Castle Pines North Metropolitan District

Water Conservation Plan
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Introduction

The Castle Pines North Metropolitan District (District) currently relies on groundwater from the Denver Groundwater Basin (Denver Basin). Groundwater levels are declining throughout the South Metro area and will lead to a decrease in production and an increase in pumping costs. These effects will require the District to add new wells if the District remains on groundwater. These new wells in addition to the existing wells will have greatly reduced production, leading to higher costs for reduced yield. The District is currently evaluating renewable surface water supplies that would provide a more sustainable supply. Conservation will also be an important component of the District's future water supply management strategy.

The purpose of this Conservation Plan (Plan) is to provide guidance in implementing a conservation program that is compatible with Castle Pines North's water supply system, water resources management strategy, and also with the values of the community. The Plan has been developed in accordance with the recommendations outlined in the Colorado Water Conservation Board's (CWCB) Water Conservation Plan Development Guidance Document.

Profile of Existing System and Demands

The District has implemented a variety of conservation measures and programs beginning in 2003. These include a modified 4-tiered water rate structure that charges customers (residential and nonresidential) more when an allotted usage is exceeded, water restrictions limiting irrigation to every third day, a rebate program, and educational programs that provide information to customers on conservation and other water related topics. A reduction in per capita demands following the implementation of these measures/programs indicates that these efforts have likely contributed to water savings. However, it is difficult to decipher how much of these savings are attributed to conservation given that a variety of factors such as rainfall and the regional drought awareness campaign following the severe 2002 drought also played a role in demand reductions.

Historical well production data from 1998 to 2005 indicates that demands have generally increased as the community continues to develop. Reduction in demands occurred in 2004, which is likely attributed to the factors mentioned above, followed by an increase in 2005. The largest water user within the community is the residential sector followed by District irrigation of parks and open space and Homeowner Association Irrigation. Demands tend to seasonally fluctuate with peak demands occurring during the summer months when outdoor irrigation is the highest.

Forecasted demands indicate that the District's water use at buildout in 2011 will be approximately 2,240 acre-feet per year (AFY). Potable demands (water that is treated and conveyed through the distribution system) is estimated to be 2,000 AFY. The non-potable demand (treated wastewater that is reused on the Ridge Golf Course) is estimated to be 240 AFY.

Profile of Proposed Facilities

The District currently relies on 10 wells that pump groundwater from the Denver Basin. As previously mentioned, groundwater levels are declining throughout the South Metro area and will eventually increase pumping costs and require the District to add new wells if the District remains on groundwater. The District is currently evaluating renewable surface water supplies through the development of an Integrated Water Resources Plan (IWRP). The IWRP will provide an action plan and decision framework for the District to acquire renewable supplies. However, currently it is not possible to conclusively describe the District's long-term water supply plans and identify future facilities. Regardless of whether the District chooses to incorporate surface water supplies or solely remain on a groundwater supply, the cost of water production will increase in the future.

Conservation Goals

The profiles of the District's water supply and demands summarized above were used to develop the following water conservation goals:

1. Provide a water savings target of an additional 175 to 220 AFY based on 2003 water demand patterns (16 to 20 gallons per capita day (gpcd) based on projected population at buildout) through existing and additional conservation measures and programs.
2. Select conservation measures and programs that target outdoor irrigation and customers of high use. Target customers include the following:
   - Residential (indoor and outdoor usage)
   - District irrigation of parks and open space
   - HOA irrigation
3. Closely monitor District irrigation on parks and open space.
   - Maintain 2005 irrigation levels on parks and drip irrigation
   - Reduce open space irrigation by an additional 10 percent (5.9 AF) with a total outdoor District usage not to exceed 93 AFY. (District metered usage in 2005 was 98.9 AF)
4. Provide assistance to the homeowner associations in reducing irrigated turf by 25 percent.
5. Select conservation measures and programs that are compatible with the community.
6. Establish a monitoring system that collects a sufficient amount of data to effectively measure the success of conservation programs and measures on an annual basis.

Evaluation of Conservation Measures and Programs

A set of preliminary conservation measures and programs were selected for further evaluation. This set consisted of existing conservation measures/programs as well as measures/programs that were likely to contribute to meeting the conservation goals, are compatible with the community, and provided water savings. Estimated water

savings for each conservation measure/program were identified as well as anticipated costs to implement the measure/program and the net economic benefits. Table ES-1 provides a description for each of the selected measures and programs following the evaluation.

Table ES-1 Selected Conservation Measures/Programs and Implementation Plan

Measure/Program	New or Existing	Description
Rebate Program - Indoor Fixtures and Appliances		
Low Flow Toilets	Existing	$100 rebate providing incentive to replace higher water use toilets (3-5 gallons per flush) with low flow toilets (1.6 gallons per flush)
Low Usage Washers	Existing	$125 rebate providing incentive to replace higher water use washing machines (45 gallons per load) with low usage front load washers (25 gallons per load)
Showerheads	New	$10 rebate providing incentive to replace higher water use showerheads (4 gallons per minute) with a more efficient showerhead (2.4 gallons per minute)
Rebate Program - Residential Outdoor		
Rain Sensor	Existing	$100 rebate providing incentive to purchase a rain sensor that overrides an irrigation system when detecting rainfall
Irrigation Clock	Existing	$75 rebate providing incentive to purchase an irrigation clock that sets time limits to conserve water
ET Controller	New	$200 rebate providing incentive to purchase an ET controller that regulates irrigation based on factors (e.g. temperature and humidity) that influence evapotranspiration
Sod replacement – residential	New	Rebate program in which residential customers will be reimbursed at $0.40 per square foot for replacing Blue grass Turf with a more water efficient landscape. This may include xeric plants, water efficient turf grass approved by the District, and/or artificial turf. The new landscape will need to cover a plot within 500 to 2,000 square feet. An inspector will visit site before and after landscape change to verify change.
Residential Indoor and Outdoor		
Audits for Residential Homes at Tier 4	New	Customers who exceed the Tier 4 billing rate may receive a free water audit. This audit will provide recommendations on how indoor and outdoor water usage may be reduced.
Indoor and Outdoor Audits for Homes Built prior to 1994	New	Homes built prior to 1994 did not have to meet water efficiency standards set forth in the Energy Policy Act of 1992. These homes tend to have water using household items that are not as efficient. Customers owning these homes may receive a free water audit. This audit will provide recommendations on how indoor and outdoor water usage may be reduced.
20% Rebate	Existing	Customer whose water use is 20% below the annual billing rate's budgeted amount will receive a 20% rebate on his/her total annual water bill

Table ES-1 Selected Conservation Measures/Programs and Implementation Plan

Measure/Program	New or Existing	Description
The Ridge Golf Course		
Audit for the Ridge Golf Course	New	The Ridge Golf Course may receive a free water audit providing recommendations on how they may improve irrigation efficiency and reduce water usage.
Reuse on Ridge Golf Course	Existing	Beginning in 2006, 240 AFY of treated wastewater will be reused to irrigate the Ridge Golf Course
HOA Irrigation		
Audits for HOAs	New	HOA customers may receive a free water audit. This audit will provide recommendations on how they may improve irrigation efficiency.
Sod Replacement – HOA	New	Rebate program in which HOA customers will be reimbursed at $0.40 per square foot for replacing Blue grass Turf with a more water efficient landscape. This may include xeric plants, water efficient turf grass approved by the District, and/or artificial turf. The new landscape will need to cover a plot within 500 to 2,000 square feet. An inspector will visit site before and after landscape change to verify change.
Conservation Rate Structure		
Billing system - Increasing Block Rate Structure	Existing	The 4-tiered billing rate structure that allots a water budget to customers. Customers are charged according to the amount of water used. The cost per 1,000 gallons of water increases as water usage exceeds a tiered threshold. This provides incentive for customers to conserve water.
Leak Detection		
Sonic Leak Detection Program	New	Procedure that will detect leaks in water mains. This will improve conveyance efficiency. One third of the water conveyance system will be evaluated annually.
Public Education Program		
Existing and new programs	Existing	Programs that convey information from the District to its customers. These include public meetings, bill inserts, newsletters, email, and the Castle Pines North website.
	New	An interactive web-based water audit will be developed. Customers will be able to go online and input information on their water use. The web site will provide recommendations on how each customer can conserve additional water. A free Waterwise class will be offered to customers. This class will educate customers on methods to improve irrigation efficiency and reduce water usage.
District Irrigation (on parks and open space) Water Conservation Efforts		
Irrigation Efficiency for Parks and Drip Irrigation	Existing	District will continue current irrigation schedule (every third day) and evaluate what additional modifications can be made to improve irrigation. This may include sod replacement and water audits. See conservation goals.
Irrigation Efficiency for Open Space	New	District will continue current irrigation schedule (every third day) and evaluate what additional modifications can be made to improve irrigation. This may include sod replacement and water audits. See conservation goals.

Table ES-1 Selected Conservation Measures/Programs and Implementation Plan

Measure/Program	New or Existing	Description
Programs not Evaluated in the Plan Yet Provide Conservation Savings and Will Continue to be Implemented		
Watering Restrictions	Existing	Restricts outdoor irrigation to every third day
Leak Repair on District's Water Distribution System	Existing	District repairs all leaks that are not on private property and within the distribution system.
Meter Source Water and Service Connections	Existing	Improves water usage efficiency by making customers accountable for amount of water used. Also enables the District to monitor the amount of water entering and leaving the water distribution system.
Metering of District Irrigation	Existing	Improves District irrigation of parks and open space by making.
Turf Restrictions and Landscape design/layout	Existing	Limitation on the amount of irrigated turf used for future parks and open space

The conservation measures and programs selected for implementation shown in Table ES-1 are estimated to provide water savings within the range of 100 to 220 AF during the 10-year planning period from 2006 to 2015. Savings will likely increase over time as the number of participants in the programs increase. Conservation savings could reduce annual operating costs (amount of water that needs to be treated and distributed is reduced) as well as the amount of water rights that would need to be purchased for surface water supplies.

Implementation Plan

The new conservation measures identified in Table ES-1 are planned to be implemented in 2007. This will provide a suitable period of time for the District to organize the facilitation of the measures and programs.

An effective monitoring and evaluation process will play a key role in the success of the conservation effort. As the District begins to acquire more data, trends between demands and conservation measures/programs may be established improving the ability to assess the effectiveness of the measures/programs. Successes as well as areas where improvements may be made will be identified, further improving the overall conservation program.

The public will also play a key role in the effectiveness of the Plan. The success of conservation measures and programs depends on public response. The more engaged the community is in altering their behavior to conserve water and participate in the conservation programs, the more effective the conservation measures and programs will be. Annual monitoring results on the effectiveness of the conservation programs and measures will be conveyed to the public. Public feedback as well as staff input will be incorporated into an action plan for the following year.

The District plans on revising this Plan no later than June of 2012. The modified Plan will incorporate findings of the annual monitoring data and public feedback. The public will have an opportunity to review the modified Plan.

Section 1
Introduction

Throughout Colorado, municipalities face potential shortages of water supplies in the future. The District is unique in that it serves a community that has a long-term physical supply. The community relies on groundwater from the Denver Basin to meet the majority of its water needs. However, this supply is nonrenewable. Water is pumped out of the basin faster than the recharge. If the District and the surrounding water entities in the South Metro area continue to withdraw groundwater at current rates, groundwater levels will decline to a point where it is economically infeasible to pump groundwater. The District is currently seeking renewable surface water supply alternatives.

Throughout Colorado the competition and expense for surface water supplies is increasing. One way to help reduce these expenses is to conserve water. The conservation of water can reduce expenses associated with acquisition of the water, conveyance, and treatment of both potable and wastewater. Conservation also promotes the stewardship of natural resources and the environment. Conservation not only reduces water demand, but also decreases the amount of energy needed to pump, treat, and heat the water.

Conservation is an important component of the District's water management strategy. As the cost of water rises, the economic benefits associated with conservation will only increase. Conservation plans are useful tools in developing a conservation program that effectively conserves water while minimizing associated costs. They are most effective when incorporated into the overall water resources management strategy.

1.1 Purpose

The purpose of this Conservation Plan (Plan) is to provide guidance in implementing a conservation program that is compatible with the District's water supply system, water resources management strategy, and also with the values of the Castle Pines North (CPN) community.

1.2 Overview and Organization

This Plan evaluates the District's historical and projected water demands and supplies. This information was used to develop a set of water conservation goals that establish targets for water saving amounts and identify specific end users that could provide the greatest water savings through conservation. The results of an evaluation of the savings and operation costs of existing and other potential conservation measures and programs are presented. This information was used to select a portfolio of conservation measures and programs that most effectively meet the conservation goals. An implementation plan as well as a monitoring plan to assess the effectiveness of each measure/program is included. The Plan is organized into the following Sections:

- Section 1 – Introduction
- Section 2 – Profile of Existing Water System
- Section 3 – Characterize Water Use and Forecast Demand
- Section 4 – Proposed Facilities
- Section 5 – Conservation Goals
- Section 6 – Conservation Measures and Programs
- Section 7 – Evaluation and Selection of Conservation Measures and Programs
- Section 8 – Integrate Resources and Modify Forecasts
- Section 9 – Implementation Plan

Section 2
Profile of Existing Water System

This section provides information on the physical characteristics of the existing water supply system, identifies water sources and system limitations, characterizes water costs and pricing, reviews current policies and planning initiatives, an summarizes current water conservation activities.

2.1 Physical Characteristics of the Existing Water Supply System

Castle Pines North is located in the south metro Denver area, in northern Douglas County approximately 5 miles north of Castle Rock and west of Interstate 25. Water is provided to the community by the District. A water treatment plant treats groundwater pumped from the Denver Basin. Wastewater is treated by the Plum Creek Wastewater Authority Treatment Plant and is discharged into East Plum Creek.

The service area is comprised of 3.4 square miles of mainly residential homes, commercial services, schools, parks, and open space. Approximately 9,000 people with over 3,000 houses and businesses currently reside within the community. Figure 2-1 shows the type of development within the District service area.

There are a several undeveloped parcels zoned for parks and commercial use within the boundaries of Castle Pines North. Approximately 38 undeveloped acres are zoned for commercial. The Lagae North and La Gae South parcels along the Castle Pines Parkway west of King Soopers are proposed to be developed. The parcel CC-20, near the center of the District is zoned commercial, but plans are being reviewed to develop the parcel with a mixture of patio homes and commercial. Plans for the Castle View Park, 26 acres of park, have been approved for development.

Castle Pines North is a relatively new community with the majority of homes constructed after 1993. Table 2-1 shows the estimated and projected number of homes from 1993 through 2010 and buildout. The residential sector is currently 95 percent build out with approximately 166 zoned residential lots remaining. There is an average of 2.88 people per household in Douglas County (U.S. Census Bureau, February 2006). The number of people living in the service area was determined by multiplying 2.88 by the number of houses built in given year. These data are also provided in Table 2-1.

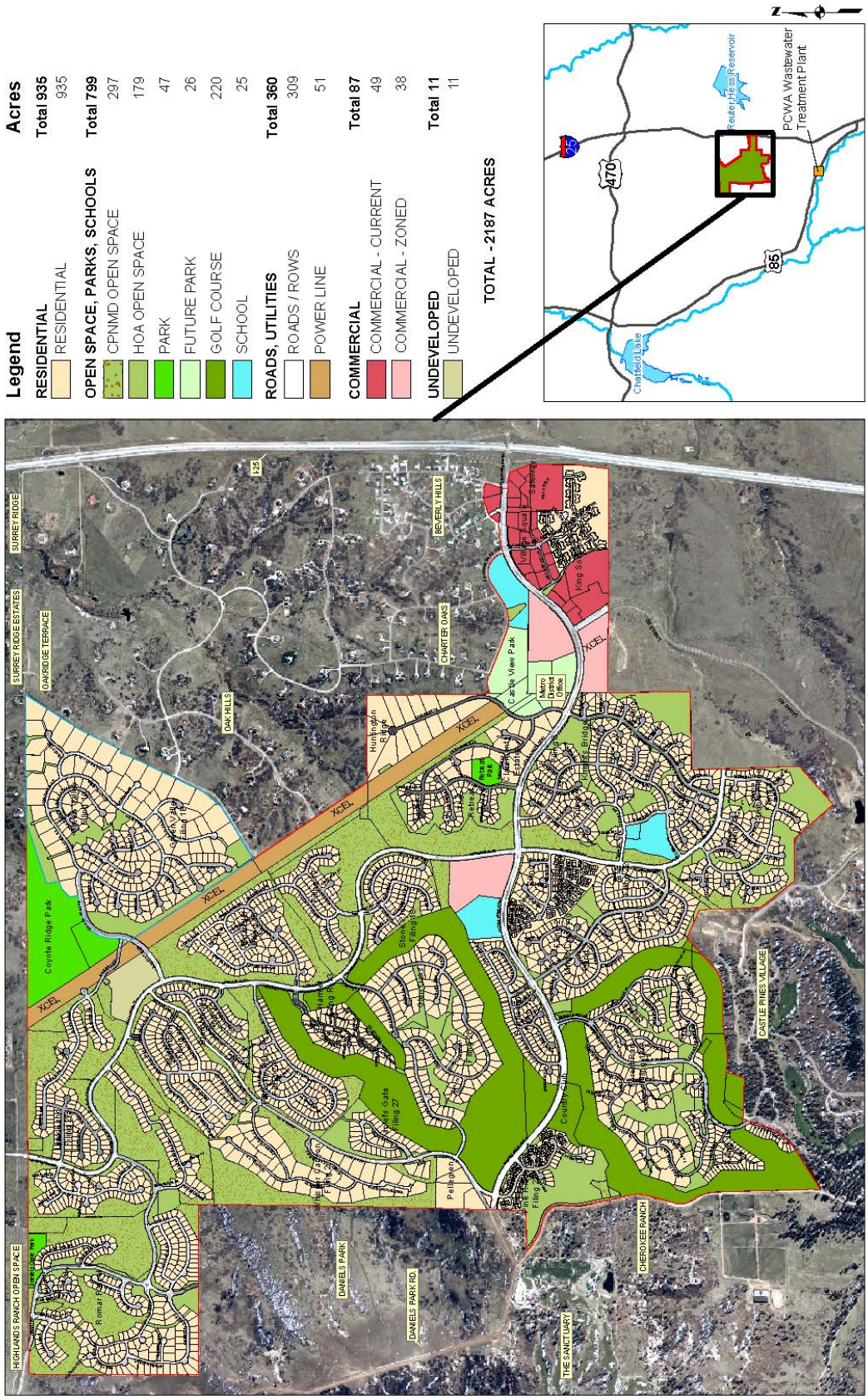


Figure 2-1
Castle Pines North Landuse

Table 2-1 Population and Homes in Castle Pines North

Year	Number of Homes	Percent Annual Increase	Estimated Population
1993	479	0%	1,380
1994	479	0%	1,380
1995	498	4%	1,434
1996	624	25%	1,797
1997	844	35%	2,431
1998	1,017	20%	2,929
1999	1,190	17%	3,427
2000	1,623	36%	4,674
2001	2,074	28%	5,973
2002	2,372	14%	6,831
2003	2,674	13%	7,701
2004	2,935	10%	8,453
2005	3,095	5%	8,914
2006	3,127	1%	9,006
2007	3,159	1%	9,098
2008	3,191	1%	9,190
2009	3,223	1%	9,282
2010	3,259	1%	9,386
Build out	3,261		9,392

Residents, employees in the schools and commercial sector, as well as customers that use the commercial facilities contribute to water usage. Customers that contribute to water usage through the use of commercial facilities are defined as traffic for purposes of this Plan. The District conducted a survey finding that employment population in 2005 totaled 458 people. Assuming a daily traffic of 100 people, the total employment and traffic population was 558 people in 2005. Historical employment and traffic values were estimated by multiplying the estimated fraction of development in each year by the sum of the 2005 employment and traffic populations. See Table 2-2.

Table 2-2 Estimated Population for Commercial, Schools, and Customer Traffic

Year	Level of Development	Employee and Traffic Population
1998	Two schools	125
1999	Two schools	125
2000	One third of 2005 commercial development and two schools	267
2001	Two thirds of 2005 commercial development and two schools	440
2002	All of 2005 commercial development and two schools	498
2003	All of 2005 commercial development and three schools	558
2004	All of 2005 commercial development and three schools	558
2005	All of 2005 commercial development and three schools	558

Table 2-3 provides water demand and supply data for 2005. The majority of these data are from the District's new billing system implemented in May 2004. The customer types included in each of the billing categories are provided in Table 2-4.

Table 2-3 Water System Profile for 2005

SERVICE CHARACTERISTICS	**Number**		
Estimated service population	8,914		
Estimated service area (square miles)	3.4		
Miles of mains	31.4 miles		
Number of treatment plants	One		
Number of separate water systems	Zero		
Interconnection with other systems	Zero		
ANNUAL WATER SUPPLY	**Annual volume**	**Number of intakes or source points**	**Percent metered**
Groundwater[1]	1,751 AF	10	100%
Reuse water	95 AF	1	100%
Total annual water supply	1,846	11	100%
SERVICE CONNECTIONS[2]	**Connections**	**Water Sales**	**Percent metered**
Residential	2,907	$1,047,327	100%
Large lot residential	46	$34,070	100%
Commercial indoor	23	$73,280	100%
Townhouse	63	$19,168	100%
Irrigation only	80	$275,104	100%
Commercial	14	$57,878	100%
Total connections	3,133	$1,506,827	100%
WATER DEMAND	**Annual volume (AFY)**	**Percent of total**	**Per connection**
Residential	1,191.5	73.5%	100%
Large lot residential	38.4	2.4%	100%
Commercial indoor	54.27	3.3%	100%
Townhouse	22.7	1.4%	100%
Irrigation only[3]	260.6	16.1%	100%
Commercial	53.7	3.3%	100%
Total system demand[2]	1,621.2		
AVERAGE & PEAK DEMAND	**Volume**	**Total supply capacity**	**Percent of total capacity**
Average-day demand	1.4 mgd	5.04 mgd	28%
Maximum-day demand	4.3 mgd	5.04 mgd	85%
Maximum-hour demand	Not available	Not available	Not available
PLANNING	**Prepared a plan P**	**Date**	**Filed with state P**
Capital, facility, or supply plan	Integrated Water Resources Plan	Summer 2006	No
Drought or emergency plan	No	No	No
Water Conservation Plan	This Document	June 2006	No

[1] This is total well production for whole service area including the Ridge Golf Course.

