways/parking areas/patios/porches or veranda	
Washing cars	II,III,IV
Watering lawns/landscapes	II,III,IV
Non-permanent agriculture	II,III,IV
Uncorrected plumbing leaks	II,III,IV
Gutter flooding	
Cleaning/filling/operating maintaining levels in non-recycling decorative fountains	II,III,IV

Table 3-20. Penalties and Charges (DWR Table 28)

Penalties or Charges	Stage When Penalty Takes Effect
Penalties for not reducing consumption	III,IV
Charges for excess use	III,IV
Flat Fine	
Charge per unit over allotment	III,IV
Flow restriction	III,IV
Termination of service	III,IV

3.9.4 Mechanisms for Determining Actual Reductions

California Water Code Section 10632 (i) requires the water supplier to develop a mechanism for determining actual reductions in water use in the course of carrying out the urban water supply shortage contingency analysis.

Under normal water supply conditions, water production figures are recorded daily within and monitored by the Water Production Supervisor during normal water supply conditions. Totals are reported monthly and are incorporated into water supply reports.

The City maintains extensive water use records on individual customer accounts. Exceptionally high usage is identified at meter reading time by the City's electronic meter reading management system. These accounts are investigated for potential water loss or abuse problems.

During all stages of water shortages, daily production figures are reported to and monitored by the Water Production Supervisor daily.

Table 3-21. Water Use Monitoring Mechanisms (DWR Table 31)

Mechanisms for determining actual reductions	Type data expected
Electric meter read	More accurate water usage

3.9.5 Revenue and Expenditure Impacts During Shortages

Section 10632 (g) of the California Water Code requires an analysis of the impacts of each of the actions taken for conservation and water restriction on the revenues and expenditures of the water supplier. The City will establish memorandum accounts to track expenses and revenue shortfalls caused by both mandatory rationing and voluntary conservation efforts. The City will implement a surcharge to recover revenue shortfalls recorded in their drought memorandum accounts.

Tables 3-22 and 3-23 display the components of revenue and expenditure impacts and summarize if the various components were discussed. Every two years the City reviews its revenue and expenditures for water and adjusts the rates.

Table 3-22. Proposed Measures to Overcome Revenue Impacts (DWR Table 29)

Names of measures	Check if Discussed
Review of rate adjustments	X
Development of reserves	X
Change in quantity of sales	X
Impact on Customer's bill	X
Distribution of customer impacts between customer types	X
Impacts to water supplier of higher rates and penalties	X
Cost recovery reviews	X

Table 3-23. Proposed Measures to Overcome Expenditure Impacts (DWR Table 30)

Names of measures	Check if Discussed
Change in quantity of sales	X
Cost recovery reviews	X
Increased staff salaries/overtime	X
Increased costs of new supplies, transfers or exchanges	X
Distribution of customer impacts between customer types	X
Impacts to water supplier of higher rates and penalties	X

3.9.6 Catastrophic Supply Interruption Plan

The Water Code Section 10632 (c) requires actions to be undertaken by the water supplier to prepare for and implement during a catastrophic interruption of water supplies. The City has a Water Quality Emergency Notification Plan in place that coordinates overall response to a disaster.

A catastrophic event that constitutes a proclamation of a water shortage would be any event, either natural or manmade, that causes a severe shortage of water, synonymous with severity equal to or greater than the Stage III or Stage IV water supply shortage conditions. Facilities are inspected annually for earthquake safety. Auxiliary generators and improvements to the water storage facilities to prevent loss of these facilities during an earthquake or any disaster causing an electric power outage have been budgeted for and installed as part of the annual construction process.

Table 3-24 is a summary of items discussed regarding the preparation actions for a catastrophe.

Table 3-24. Preparation Actions for a Catastrophe (DWR Table 25)

Possible Catastrophe	Check if Discussed
Determine what constitutes a proclamation of a water shortage	X
Stretch existing water storage	
Obtain additional water supplies	
Determine where the funding will come from	X
Contact and coordinate with other agencies	X
Create an Emergency Response Team/Coordinator	X
Create a catastrophe preparedness plan	X
Put employees/contractors on-call	X
Develop methods to communicate with the public	X
Develop methods to prepare for water quality interruptions	X

SECTION 4.0

RECYCLED WATER

4.1 Wastewater Generation

Municipal wastewater is generated in the service area from a combination of residential and commercial sources. The quantities of wastewater generated are proportional to the population and the water use in the service area. At this time, Sunset Park is the City of Brentwood's only recycled water customer. As shown in Table 4-1, there are no other agencies currently purchasing recycled water from the City.

Table 4-1. Participating agencies (DWR Table 32)

	Participated
Water agencies	N/A
Wastewater agencies	N/A
Groundwater agencies	N/A
Planning agencies	N/A
Other agencies	N/A

4.2 Wastewater Collection

The City of Brentwood (City) uses the Brentwood Wastewater Treatment Plant (WWTP) for the treatment and disposal or reuse of the wastewater generated in the City service area. The wastewater is collected by gravity in a series of main, trunk, and interceptors. Collected wastewater is transported to the WWTP. The WWTP currently receives and treats approximately 3.35 million gallons per day (mgd) of dry weather flow on average. The current capacity of the plant to treat dry weather flows is approximately 4.5 mgd.

Table 4-2. Wastewater Collection and Treatment – AF Year (DWR Table 33)

Type of Wastewater	2000	2005	2010	2015	2020	2025
Wastewater collected & treated in service area	2,352	3,887	4,458	5,298	6,284	7,471
Volume that meets recycled water standards	0	1,941	2,229	2,649	3,142	3,736

The WWTP produces a tertiary effluent that is disinfected with liquid sodium hypochlorite and the post-disinfection dechlorination process uses liquid bisulfite. The effluent is then either pumped throughout the plant as process water or offsite as recycled water for surface irrigation of landscaping. The remaining treated effluent is discharged into Marsh Creek via a cascade aeration process that increases the dissolved oxygen level before entering the creek.

Table 4-3. Disposal of Wastewater (non-recycled) – AF Year (DWR Table 34)

Method of disposal	Treatment level	2005	2010	2015	2020	2025
Retention Ponds	Secondary	560	560	560	560	560
Marsh Creek	Tertiary	2,869	1,668	2,092	2,582	3,178
Total		3,429	2,228	2,652	3,142	3,738

4.3 Current and Projected Recycled Water Use

The City has developed some preliminary planning documents to identify uses for reclaimed wastewater at both existing and future sites. The City's recycled water distribution system is shown in Figure 4-1. The reclaimed wastewater will be used for irrigation of parks, golf courses, and other landscape amenities. The City has already constructed a portion of the distribution system for the reclaimed water and will continue to expand the system as the City grows. The City estimates that 50 percent of the reclaimed water produced by the WWTP is available for recycled water supply.

Existing landscape that has the potential to be serviced by reclaimed water includes about 288 acres of city parks and two existing golf courses. A third golf course is almost complete, and a fourth is in the planning stages. The existing and planned golf courses comprise 802 acres. Sunset Park, which has approximately 30 acres of soccer and baseball fields currently uses 0.29 mgd of recycled water for irrigation. Another potential use of reclaimed water is a proposed concrete batch plant of 5 acres in size. The evapotranspiration data indicate that 4.7 feet of water per acre is required in the City's area. Therefore, the parks and golf courses will require about 5,260 acre-feet of reclaimed water per year at build-out. The current demand for landscape irrigation is estimated at approximately 2,500 acre-feet per year. The existing distribution lines can service the existing golf courses and one existing park. This demand is estimated at 1,390 acre-feet. The existing distribution lines can also service the two future golf courses and two proposed parks.

Table 4-4. Recycled Water Uses– Actual and Potential (AFY) (DWR Table 35)

User type	Treatment Level	2005	2010	2015	2020	2025
Agriculture		0	25	50	75	100
Landscape		323	800	1300	1800	2300
Wildlife Habitat		0	5	10	15	20
Wetlands		0	0	0	0	0
Industrial		0	25	50	75	100
	Total	323	855	1410	1965	2520

Table 4-5. Projected Future Use of Recycled Water in Service Area – AF Year (DWR Table 36)

	2010	2015	2020	2025
Projected use of Recycled Water	855	1410	1965	2520

Table 4-6. Recycled Water Use – 2000 Projection Compared with 2005 Actual – AFY (DWR Table 37)

User type	2000 Projection for 2005	2005 Actual use
Agriculture	Not Available	0
Landscape	Not Available	323
Wildlife Habitat	Not Available	0
Wetlands	Not Available	0
Industrial	Not Available	0
Groundwater Recharge	Not Available	0
Total		323

4.4 Optimization Plan with Incentives

The City of Brentwood currently offers potable water at $2.38 per 1,000 gallons. This rate is more than double the recycled water which is $1.11 per 1,000 gallons. The City anticipates the cost of recycled water to remain proportionally lower than the cost of potable water in the future. Another method of optimizing the use of recycled water is by banning the use of potable water for dust control and earth compaction by local contractors.

In the future, the City hopes to increase its number of large volume customers. This includes golf courses, irrigation of roadways, and City parks. The time it takes City staff to supervise a small customer is about the same as supervising a large one.

Table 4-7. Methods to Encourage Recycled Water Use (DWR Table 38)

Actions	2010	2015	2020	2025
Financial incentives	Availability and Decreased Rate	Availability and Decreased Rate	Availability and Decreased Rate	Availability and Decreased Rate
Total	0	0	0	0