[2] Data from the billing system which does not include the Ridge Golf Course. The Ridge Golf Course is contracted to receive 240 AFY in reimbursement for the drilling of a well for the District.

[3] District open space and parks (included in irrigation only billing category, see Table 2-4) were metered for the first time in 2005, yet were not billed. 2006 will be the first year in which the District will bill for irrigation on District parks and open spaces.

Table 2-4 Grouping of Customers in Billing Rate System

Billing Rate Category	Customer Type
Residential	Single family homes, indoor use for patio homes, and HOA club houses
Large lot residential	Single family homes greater than 1-1/4 acres
Commercial indoor	Indoor only use for commercial and 2 of 3 schools, the Ridge Golf Course maintenance building, two restrooms on the Ridge Golf Course, and indoor only meters for the apartments
Townhouse	Indoor use for townhouses
Irrigation only	Home Owner Association (HOA) irrigation (includes outdoor for patio homes & townhouses), outdoor commercial, outdoor for 2 of 3 schools, District irrigation meters, and District office.
Commercial	Commercial meters that handle indoor and outdoor needs, Ridge Golf Course Club House, 1 of 3 schools, as well as all other commercial indoor/outdoor meters.

2.2 Sources of Water

The District currently relies on ten Denver Basin Groundwater Wells for water supply. Figure 2-2 shows the location of each well. Table 2-5 provides information well construction and aquifer location, permitted pumping rate, and the pumping rates for 2005.

Table 2-5 Groundwater Wells in Castle Pines North

Well	Aquifer	Drilled	Completion Date	Permitted Pumping Rate	Pumping Rates for 2005
A-1	Arapahoe	July-Sept 1985	March 1996	287.3 AFY	512 – 400 gpm
A-2	Arapahoe	June–Aug 1985	October 1996	287.3 AFY	541 – 505 gpm
A-3	Arapahoe	March-June 1985	1985	287.3 AFY	419 gpm
A-4C	Arapahoe	Feb–Aug 1996	Fall 1996	287.3 AFY	440 – 398 gpm
A-5	Arapahoe	June 2004	Planned for 2007	287.3 AFY	Not in operation
LDa-1	Lower Dawson	Feb-Oct 1999	October 1999	109 AFY	140 – 120 gpm
LDa-2	Lower Dawson	July – Oct 2003	October 2003	109 AFY	36 gpm
De-7	Denver	Jan –April 2001	Nov 2001	109 AFY	232 – 235 gpm
De-6	Denver	Feb-June 2002	April 2003	109 AFY	201 gpm
A-7	Arapahoe	Jan-April 2001	Nov 2001	287.3 AFY	834 – 718 gpm
A-6	Arapahoe	Feb-June 2002	April 2003	287.3 AFY	775 – 727 gpm

The District can also legally reuse its non-tributary groundwater. The District began to reuse a portion of their treated reclaimed water for irrigation of the Ridge Golf Course in 2004. In 2004, 78 AF was used for irrigation and in 2005, 95 AF was used. The District plans to annually use 240 AFY for irrigation of the golf course beginning in 2006.

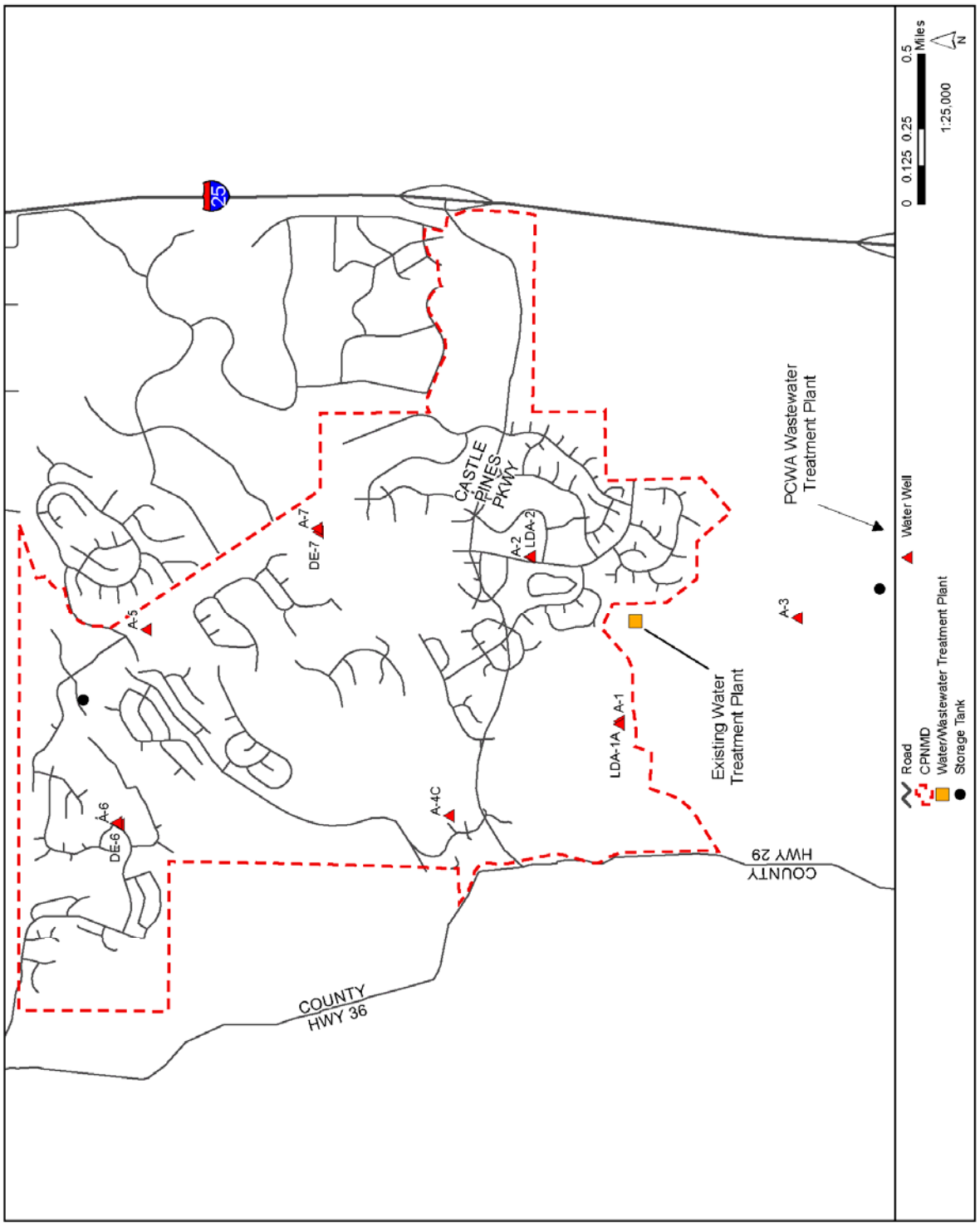


Figure 2-2
Castle Pines North Non-Tributary Groundwater Wells

2.3 System Limitations

The South Metro area is one of the key "gap" areas identified by the Statewide Water Supply Initiative (SWSI). Although the District can currently meet its water supply needs, it is projected that groundwater levels will continue to decline both directly underlying the District service area as well as regionally throughout the entire South Metro area. This is attributed to the growing demands and to the regional dependence on groundwater. If alternative renewable supplies are not found to slow the decline of groundwater levels, it is anticipated that the costs to maintain groundwater production rates (e.g., redrilling wells; increased pumping energy requirements) will eventually escalate to the point that this source is no longer economically viable.

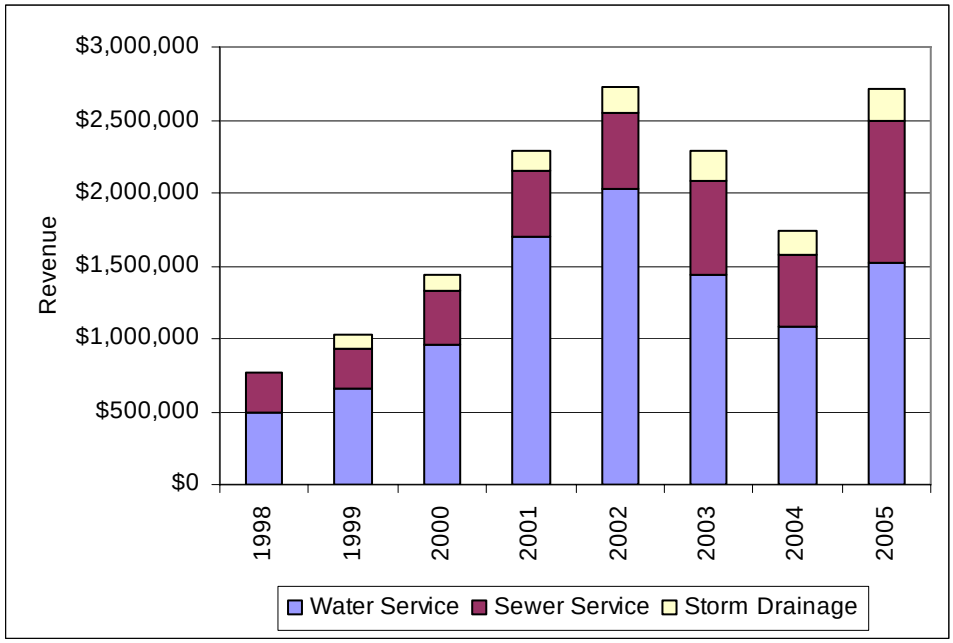
The District has participated in regional planning studies, including the South Metro Water Supply Study and is a participant in the proposed enlargement of Reuter Hess Reservoir. In addition, the District is developing an IWRP, which is to evaluate the District's demands, conservation measures, and the short-term and long-term sustainability of the District's existing groundwater supply. This is discussed in more detail in Section 2.5. Table 2-6 provides a brief summary on the conditions of the water supply system.

Table 2-6 Water System Profile

PLANNING QUESTIONS	Yes	No	Comment
Is the system in a designated critical water supply area?	X		CPN is in an area identified by SWSI.
Does the system experience frequency shortages or supply emergencies?		X	The existing groundwater supply and conveyance system is of adequate capacity to meet average demands. Mandatory watering restrictions were permanently set in May 2003 to manage peak demands. An additional well is being brought online in 2007 to supplement the supply. See Section 2.5.
Does the system have substantial unaccounted-for and lost water?		X	The District began to meter their irrigation on parks and open space in 2005. This was the only end user not previously metered. Accounting of the 2005 data did not indicate significant water loss.
Is the system experiencing a high rate of population and/or demand growth?		X	The District experienced substantial growth between 1993 and 2005. A 5% percent growth is expected from 2006 to 2011 within CPN's existing boundaries.
Is the system planning substantial improvements or additions?	X		The District is currently developing in Integrated Water Resources Plan evaluating renewable surface water supply alternatives. In the short-term, an additional well is being brought online and other system improvements or occurring in 2006-2007.
Are increases to wastewater system capacity for Castle Pines North anticipated within the planning horizon?		X	An expansion of the wastewater treatment plan was recently completed in 2005. Additional expansions may be necessary because of growth in other water Districts that the plant services.

2.4 Characterize Water Costs and Pricing

Figure 2-3 provides the District's revenue history from 1998 to 2005. In 2005, water rates were increased for the first time since 1997 and will increase again in 2006. These rate increases are intended to generate revenue for operation and maintenance costs as well as fund studies for the acquisition of renewable surface water supplies.



* Historical revenue data was derived from annual budgets. Sewer and storm drain are added together for 1998.

Figure 2-3
Historical Revenue

Billing System

Prior to 2004, the District used a fixed fee plus a four-tiered increasing block rate structure where after a specified amount of water use is exceeded, the rate per thousand gallons increases.

A new system was implemented in 2004. This system also incorporates a four-tiered increasing block rate structure and includes a water budget for each customer based upon actual lot size. Water budgets have been calculated for each customer type (residential and non-residential) based on a reasonable amount of usage needed to meet both indoor and outdoor needs. The water rate (unit price per thousand gallons) a customer pays remains fixed until usage exceeds the budget. Water rates are the same for all customer types (water budgets differ per customer). As shown in Table 2-7, the increase in unit price depends on the percentage by which each customer exceeds their water budget. The District has approved a 12 percent rate hike. These will be implemented on April 1, 2006.

Table 2-7 2005 and 2006 Rate Structure for the New Water Rate System

Level	Percentage Exceedence	2005 Cost/1000 Gallons	2006 Cost/1000 Gallons
1	Within Budget Amount	$2.50	$2.80
2	100.01% - 120%	$3.25	$3.64
3	120.01% - 140%	$4.00	$4.48
4	Over 140.01%	$7.00	$7.84

The water budget for each customer depends on customer type and lot size. Budgets for commercial customers that do not have any outdoor landscaping only account for indoor use, whereas budgets for residential homes assume an indoor usage of 9,000 gal/month and also account for landscape irrigation during the summer months (May - October). The total monthly budget is the sum of the indoor use and outdoor irrigation.

In order to calculate the budget for outdoor irrigation, the District assumes 27 inches of water (17 gal/square foot/yr) is adequate to maintain green lawns during the irrigation season. This value is multiplied by a percentage of the lot size that is assumed to be irrigated to determine the quantity of water needed for irrigation. Table 2-8 lists the assumptions made to calculate water budgets for a variety of customers.

Table 2-8 Water Budget Assumptions

Type	Indoor	Outdoor
Single family homes less than 1.25 acres	9,000 gal/year	50% of lot is irrigated
Single family homes greater than 1.25 acres	9,000 gal/year	25% of lot is irrigated
Outdoor Commercial	n/a	85% of lot is irrigated
HOA open space	n/a	85% of lot is irrigated
Indoor/outdoor commercial	Meter reading	85% of lot is irrigated
Indoor Commercial	Meter reading	n/a

This District has not experienced any unusual revenue or billing issues. Every billing cycle there are several customers that do not pay their bill. The District issues three notices before the water is shut off. The first two notices are letters while the final notice is posted on the door of the resident the day before the water is shut off.

2.5 Current Policies and Planning Initiatives

The District has implemented a water restriction policy and been involved in a variety of planning initiatives to address water supply and demand as well as water supply reliability.

Water Restrictions

Water restrictions have historically been voluntary within the District. Customers that inquired about restrictions were referred to Denver Water's recommendations. However, the District placed mandatory restrictions in May of 2003 following the extreme drought conditions of 2002. This was primarily intended to manage peak demands. These restrictions are still enforced and are planned to continue.

Customers may water every third day on designated water days. The days on which a customer may water are based on the last digit of their address. These days are posted on the website for easy access. Water times are allowed from 6 p.m. to 12 a.m. in the evenings and from 12 a.m. to 6 a.m. in the mornings.

Water restrictions were enforced by a full-time District employee in 2004 that patrolled the neighborhood. Following the first infraction, which was a warning, a fine was issued. The fine increased as the number of infractions increased. See Table 2-9. Water restriction are still mandatory, however, the District did not patrol the service area in 2005.

Table 2-9 Fine for Infraction of Water Restrictions

Infraction	Fine
First	Warning
Second	$75
Third	$100
Fourth	$150
Fifth	$200

As disclosed in Section 9.0, rebates of $200 will be provided to customers who purchase an evapotranspiration (ET) controller. ET controllers regulate irrigation based on ET (the amount of water that is lost to the atmosphere through evaporation and plant transpiration). ET is estimated by using empirical calculations and monitoring atmospheric factors that influence ET, such as humidity and temperature.

The timing and amount of irrigation for systems using ET controllers depends on atmospheric and weather conditions rather than the day of the week. Consequently, residents using ET controllers may be exempt from the water restrictions. Upon receiving the ET controller rebate, residents will also receive a notice that they may post to notify the District that they are exempt from the watering restrictions. Table 6-1 in Section 6 provides additional details on the ET controller rebate.

Planning Initiatives

The District is planning to develop a reliable and sustainable (renewable) surface water supply and has been involved with several studies focusing on this. The District has participated in regional planning studies, including the South Metro Water Supply Study and is participating in the enlargement of Reuter Hess Reservoir and the reallocation of surface water in Chatfield Reservoir. The South Metro Study addressed the declining groundwater levels throughout the South Metro area and evaluated the potential of conjunctive use. The study indicated that conjunctive use can curtail groundwater declines and supply a renewable water source to the area.

As previously mentioned, the District is currently developing an IWRP. The IWRP will outline the methodologies needed to attain reliable and sustainable water supply. This supply will most likely consist of a combination of water supply and management options including surface water, conservation, conjunctive use, and water reuse. This IWRP will identify and prioritize the District's main objectives in obtaining a reliable supply. These objectives will be used to evaluate water supply

options and provide the District guidance in selecting a group of options that are best suited for the District's needs. The development of the IWRP is divided into a four step process that includes:

- Task 1: Investigating the current and future water demands
- Task 2: Assessing the effects of existing and future water conservation efforts
- Task 3: Evaluating the long-term sustainability of the District's existing groundwater supply
- Task 4: Developing a long-term supply plan

The District is also planning on joining other entities in the South Metro area to conduct a rain harvest study. This study will be evaluating water rights implications if the study area collects rainwater for reuse. The collection of rainwater will reduce the amount of runoff entering nearby streams, reducing the amount of water downstream for other users. This study will focus on quantifying the amount of water needed to compensate downstream users.

2.6 Current Water Conservation Activities

In 2003, the District began to implement a variety of conservation measures to conserve water. These consist of adjusting water rates, watering restrictions, rebate incentives, and public education. Table 2-10 provides details on each conservation measure. Further details on water restrictions and the water rate structure are provided in Sections 2.5 and 2.4, respectively.

Table 2-10 shows that the water savings from the majority of the conservation activities are difficult to quantify. This is attributed to a variety of factors. For instance, information on the unit savings for many of the retrofits is limited and the savings also depends on behavior. Savings through education is highly variable and depends on a variety of factors including the number of participants and regional climatic factors. Customers are much more willing to respond to education if there is an existing water shortage. Section 2.1 describes the per capita demand reductions since the onset of the programs and provides further explanation on why limited quantitative data is available on water savings.

Table 2-10 Current Conservation Activities

Water Conservation Measures and Programs	Approximate Annual Water Savings Since Implementation	Implemented Since	Is Planned to Continue?
Water Restrictions	Unknown	May 2003	Yes
Water Rate Structure – Increasing block rate structure with assigned water budget	Unknown – The program is relatively new and there is not an adequate period of record to quantify savings.	May 2004	Yes
Rebate Program	See discussion below	May 2003	Yes
Public Education Program	Can not quantify	2004	Yes

Table 2-10 Current Conservation Activities

Water Conservation Measures and Programs	Approximate Annual Water Savings Since Implementation	Implemented Since	Is Planned to Continue?
Replacement of Meters with Radio Read meters	Can not quantify	2003	Will complete replacement of all meters in 2006
Leak Repair on District's Water Distribution System	Can not quantify	When water system was put on line (1984)	Yes
Volume Billing	Can not quantify	1996	Yes
Meter Source Water	Can not quantify	When water system was put on line (1984)	
Metering of District Irrigation	Can not quantify	2005	Yes
Turf Restrictions and Landscape design/layout for District Irrigation	Can not quantify	2005	Yes

Rebate Program

The District began a rebate program in May of 2003 to provide incentive for customers to install items that enhance water use efficiency. Details on each rebate are provided in Table 2-11. Customers receive a rebate from the District for the purchase and use of any of the items. For the first 3 years of the program, 196 rebates were provided to customers totaling $21,426. Estimated water savings for the rebates where savings could be quantified from 2003 to 2005 are presented in Table 2-12.

Table 2-11 Retrofit Incentives

Item	Benefit/Savings	Rebate	Number of Rebates Since Onset of Program	Total Rebate Expenditures
Rain Sensors	Overrides irrigation system by detecting rainfall.	$100 *(Limit one per household)*	28	$2,800
Irrigation Clock	Sets time limits to help conserve water	$75 *(Limit one per household)*	38	$2,950
Low Flow Toilets[1]	Uses 1.6 gallons per flush; Old toilets use three to five gallons per flush	$100 *(Limit three per household)*	18	$1,900
Low Usage Washing Machines[2]	Uses 25 gallons per load; Horizontal machines use 40 gallons per load	$125 *(Limit two per household. Contact Metro District for a list of qualifying washers.)*	80	$10,500
Hot Water Recirculation System and Tankless Hot Water Heaters	Delivers hot water to fixtures quickly	$100 *(Limit one per household)*	20	$2,000
20% Water Usage Reduction	20% rebate given to customers whose annual water demand is 20% lower than what is allocated in their budgeted water rate	20%	12	$1,976

Table 2-12 Estimated Water Savings from Existing Rebates

Retrofit	Rebate	2003		2004		2005		Total Rebates	Average Savings (1000 gal/yr)
		Number Rebates	Savings (1000 gal/yr)	Number Rebates	Savings (1000 gal/yr)	Number Rebates	Savings (1000 gal/yr)		
Low Flow Toilets	$100	3	15	3	30	12	90	18	45
Low Usage Washers	$125	7	38	56	344	17	437	80	273
Irrigation Clock	$75	13	137	15	294	10	399	38	277
Rain Sensor	$100	9	95	17	273	2	294	28	221

Public Education Program

In 2004, the District began to implement a coordinated effort to educate its customers on their water supply, water rates, and the importance of water conservation. A variety of media/venues are used to distribute information to customers. These include:

- *Newsletters* – Five newsletters have been distributed to customers since May 2004. Typically, one third or more of each newsletter has focused on conservation. Topics such as the Rebate Program, explanation of the water rate structure and water bills, xeriscaping, and efficient outdoor water tips have been covered.
- *Bill inserts* – Four bill inserts have been distributed to customers since 2004. These inserts have provided information on rate increases, the IWRP, and on stormwater.
- *Website* – In 2003, Castle Pines North developed a website providing information on water, parks, finances, board members, and a variety of other information. Information on water focuses on water supply and infrastructure, water rates and budget, water quality, conservation, sewer, and storm drain. See www.cpnmd.org/.
- *Email distribution list* – In late 2004, the District began to notify the customers about upcoming events (e.g., public meetings), programs, and other District news through email. The District may access 70 percent of its customers by email.

The District held a total of six public meetings in 2004 and 2005 to discuss groundwater supplies and the IWRP. The District believes that public meetings are an important venue of communication.

Distribution System

The District has metered their source water and majority of meter service connections since inception of the District. In 2005, the District began to meter its irrigation of open space and parks. This was the remaining "loop hole" needed to develop a water budget where the quantity of water produced from the wells could be compared to the metered quantity of the end user. This comparison provides an indication of major water losses or infiltration of water into the water conveyance system.

The District began to replace service connection meters with radio read meters in 2002. Approximately one-third of the meters were replaced annually. The entire District is now fully automated from a meter reading perspective. This will improve meter accuracy and accounting and also ensure that the meters are read at the same time each month, improving the consistency of the billing system. Prior to the installation of these meters, meter readings would occur over the course of several days. Customers could not make a direct comparison of monthly water usage given that the billing duration would sometimes vary by a few days.

The District also provides leakage repair services. All leaks within the distribution system that are not on private property are repaired at the District's expense. In 2006, the District budgeted to leak survey approximately one-half of the District system (distribution system not on private property).

District Irrigation

The District began metering their irrigation on open space and parks in 2005 and they plan on billing themselves in 2006. In addition to metering, they routinely test all irrigation zones to ensure that irrigation heads are properly adjusted. During the irrigation season, signs are posted on District open space, providing a phone number that the public may call to report a broken sprinkler head.

Key Success Factors and Challenges of Conservation

A key success to the District's conservation effort is the implementation of the budget water rates structure. This rate structure has received a positive response from customers. Customers have a good understanding of how their water budget is calculated and generally feel comfortable having a budget to gauge their water usage. A particular challenge to this program is that customers must wait for their water bill to find out how much water they have used. They are not able to directly read their water usage off their meters. They must also contact the District to find out what their monthly billing water budget is. This information is not available on individual bills.

Section 3
Water Use and Forecasted Demands

This section provides information on current water use. This includes annual water demands, water use by customer type, potable and non-potable uses, seasonality of use, and indoor and outdoor uses. Forecasted annual water demands up to 2015 are also provided.

3.1 Current Water Use

Water demand within a community is attributed to a variety of factors including population growth, land use, climate conditions, drought awareness, and conservation efforts. This section identifies the District's water demands from 1998 to 2005 and identifies how their demands may be influenced by the aforementioned factors.

Data Limitations

Generally historical water demands are assessed with metered billing data. Unfortunately, when the District changed billing systems in May of 2004, data from the former billing system are not available. Consequently, historical customer demand data are not available. The historical demand data presented in the remainder of this report (unless noted otherwise) have been derived from well production data.

Potable and Non-potable Demand

The District provides potable and non-potable water. Non-potable water is used for the irrigation of the Ridge Golf Course. Groundwater is extracted, temporarily stored in a pond, and distributed for irrigation of the Golf Course. The District has also begun to use reclaimed treated wastewater effluent to irrigate the Ridge Golf Course. In 2004 and 2005, the District used 78.0 and 95.4 AFY of reclaimed water, respectively. The District plans on irrigating the entire golf course with reclaimed water starting in 2006. This will use approximately 240 AFY. Potable water is provided to the remainder of the service area. Groundwater is extracted and conveyed to the water treatment plant prior to distribution throughout the service area.

Total Annual Demand

With the exception of reclaimed water used to irrigate the Ridge Golf Course in 2004 and 2005, the District relies exclusively on groundwater. Total well production data were used to evaluate demands within the District service area. Figure 3-1 shows annual well production (for the Ridge Golf Course and remaining service area) and reclaimed water used to irrigate the golf course since 1998.

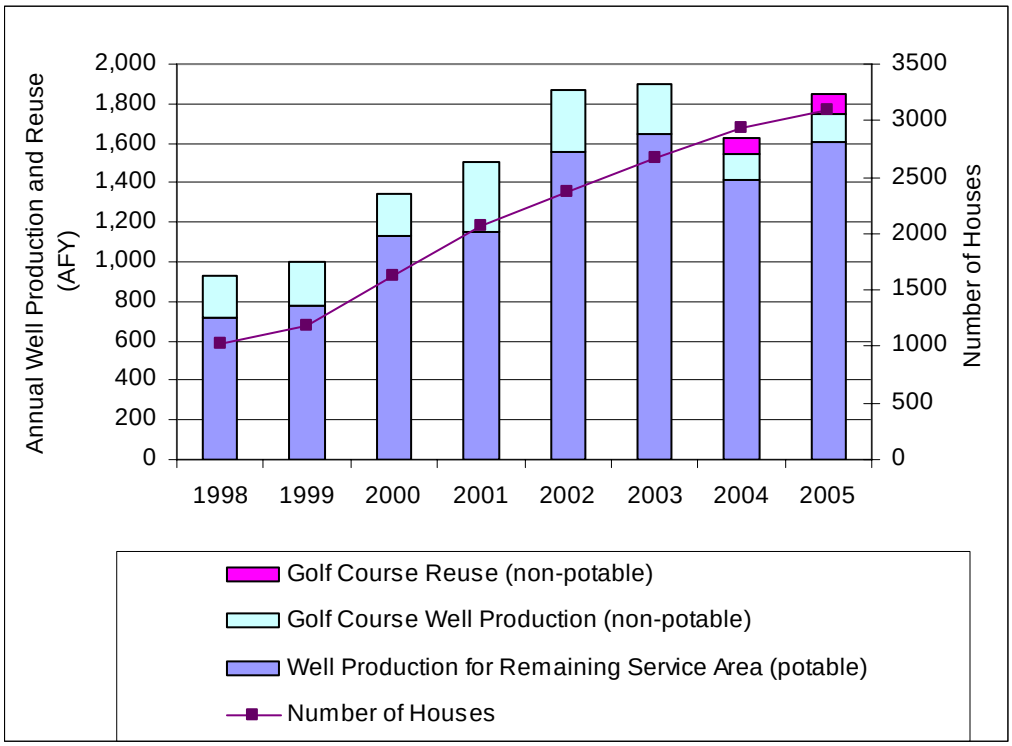


Figure 3-1
Annual Well Production and Reuse

Generally, demands have increased as the number of homes has increased. Total demands in 2002 and 2003 were relatively high while in 2004 the demand noticeably decreases. This is likely attributed to a reduction in customer's water use responding to the regional drought awareness campaign, the District's efforts to encourage conservation and an abnormally wet year in 2004, which reduced the need for irrigation.

Seasonality of Use

As shown in Figure 3-2 monthly water production seasonally varies. Demand is highest during the summer months when outdoor landscapes are irrigated and lowest during the winter months. From 1998 to 2005, the highest total monthly production occurred from June to September with peak monthly production occurring in July for 5 out of the 8 years, twice in June, and the highest monthly use in 2004 was in September.

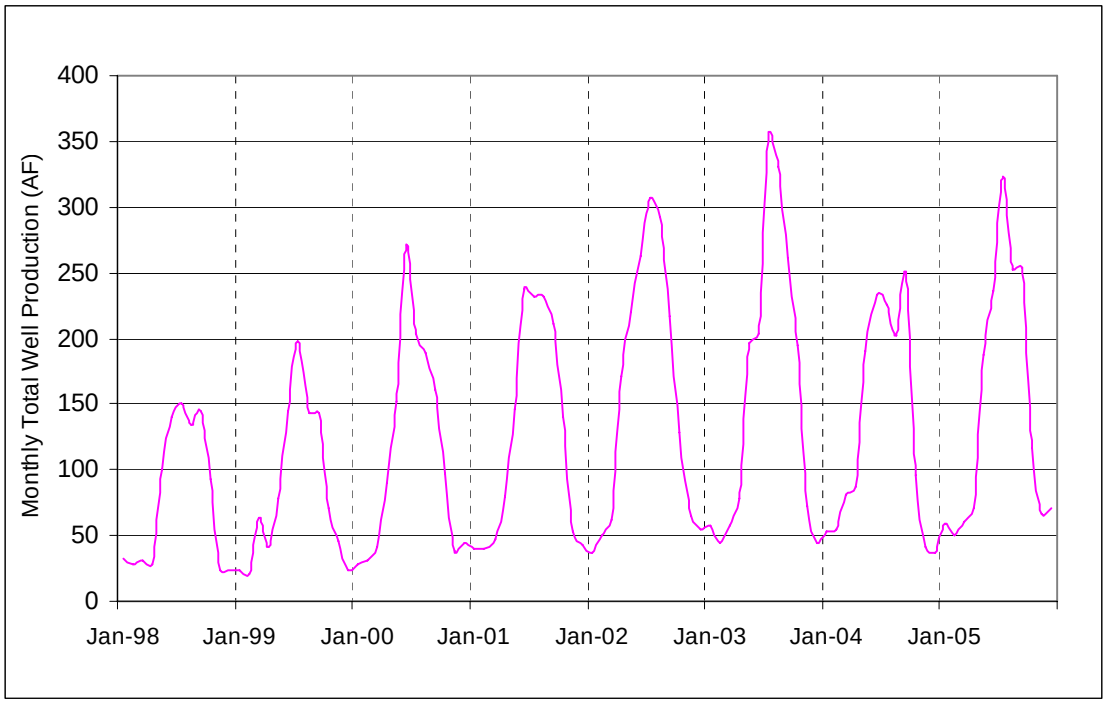


Figure 3-2
Monthly Well Production

Water Use and Rainfall

Figure 3-3 shows well production in relation to rainfall during the irrigation season. Rainfall data was collected from two rain gages in Castle Rock (CR) and within the District's service area (CPN). In 2002, Colorado experienced a significant drought as snowfall and runoff were well below normal and summer temperatures above average. The District and other users in Douglas County that were on Denver Basin groundwater supplies did not experience reductions in supply since the groundwater is not impacted by surface water runoff. Well yields for many water providers in Douglas County, however, were impacted by continued decline in aquifer levels and the increased water demands resulting in elevated pumping rates. Along the Front Range water providers made a strong effort to increase drought awareness and educate the public on conservation measures. Many water providers implemented water rate surcharges or mandatory watering restrictions. The District began enforcing conservation measures in 2003 further bringing the importance of conservation to the District's public. This is discussed in further detail in Section 2.5.

The irrigation season precipitation in 2004 was 32 percent greater than in 2002 and 2003. Higher rainfall reduced the amount of outdoor use needed to maintain a green landscape, reducing well production. Data in 2005 indicates that water usage has increased, yet not returned to 2003 levels.

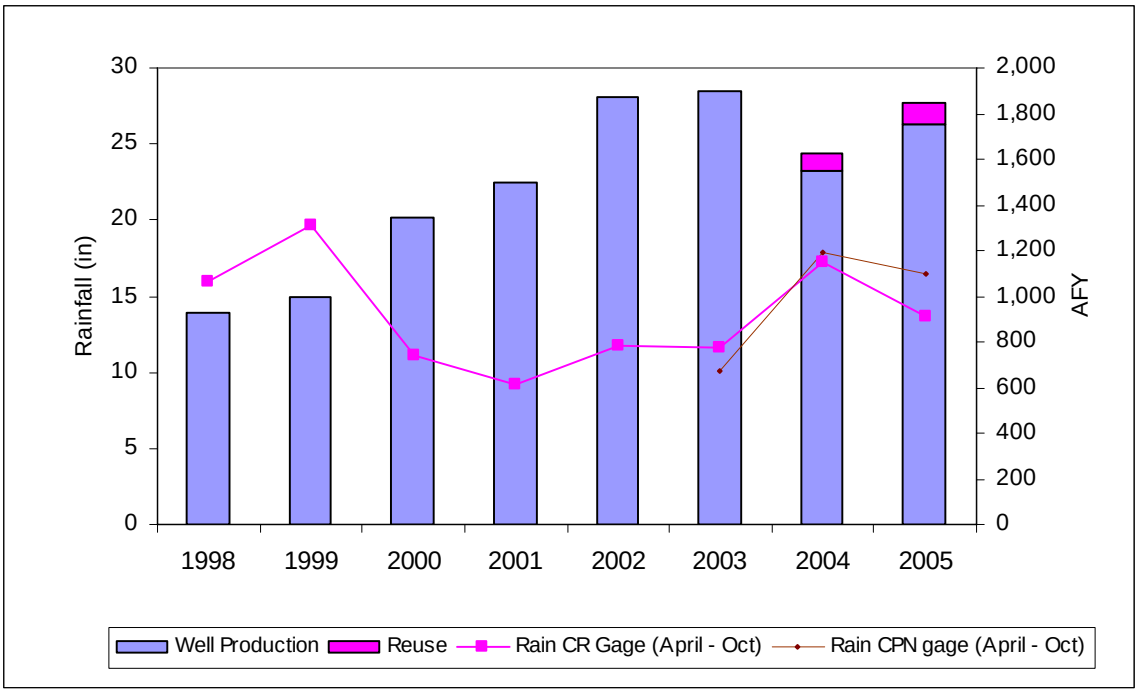


Figure 3-3
Annual Well Production and Total Annual Rainfall

Demands and Customer Type

As previously discussed, historical billing data are not available to differentiate historical water use by customer type. However, some 2003 metered data are available through a study conducted on 2003 water demands by Jehn Water Consultants, Inc. Table 3-1 provides 2003 water demands per customer type and Figure 3-4 shows the percentage of 2003 water demands using values from that study.

Table 3-1 Water Use by Customer in 2003

Type of Water Use	Demand (acre-ft)	Calculations
Residential	1,248	Difference of well production and all other water uses
Schools	16	Product of number of schools, students, and water usage/student/year
Commercial	52	Metered
District Irrigation	123	Metered for study (was not a standard practice by the District until 2005)
HOA Irrigation	119	Metered
The Ridge Golf Course	254	Metered
Pools, Club Houses, and Community Center	9	Sum of water usage by 3 residential pools, 7 clubhouse pools including showers, and use of community center – Results of 2003 Demand Study by Jehn Water Consultants, Inc

Total Demand = 1,821 AFY
Assumed unaccounted water of 4 percent = 76 AFY
Total = 1,897 AFY

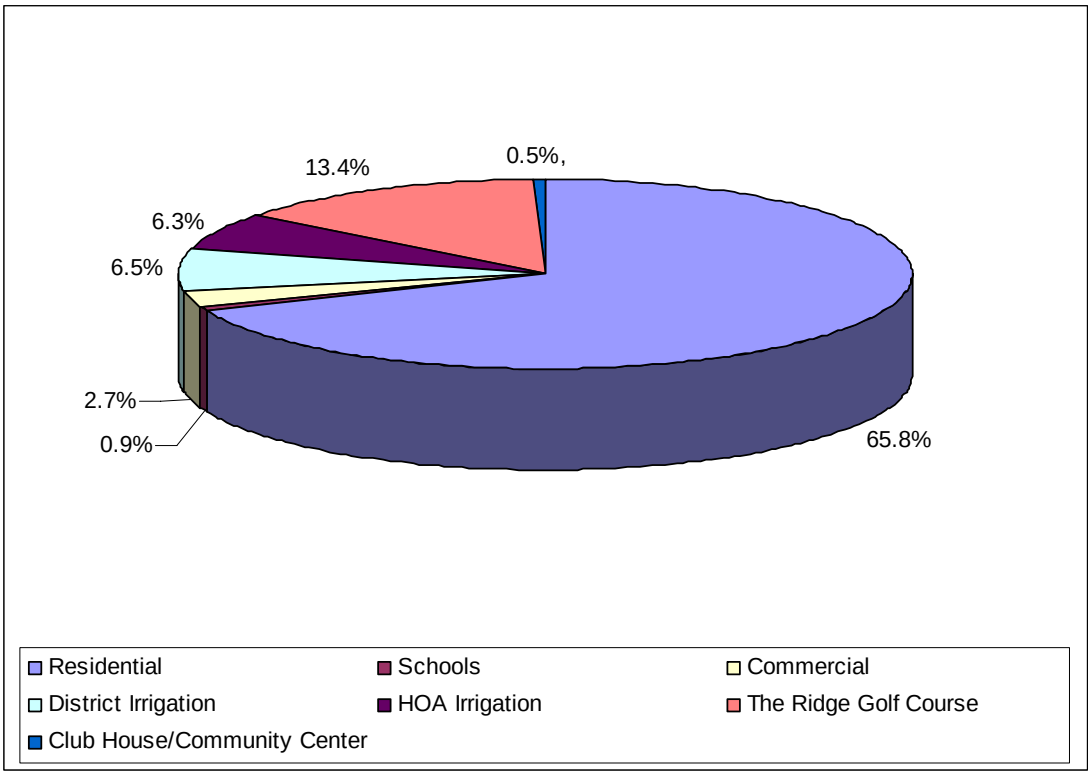
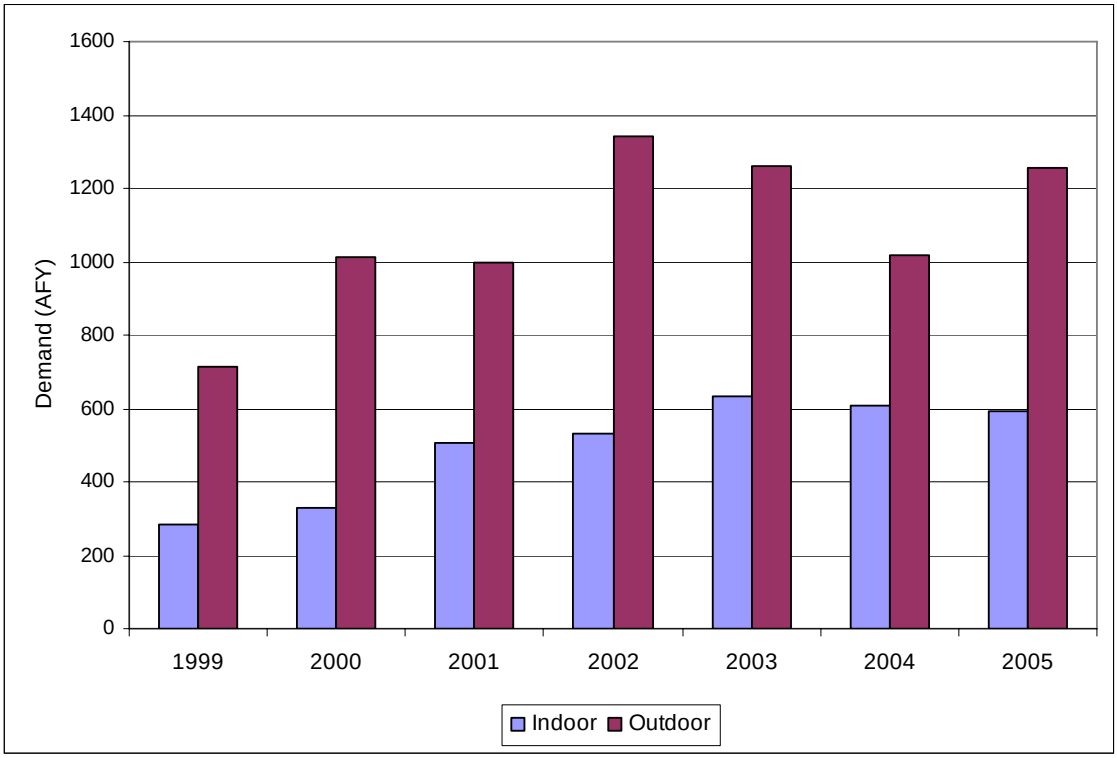


Figure 3-4
Water Demands in 2003

These data shows residential households used 66 percent of the District water (1,279 AFY) with the Ridge Golf Course being the second largest single water user, followed by District and Home Owners Association (HOA) irrigation. Schools and the club houses and community center used the least, whereas commercial used about 3 percent.

Indoor and Outdoor Water Demand

Figure 3-5 shows the estimated outdoor and indoor water demands. These data shows the indoor usage is approximately 31 percent of total demands during this study period.



* Average annual indoor water demands were estimated by summing monthly water demands from November through January. Outdoor demands were determined by individually subtracting monthly demands from the average annual indoor demand and then adding the monthly outdoor demands.