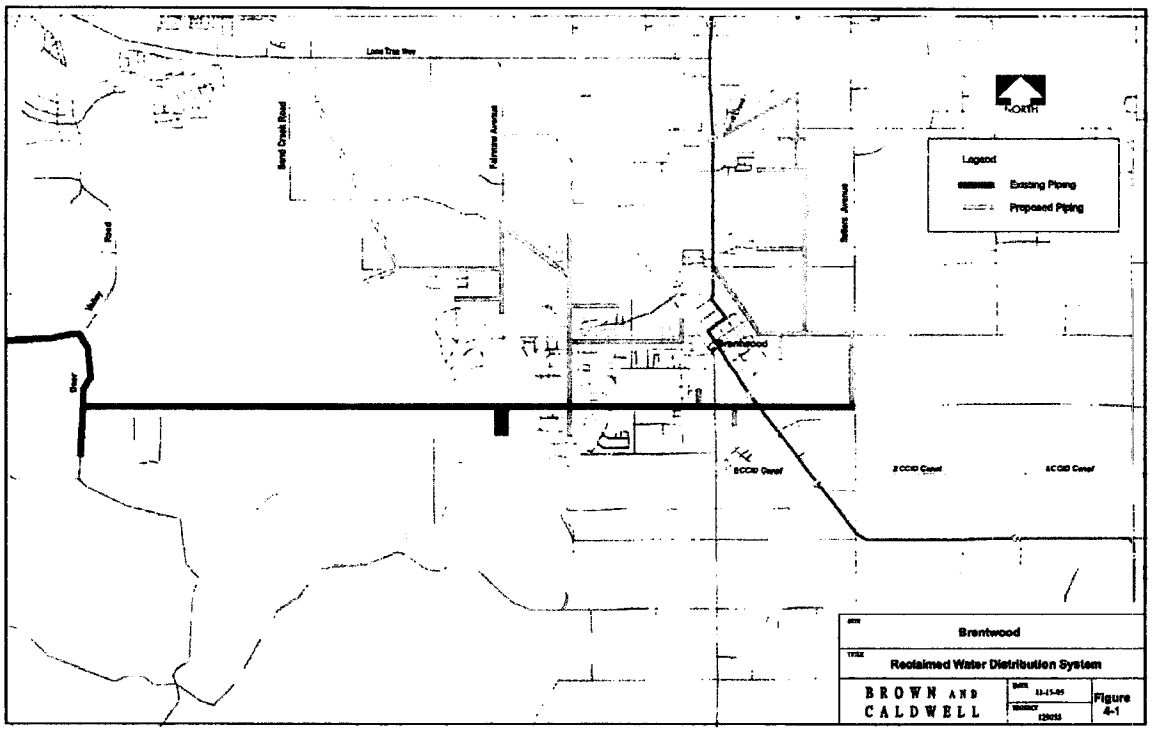

Figure 4-1. Brentwood Reclamation Water Distribution System

SECTION 5.0

HISTORICAL AND PROJECTED WATER USE

Water demand projections provide the basis for sizing and staging future water facilities. Water use and production records, combined with projections of population, employment, and urban development, provide the basis for estimating future water requirements. This chapter presents an analysis of available demographic and water use data, customer connections, historical groundwater and surface water production, unit water use, and the resulting projections for future water needs for the City.

5.1 Population, Employment, and Housing

Population, housing, and employment data developed by the Association of Bay Area Governments (ABAG) and available U.S. Census data were used to develop estimates of future City water use for this report. These were not used for the Master Plan Update currently being prepared. The water service area encompasses the City sphere of influence rather than the jurisdictional boundary, as defined in the ABAG Projections 2005 publication; therefore, sphere of influence projections were used.

On November 28, 2000, the City annexed approximately an additional 1,133 acres. The areas of annexation are shown on Figure 5-1. The Central Annexation encompasses approximately 910 acres of inhabited land and fills in the area from Central Boulevard on the south to Neroly Road on the north. The other two annexations are the Stolich/Brown and Bonnickson/Tambellini properties located along the eastern side of the City. These two annexation areas are uninhabited and encompass about 223 acres. These annexations are consistent with the 1993 General Plan and the update. The annexation will enable the connection of several major arterial streets throughout the City.

ABAG population projections use the California State Department of Finance's Demographic Research Unit (DRU) data as control totals for each jurisdiction. The ABAG population projections are driven by economic and demographic mathematical models and constrained by examining local governments' plans, policies, and regulations affecting land development. ABAG housing projections are based on 1990 and 2000 U.S. Census data. By assuming a certain housing unit vacancy factor, the ABAG projections can be converted into the number of new housing units that can be expected to be constructed during the period. Projections are made considering historical and present trends, taking into account available vacant land, redevelopment activities and current land use policies and plans.

According to the 2005 U.S. Census, it is estimated that the current population within the jurisdictional boundary of the City is approximately 44,300 people. Within the City sphere of influence and the area served by the City's water system, the current population is about 45,700. This population is anticipated to reach 62,100 by 2025. A summary of the historic and projected population within the area served by the City water system, based on ABAG data, is presented in

Table 5-1. A large increase in the number of employees working in the areas served by the city water system is expected over the next 20 years.

Table 5-1. Population - Current and Projected (DWR Table 2)

	2005	2010	2015	2020	2025
Service Area Population	44,300	51,700	55,600	59,000	62,100

In summary, according to ABAG the City population increased 42 percent from 1990 to 1995, which is a growth rate of approximately 7.2 percent per year. From 1995 to 2000, the City population increased 78 percent, which is a growth rate of approximately 12 percent per year. From 2000 to 2005, the city population increased 90 percent. By 2025, population served by Brentwood (inside the City's sphere of influence) is expected to increase by 40 percent, from 44,300 in 2005 to 62,100 in 2025. The projected growth rate would then average 2.0 percent per year.