Figure 3-5
Indoor and Outdoor Water Demands

Per Capita Water Demands

Estimates for the service area daily per capita water demands (amount of water used by the service area per water user per day) and the residential daily per capita water demands (amount of water used by the residential sector per water user per day) are provided in Figure 3-6 and Figure 3-7, respectively. As shown in the equation below, per capita demands for the service area were estimated by dividing potable system water demands (i.e., total well production minus water used by the Ridge Golf Course) by the total population. Total potable water demands include District and HOA irrigation. The total population includes employment in the school and commercial sector, traffic, and residents.

$$\textbf{Per capita demands} = \frac{\textbf{Total annual well production} - \textbf{(Annual golf course water use)}}{\textbf{Total population x 365 days}}$$

The residential daily per capita residential water demands includes single family homes, townhouses, and patio homes. These estimates were calculated by dividing residential water use by the total residential population shown in Table 2-1. Residential water use was estimated by subtracting the water use of all customer types (with exception to the residential) from the annual well production. Metered 2003 data was used to estimate the historical water use of other customer types.

Commercial, HOA, and park irrigation was adjusted according to the level of development. The residential use includes indoor and outdoor usage.

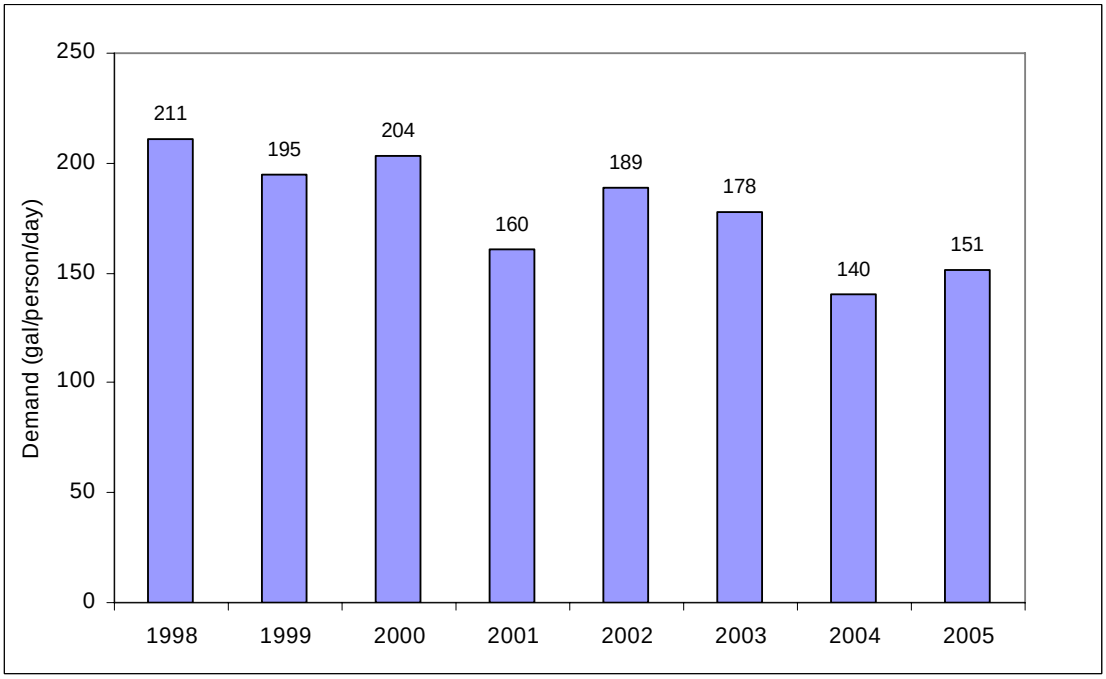


Figure 3-6
Daily Per Capita Water Demands for District Service Area (with exception to the Ridge Golf Course)

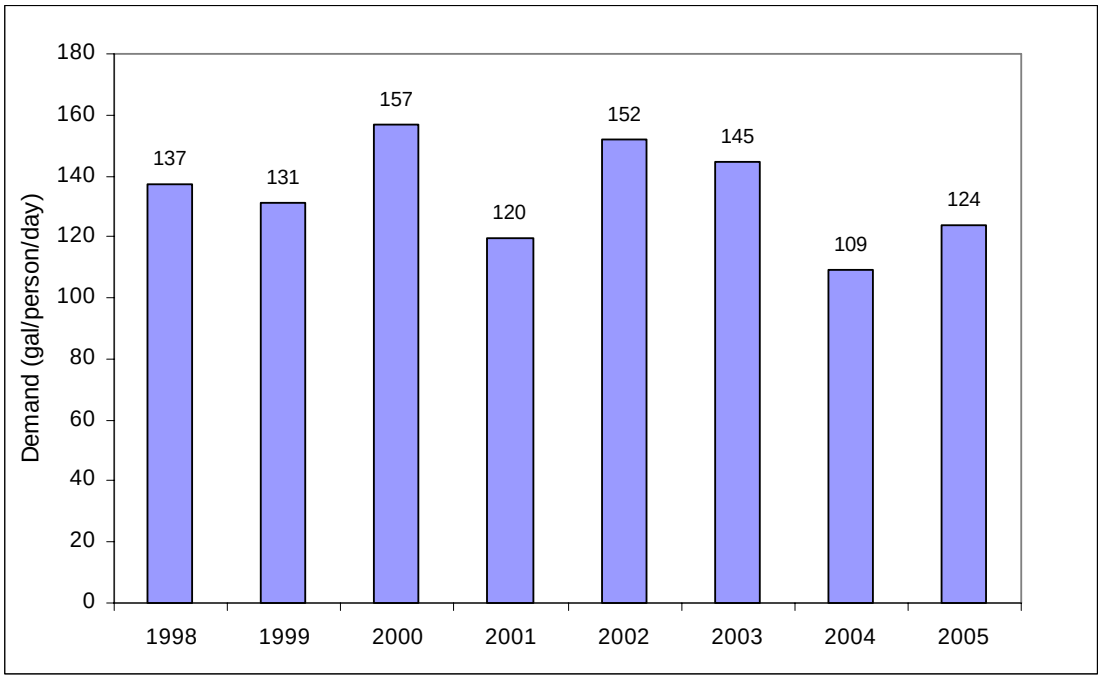


Figure 3-7
Daily Per Capita Residential Water Demands

Demands and Water Conservation

As discussed in Section 2.6, the District began to implement a variety of conservation measures in 2003. Figure 3-6 shows a reduction in demand per capita in 2003 and a continued reduction in 2004 with a small increase in 2005. Similarly, Figure 3-7 shows a reduction in residential use per home in 2003 with a continued reduction in 2004 and a small increase in 2005.

Both of these figures indicate that although the community has been growing and collectively using more water, the amount of water used per household and per capita has decreased. This is likely attributable to the following:

- Community response to regional drought awareness campaigns
- Community response to the District's efforts to encourage conservation (see next section)
- Relatively high precipitation in 2004, reducing the need for outdoor irrigation

Section 2.6 provides the estimated savings for various conservation measures. However, given the multiple factors that have attributed to the lower demands in 2004 and 2005, it is difficult to precisely quantify the water savings since the onset of the District's conservation efforts. Table 3-2 shows the change in per capita water usage from 2002 through 2005 and the associated demand reduction. It is important to emphasize that although conservation efforts have attributed to the reduction in per capita usage, they are not fully responsible for the savings represented in Table 3-2.

Table 3-2 Change in Demand from 2002 to 2005

Period	Change in per Capita Demand AFY	Change in per Capita Demand gpcd	Demand Reduction AFY
Change from 02-03	0.01	11.4	99.6
Change from 03-04	0.04	37.3	361.1
Change from 02-05	0.04	37.6	353.5

3.2 Forecasting Method

Water use levels in 2003 were used as the baseline for future demand projections. 2003 baseline levels were chosen because metered data for most customer types is available for this year and also the 2003 water demands include active conservation measures and a high level of awareness regarding the drought and the importance of water use. As a result, the use of 2003 water demands as a base for future water demand projections assume that existing conservation measures will continue to be implemented and reinforced in the future to ensure that water demands do not increase to pre-2003 levels.

Table 3-3 shows the projected demands, calculations, assumptions, and data sources for the different customer types within the District at buildout (2011). Projected demands prior to buildout were estimated in a similar matter as the buildout

demands by adjusting the Single Family Equivalents (SFEs)[1] for the number of houses expected to be built for a given year. These projections assume that half of remaining land zoned commercial will be built by 2008 and completed at buildout (2011). It is also assumed that all areas zoned for parks will be constructed by 2008. The District plans on using 240 AFY of reclaimed water to irrigate the Ridge Golf Course from 2006 forward. This is also reflected in the demand projections along with the assumption that 4 percent of the total demand is unaccounted for water[2].

Table 3-3 Projected Water Demands at Buildout

Type of Water Use	Demand AFY	Calculations	Assumptions	Sources
Residential	1,539	Product of 2003 residential water use per SFE (0.53 AF/SFE) and number of buildout SFEs (3,108)	Assume 2003 demand/ SFE remains the same.	Well production data
Schools	16	3 schools, 1,598 students, 7,300 gal/student/yr	Assume 2003 demand/acre remains the same. No additional schools are built.	Results of 2003 demand study
Commercial	93	Product of 2003 commercial water use per acre (1.1 AF/acre) and number of acres at buildout (83 acres)	Assume 2003 demand/acre remains the same	2003 metered data from demand study
District Irrigation	133	Product of 2003 District water use per acre (3.2 AF/acre) and number of irrigated acres at buildout (41 acres)	Assume 2003 demand/acre remains the same	2003 metered data from demand study
HOA Irrigation	123	3% increase from metered 2003 data of 119.3 acre-ft	Assume additional 3% increase in HOA irrigated acreage	2003 metered data from demand study
The Ridge Golf Course (Effluent)	240	n/a	Golf Course will fully rely on effluent in the future	District's planned usage of treated wastewater
Pool Club House/Community Center	9	Sum of water usage by 3 residential pools, 7 clubhouse pools including showers, and use of community center	Sum of water usage by 3 residential pools, 7 clubhouse pools including showers, and use of community center	Results of 2003 demand study

Total Demand = 2,153 AFY
Assumed unaccounted water of 4 percent = 90 AFY
Total = 2,243 AFY

[1] A SFE is a unit that is used for water demand projections by normalizing water usage for a variety of customer types. The amount of water consumed by a SFE is equivalent to the amount consumed by a single family home. Water usage of various customer types (e.g. townhomes, parks, schools, etc) may be converted into SFEs by dividing the water usage of each customer type by the average amount of water consumed by a single family home.

[2] Unaccounted for water is water that is not metered. This may include water distribution system losses (leaks), water used for fire hydrants, meter error, and any other unmetered uses.

Projected potable demands at buildout are estimated to be 2,003 AFY. This is obtained by subtracting the non-potable 240 AF of reuse on the Ridge Golf Course from the total projected demands.

3.3 Demand Forecast

As CPN develops, water demands will continue to increase. Demand projections shown in Figure 3-8 shows the District's projected total demands until 2015. Buildout is most likely to occur around 2011. These projections show that the average projected demand for 2006 to 2010 is 2,211 AFY, exceeding the 2,000 AFY requirement to qualify as a "covered entity" for CWCB's Water Conservation Planning Grant.

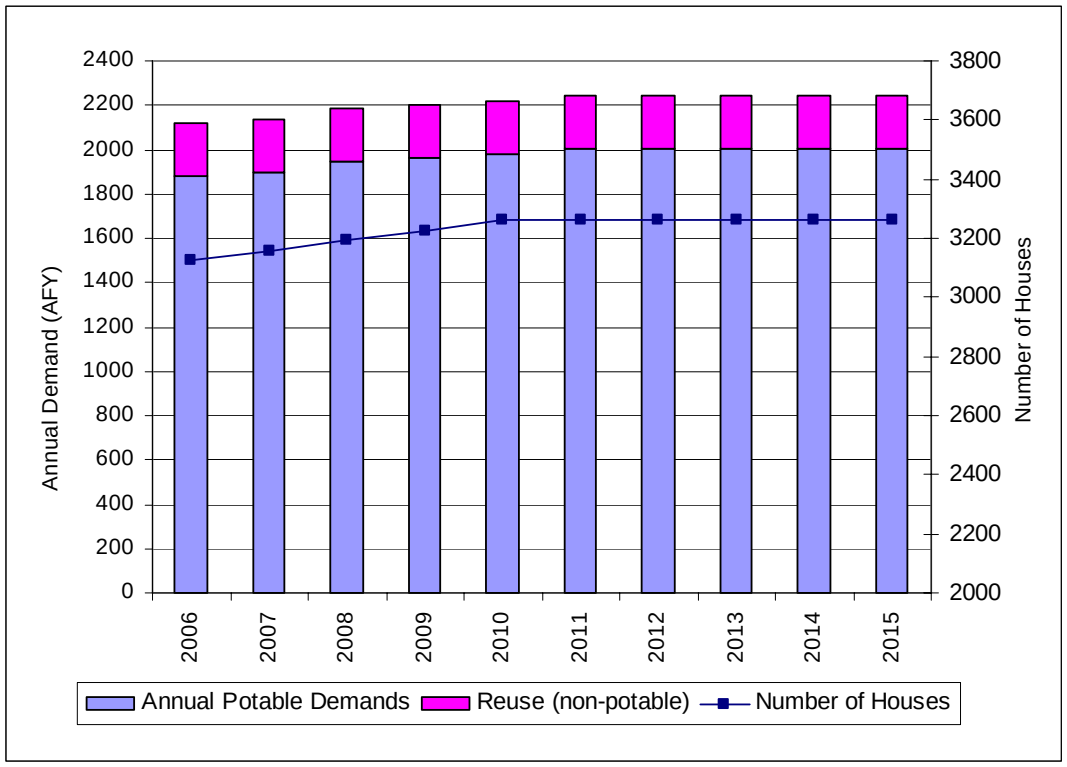


Figure 3-8
Projected Annual Water Demands

Figure 3-1 shows a decrease in the amount of water used since 2003 when the conservation measures were enacted. Given the public campaign during the drought of 2002 to conserve water and the District's conservation efforts, customers have been more efficient with their water use. However, it is important to note that this "drought shadow" demand reduction may not be permanent as customers return to pre-drought behavior. Demands in 2005 began to increase and as reflected in the demand projections, will continue to increase. This pattern of usage is typical of a drought memory effect.

This is illustrated by examining per capita water use for the City of Los Angeles. Figure 3-9 shows Los Angeles' per capita use from 1980 to 2004. In 1991, the last year of a 5-year drought, Southern California water agencies imposed mandatory water conservation. There was also an extensive drought education campaign in 1990 and 1991. This resulted in per capita water use to fall sharply from 1990 levels. In 1992 and 1993, the drought subsided but per capita use remained low due to what is called drought memory effect. This occurs when water customers have had to change behavior dramatically as a result of mandatory restrictions and drought education. However, unless permanent conservation measures are put in place (e.g., ultra-low-flush toilets, landscaping efficiency, etc.) per capita water use tends to increase to levels near pre-drought levels. In California, this has occurred even when water rates have increased. In 1998, a very wet year caused per capita use to fall again. But by 2004, per capita use was 30 gpcd higher than the low in 1991. This indicates that although customers may continue to conserve water post drought, over time they may conserve less and less and even increase water usage beyond pre-drought levels. Nevertheless, conservation efforts are an important component establishing a water management program that promotes a sustainable and reliable water supply. As long as these conservation efforts continue, results in the form of water savings will occur.

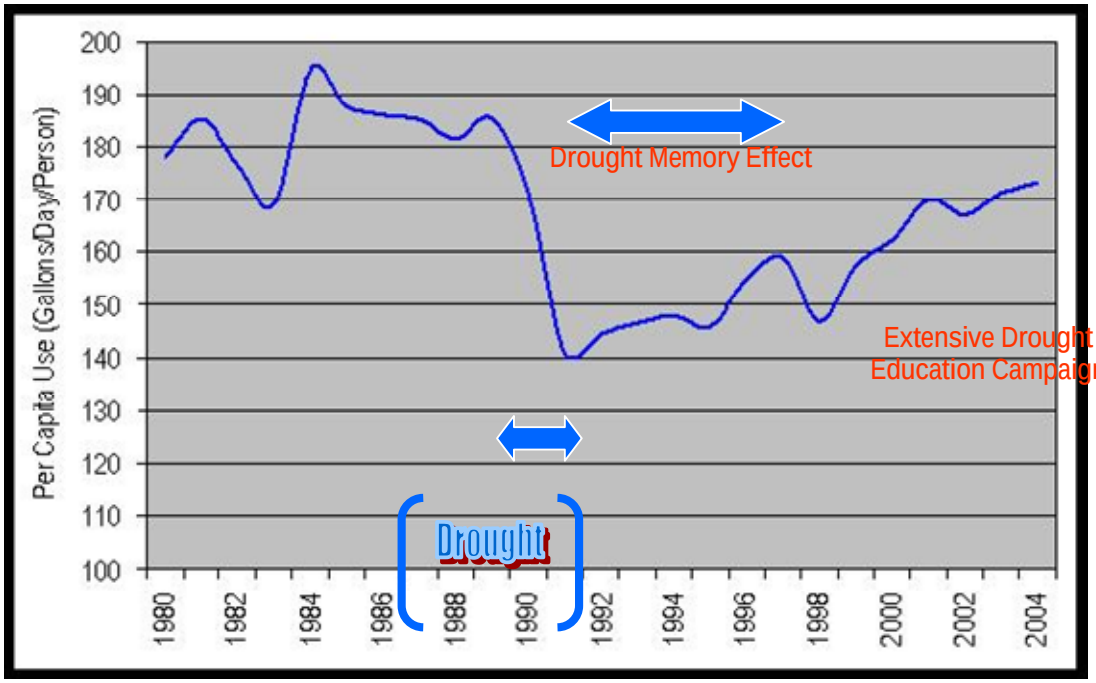


Figure 3-9
Los Angeles' per Capita Use

Daily Water Demands

Table 3-4 shows average and peak day water demands for 2004, 2005, and projected peak daily demands. Projected peak demand at buildout is estimated to be 5.4 mgd. This was determined by multiplying the 2005 peak day ratio by the projected daily average at buildout.

Table 3-4 2004 and 2005 Daily Demands

Year	Daily Average Demand (mgd)	Peak Day Demand (mgd)	Time of Peak Day	Daily Average/Peak Day
2004	1.3	3.1	June*	2.5
2005	1.4	4.3	July	3.0
Buildout	1.8	5.4	summer	3.0

* A complete set of July 2004 data was not available. The highest peak day occurred in June based on the data available.

Section 4
Proposed Facilities

4.1 Cost Potential Facility Needs

Background

As discussed in Section 2.5, Castle Pines North has initiated an IWRP to study groundwater supplies and to develop renewable surface water supply alternatives. Preliminary results from the groundwater study show that if the basin continues to experience withdrawals of magnitude currently experienced, groundwater levels underlying the District's service area will continue to decline regardless of the District's pumping activities. The timing of when the District would need to add additional wells to compensate for reduction in well yields is uncertain at this time but is estimated to be within approximately 20 years. Although the timing of new wells is uncertain, the District's need for additional wells within a reasonable planning horizon is a certainty.

Throughout Colorado the competition and expense of water is increasing. The District aims to acquire a sustainable and renewable source of water before the water becomes too expensive. This would consist of a combination of reuse, conservation, and surface water supplies. Given the complexity and dynamic nature of the water market, a single water supply alternative may not best meet future needs. The IWRP will provide an action plan and decision framework for the District to acquire renewable supplies. A variety of water supply alternatives will be proposed enabling the District to make an informed decision and to develop an implementation plan

It currently is not possible to conclusively describe the District's long-term water supply plans. The following discussion qualitatively describes possible water supply alternatives that are being developed through the development of the IWRP.

Surface Water Supply Alternatives Evaluated in the IWRP

Surface water supplies may be acquired through the acquisition of water rights from the upper or middle South Platte River system and from treated wastewater return flow credits. Figure 4-1 shows the infrastructure that may be constructed to facilitate a new surface water supply. The District has applied for 540 AF of storage in Chatfield Reservoir as part of the reallocation effort and may contract for 3,000- to 4,000 AF of storage in Rueter Hess Reservoir. These two reservoirs could serve as the primary means of storage. A pipeline from Chatfield to Rueter Hess Reservoir would convey water acquired through upper South Platte River rights or return flow credits discharged into East Plum Creek flowing into Chatfield to Rueter Hess for storage. Water acquired from middle South Platte water rights could be conveyed through the East Cherry Creek Valley or Aurora pipelines to Rueter Hess.

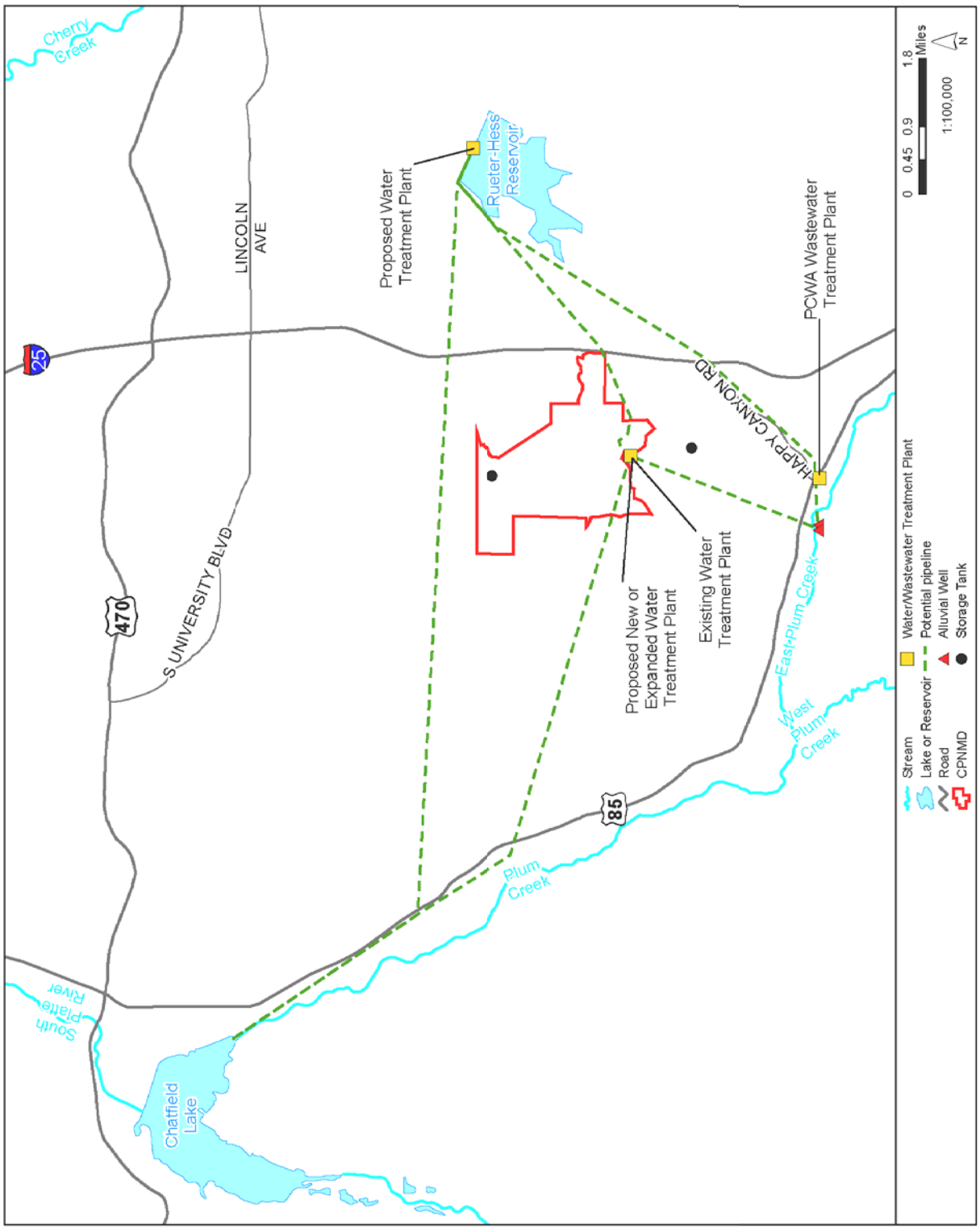


Figure 4-1
Possible Infrastructure Associated with Water Surface Supply Alternatives

A conventional or advanced water treatment plant (depending upon water quality) would treat water stored in Rueter Hess, prior to conveyance to the District service area. Another option would be to capture treated wastewater return flow credits downstream of the wastewater discharge and convey the water to Rueter Hess for storage. A pipeline would be constructed from downstream of the wastewater outlet to Rueter Hess. Surface water could also be used to recharge the groundwater under an aquifer storage and recovery (ASR) concept. This is described in more detail in Section 4.3. The IWRP will provide a detailed evaluation of all these alternatives.

Approach

Given the number of water supply alternatives and the lack of knowledge on what actions will be taken to acquire surface water supplies, specific information regarding future costs and timing of when renewable surface water may come online is unknown. The costs of a future surface water supply will be further influenced by the District's investment decisions as well as the phasing of when and how the surface supplies are brought online. Consequently, for the purposes of this Plan, the cost analyses assume that the District will continue to rely on groundwater and the effects of a renewable surface water supply is addressed qualitatively.

This Plan incorporates a planning period of 10 years from 2006-2015. A 10-year planning period was chosen for the following reasons:

- Buildout is projected to occur in 2011. This planning period provides an adequate period of time to capture demands at buildout.
- Ten years provides a suitable time period to assess the effects of conservation measures for Castle Pines North.
- It is not necessary to go beyond 10 years. The Colorado Water Conservation Board requires that covered Conservation Plan be updated at a minimum of 7 years. The update of this Plan will be able to capture much more information on the costs of surface water supplies and conservation savings, given that there will be much more data available.

Water Supply Improvements

Several improvements to the existing well system are planned for 2006 and 2007. In 2006 wells A-1 and A-3 are to be rehabilitated. In 2007, well, A-5 is to be put online. This well was originally drilled as a directional well. The well did not perform as anticipated and experienced a number of construction related delays and issues; however, data have shown that yields may be attained from the vertical portion of the shaft. The horizontal portion is to be sealed off, enabling water to be withdrawn from the vertical portion.

Costs for the use of groundwater during the planning period are shown in Table 4-1. The capital and O&M costs are summed for each year and adjusted for escalation and discount rates to obtain present value costs. Operation costs were adjusted for the increase in water demand (See Section 3.3) and electricity costs.

Table 4-1 Costs of Supply Side Facilities for the Continued Use of Groundwater

Year	Projected Demands	Unit Operation Costs adjusted for increase in electricity costs ($/AF) [1]	Total Operation Costs (Adjusted for Demands) [2]	Maintenance Costs (Well and Water Treatment)	Escalated Maintenance Costs (Well and Water Treatment) [3]	Total Escalated O&M Costs	Capital Costs [4]	Escalated Capital Costs [5]	Total Escalated Capital and O&M Costs [6]	Present Value of Supply Costs [7]
2006	2,121	$403	$853,940	$122,000	$122,000	$975,940	$600,000	$600,000	$1,575,940	$1,575,940
2007	2,137	$438	$936,467	$122,000	$126,880	$1,063,347	$600,000	$624,000	$1,687,347	$1,606,997
2008	2,185	$477	$1,042,435	$122,000	$131,955	$1,174,391	$600,000	$648,960	$1,823,351	$1,653,833
2009	2,203	$519	$1,143,969	$122,000	$137,233	$1,281,202	$600,000	$674,918	$1,956,120	$1,689,770
2010	2,221	$565	$1,255,298	$122,000	$142,723	$1,398,021	$250,000	$292,465	$1,690,485	$1,390,766
2011	2,240	$615	$1,378,000	$122,000	$148,432	$1,526,432	$250,000	$304,163	$1,830,595	$1,434,319
2012	2,240	$670	$1,499,968	$122,000	$154,369	$1,654,337	$250,000	$316,330	$1,970,666	$1,470,542
2013	2,240	$729	$1,632,730	$122,000	$160,544	$1,793,274	$250,000	$328,983	$2,122,257	$1,508,248
2014	2,240	$793	$1,777,244	$122,000	$166,965	$1,944,209	$250,000	$342,142	$2,286,351	$1,547,493
2015	2,240	$864	$1,934,548	$122,000	$173,644	$2,108,192	$250,000	$355,828	$2,464,020	$1,588,329

[1] Unit costs were increased by 9% to account for increase in electricity costs and pumping
[2] Total Operation Costs = Unit Operation Costs x Projected Demands
[3] Escalated Maintenance Costs assume an escalation rate of 4%
[4] Capital Costs:
Assume 3 sets of wells and pumps needed over 20-year period for a total of $5 million distributed uniformly
Assume additional $350,000/year for lowering of pumps in 2006, 2007, 2008, and 2009 and well rehabilitation.
[5] Escalated Capital Costs assume an escalation rate of 4%
[6] Total Escalated Capital and O&M Costs = Escalated Capital Costs + Total Escalated O&M Costs
[7] Present Value of Supply Costs assumes 5% interest rate

The capital costs assume that within 20 years, 3 additional wells will be needed at a total cost of $5 million. Costs for these wells are distributed uniformly at $250,000/year. It is also assumed that additional capital costs will accrue from the lowering of several wells and rehabilitation of wells A-1 and A-3. These costs are included in the capital costs in 2006, 2007, 2008, and 2009. It is important to note that assuming groundwater levels continue to decline, the expense of additional wells and pumping could significantly increase in the long term. Given that the timing of when additional wells would be needed is not certain; these costs are only an approximate estimation.

Table 4-2 provides a brief qualitative summary of anticipated improvements that includes both the planned groundwater improvements and the potential surface water supply.

Table 4-2 Anticipated Improvements and Additions

Types of Projects					
Types	**Improvement**	**New Capacity**	**Start Date**	**End Date**	**Notes**
Source of supply		X	Unknown	Unknown	Purpose is to provide a reliable source, not increase capacity.
Water treatment facilities		X	Unknown	Unknown	
Treated water storage		X	Unknown	Unknown	
Major transmission lines		X	Unknown	Unknown	
Lowering of groundwater wells	X	X	Unknown	Unknown	Will increase well production as the groundwater table lowers.
Groundwater Well Rehab	X	X	2006	Ongoing maintenance	Rehab for wells A-5, A-1, and A-3 is planned. Additional rehab is anticipated in future.

Need for Projects		
Needs	**Apply**	**Notes**
Enhance compliance with regulations		n/a
Replace older equipment or facilities	X	Well rehabilitation and maintenance
Meet average-day demand	X	Additional wells and/or a surface water supply would be designed to meet average day demands
Meet maximum-day demand	X	Additional wells and/or a surface water supply would be designed to meet average day demands
Meet future growth needs	X	Additional wells and/or a surface water supply would be designed to meet demands at buildout
Provide Renewable Supply	X	A surface water supply would be a renewable supply

Wastewater

The Plum Creek Wastewater Authority (PCWA) wastewater treatment facility was recently expanded from 3.55 mgd to approximately 6.0 mgd. The plant is currently permitted for 4.87 mgd, yet has the capacity to further expand. Construction of the expansion began in October 2002 and was completed in July 2005. The facility serves CPN, Castle Rock, Castle Pines Metro, Castleton Center, and Silver Heights. As discussed in Section 3.3, potable demands within the District's service area are estimated to be 2,000 AFY (does not include 240 AF of reuse for the Ridge Golf Course) at buildout around 2011. Figure 4-2 shows effluent production vs well production (not including the Ridge Golf Course) for 2004 and 2005. (Wastewater data was not available prior to 2004). This trend shows the annual wastewater production is approximately 40 percent of well production, resulting in an estimated 800 AFY of wastewater at buildout. Given that the addition of surface water supplies is not going to increase water supply, but rather replace non-renewable supplies, surface water supplies will not significantly change water consumption or wastewater production levels.

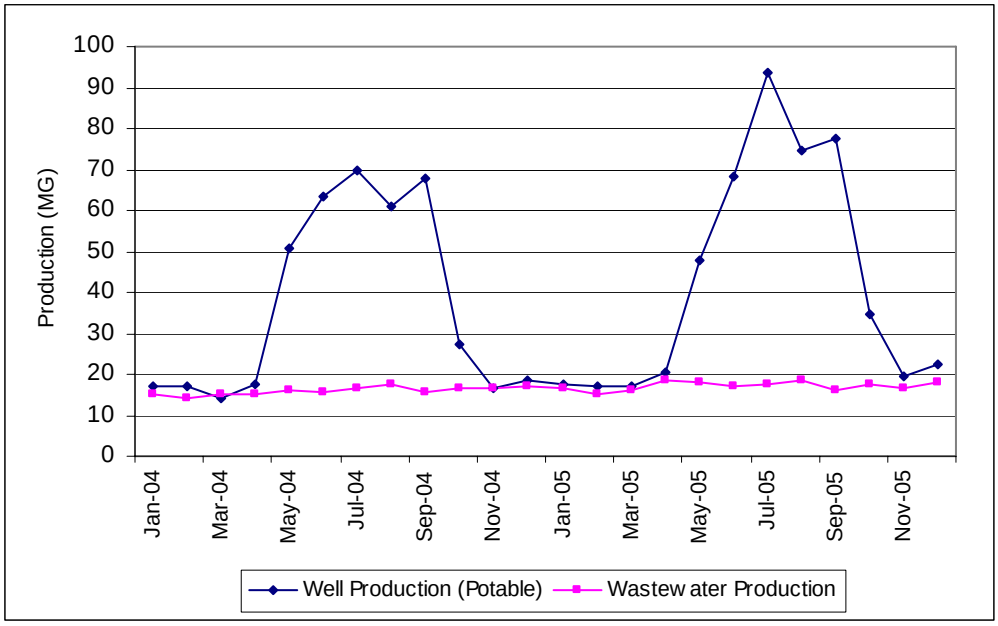


Figure 4-2
Well and Wastewater Productions

4.2 Incremental Cost Analysis

Table 4-3 shows the annual well production, the present value of supply costs in nominal dollars, and the present value of supply costs per gallon. The average cost per gallon for the 10-year planning period is $2.41/gallon.

Table 4-3 Present Value Costs

Year	Annual Water Production (Assuming Projected Demands)	Present value of supply cost	Present value of supply cost per gallon
	1000 gal	$	$/1000 gal
2006	613,002	$1,575,940	$2.57
2007	618,166	$1,606,997	$2.60
2008	633,934	$1,653,833	$2.61
2009	639,750	$1,689,770	$2.64
2010	645,560	$1,390,766	$2.15
2011	652,671	$1,434,319	$2.20
2012	652,671	$1,470,542	$2.25
2013	652,671	$1,508,248	$2.31
2014	652,671	$1,547,493	$2.37
2015	652,671	$1,588,329	$2.43
	Average	$1,546,624	$2.41

4.3 Preliminary Capacity and Cost Forecasts Supply Capacity

The District's water supply corresponds to its demand. This is because the District relies on a groundwater which is a direct function of its demands. When demands increase, well production increases and vice versa when demands are not as high, the well production decreases.

Assuming the District continues to use its groundwater system on an as needed basis, the addition of surface water supplies will increase the overall supply capacity. Acquired water rights may provide a suitable surface supply in average years and a surplus in wet years. Surplus water may be used to recharge the groundwater basin. Figure 4-3 illustrates this situation. Conversely, in dry years surface water may be able to meet half of the District's needs. Under this case, the District would use its groundwater wells to meet its remaining wells. This is concept is called conjunctive use, where groundwater and surface water supplies are used conjunctively to help sustain groundwater levels.

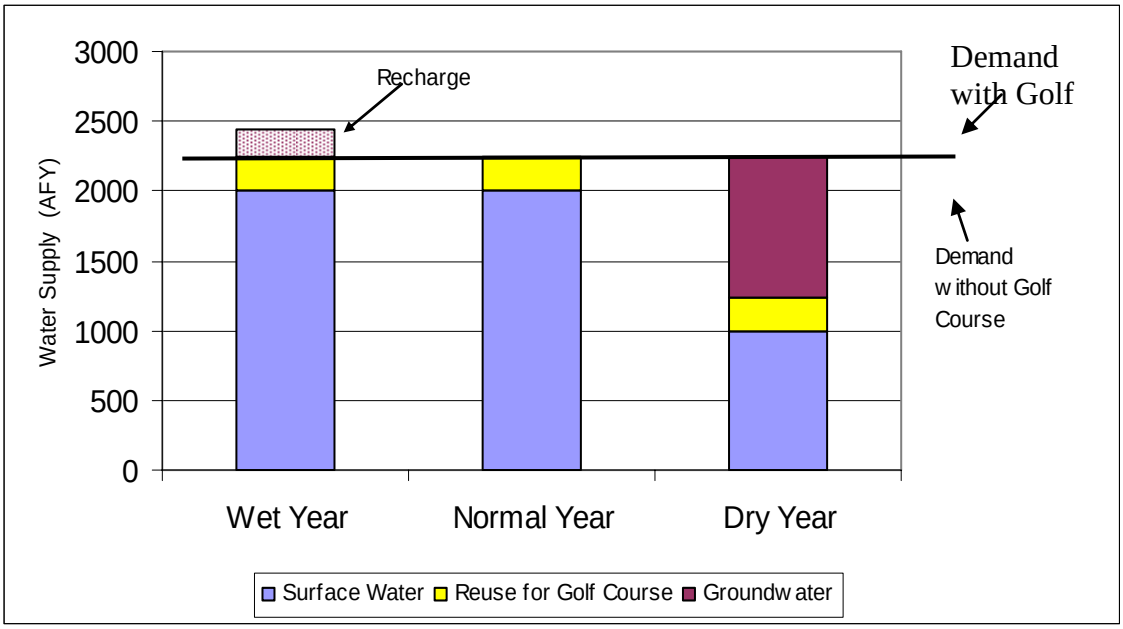


Figure 4-3
Conjunctive Use and Projected Water Supply

Cost Forecasts

Present value costs per gallon for the pumping of groundwater are shown in Table 4-3. Surface water supplies will likely be more expensive than groundwater given that large upfront capital costs are needed. However, as previously noted, the cost of groundwater will significantly increase once groundwater levels decline to the point when additional wells need to be drilled and pumping costs increase. Studies have indicated that this will happen if the South Metro area continues to pump at current rates. The timing on when this will occur can not be accurately determined.

Section 5
Conservation Goals

This section presents the water conservation goals for this Plan and explains how the goals were developed.

5.1 Water Conservation Goals

The development of attainable water conservation goals are a key component to the success of a conservation plan. The goals presented below were developed based on the District's water system and demands. These goals provided a framework in the selection and implementation of conservation programs and will also serve as a guidance tool during implementation of the Plan. They were developed with the intention of providing an optimal range of target savings, while also facilitating the ability to easily measure the success of the plan on an annual basis. The goals are as follows:

1. Provide a water savings target of an additional 175 to 220 AFY based on 2003 water demand patterns (16 to 20 gpcd based on projected population at buildout) through existing and additional conservation measures and programs.

2. Select conservation measures and programs that target outdoor irrigation and customers of high use. Target customers include the following:
   - Residential (indoor and outdoor usage)
   - District irrigation of parks and open space
   - HOA irrigation

3. Closely monitor District irrigation on parks and open space.
   - Maintain 2005 irrigation levels on parks and drip irrigation. (District irrigation of parks and open space were metered for the first time in 2005).
   - Reduce open space irrigation by an additional 10 percent (5.9 AFY) with a total outdoor District usage not to exceed 93 AFY. (District metered usage in 2005 was 98.9 AF)

4. Provide assistance to the homeowner associations in reducing irrigated turf by 25 percent.

5. Select conservation measures and programs that are compatible with the community.

6. Establish a monitoring system that collects a sufficient amount of data to effectively measure the success of conservation programs and measures on an annual basis.

5.2 Goal Development Process

A variety of steps were taken develop the conservation goals. Data on the District's water system and existing conservation measures were collected and analyzed to characterize supply, demands, and customer use. These data were used to identify the major water consumers and the magnitude of savings the District could feasibly attain.

The development of the quantitative goals were developed by reviewing estimated saving projections provided in Section 6.2 and determining a range of savings that fell within the saving projections. The development of these goals also considered how easily billing and well production data could be processed to annually measure the success of the goal. In order to measure the success, current data should be compared to historical data to identify trends and changes. Unfortunately, the change in billing systems in May 2004 resulted in the loss of customer demand data stored in the previous billing system. This limited the ability to develop quantitative saving goals targeting specific customer types.

Quantitative goals are further limited, by the different grouping of customer types in the new billing system. Customer types are grouped according to assigned water budgets (Table 2-2), which is different from the customer partitioning in the older system. Although some metered data of customer types are available in 2003, it would take a significant effort to extract the customer types according to the old system in order to make a consistent comparison when assessing the success of water conservation goals.

Consequently, the quantitative goals of this Plan rely on well production and District metered data that are available for comparison. These goals can be measured on an annual basis with minimal effort. As the District begins to acquire more water use data over time, historical demand trends by customer type may be developed and used to establish new quantitative conservation goals that target customers types and certain use applications (outdoor vs. indoor). The development of an effective monitoring plan is important to the success of the Plan. This will enable the conservation goals, measures, and programs to be modified if changes are needed to further enhance conservation benefits.

One of the conservation goals is to select measures and programs that are compatible with the community. The conservation goals were presented to the public at a meeting that highlighted the major elements of the Plan. The Plan also went through a public review process. Comments on the goals and Plan were be reviewed and incorporated into the final draft. (See Appendices for further details).

Section 6
Conservation Measures and Programs

This section provides a collection of conservation measures and programs. A preliminary screening identifies the conservation measures/programs that are most conducive for CPN. These are evaluated in Section 7. An explanation of why certain measures are not chosen is provided.

6.1 Identification of Conservation Measures and Programs

Table 6-1 in Section 6.3 provides a list of conservation measures and programs that were considered during the development of this Plan. This list consists of measures and programs identified in the CWCB guidelines as well as additional measures that were thought of during the development process.

6.2 Screening of Conservation Measures and Programs

A set of screening criteria were developed to eliminate certain conservation measures and programs from further consideration. These criteria were developed by reviewing the conservation goals and potential conservation measures and programs. Preliminary criteria were developed based on reasons why certain measures/programs were not as effective in meeting the conservation goals as others. These criteria were refined into the screening criteria listed below.

- Criteria 1: The measure/programs are not conducive for the District's water system or community.
- Criteria 2: Water savings resulting from the conservation measure/program are already met by other existing or more effective conservation measures/programs.
- Criteria 3: The measure/program would not provide water savings within the District.
- Criteria 4: Within the context of the District's water system, the measure/program is considered to be more of a water supply option than a conservation program/measure. These may be evaluated in the IWRP, if considered a viable supply option.
- Criteria 5: The measure/program is a standard practice that has been implemented since the water system came online and/or is a practice that will continue to be an integral component of water management. Although the measure/programs may provide savings, there are not additional savings in reference to 2003 demand patterns. The savings were incorporated in the 2003 demand projections. The measure/program is not evaluated in the Plan, but is included in the final list of measure/programs to be implemented.