The City's June 2001 General Plan assumes there will be approximately 25,229 dwelling units at buildout. Assuming 3.1 persons per household, this equates to a population of about 78,210 persons at buildout. For this Urban Water Management Plan, we assume buildout will occur at the year 2040. This Urban Water Management Plan only addresses water supply and demand through the year 2025.

5.2 Historical Water Use

Records of historical water production obtained from the City serve as the basis for developing unit water demands and peaking ratios for the City's system. These data include maximum day and annual water production. Water production is the volume of water measured at the source, which includes all water delivered to residential, commercial, and public authority connections, as well as unaccounted-for water.

5.2.1 Annual Water Production and Average Daily Demand

Currently, the City system produces 67 percent of its water demand from groundwater wells. The City's surface water is treated at the Randall-Bold WTP, which is operated by Contra Costa Water District (CCWD). Total water production in 2004 was 9,043 acre-feet (ac-ft).

5.2.2 Maximum Day Demand

Daily demand fluctuates throughout the year based primarily on seasonal climate changes. More water is used in the summer than the winter. System production facilities must be sized to meet the demand on the maximum day of the year, not just the average. The ratio between average and maximum day demands provides a maximum day peaking factor that can be used to scale future demand projections to maximum day levels. For this report, a maximum day peaking factor of 2.1 is used[1].

[1] CDM, Water Master Plan, March 23, 2004, page 5

Table 5-2. Past, Current and Projected Water Deliveries (MG) (DWR Table 12)

Year		Water Use Sector	Single family	Multi-family	Commercial	Industrial[a]	Institutional/gov	Landscape[b] / Hydrant	Agriculture	Total
2002	metered	Deliveries MG/Y	1,348	61	157	0	117	N/A	N/A	1,683
		# of accounts	11,412	33	366	0	127	N/A	N/A	11,938
2004	metered	Deliveries MG/Y	2,072	77	310	0	283	7	N/A	2,749
		# of accounts	14,866	37	472	0	177	8	N/A	15,560
2010	metered	Deliveries MG/Y	2,431	90	364	0	332	8	N/A	3,225
		# of accounts	17,444	43	554	0	208	8	N/A	18,257
2015	metered	Deliveries MG/Y	2,619	97	392	0	358	9	N/A	3,475
		# of accounts	18,792	47	597	0	224	9	N/A	19,669
2020	metered	Deliveries MG/Y	2,780	103	416	0	380	9	N/A	3,688
		# of accounts	19,947	50	633	0	238	9	N/A	20,877
2025	metered	Deliveries MG/Y	2,921	108	437	0	399	10	N/A	3,875
		# of accounts	20,964	53	666	0	250	10	N/A	21,943

[a]Industrial water use is included in the commercial connections
[b]Landscape water use is included with Institutional/government use

5.2.3 Unit Water Use Factors

Unit water use factors are developed to estimate future water needs based on the housing and employment projections discussed previously. Two main categories of water users are employed to estimate future water needs, residential and nonresidential. Residential future water needs are determined using the projections for single family and multi-family dwelling units within the City, coupled with a unit water use factor per dwelling unit type. Nonresidential future water needs are determined using the projections for employment within the City, coupled with a unit water use factor per employee. Studies show there is a good correlation between nonresidential water use and number of employees (California Urban Water Agencies, 1992).

Unit water use factors were developed by the City in their Water Master Plan Update to estimate future water needs. The City analyzed water consumption by lot size. In general, there is a tendency for water use to increase with larger lot size. The Master Plan Update estimates water consumption per dwelling unit at 600 gallons per dwelling unit per day. The average water consumption from 2001 to 2003 is estimated at 192 gallons per person per day. The Master Plan Update predicts that average water consumption will increase to 260 gallons per person per day. For this report, this increase is assumed to happen by 2025. For all nonresidential water uses in the City, the current water consumption is estimated at 800 to 1,500 gallons per acre per day.

5.2.4 Water Sales to Other Agencies

Table 5-3. Sales to Other Agencies - AF Year (DWR Table 13)

Water Distributed	2000	2005	2010	2015	2020	2025	
N/A	0	0	0	0	0	0	
Total							

Water use varies continuously throughout a given day, as well as seasonally. Water use during a typical summer day is approximately four times that of a winter day. Maximum demands for water normally occur in June, July, August, and September. Increased landscape irrigation during the hot, dry weather is largely responsible for these higher demands. The ratio between the highest daily water use and the annual average water use is defined as the maximum day peaking factor.

5.2.5 Unaccounted-for Water and Additional Water Use

Unaccounted-for water use is unmetered water use including water used for fire protection and training, system and street flushing, sewer cleaning, construction, system leaks, and unauthorized connections. Unaccounted-for water can also result from meter inaccuracies. Unaccounted-for water is assumed for this study to be approximately 5 percent of total water production.