6.3 Screening Conservation Measures and Programs

The screening criteria were used to identify the conservation measures/programs that are evaluated in this Plan. Table 6-1 lists each program, provides a description of the measures/programs evaluated in the Plan, and lists the applicable criteria of why certain measures/program that were eliminated.

Table 6-1 Water Conservation Measures and Programs

Measure	Already Implemented	Evaluated in Plan	Comments on Measures/Programs
DEMAND SIDE MEASURES			
Water-efficient fixtures and appliances			
Low Flow Toilets	Yes	Yes	Existing rebate program. See Section 2.6.
Front Loading Washing Machines[2]	Yes	Yes	Existing rebate program. See Section 2.6
Hot Water Recirculation System	Yes	Yes	Existing rebate program. See Section 2.6.
Tankless Hot Water Heaters	Yes	No	Criteria 3
Shower Heads	No	Yes	Rebate offered for installation of low flow showerhead.
Faucets	Yes	Yes	Rebate offered for installation of low flow faucet.
Urinals	No	No	Criteria 3
Landscape Efficiency			
Low Water Use Landscapes	No	Yes	Rebate program in which residential and HOA customers will be reimbursed at $0.40 per square foot for replacing Blue grass Turf with a more water efficient landscape. This may include xeric plants, water efficient turf grass approved by the District, and/or artificial turf. The new landscape will need to cover a plot within 500 to 2,000 square feet. An inspector will visit site before and after landscape change to verify change.
Drought-resistant vegetation	No	Yes	Rebate program in which residential and HOA customers will be reimbursed at $0.40 per square foot for replacing Blue grass Turf with a more water efficient landscape. This may include xeric plants, water efficient turf grass approved by the District, and/or artificial turf. The new landscape will need to cover a plot within 500 to 2,000 square feet. An inspector will visit site before and after landscape change to verify change.
Efficient irrigation	Yes	Yes	The District has improved irrigation efficiency on irrigated parks and open space by limiting watering to every 3 days. Additional District's efforts to conserve water are provided in Section 2.6. Water restrictions that limit watering to every three days, are also mandatory for residential and HOA customers.
Equipment – Rain sensors and irrigation clocks.	Yes	Yes	Rebates offered for installation of rain sensors and irrigation clocks.
Equipment – ET Controllers	No	Yes	Rebate offered for the purchase and installation of an approved ET controller. This would include the purchase of the controller as well as the weather monitor or service needed to acquire real time data on factors that influence ET (e.g. humidity, temperature). In addition to the controller, residents will be required to provide proof of purchase of the weather monitor or annual service. Recommended models include

Table 6-1 Water Conservation Measures and Programs

Measure	Already Implemented	Evaluated in Plan	Comments on Measures/Programs
			Toro's Intellisense, Irritrol's Smart Dial, Weathermatic's Smartline, and Hunter's ET system. Additional information on ET controllers is provided in Section 2.5.
Scheduling	Yes	Yes	The District has improved irrigation efficiency on irrigated parks and open space by limiting watering to every 3 days. Additional District's efforts to conserve water are provided in Section 2.6.
Commercial Efficiency			
Recirculating cooling systems in grocery stores	No	No	Criteria 3
Other Indoor and Outdoor Conservation Measures	No	No	Criteria 3
SUPPLY SIDE MEASURES			
Water Reuse Systems			
Ridge Golf Course	Yes	Yes	The District is planning on using 240 AF of treated effluent to irrigate the Ridge Golf Course starting in 2006.
Distribution System Efficiency			
Leak Detection	No	Yes	District is to implement a sonic leak detection system in 2007.
Leak Repair on District's Water Distribution System	Yes	No	Criteria 5
Removal of phreatophytes	No	No	Criteria 1
Temporary Transfers from agriculture			
Dry year leasing	No	No	Criteria 4
Rotational fallowing	No	No	Criteria 4
Water Salvage	No	No	Criteria 4
Source Optimization			
Conjunctive Use	No	No	Criteria 4
System Integration with other utilities	No	No	Criteria 4
DEMAND SIDE PROGRAMS			
Education/information dissemination			
Water-saving demonstrations	No	No	Criteria 2
School Programs	No	No	Criteria 2
Informative and Understandable Water Bill	Yes	Yes	Details are provided in Section 2.6
Water Bill inserts	Yes	Yes	Details are provided in Section 2.6
District's website	Yes	Yes	Details are provided in Section 2.6
Newsletter published quarterly	Yes	Yes	Details are provided in Section 2.6
Public Meetings	Yes	Yes	Details are provided in Section 2.6
Water Wise Class	No	Yes	Class offered to residents providing information on how to improve irrigation efficiency and reduce water usage.
Hotline to report water wasting	No	Yes	A phone number posted on the District's website where customers could report incidents where water is being wasted.
Web-based Water Audit	No	Yes	Interactive website where residents may input water usage specific to their home and learn how they can conserve additional water.
Technical Assistance			
Customer Water Audits			
Targeted at large	No	Yes	Provide water audits for HOAs and the Ridge

Table 6-1 Water Conservation Measures and Programs

Measure	Already Implemented	Evaluated in Plan	Comments on Measures/Programs
landscapes			Golf Course.
Targeted at large users	No	Yes	Contact residents who reach the highest billing rate level of water usage (Tier 4) and offer them a free water audit.
Water conservation expert available	No	No	Criteria 2
Rate structures & billing systems designed to encourage efficiency			
Volume billing	Yes	No	Criteria 5
Conservation (tiered) rate structure	Yes	Yes	The billing system consists of a 4-tiered inclined block rate structure with a water budget. See Section 2.4.
Increase Water Rates	Yes	No	Criteria
Increased (monthly) billing frequency	No	No	Criteria 3
Regulations/Ordinances			
Addressing fixtures and appliances			
Standards for fixtures & appliances	No	No	Criteria 1
Time of sale upgrades	No	No	Criteria 1
Addressing landscapes			
Watering Restrictions	Yes	No	Criteria 5
Turf restrictions	No	No	Criteria 5
Landscape design/ analysis	No	No	Criteria 5
Soil Preparation	No	No	Criteria 1
Irrigation equipment	No	No	Criteria 1
Water waste prohibition	No	No	Criteria 2
Incentives			
20% Rebate	Yes	Yes	Existing rebate program. See Section 2.6.
Rain Sensors	Yes	Yes	Existing rebate program. See Section 2.6.
Programmable Irrigation Clock	Yes	Yes	Existing rebate program. See Section 2.6.
Give-aways	No	No	Criteria 2
SUPPLY SIDE PROGRAMS			
Distribution System Efficiency			
Leak identification	Yes	Yes	District is to implement a sonic leak detection system in 2007.
Meter Source Water	Yes	No	Criteria 5
Meter service connections	Yes	No	Criteria 5
Metering of District irrigation	Yes	No	Criteria 5
Meter testing and replacement	Yes	No	From 2003 - 2005, the District replaced the majority of meters with radio read meters.
Improved water accounting	Yes	No	Criteria 2
Analysis of none account water	Yes	No	Criteria 2

An explanation for each eliminated program/measure and why it was not considered for further analysis is provided below.

Programs Eliminated by Criteria 1

Removal of Phreatophytes - Phreatophyte removal is not applicable to the District's water system. The District currently relies on groundwater that is conveyed through a closed pipe system.

Soil Preparation – This regulation/ordinance would improve the water holding capacity of soil underlying new landscapes and generally produces the greatest savings in communities experiencing significant growth. Castle Pines North is 95 percent buildout and the majority of the service area is either landscaped or natural open space. Substantial water savings are not available in the District service area.

Irrigation Equipment – This regulation/ordinance would require more efficient irrigation equipment to be installed on new landscapes and generally produces the greatest savings in communities experiencing significant growth. Castle Pines North is 95 percent buildout and the majority of the service areas are either landscaped or natural open space. Substantial water savings are not available in the District service area.

Programs Eliminated by Criteria 2

Water Conservation Expert - This plan evaluates water audits for HOAs and residents that target the same type of end users as would a water conservation expert. It is not necessary to evaluate both programs.

Give-aways – Water savings may be obtained by providing customers with free kits that can be used to enhance the water efficiency of appliance and fixtures. The District prefers to focus on the existing rebate program that offers incentive for the replacement of inefficient appliances and fixtures. This provides similar if not more effective results.

Standards for Fixtures and Appliances – A series of rebates/incentives are offered for replacing fixtures and appliances with a more efficient model. This voluntary approach is publicly more acceptable than establishing mandatory standards.

Time of Sale Upgrades - A series of rebates/incentives are offered for replacing fixtures and appliances with a more efficient model. This voluntary approach is publicly more acceptable than establishing mandatory standards.

Water Waste Prohibition - This regulation/ordinance would penalize users who are wasting water. The District prefers to focus on the public education program and incentives promoting water conservation that will provide similar results. A hotline where customers could report water wasting is evaluated in this Plan.

Improved water accounting – From 2002 to 2005, the District replaced the majority of its meters with radio read meters. The District also began to meter its irrigation of parks and open space in 2005. This will immensely improves the ability to account for water production and water use throughout the service area. All source and service connections are metered. Additional improvements to the accounting system are not necessary.

Analysis of none-account water – From 2002 through 2005, the District replaced the majority of its meters with radio read meters. The District also began to meter its

irrigation of parks and open space in 2005. This will immensely improves the ability to account for water production and water use throughout the service area. All source and service connections are metered. Additional improvements to the accounting system are not necessary.

Water Saving Demonstrations – The District already has an extensive public education program that addresses xeriscaping and irrigation efficiency and is considering additional elements to the program that will address these topics. Also, there is a variety of water saving demonstrations in the Denver metropolitan area, including the xeriscape garden at Denver Water that District customers may visit for xeriscaping ideas. The District would prefer to focus on other elements to promote water savings.

School Programs – Castle Pines North already has an extensive public education program and is considering additional elements to the program. The District would prefer to focus on other elements to promote water savings.

Programs Eliminated by Criteria 3

Tankless Hot Water Heaters – The District currently gives a $100 rebate for tankless hot water heaters. However, these primarily save energy and there are no water savings. The District plans on taking this rebate out of the Rebate Program.

Urinals - The Energy Policy Act of 1992 specified a maximum flush volume of 1 gallon or less. All post 1994 urinals use 1.0 gallons or less. Commercial development and the schools were developed after 1994 where low flow urinals were installed.

Recirculating cooling systems in grocery stores – An enquiry was made concerning the existing cooling systems at the two groceries stores within the service area. It was found that the Safeway store relied on an air cooling system and that the King Soopers already used a recirculating water cooling system.

Other commercial indoor and outdoor conservation measures - The owners of the commercial lots generally live out of state and water conservation within Colorado is not a high priority. It would take a lot of effort on behalf of the District to contact the owners and offer incentives for implementing conservation measures and would likely not be very effective.

Increased billing frequency – The District bills customers on a monthly basis. It would be a significant expense to increase the billing cycle to more than once a month and would not produce significant water savings.

Increase water rates – Studies have shown that increases in water rates can reduce water consumption and promote water conservation. However, this depends on how responsive customers are to price increases. In a community such as CPN where the medium household income is relatively high, customers are less sensitive to prices that in a community where financial resources are tight. A substantial increase in water rates would likely be required to encourage conservation and would not be as

politically acceptable as other conservation efforts. Although rates may increase, the raise would be for revenue purposes rather than to encourage conservation.

Programs Eliminated by Criteria 4

Agricultural transfers (Dry year leasing, Rotational fallowing, and water salvage) - Within the context of the District's water system, agricultural transfers are considered to be more of a water supply option than a conservation measure/program. These options could serve as a future surface water supply source.

Conjunctive Use – The District's future water supply will likely incorporate conjunctive use, using both groundwater and surface water. Surface water supply alternatives are being evaluated in the IWRP. Under the context of this Plan, conjunctive use is treated as a water supply alternative rather than a conservation measure.

System Integration with other Utilities - The District has considered the possibility of annexing small neighboring water districts into their water system and estimated demands of neighboring Districts will be included in the IWRP. However, this is a preliminary assessment and nothing has been negotiated or planned.

Programs Eliminated by Criteria 5

Watering Restrictions – The District currently limits residential and HOA watering to every three days. See Section 2.5 for more details. This is intended to manage daily demands and provides some conservation benefits. Water restrictions will continue to be a standard practice in managing the water system.

Leak Repair on District's Water Distribution System– Leak repair has been a standard practice since the water system was brought online. The District repairs all leaks that are not on private property. Water savings are obtained from this practice; however, it is difficult to quantify the savings given the variable nature of leaks and that there is not a means to compare water demands before and after the leak repair program. Leak repair will continue to be standard in the management of the water system.

Volume Billing – Volume billing has been a standard practice since the water system was brought online. The District bills its customers based on the volume of use. Water savings are obtained from this practice; however, it is difficult to quantify the savings given that there is not a means to compare water demands before and after volume billing. Volume billing will continue to be standard in the management of the water system.

Meter Source Water – The metering of source water (well production) has been a standard practice since the water system was brought online. It is difficult to quantify any savings given that there is not a means to compare water demands before and after the metering of source water. The metering of source water will continue to be standard in the management of the water system.

Meter Service Connections - The metering of service connections (with exception to District irrigation) has been a standard practice since the water system was brought online. From 2002 to 2005, the District replaced the majority of its meters with radio read meters. This will improve/maintain water accounting accuracy. Water savings are obtained from this practice; however, it is difficult to quantify the savings given that there is not a means to compare water demands before and after metering. Metering of service connections will continue to be standard in the management of the water system.

Metering of District Irrigation - The District began to meter its irrigation of parks and open space in 2005. In 2006, the Utility Enterprise will begin billing the Parks and Open Space development. This will improve the District's ability to monitor its irrigation and accounting abilities. Although water savings from metering, the District has also implemented a strict watering schedule to conserve water. It is difficult to decipher the amount of savings through scheduling vs. District metering. In this Plan the District savings is credited to irrigation schedule. District metering will become a standard practice in the management of the water system.

Turf Restrictions and Landscape design/layout – The District plans on restricting the development of irrigated turf in new parks proposed for development. Artificial turf will be used for recreational fields.

Section 7
Evaluation and Selection of Conservation Measures and Programs

In this section the estimated savings and costs of the conservation measure/programs selected in Section 6.3 are presented. The net benefits and costs are compared and a final group of conservation measures and programs are selected for implementation.

7.1 Combinations of Measures and Programs

Conservation measures/programs are often used in conjunction with one another. In order to facilitate a more integrated assessment of the benefits and costs, the conservation measures/programs selected for evaluation were grouped into combinations. The combinations were developed by identifying the type of program/measure and the end user each program/measure targets. Table 7-1 lists the combinations as well as the conservation measures/programs within each combination.

Table 7-1 Combinations of Conservation Measures and Programs

Combination	Conservation Measures and Programs
Rebate Program - Indoor Fixtures and Appliances	Low Flow Toilets
	Low Usage Washers
	Hot Water Recirculation System
	Showerheads
	Faucets
Rebate Program -Residential Outdoor	Rain Sensor
	Irrigation Clock
	Sod Replacement – Residential
	ET Controller
Residential Indoor and Outdoor	Audits for Residential Homes at Tier 4
	Indoor and Outdoor Audits for Homes Built prior to 1994
	20% Rebate
The Ridge Golf Course	Audit for the Ridge Golf Course
	Reuse on Ridge Golf Course
HOA Irrigation	Audits for HOAs
	Sod Replacement – HOA
Conservation Rate Structure	Increasing Block Rate Structure
Leak Detection	Sonic Leak Detection Program
Public Education Program	Existing and new measures
District Irrigation Water Conservation Efforts	Irrigation Watering Efficiency for Parks and Drip Irrigation
	Irrigation Water Efficiency for Open Space

7.2 Estimated Costs and Water

Table 7-2 provides the water saving estimates for each all of the evaluated measures. Where applicable, the savings presented in the table are cumulative where savings acquired through previous year retrofits/conservation measures are added to savings acquired for the year presented in the table. Cumulative savings are applicable for the majority of conservation measures/programs and are noted in the calculations column. The assumptions and calculation columns provide explanation of how the savings of each measure were estimated per unit (e.g. household water savings for a

washing machine retrofit). The penetration columns and target number of units per year refer to how many single family houses are assumed to participate in the measure/program. The total penetration by 2015 refers to the total percentage of houses (at buildout) that participate in the program. This assumes that there will be a total of 2,805 single family homes at buildout. The annual penetration refers to the number of houses that are assumed to participate annually. Water savings for the existing rebate program in 2003, 2004, and 2005 were calculated from the number of recorded rebates. Following 2005, it is assumed that the number of new participants in the measure/program is the same every year. This is shown in the target number of units column and is directly related to the annual and total penetration rates. Water savings are also adjusted for the estimated annual service life. For a given year, the cumulative water savings calculations do not include water savings for measures that have exceeded their service life.

Table 7-2 Estimated Water Savings

Retrofit	Target Number of Units per year	Annual Penetration	Total Penetration at 2015	Estimated Service Life Years	Average Annual Savings (1000 GAL/YR)	Annual Savings in 2005 or at onset of program[4] (1000 GAL/YR)	2015 Annual Savings (1000 GAL/YR)	Total Savings of Program During Planning Period 1000 GAL	Calculation of Water Savings Per Unit (Water Savings presented in this table are cumulative)	Assumptions
Rebate Program - Indoor Fixtures and Appliances										
Low Flow Toilets[1]	48	1.7%	17.0%	15-25	1,087	90	2,471	14,129	Average flush/person/day x Average people per home x (gal/flush of toilets prior to 1994 - gal/flush of toilets post 1994) = gal saved/home/day Savings are multiplied by reduction factor[5] Water savings presented are cumulative	Average flush/person/day = 5 Average people per home = 2.88 Toilet prior to 1994 = 3.5 gal/flush Toilet post 1994 = 1.6 gal/flush 17% of homes at buildout were build prior to 1994 Reduction factor = 50%
Low Usage Washers	39	1.4%	14.0%	12	1,306	437	2,581	16,980	Average washes/week/household x (gal/wash of average washer - gal/wash of low usage washer) = gal saved/week Water savings presented are cumulative	Low Usage Washer = 25 gal/wash Average Washer = 40 gal/wash Average 7 washes per week
Hot Water Recirculation System	14	0.5%	5.0%	Not available Assume greater than 10 years	Can not quantify	Can not quantify	Can not quantify	Can not quantify	Assumed savings (gpcd) x number of people per household = gal saved/day/household Water savings presented are cumulative	Assume savings of 10 gpcd Average people per home = 2.88
Showerheads	28	1.0%	10.0%	7	1,238	265	1,858	11,146	Average time of shower x (flow of old shower head - flow of new shower head) x average people per home = gal saved/day Water savings presented are cumulative	Average time of shower = 6 minutes Average people per home = 2.88 Old showerhead = 4 gpm New showerhead = 2.5 gpm Rebate of $10 per showerhead
Faucets	28	1.0%	10.0%	15	442	88	796	3,981	Average time of usage x (flow of old faucet - flow of new faucet) x average people per home = gal saved/day Water savings presented are cumulative	Average time of usage = 8.1 minutes Average people per home = 2.88 Old faucet = 3 gpm New faucet = 2.5 gpm
Residential Outdoor										
Rain Sensor	14	0.5%	5.0%	4	238	147	295	3,095	Assumed savings (gpcd) x number of people per household = gal saved/day Water savings presented are cumulative	Assume savings of 5 gpcd
Irrigation Clock	20	0.7%	7.0%	4	663	399	826	8,616	Assumed savings (gpcd) x number of people per household = gal saved/day Water savings presented are cumulative	Assume savings of 10 gpcd Average people per home = 2.88 Water savings were adjusted to account for the four year service life. Irrigation timers older did not contribute towards additional savings.
Sod Replacement - Residential[2]	217,800 square feet	n/a	n/a	10	9,801	1,960	17,642	88,209	Savings of irrigation application (gal/sf/year) x area of xeriscape = gal saved/year Water savings presented are cumulative	Irrigation savings application = 9 gal/sf/year. (This is close to 1/2 of the 27 inches the District uses for its budget billing system). Total xeriscaping of residence landscapes = 1 acre/yr

Table 7-2 Estimated Water Savings

Retrofit	Target Number of Units per year	Annual Penetration	Total Penetration at 2015	Estimated Service Life Years	Average Annual Savings (1000 GAL/YR)	Annual Savings in 2005 or at onset of program[4] (1000 GAL/YR)	2015 Annual Savings (1000 GAL/YR)	Total Savings of Program During Planning Period 1000 GAL	Calculation of Water Savings Per Unit (Water Savings presented in this table are cumulative)	Assumptions
ET Controller	20	0.7%	7.0%	10	133	27	240	1,198	Average water usage per home x percentage outdoor use x percentage outdoor water savings = gal saved/year Water savings presented are cumulative	Average water usage per home = 161kgal/home Average outdoor water usage = 55% Percentage outdoor water savings = 30%
Residential Indoor and Outdoor										
Audits for Residential Homes at Tier 4[3]	All customers exceeding Tier 4	2.4% of total annual water production	n/a	Audits provided every year	1,547	1,484	1,566	13,922	Total potable annual water demand x 2.4% x 10% audit savings = gal saved/year Water savings presented are cumulative	2.4% of total annual potable water demand is residential water use at Tier 4 level 10% water savings from audit
Indoor and Outdoor Audits for Homes Built prior to 1994[1]	53	1.9%	17.0%	4	2,774	805	4,027	24,966	Average water usage per home x percentage water savings = gal saved/year Water savings presented are cumulative	% water savings = 10% Average water usage per home = 152 Kgal/yr
20% Rebate	14	0.5%	5.0%	1	Can not quantify	Can not quantify	Can not quantify	Can not quantify	n/a	n/a
The Ridge Golf Course										
Water Audit for the Ridge Golf Course	n/a	n/a	n/a	Audit provided every 2 years	Can not quantify	Can not quantify	Can not quantify	Can not quantify	n/a	n/a
Reuse on Ridge Golf Course	n/a	n/a	n/a	10	78,204	78,204	78,204	782,042	n/a	District is planning on using 240 AFY of treated effluent to irrigate the Ridge Golf Course
HOA Irrigation										
Audits for HOAs	11 HOAs (Total of 33 HOAs)	33.0%	100.0%	10	1,778	667	2,001	16,006	15% x HOA water usage Water savings presented are cumulative	5% water savings from audit 1/3 of the HOA irrigated lands is audited every year and water savings last at least 3 years until next audit
Sod Replacement - HOA[2]	194,931 square feet	2.5%	25.0%	10	8,772	1,754	15,789	78,947	Savings of irrigation application (gal/sf/year) x area of xeriscape = gal saved/year Water savings presented are cumulative	Irrigation savings application = 9 gal/sf/year. (This is close to 1/2 of the 27 inches the District uses for its budget billing system).
Conservation Rate Structure										
Increasing Block Rate Structure	n/a	100.0%	100.0%	Implemented whole planning period	18,463	15,709	18,700	200,263	% decrease in potable demands x end user demands	Assume 3% decrease in total potable water use (excluding Ridge Golf Course)
Leak Detection										
Sonic Leak Detection Program	n/a	1/3 of system each year	Entire system	System will be assessed every 3 ears	6,154	5,901	6,233	55,388	1% x annual potable usage	1% savings of all potable usage
Public Education Program										
Existing and new measures	n/a	n/a	n/a	10	6,154	5,901	6,233	55,388	1% x annual potable water usage	1% savings of all potable usage
District Irrigation Water Conservation Efforts										
Irrigation Efficiency for Parks and Drip Irrigation	n/a	n/a	n/a	10	3,109	3,109	3,109	31,086	Metered savings from 2003 to 2005 x 40% = gal saved	Open space and parks/drip irrigation uses 60% and 40%, respectively Metered data shows a savings of

Table 7-2 Estimated Water Savings

Retrofit	Target Number of Units per year	Annual Penetration	Total Penetration at 2015	Estimated Service Life	Average Annual Savings	Annual Savings in 2005 or at onset of program[4]	2015 Annual Savings	Total Savings of Program During Planning Period	Calculation of Water Savings Per Unit (Water Savings presented in this table are cumulative)	Assumptions
				Years	(1000 GAL/YR)	(1000 GAL/YR)	(1000 GAL/YR)	1000 GAL		
Irrigation Efficiency for Open Space	n/a	n/a	n/a	10	6,597	4,663	6,597	65,965	Metered savings from 2003 to 2005 x 60% + (2005 metered pen space usage - 2005 metered open space usage x 90%)	7,772 kgal total District irrigation from 2003 to 2005 Conservation goals target an additional 10% reduction in irrigation for open space and maintaining 2005 level in parks and areas with drip irrigation

[1] 17 percent of all single family homes were built prior to 1994 (This does not includes townhomes and apartments). This is before the U.S. Energy Policy Act of 1992 was enforced. In 1994, this Act was enforced, requiring new toilets, urinals, showerhead, and faucets to be of higher efficiency. Homes older than 1994 tend to have less efficient toilets, showerheads, and faucets. A penetration of 17% assumes that all homes built prior to 1994 have participated in the Rebate Program.

[2] The target number of units refers to the amount of square feet xeriscaped. The penetration rate for HOAs refers to the percentage of HOA irrigated landscape that is xeriscaped.

[3] Tier 4 is the highest level of water usage for the billing rate structure. See Section 2.4. Customers that are at this level are the least efficient with water usage and paying the highest cost for water.

[4] Recent savings for existing programs are provided for 2005, whereas savings for potential new programs are evaluated assuming they would start in 2007.

[5] Water savings for the toilet retrofit are multiplied by a reduction factor of 50% (water savings are reduced by one half) to compensate for the assumptions that likely over estimate water savings. Many of the future toilet retrofits will replace post 1994 toilets. Consequently, savings will not be as high as indicated in the assumption that a post-1994 toilet would replace a pre-1994 toilet of 3 gal/flush. Furthermore, there is no guarantee that residents would purchase low flush toilets for their entire home. In contrast, the water savings calculations assume that all residents within a home would use low flush toilets. Residents may still use their higher flush toilets further reducing water savings. Conversely, customers have the option of purchasing a 1.0 gallon low flush toilet which could produce higher water savings then what is assumed for the 1.6 gal/flush toilet. However given the variety of factors that can influence savings, estimates assume a 1.6 gal/flush low flush toilet to be conservative.

Table 7-3 provides estimated costs for each measure/program, an analysis of cost effectiveness, and net benefits. The first column provides the assumed number of new units per year (e.g. retrofit or square feet for the Sod Rebate Program). The second column shows the assumed costs per each unit (e.g. rebate received by a customer for installing a toilet) while the third column shows the estimated total water savings for the 10-year (2006 to 2015) planning period. The remaining columns provide information on the costs associated with implementing conservation measures/ programs, an analysis of cost effectiveness, and the net benefits of conservation. The analysis of cost effectiveness compares the cost per 1,000 gallons to produce the water (pump, treat, and distribute) and the cost per 1,000 gallons to implement the conservation program/measure. The net benefit analysis provides the costs saved by conserving water and the net benefit. If the net benefit is negative, the costs for the conservation program exceed the costs saved in conserving water. Details on how each of these columns is calculated are provided in the footnotes at the end of the table.

7.3 Comparison of Benefits and Costs

Table 7-4 consolidates information from Table 7-2 and 7-3. It presents a comparison of program costs, average annual water savings for the planning period, and net costs benefits for the evaluated conservation measures and programs. The net benefits are ranked from the highest benefits to lowest.

The net benefits would likely be substantially higher if surface water supplies are brought online (assuming surface water is more expensive than groundwater) or if the cost of groundwater production significantly increases. This is because the cost of water production would be much higher and consequently there would be greater cost savings per gallon of water conserved. There would be greater incentive for the District to conserve water.

As discussed in Section 4.3, groundwater is nonrenewable. The decline of the groundwater table will eventually cause a substantial increase in the cost of groundwater pumping. It is important to note that this evaluation does not account for this increase because the timing of when this will occur can not be accurately determined. If the District continues to solely rely on groundwater, eventually the cost to produce the water will increase, providing greater incentive for conservation.

The conservation programs that rank the highest include the following:

- Increasing block rate structure
- District irrigation efficiency for open space
- Sonic Leak Detection Program
- District irrigation efficiency for parks

Table 7-3 Analysis of Conservation Measures and Programs

Measures	Target Number of Units per Year	Cost per Unit	Total Savings of Program During Planning Period 1000 Gal	Costs of Conservation Program/Measures		Analysis of Cost Effectiveness			Net Benefit of Conservation	
				Total Annual Cost of Measure	Total cost of Measure/Program for Planning Period[1]	Cost of Water Saved by the Measure[2] $/1000 GAL	Simple Incremental Supply Cost[3] $/1000 GAL	Cost Comparison[4] $/1000 GAL	Estimated value of water saved by measure based on incremental supply costs[5]	Net Value of Water Saved by Measure[6]
Rebate Program - Indoor Fixtures and Appliances										
Low Flow Toilets	48	$100.00	14,129	$4,769	$47,685	$1.69	$2.41	-$0.96	$34,109	-$13,576
Low Usage Washers	39	$125.00	16,980	$4,909	$49,088	$2.89	$2.41	-$0.48	$40,991	-$8,096
Hot Water Recirculation System	14	$100.00	Can not quantify	$1,403	$14,025	n/a	$2.41	n/a	n/a	n/a
Showerheads	28	$10.00	11,146	$281	$2,525	$0.23	$2.41	$2.19	$26,907	$24,383
Faucets	28	$50.00	3,981	$1,403	$12,623	$3.17	$2.41	-$0.76	$9,610	-$3,013
Residential Outdoor										
Rain Sensor	14	$100.00	3,095	$1,403	$14,025	$4.53	$2.41	-$2.12	$7,472	-$6,553
Irrigation Clock	20	$75.00	8,616	$1,473	$14,726	$1.71	$2.41	$0.70	$20,799	$6,073
Sod Replacement Residential	217,800	$0.40	88,209	$87,120	$784,080	$8.89	$2.41	-$6.47	$212,947	-$571,133
ET Controller	20	$200.00	1,198	$3,927	$35,343	$29.50	$2.41	-$27.08	$2,893	-$32,450
Residential Indoor and Outdoor										
Audits for Residential Homes Tier 4	4	$75.00	13,922	$300	$2,700	$0.19	$2.41	$2.22	$33,609	$30,909
Audits for Homes Built prior to 1994	53	$75.00	24,966	$3,974	$35,764	$1.43	$2.41	$0.98	$60,270	$24,507
20% Rebate	14	20% of annual water bill	Can not quantify	Total annual rebate amount varied from $1,717 to $119 from 2003 to 2005.	Total annual rebate amount varied from $1,717 to $119 from 2003 to 2005.	n/a	$2.41	n/a	n/a	n/a

Table 7-3 Analysis of Conservation Measures and Programs

Measures	Target Number of Units per Year	Cost per Unit	Total Savings of Program During Planning Period 1000 Gal	Costs of Conservation Program/Measures		Analysis of Cost Effectiveness			Net Benefit of Conservation	
				Total Annual Cost of Measure	Total cost of Measure/Program for Planning Period[1]	Cost of Water Saved by the Measure[2] $/1000 GAL	Simple Incremental Supply Cost[3] $/1000 GAL	Cost Comparison[4] $/1000 GAL	Estimated value of water saved by measure based on incremental supply costs[5]	Net Value of Water Saved by Measure[6]
The Ridge Golf Course										
Water Audit for the Ridge Golf Course	1	$400.00	Can not quantify	$200	$2,000	n/a	$2.41	n/a	n/a	n/a
Reuse on Ridge Golf Course	n/a	n/a	782,042	$86,025	$860,247	$1.10	$0.90	-$0.20	$703,838	-$156,408
HOA Irrigation										
Audits for HOAs	11	$100.00	16,006	$1,100	$9,900	$0.62	$2.41	$1.80	$38,640	$28,740
Sod Replacement HOA	194,931	$0.40	78,947	$77,972	$701,752	$8.89	$2.41	-$6.47	$190,588	-$511,164
Conservation Rate Structure										
Increasing Block Rate Structure	n/a	n/a	200,263	Assume zero net change from 2003 - costs included in O&M Budget	$0	$0.00	$2.41	$2.41	$483,458	$483,458
Leak Detection for District Water Distribution System										
Sonic Leak Detection Program	n/a	n/a	55,388	$5,000	$45,000	$0.81	$2.41	$1.60	$133,713	$88,713
Public Education Program										
Existing and new measures	n/a	n/a	55,388	$50,000	$450,000	$8.12	$2.41	-$5.71	$133,713	-$316,287
District Irrigation Water Conservation Efforts										
Irrigation Efficiency for Parks and Drip Irrigation	n/a	n/a	31,086	$0	$0	$0.00	$2.41	$2.41	$75,046	$75,046

Table 7-3 Analysis of Conservation Measures and Programs

Measures	Target Number of Units per Year	Cost per Unit	Total Savings of Program During Planning Period 1000 Gal	Costs of Conservation Program/Measures		Analysis of Cost Effectiveness			Net Benefit of Conservation	
				Total Annual Cost of Measure	Total cost of Measure/Program for Planning Period[1]	Cost of Water Saved by the Measure[2] $/1000 GAL	Simple Incremental Supply Cost[3] $/1000 GAL	Cost Comparison[4] $/1000 GAL	Estimated value of water saved by measure based on incremental supply costs[5]	Net Value of Water Saved by Measure[6]
Irrigation Efficiency for Open Space	n/a	n/a	65,965	$2,500	$22,500	$0.34	$2.41	$2.07	$159,248	$136,748

1 The planning period is for 10 years from 2006 to 2015.
2 Total cost of the measure/program divided by the gallons of water saved.
3 The cost per gallon to produce water (conveyance, treatment, etc). See Table 4-5 in Section 4.3 for more details.
4 The difference in the simple incremental supply (cost to produce water) and the cost of water saved.
5 The simple incremental supply cost multiplied by the amount of water saved. This is the costs saved by conserving water.
6 The difference of the estimated value of water saved by measure based on incremental supply costs and the Total cost of Measure/Program for Planning Period. This is the net cost benefit of conserving water.

Table 7-4 Comparison of Benefits and Costs of the Conservation Measures and Programs

Conservation Measure/Program	Total cost of Measure/Program for Planning Period[1]	Anticipated Average Annual Water Savings 1000 gal	Cost of Water saved by the measure $/1000 gal	Net Benefit of Implementing the Measure/Program	Net Benefit Ranking
Rebate Program - Indoor Fixtures and Appliances					
Low Flow Toilets	$47,685	1,087	$3.37	-$13,576	9
Low Usage Washers	$49,088	1,306	$2.89	-$8,096	13
Hot Water Recirculation System	$14,025	Can not quantify	n/a	n/a	n/a
Showerheads	$2,525	1,238	$0.23	$24,383	8
Faucets	$12,623	442	$3.17	-$3,013	11
Residential Outdoor					
Rain Sensor	$14,025	238	$4.53	-$6,553	12
Irrigation Clock	$14,726	663	$1.71	$6,073	10
Sod Replacement – Residential	$784,080	9,801	$8.89	-$571,133	18
ET Controller	$35,343	133	$29.50	-$32,450	14
Residential Indoor and Outdoor					
Audits for Residential Homes at Tier 4	$2,700	1,547	$0.19	$30,909	5
Indoor and Outdoor Audits for Homes Built prior to 1994	$35,764	2,774	$1.43	$24,507	7
20% Rebate	Total annual rebate amount varied from $1,717 to $119 from 2003 to 2005.	Can not quantify	n/a	n/a	n/a
The Ridge Golf Course					
Water Audit for the Ridge Golf Course	$2,000	Can not quantify	n/a	n/a	n/a
Reuse on Ridge Golf Course	$860,247	78,204	$1.10	-$156,408	15
HOA Irrigation					
Audits for HOAs	$9,900	1,778	$0.62	$28,740	6
Sod Replacement – HOA	$701,752	8,772	$8.89	-$511,164	17
Conservation Rate Structure					
Increasing Block Rate Structure	$0	18,463	$0.00	$483,458	1
Leak Detection					
Sonic Leak Detection Program	$45,000	6,154	$0.81	$88,713	3
Public Education Program					
Existing and new measures	$450,000	6,154	$8.12	-$316,287	16
District Irrigation Water Conservation Efforts					
Irrigation Efficiency for Parks and Drip Irrigation	$0	3,109	$0.00	$75,046	4
Irrigation Efficiency for Open Space	$22,500	6,597	$0.34	$136,748	2

[1] The planning period is for 10 years from 2006 to 2015.

These programs ranked the highest because there is no or very little cost to implement the program. For the purposes of this analysis, it was assumed that there are no costs for the increasing block rate structure or for the District irrigation efficiency (for both the parks and open space). Although technically there are costs associated with facilitating these programs (e.g. operating the billing system and irrigating the parks), these costs are necessary regardless of the conservation effort. The assumed zero costs for this analysis reflects the notion that costs for specifically having the increasing block rate structure or for implementing more efficient irrigation techniques is included within the District's general capital and operations and maintenance budget. It is assumed that no additional costs specific to these conservation efforts are accrued. Unlike the other programs discussed above, the sonic leak detection does have a program cost, yet the program ranks high because the cost for the program is much lower than the cost savings of conserving water.

Programs that provided the greatest water savings include the following:

- Reuse of reclaimed water to irrigate the Ridge Golf Course
- Increasing block rate structure
- Sod Replacement for HOAs and residential

The Sod Replacement Program was evaluated further to assess how the rebate amount affects the net benefits. It was assumed that five acres of sod per year are replaced with xeriscape. The analysis shows that net benefits are highly dependent on the cost of water production, duration of program, and the rebate amount. Figures 7-1 and 7.2 show the net benefits in relation to rebates and program duration assuming the water production costs presented in these analyses and also assuming an increase in water production costs, respectively. Figure 7-1 shows that when the water production is at relatively current levels (assuming costs for well production does not significantly increase) there are no net benefits. Figure 7-2 shows that at a higher water production costs, the net benefits are higher, pending on the duration of the program and rebate amount. Programs with low rebates tend to begin receiving net benefits sooner than programs of higher rebates. However, the level of participation in the program will depend on the amount of rebate. If rebates are too low, there is not enough incentive for customers to participate in the program. Programs of longer duration tend to provide the greatest net benefits in the long-term. However this also assumes that once sod is replaced with xeriscaping, the xeriscaping remains perpetually. There is no guarantee that this would occur, given that people often redo their landscaping and/or sell their homes. New homeowners may not favor xeriscaping and return to a sod landscape.

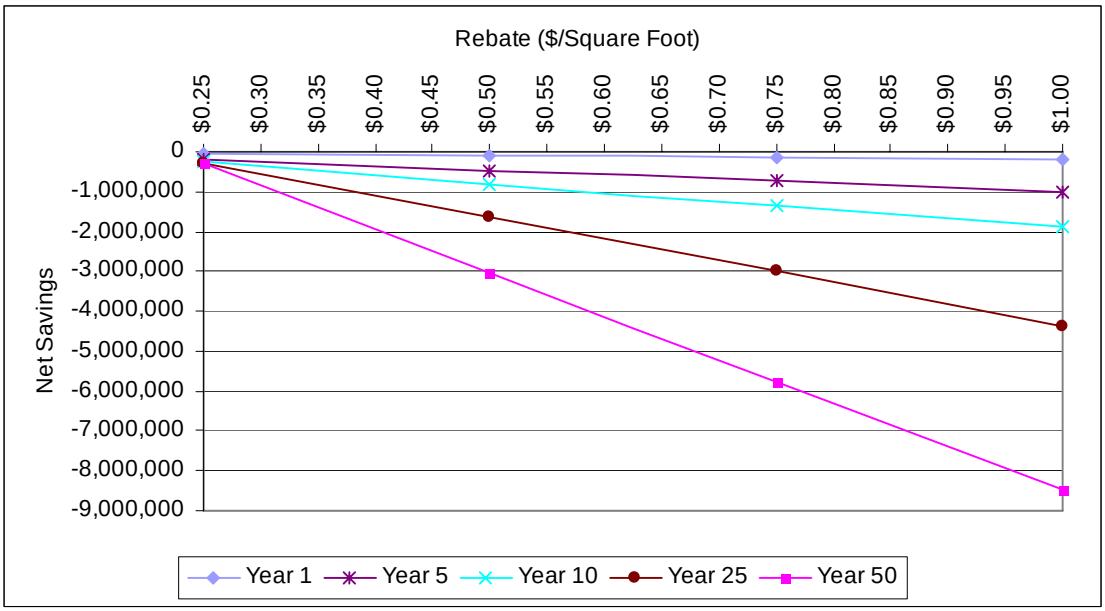


Figure 7-1
Net Benefits of the Sod Replacement Program Assuming Water Production Costs Remain Relatively Stable

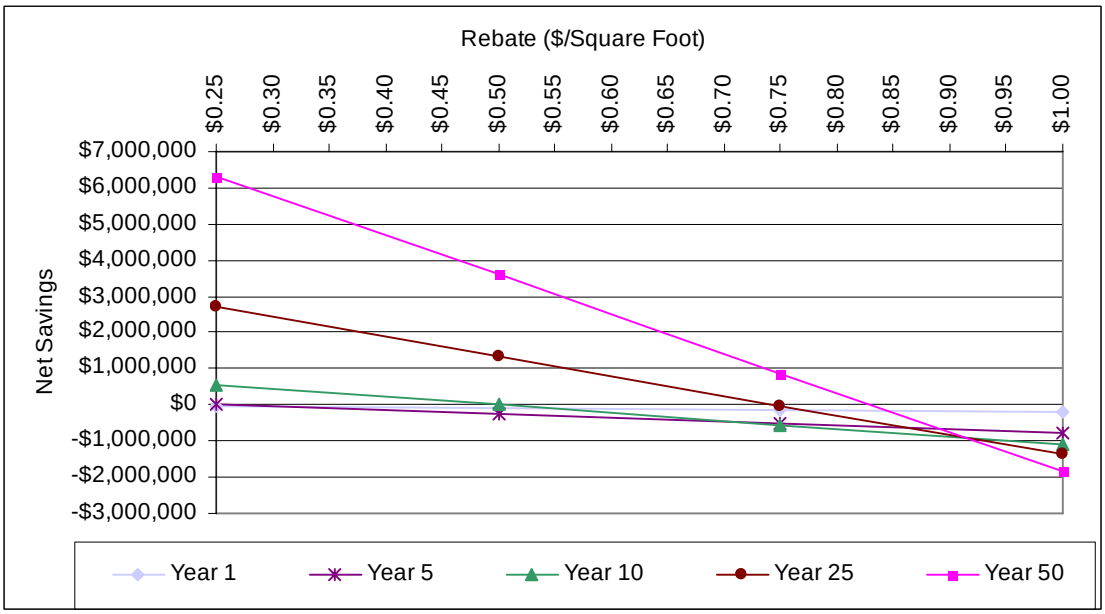


Figure 7-2
Net Benefits of the Sod Replacement Program Assuming Water Production Costs Significantly Increase

Figure 7-2 shows that the break even point for net benefits after 10 years is about $0.50 per square foot, assuming the costs of water production significantly increase. A rebate of $0.40/square foot was chosen for both the HOA and residential District programs. The timing on when net benefits will be accrued depends on the number of participants and water production costs.