Table 5-4. Additional Water Uses and Losses - AF Year (DWR Table 14)

Water Use	2000	2005	2010	2015	2020	2025
Saline barriers	0	0	0	0	0	0
Groundwater recharge	0	0	0	0	0	0
Conjunctive use	0	0	0	0	0	0
raw water	0	0	0	0	0	0
recycled	0	323	2,230	2,646	3,142	3,733
other (define)	0	0	0	0	0	0
Unaccounted-for system losses	-300	-700	-750	-800	-850	-900
Total	-300	-377	1,480	1,846	2,292	2,833

5.2.6 Total Water Use

Past, present, and future water use for the system, which is the sums of the totals from Tables 5-2, 5-3, and 5-4 is provided in Table 5-5.

Table 5-5. Total Water Use - AF Year (DWR Table 15)

Water Use	2000	2005	2010	2015	2020	2025
Total of Tables 5-2, 5-3, 5-4	4,865	8,059	11,344	12,510	13,610	14,724

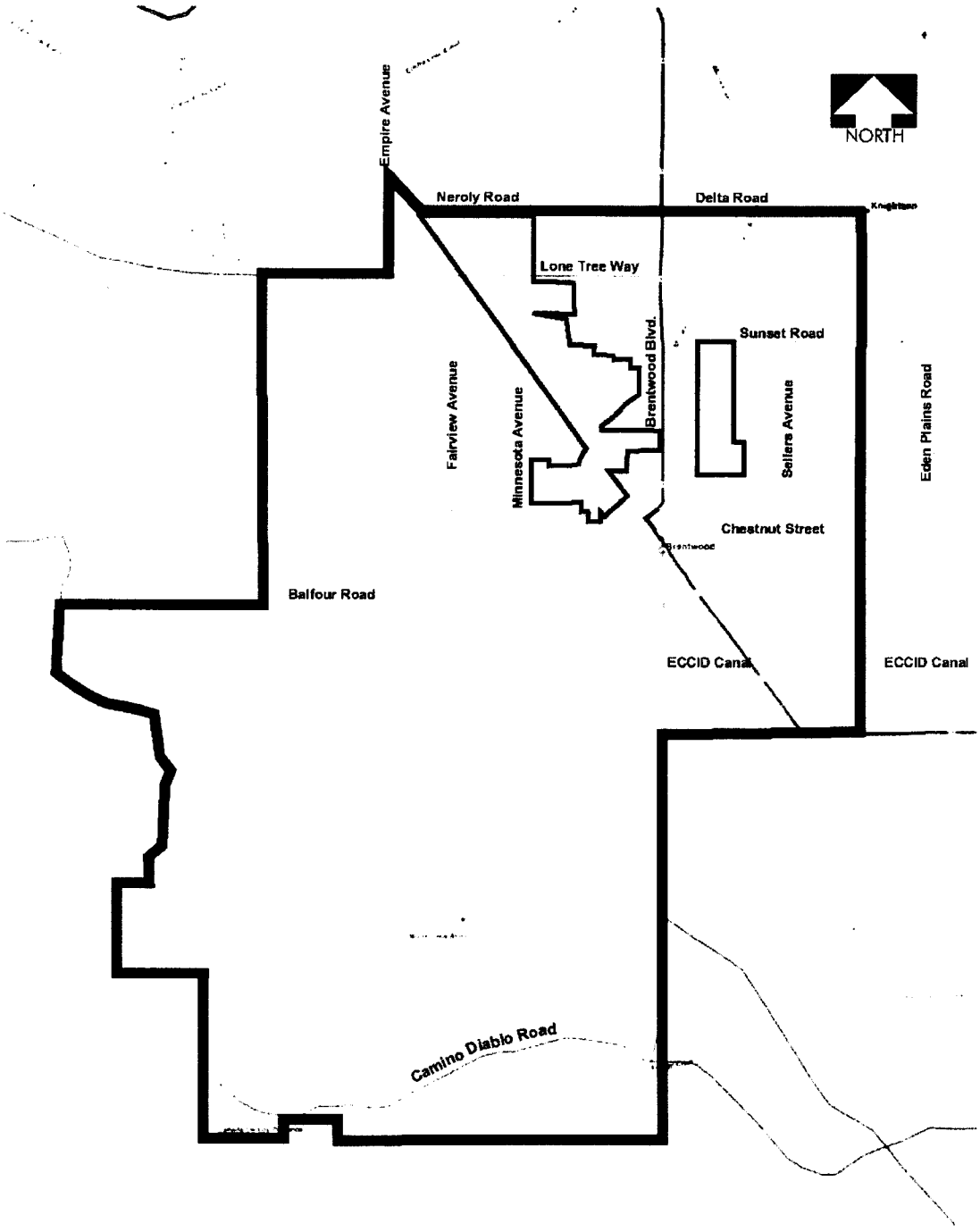

Figure 5-1 Areas of Annexation

SECTION 6.0

WATER SUPPLY VERSUS DEMAND COMPARISON

6.1 Current and Projected Water Supplies vs. Demand

Tables 6-1 and 6-2 summarize the projected normal water supply and projected normal water demand. As shown in the two tables, the supply is adequate to meet the projected demands during normal climate years.

Table 6-1. Projected Normal Water Supply - AF Year (DWR Table 40)

(from DWR Table 4)	2010	2015	2020	2025
Supply	27,824	27,824	27,824	27,824
% of year 2005	193	193	193	193

Table 6-2. Projected Normal Water Demand - AF Year (DWR Table 41)

(from DWR Table 15)	2010	2015	2020	2025
Demand[1,2]	12,603	13,554	14,383	15,139
% of year 2005	116	125	133	140

Table 6-3. Projected Supply and Demand Comparison - AF Year (DWR Table 42)

	2010	2015	2020	2025
Supply totals	27,824	27,824	27,824	27,824
Demand totals	12,603	13,554	14,383	15,139
Difference	15,221	14,270	13,441	12,685
Difference as % of Supply	55	51	48	46
Difference as % of Demand	121	105	93	84

6.2 Single and Multiple Dry Water Years

Tables 6-4 through 6-18 summarize the projected water supply and demand for normal, single dry, and multiple dry water years based on the knowledge that Brentwood has pre-1914 water rights. Table 6-17 shows that the City will have an adequate water supply during multiple dry water years through the year 2025 assuming no concurrent demand reduction. The demands recognize that the City's water demand associated with growth will continue to occur during multiple dry years.

[1]ABAG Projections, 2005.
[2] CDM Water Master Plan, March 23, 2004, page 5.

Table 6-4. Projected Single Dry Year Water Supply - AF Year (DWR Table 43)

	2010	2015	2020	2025
Supply	27,824	27,824	27,824	27,824
% of projected normal	193	193	193	193

Table 6-5. Projected Single Dry Year Water Demand - AF Year (DWR Table 44)

	2010	2015	2020	2025
Demand	12,603	13,554	14,383	15,139
% of projected normal	116	125	133	140

Table 6-6. Projected Single Dry Year Supply and Demand Comparison - AF Year (DWR Table 45)

	2010	2015	2020	2025
Supply totals	27,824	27,824	27,824	27,824
Demand totals	12,603	13,554	14,383	15,139
Difference	15,221	14,270	13,441	12,685
Difference as % of Supply	55	51	48	46
Difference as % of Demand	121	105	93	84

Table 6-7. Projected Supply During Multiple Dry Year Period Ending in 2010 - AF Year (DWR Table 46)

	2006	2007	2008	2009	2010
Supply	14,382	14,382	27,824	27,824	27,824
% of projected normal	100	100	193	193	193

Table 6-8. Projected Demand Multiple Dry Year Period Ending in 2010 - AFY (DWR Table 47)

	2006	2007	2008	2009	2010
Demand	11,150	11,513	11,887	12,273	12,603
% of projected normal	103%	107%	110%	114%	117%

Table 6-9. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2010- AF Year (DWR Table 48)

	2006	2007	2008	2009	2010
Supply totals	14,382	14,382	27,824	27,824	27,824
Demand totals	11,150	11,513	11,887	12,273	12,603
Difference	3,232	2,869	15,937	15,551	15,221
Difference as % of Supply	22	20	57	56	55
Difference as % of Demand	29	25	134	127	121

Table 6-10. Projected Supply During Multiple Dry Year Period Ending in 2015 - AF Year (DWR Table 49)

	2011	2012	2013	2014	2015
Supply	27,824	27,824	27,824	27,824	27,824
% of projected normal	193	193	193	193	193

Table 6-11. Projected Demand Multiple Dry Year Period Ending in 2015 - AFY (DWR Table 50)

	2011	2012	2013	2014	2015
Demand	12,792	12,984	13,179	13,377	13,554
% of projected normal	118%	120%	122%	124%	126%

Table 6-12. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2015- AF Year (DWR Table 51)

	2011	2012	2013	2014	2015
Supply totals	27,824	27,824	27,824	27,824	27,824
Demand totals	12,792	12,984	13,179	13,377	13,554
Difference	15,032	14,840	14,645	14,447	14,270
Difference as % of Supply	54	53	53	52	51
Difference as % of Demand	118	114	111	108	105

Table 6-13. Projected Supply During Multiple Dry Year Period Ending in 2020 - AF Year (DWR Table 52)

	2016	2017	2018	2019	2020
Supply	27,824	27,824	27,824	27,824	27,824
% of projected normal	193	193	193	193	193

Table 6-14. Projected Demand Multiple Dry Year Period Ending in 2020 - AFY (DWR Table 53)

	2016	2017	2018	2019	2020
Demand	13,717	13,881	14,048	14,217	14,383
% of projected normal	127	129	130	132	133

Table 6-15. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2020- AF Year (DWR Table 54)

	2016	2017	2018	2019	2020
Supply totals	27,824	27,824	27,824	27,824	27,824
Demand totals	13,717	13,881	14,048	14,217	14,383
Difference	14,107	13,943	13,776	13,607	13,441
Difference as % of Supply	51	50	50	49	48
Difference as % of Demand	103	100	98	96	93

Table 6-16. Projected Supply During Multiple Dry Year Period Ending in 2025 - AF Year (DWR Table 55)

	2021	2022	2023	2024	2025
Supply	27,824	27,824	27,824	27,824	27,824
% of projected normal	193	193	193	193	193

Table 6-17. Projected Demand Multiple Dry Year Period Ending in 2025 - AFY (DWR Table 56)

	2021	2022	2023	2024	2025
Demand	14,527	14,672	14,819	14,967	15,139
% of projected normal	130	127	125	122	140

Table 6-18. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2025- AF Year (DWR Table 57)

	2021	2022	2023	2024	2025
Supply totals	27,824	27,824	27,824	27,824	27,824
Demand totals	14,527	14,672	14,819	14,967	15,139
Difference	13,297	13,152	13,005	12,857	12,685
Difference as % of Supply	48	47	47	46	46
Difference as % of Demand	92	90	88	86	84

6.3 Water Service Reliability and Demand

Based on available and planned supplies, the City should have adequate supply to meet normal, single and multiple dry years. This conclusion assumes that the following measures will be taken:

- Groundwater supply remains at current levels. No additional wells are required to be drilled.
- In 2008, the CCWD and the City will add an additional WTP with a capacity of 16,162 acre-feet per year. This will be in addition to the Randall-Bold Water Treatment Plant, and existing groundwater supplies.
- Reclaimed water from the Brentwood WWTP will be a real source of water for landscaped irrigation of parks and golf courses.
- Demand of irrigation water for parks and golf courses will be at least 3,733 acre-feet by the year 2025.

SECTION 7.0

DEMAND MANAGEMENT PRACTICES

Water conservation is a method available to reduce water demands, thereby reducing water supply needs for the City. This chapter describes of the City's water conservation program including water conservation Demand Management Measures (DMMs).

7.1 California Urban Water Conservation Council

The unpredictable water supply and ever increasing demand on California's complex water resources have resulted in a coordinated effort by the State of California Department of Water Resources (DWR), water utilities, environmental organizations, and other interested groups to develop a list of urban DMMs for conserving water. This consensus-building effort resulted in a Memorandum of Understanding Regarding Urban Water Conservation in California, as amended September 16, 1999, among parties, which formalizes an agreement to implement these DMMs and makes a cooperative effort to reduce the consumption of California's water resources. The DMMs as defined by the MOU are presented in Table 7-1. The MOU is administered by the California Urban Water Conservation Council (CUWCC). Brentwood is currently an MOU signatory.

The MOU requires that a water utility implement only the DMMs that are economically feasible. If a DMM is not economically feasible, the utility may request an economic exemption for that DMM. The DMMs as defined in the MOU are generally recognized as standard definitions of water conservation measures.

Table 7-1. Water Conservation Demand Management Measures

No.	DMM Name
1.	Water survey programs for single-family residential and multi-family residential connections.
2.	Residential plumbing retrofit.
3.	System water audits, leak detection and repair.
4.	Metering with commodity rates for all new connections and retrofit of existing connections.
5.	Large landscape conservation programs and incentives.
6.	High-efficiency washing machine rebate programs.
7.	Public information programs.
8.	School education programs.
9.	Conservation programs for commercial, industrial, and institutional accounts.
10.	Wholesale agency assistance programs.
11.	Conservation pricing.
12.	Conservation coordinator.
13.	Water waste prohibition.
14.	Residential ULFT (ultra low flow toilets) replacement programs.

7.2 Current Water Conservation Program

The City conducts an ongoing water conservation program. A description of each DMM that is currently being implemented or scheduled for implementation, a schedule of implementation, and a method to evaluate effectiveness is provided in this section.

DMM 1. Water survey programs for single-family residential and multi-family residential connections.

Description: Water survey programs for single-family residential and multifamily residential connections consist of annual water audits, water use reviews, and surveys of past program participants. Audits will be conducted by trained auditors and may include low flow device installation. Audits will identify water-use problems, recommend repairs, instruction in landscape principles, irrigation timer use and, when appropriate, meter reading.

Schedule: The City will conduct such surveys annually and plans to start such surveys by the start of the next fiscal year, July 1, 2006, conducting about 370 surveys per year.

Evaluation of DMM Effectiveness: Effectiveness of this DMM will be evaluated by program penetration and by comparison of prior audited customer water use to future water use.

DMM 2. Residential plumbing retrofit.

Description: Plumbing retrofit of existing residential accounts consists of providing low flow showerheads, faucet aerators, and toilet leak detection tablets to customers. Since over 75 percent of construction in the City occurred after 1992, most plumbing fixtures are ultra low flow. Remodeling and equipment replacement will upgrade older installations. Therefore, the City currently does not plan to support plumbing retrofits.

Schedule: Not applicable.

Evaluation of DMM Effectiveness: Not applicable.

DMM 3. System water audits, leak detection and repair.

Description: A system water audit, leak detection and repair program consists of ongoing leak detection and repair within the system, focused on the high probability leak areas. This program will also include an ongoing meter calibration and replacement program for all production and distribution meters.

Schedule: the City will conduct this program annually, with a planned start within three years.

Evaluation of DMM Effectiveness: Effectiveness of this DMM will be evaluated by tracking leak detection and leak repair and comparison of prior water use to future water use.

DMM 4. Metering with commodity rates for all new connections and retrofit of existing connections.

Description: The City meters all served residential connections and non-residential connections. Water is sold on a commodity basis. Also see discussion under DMM 11 below.

Schedule: Already implemented.

Evaluation of DMM Effectiveness: Effectiveness of this DMM will be evaluated by comparison of prior water use to future water use.

DMM 5. Large landscape conservation programs and incentives.

Description: The large landscape conservation program will consist of identifying all irrigation accounts and commercial, industrial, and institutional accounts with landscape of one acre and larger, and recording this information into a database. The City will prepare irrigation educational information for all customers. The City will perform surveys with its own staff or contractors.

Schedule: This program will be conducted annually and will begin within three years.

Evaluation of DMM Effectiveness: Effectiveness of this DMM will be evaluated by comparison of prior water use to future water use for large landscape customer accounts.

DMM 6. High-efficiency washing machine rebate programs.

Description: The City has committed to a high-efficiency washing machine rebate program, to promote this water saving technology. The City is also coordinating with other local agencies to obtain grant money for this program.

Schedule: The program will commence by July 1, 2006.

Evaluation of DMM Effectiveness: Effectiveness of this DMM will be evaluated by program penetration and high-efficiency washing machine savings estimates.

DMM 7. Public information programs.

Description: Public information is an ongoing component of the City's water conservation program. The City currently produces bill inserts and news articles in the Brentwood quarterly newsletter. The City plans to expand its website to include conservation information.

Schedule: The City's public information program is an ongoing, annual program.

Evaluation of DMM Effectiveness: Savings from this program cannot be directly quantified.

DMM 8. School education programs.

Description: School education is an ongoing component of the City's water conservation program. The program targets all grades.
Schedule: The City's school education program is an ongoing, annual program.

Evaluation of DMM Effectiveness: Savings from this program cannot be directly quantified.

DMM 9. Conservation programs for commercial, industrial, and institutional accounts.

Description: The City will develop a conservation program for CII accounts that includes water audits targeted to the top water users. This program will also include surveys of past program participants to determine if audit recommendations were implemented.

Schedule: Within three years the City will commence this annual program.

Evaluation of DMM Effectiveness: Effectiveness of this DMM will be evaluated by comparison of CII accounts prior water use to future water use.

DMM 10. Wholesale agency assistance programs.

This DMM is not applicable to the City since the City is not a wholesale agency.

DMM 11. Conservation pricing.

Description: The City currently implements conservation pricing for all its metered customers. All of the City's customers are metered. Tiered rates are implemented for residential and commercial customers.

Schedule: The implementation of this DMM is ongoing.

Evaluation of DMM Effectiveness: Effectiveness of this DMM will be evaluated by comparison of City water use prior to and following the implementation of conservation pricing.

DMM 12. Conservation coordinator.

Description: The City has hired a conservation coordinator as an ongoing component of the City's water conservation program. The conservation coordinator is responsible for implementing and monitoring the City's water conservation activities.

Schedule: The implementation of this DMM is ongoing.

Evaluation of DMM Effectiveness: Water savings from this DMM cannot be directly quantified. Effectiveness of this DMM will be evaluated by the success of the City's water conservation program.

DMM 13. Water waste prohibition.

Description: The City has adopted landscape and irrigation ordinances to encourage the efficient use of its water resources. The City is considering other ordinances to discourage wasting of water.

Schedule: The implementation of this DMM is ongoing.

Evaluation of DMM Effectiveness: Water savings from this program cannot be directly quantified.

DMM 14. Residential ULFT replacement programs.

Description: As noted above over 75 percent of construction in the City occurred after 1992. Hence, most toilets are already ultra low flow. Remodeling and equipment replacement will upgrade

older installations with a typical rate for toilets of four percent per year. Based on newer construction and older toilet replacement since 1992, the City estimates that over 90 percent of toilets are already ultra low flow. Therefore, the City currently does not plan to support a ULFT program but rather depend on toilet replacement to remove remaining older units.

Schedule: Not applicable. The City is not currently implementing this DMM.

Evaluation of DMM Effectiveness: Not applicable. The City is not currently implementing this DMM.

7.3 Economic Analysis Methodology and Assumptions

As noted above the City already has implemented or plans on implementing most DMMs. Owing to existing high market penetration for the other DMMs (2 and 14), no economic analyses were completed in the preparation of this plan.

7.4 Economic Analysis Results

As noted above no economic analyses were completed for this plan. Hence, this section is not applicable.

Table 7-2. Evaluation of Unit Cost of Water Resulting from Non-Implemented / Non-Scheduled DMMs and Planned Water Supply Project and Programs (DWR Table 16)

Non-implemented & Not Scheduled DMM / Planned Water Supply Projects (Name)	Per-AF Cost ($)
NA	NA