7.4 Evaluation Criteria

As shown in Table 7-4, many of the programs do not provide an economic benefit. This is because the cost of producing water is low when compared to the costs of implementing a conservation program/measure. Programs may not initially provide a net benefit, but because the annual water savings are cumulative. In the long-term, the water savings will likely outweigh the initial costs of the program/measures. For example, the Sod Replacement Program would initially cost more than the monetary value of the water savings. However, as the amount of xeriscaped landscape increases each year and the cost of water production increases, the water savings increases and ultimately exceeds the one time rebate costs.

Criteria were developed for selecting and eliminating the conservation measures and programs evaluated in Section 7.3. The economic net benefits were factored into the selection process; however, they were not the main reason why certain measures/ programs were chosen or eliminated. Several programs that did not provide an economic benefit were chosen because of the estimated amount of water savings was relatively large or that eventually the measure/program would likely provide an economic benefit as the cost of water production increases. Programs selected for implementation met at least two of the following criteria:

- *Criteria 1* – Conservation measure or program will contribute to meeting the conservation goals outlined in Section 5.1.
- *Criteria 2* – Conservation measure or program will likely provide a long term net economic benefit as the cost of water production increases.
- *Criteria 3* - Conservation measure or program provides substantial water savings.
- *Criteria 4* – Conservation measures does not meet any of the elimination criteria.

The following criteria were used to eliminate programs:

- *Criteria 5* – Conservation measure is low in the relative ranking and does not provide substantial water savings.
- *Criteria 6* – It is uncertain whether savings are acquired from the conservation measure.

7.5 Selection of Conservation Measures and Programs

The criteria in Section 7.4 were used to either select or eliminate the conservation programs and conservation measures. Table 7-5 shows which criteria applied to each measure/program and the estimated average daily demand savings. Maximum daily demand reductions could not be estimated given that it is unclear how these conservation measures/program will impact peak demands.

Table 7-5 Selection of Conservation Measures/Programs and Estimated Water Savings

Measure/Program	Selected	Primary Criteria for selecting or rejecting the conservation measure/program for implementation	Estimated average day reduction in demand for selected measures/programs (1000 gal per day)
Rebate Program - Indoor Fixtures and Appliances			
Low Flow Toilets	**X**	Criteria 1, 2, and 4	3.0
Low Usage Washers	**X**	Criteria 1, 2, and 4	3.6
Hot Water Recirculation System		Criteria 5	Unknown
Showerheads	**X**	Criteria 1, 2, and 4	3.4
Faucets		Criteria 6	1.2
Residential Outdoor			
Rain Sensor	**X**	Criteria 1, 2, and 4	1.3
Irrigation Clock	**X**	Criteria 1, 2, and 4	1.8
ET Controller	**X**	Criteria 1, 2, and 4	0.4
Sod Replacement – Residential	**X**	Criteria 1, 3, and 4	26.9
Residential Indoor and Outdoor			
Audits for Residential Homes at Tier 4	**X**	Criteria 1, 2, and 4	4.2
Indoor and Outdoor Audits for Homes Built prior to 1994	**X**	Criteria 1, 2, and 4	7.6
20% Rebate	**X**	Criteria 1 and 4	Unknown
The Ridge Golf Course			
Audit	**X**	Criteria 1, 3, and 4	Unknown
Reuse on Ridge Golf Course	**X**	Criteria 1, 3, and 4	214.3
HOA Irrigation			
Audits for HOAs	**X**	Criteria 1, 2, and 4	4.9
Sod Replacement – HOA	**X**	Criteria 1, 3, and 4	24.0
Conservation Rate Structure			
Increasing Block Rate Structure	**X**	Criteria 1, 2, 3, 4	50.6
Leak Detection			
Sonic Leak Detection Program	**X**	Criteria 1, 2, and 4	16.9
Public Education Program - Existing and new measures	**X**	Criteria 1, 2, and 4	16.9
District Irrigation Water Conservation Efforts			
Irrigation Efficiency for Parks and Drip Irrigation	**X**	Criteria 1, 2, and 4	8.5
Irrigation Efficiency for Open Space	**X**	Criteria 1, 2, and 4	18.1

The majority of measures/programs were selected for implementation. Programs that were not selected for implementation included the hot water recirculating system, the tankless hot water heater, and the faucet rebates. The faucet rebate was eliminated because it was among the lowest on the relative net benefit ranking for both the groundwater and surface water alterative as well as providing little water savings. Furthermore, there is lack of assurance that replacement of a faucet would provide water savings. Customers could purchase a new faucet, receive the rebate, and then remove the aerator eliminating water savings. The hot water recirculating system and tankless hot water heater were eliminated because studies are unclear on whether these systems provide water savings. Although the systems provide immediate access to hot water, this does not guarantee that this shortens the amount of time people run the water. Section 9.1 provides further information on the scheduling and implementation of the selected conservation measures.

Section 8
Integrate Resources and Modify Forecasts

In this section the projected demands are revised in to include conservation and the benefits associated with conservation. The potential reduction in operation costs and water right purchases are also discussed.

8.1 Revised Demand Forecast

The conservation measures and programs selected for implementation in Section 7.5, are estimated to provide water savings ranging from 130 to 280 AFY over the planning period. However, there is likely some overlap of water savings for various programs. For instance, the savings acquired from public education, rebates, audits and sod replacement on single family homes could be contributed to the combined effects of all these programs and the savings may not be as high as indicated when evaluated independently. Furthermore, the saving estimates assume that a certain amount of rebates are distributed annually. Saving estimates could be significantly lower, if the level of participation is not as high as assumed for this analysis. To compensate for these factors, the total estimated annual savings has been reduced by 20 percent, providing an estimated water savings range of 100 to 220 AFY.

Table 8-1 shows the differences in daily demands with and without conservation. This analysis indicates that conservation measures selected in this Plan may reduce average day demands by 8 percent in 2010 and by 11 percent in 2015. It is uncertain how the conservation measures/program will affect peak day demands. The monitoring data, discussed in Section 9.2, may be useful in providing more accurate estimations than presented in Table 8-1 at a later date.

Table 8-1 Modified Demand Forecast

Item	2005	2010	2015
Average-day demand before conservation (1,000 gal/day)	1,435	1,769	1,788
Average-day demand after conservation		1,621	1,591
Reduction in average-day demand (1,000 gal/day)		147	198
Maximum-day demand before conservation (1,000 gal/day)	4,330	5,338	5,397
Maximum-day demand after conservation (1,000 gal/day)		4,896	4,804
Reduction in maximum-day demand (1,000 gal/day)		442	593
Ratio maximum-day to average-day demand before conservation (1,000 gal/day)	3.0	3.0	3.0
Ratio maximum-day to average-day demand after conservation (1,000 gal/day)		3.0	3.0

*Assumed ratio maximum-day to average-day demand before and after conservation is the same for before and after new conservation efforts. This ratio was used to estimate peak day reductions with conservation.

8.2 Identification of Project-Specific Savings

The implementation of this Plan will not significantly affect future capital expenditures associated with the development of groundwater supplies or surface water supplies. Although water savings have been estimated to the best of accuracy given the data available, there is not enough certainty in the data to support water capacity design decisions. For instance, the estimates assume that a specified number rebates are distributed every year. This number could vary pending on customer behavior. Conservation monitoring data, discussed in Section 9.2 will provide further insight into customer behavior and more accurate estimates of savings will be possible in the future.

However, conservation savings could affect annual operating costs as well as the amount of water rights purchased. Savings would reduce the amount of well pumping, if the system if relying on groundwater. If surface water supplies are acquired, conservation savings could reduce the amount of surface water needed, reducing costs associated with pumping and storing the water. Substantial conservation savings could also reduce the amount of water rights that need to be purchased. Table 8-2 summarizes the potential cost savings is surface water supplies were brought online.

Table 8-2 Changes to Project

Item	Project capacity (daily)	Project Costs	
		Total capital costs ($)	Annual operating costs ($)
CAPITAL PROJECT IS ELIMINATED			
Original project	n/a	n/a	n/a
Savings from elimination	n/a	n/a	n/a
CAPITAL PROJECT IS DOWNSIZED			
Original project	n/a	n/a	Energy costs for pumping and maintenance
Downsized project	n/a	n/a	Reduction in energy costs
Savings from downsizing	n/a	n/a	Potential reduction
CAPITAL PROJECT IS POSTPONED			
Present value of original project		n/a	n/a
Present value of postponed project		n/a	n/a
Savings from postponement		n/a	n/a
NEED FOR PURCHASED WATER IS REDUCED			
Original estimate of purchases (AFY)	5.5		2,000
Revised estimate of purchases (AFY)	5.5		~1,800
Savings from reduced purchases (AFY)	5.5		~200

8.3 Revised Supply-Capacity Forecast

As discussed in Section 8.2, conservation savings will not significantly affect future capital expenditures and consequently will not affect future design supply-capacity of a surface water supply system.

8.4 Summary of Forecast Modifications and Benefits of Conservation

Figure 8-1 shows the projected demands with and without conservation as well as an assumed surface water supply capacity of 2,000 AFY and reuse of 240 AFY. Projected demands with conservation were estimated by subtracting the total of the water saving estimates presented in Section 7.2. As discussed in Section 8.1, these water estimates were reduced by 20 percent to compensate for overlapping demands and uncertainty on the level of customer participation.

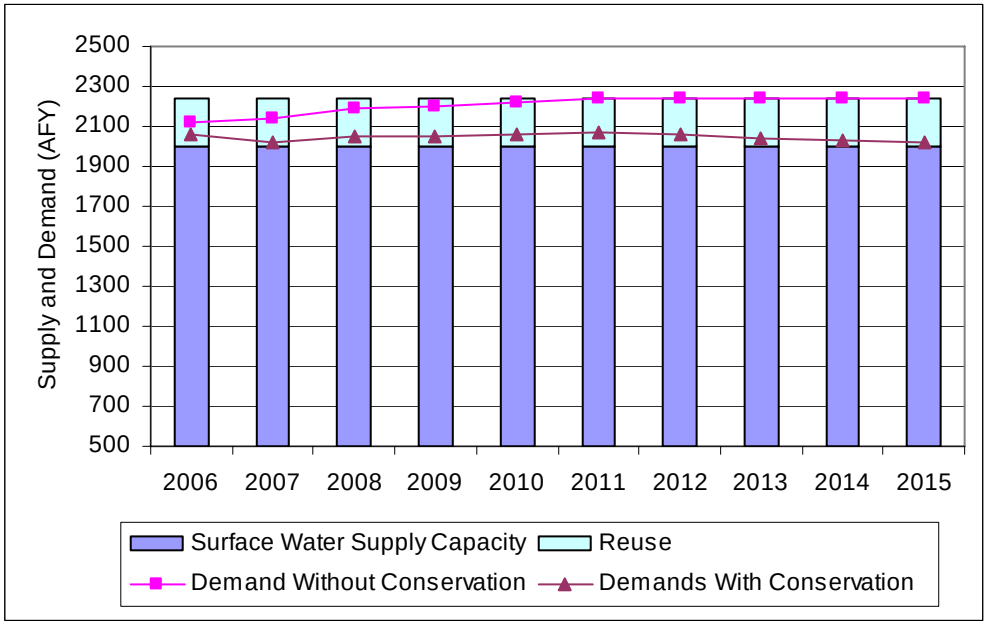


Figure 8-1
Supply and Projected Demands with and without Conservation

As discussed in Section 8.2, conservation will not significantly affect future capital expenditures or the timing of development of new infrastructure. However, conservation can reduce the amount of water consumed and consequently the operation and maintenance costs to produce treated drinking water. Significant conservation savings may also reduce the amount of water rights that are needed to be purchased for surface water supplies.

8.5 Revenue Effects

Conservation can reduce the amount of revenue received by the District. As the amount of water used by customers decreases, the less revenue the District receives. Figure 8-2 shows projected revenues based on projected demands with and without conservation. It is assumed that the District charges an average of $3.67 per 1,000 gallons for water. This price was derived by calculating a weighted average of 2006 tiered water rates and the projected amount of usage per tier.

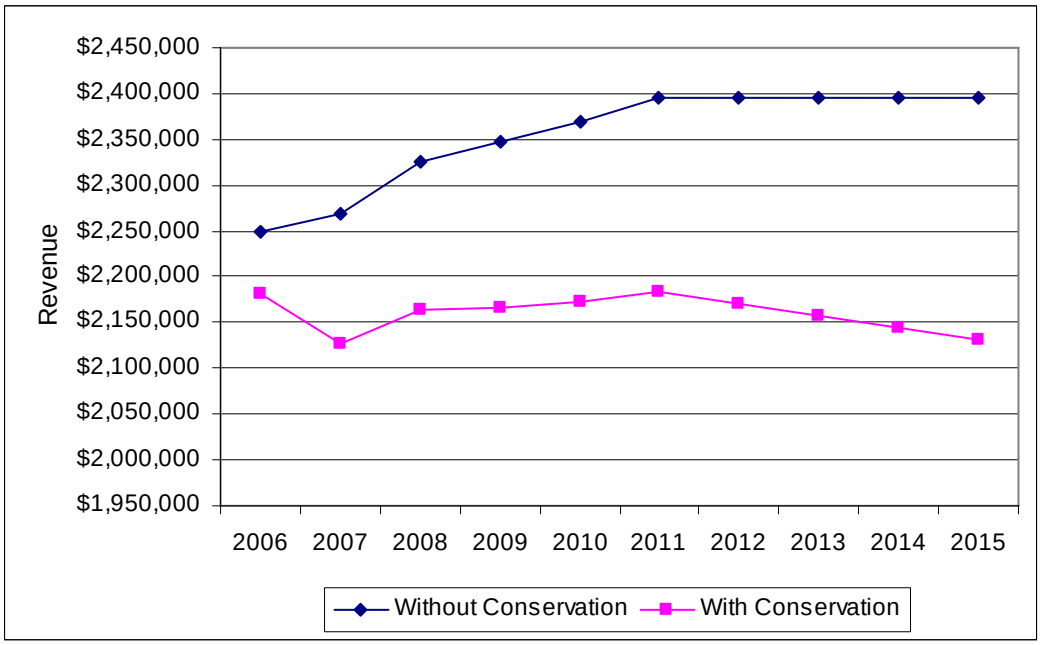


Figure 8-2
Project Annual Revenues based on 2006 Water Rate and Projected Demands with Conservation

These data indicates that the District will receive less revenue with conservation than without. However, this assumes that the conservation savings estimated in this Plan are obtained and that the 2006 water rates do not change. In order to make up for the loss of revenue, the District may need to raise water rates. However, the District may also save money through the reduction of operational costs and purchases of water rights. Capital and operation expenditures as well as projected revenues are evaluated on a yearly basis. Water rates will only be raised if it is necessary to meet future expenses.

Section 9
Implementation Plan

This section provides a schedule on when the selected conservation plans and measures are to be implemented as well as identifies the public participation and monitoring processes. It also defines when the Plan will be revised to incorporate new data and the efforts of the District to acquire a surface water supply.

9.1 Implementation Schedule

Table 9-1 provides an implementation schedule for the selected conservation measures and programs. All new measures and programs are to be implemented in 2007. Key actions required to initiate and or continue existing programs are provided.

Table 9-1 Implementation Schedule for Measures and Programs

Measure/Program	Required Action	Beginning Date
Rebate Program - Indoor Fixtures and Appliances		
Low Flow Toilets	Continue to advertise rebates through public education program. This could include newsletters, bill inserts, and the website.	Existing Measure
Low Usage Washers	Continue to advertise rebates through public education program. This could include newsletters, bill inserts, and the website.	Existing Measure
Showerheads	Introduce rebate through public education program. This could include newsletters, bill inserts, and the website.	2007
Rebate Program - Residential Outdoor		
Rain Sensor	Continue to advertise rebates through public education program. This could include newsletters, bill inserts, and the website.	Existing Measure
Irrigation Clock	Continue to advertise rebates through public education program. This could include newsletters, bill inserts, and the website.	Existing Measure
ET Controller	Introduce rebate through public education program. This could include newsletters, bill inserts, and the website.	2007
Sod replacement – residential	Introduce rebate through public education program. This could include newsletters, bill inserts, and the website.	2006 or 2007
Residential Indoor and Outdoor		
Audits for Residential Homes at Tier 4	Hire a company that conducts water audits. Identify residential customers that exceeded Tier 4 in 2006. Contact these customers and inform them that they may receive a water audit for free. If they agree to participate, schedule an audit.	2007
Indoor and Outdoor Audits for Homes Built prior to 1994	Hire a company that conducts water audits. Identify contact information for residential homes older than 1994. Contact these customers and inform them that they may receive a water audit for free. If they agree to participate, schedule an audit.	2007
20% Rebate	Continue to advertise rebates through public education program. This could include newsletters, bill inserts, and the website.	Existing Measure
The Ridge Golf Course		
Water Audit for the Ridge Golf Course	Hire a company that conducts water audits. Contact the Ridge Golf Course and inform them of the water audit program.	2007

Table 9-1 Implementation Schedule for Measures and Programs

Measure/Program	Required Action	Beginning Date
Reuse on Ridge Golf Course	Reuse was implemented in prior years. Continued maintenance required.	Existing Measure
HOA Irrigation		
Audits for HOAs	Hire a company that conducts water audits. Contact the HOAs and inform them that they may receive a water audit for free. If they agree to participate, schedule an audit.	2007
Sod Replacement – HOA	Introduce rebate through public education program. This could include newsletters, bill inserts, and the website.	2006 or 2007
Conservation Rate Structure		
Increasing Block Rate Structure	Continue to explain rate structure in bill inserts/newsletters on at least an annual basis.	Existing Measure
Leak Detection		
Sonic Leak Detection Program	Hire firm to conduct sonic leakage program and educate the public on program.	2007
Public Education Program		
Existing and new measures	Hire a programmer to develop the web based water audit. Increase frequency of bill inserts (every other month) and newsletters (every three months). Develop an annual public meeting plan at the beginning of each year. This plan should identify the meeting dates and items to be discussed at each meeting. Notify public of the opportunity to report water wasting by calling a hotline. Post the phone number on the website. Develop a schedule and materials for the Waterwise Program. Certify instructors. Advertise the Program.	New measures begin in 2007
District Irrigation Water Conservation Efforts		
Irrigation Efficiency for Parks and Drip Irrigation	Continue current irrigation schedule and evaluate what additional modifications can be made to improve irrigation. This may includes water audits and/or sod replacement.	Existing Measure
Irrigation Efficiency for Open Space	Continue current irrigation schedule and evaluate what additional modifications can be made to improve irrigation. This may includes water audits and/or sod replacement.	Existing Measure

The following items were identified in Section 6.3 as items that would not be evaluated in the Conservation Plan, but that are standard practices of the District and would be included in the final implementation plan. These items are existing programs and do not require any new significant actions beyond existing operations and management.

- Watering Restrictions
- Leak Repair on District's Water Distribution System
- Volume Billing
- Meter Source Water
- Meter Service Connections
- Metering of District Irrigation
- Turf Restrictions and Landscape design/layout

9.2 Plan for Public Participation in Implementation

The public will play a key role in the effectiveness of the Plan. The success of conservation measures and programs depends on how the public responds to the measures. The more engaged the community is in altering their behavior to conserve water and participate in the conservation rebate programs, the more effective the conservation measures and programs will be.

The District will continue to implement a public education program educating the public on why and how they may conserve water and the incentives offered to encourage conservation throughout the community. Historically the District has provided three or four public meetings a year and provided newsletters and bill inserts as well. Annual monitoring results on the effectiveness of the conservation programs and measures will be conveyed to the public through these mediums. The District plans to continue these programs.

It is also important to establish a means where feedback from the public on the conservation measures and programs may be received. The public will have the opportunity to provide input during public meetings, through email and mail correspondence, and through the annual election process. The District will also conduct a telephone every 2 years to 200 to 300 customers. The survey will evaluate customer response to topics such as conservation, groundwater and surface water supplies, and the flow of information from the District to the customer. Public feedback will help the District take to into account the community's values when making important water management decisions.

9.3 Plan for Monitoring and Evaluating Processes

One of the conservation goals of this Plan is to establish an effective monitoring and evaluation process. Data limitations were a challenge in the development of this Plan. This was mainly attributed to the short implementation period of the conservation measures and the change in the billing system which limited data available on demands by customer type. As the District begins to acquire more data, trends between demands and conservation measures/programs may be established improving the ability to assess the effectiveness of the Plan.

The collection and organization of data is instrumental in the success of this monitoring plan. Data shall be collected on the following:

- Daily well production by well including production for the Ridge Golf Course and storage in the two water storage tanks
- Daily applications of reclaimed water on the Ridge Golf Course
- Billing system data including metered demands and costs
- Daily wastewater and water treatment production

- Daily operations of the surface water supply system when applicable
- Annual costs of each conservation measure/program. This also includes the number of distributed rebates and costs for each rebate.
- Number of square feet xeriscaped on residential properties and HOA as well as the cost of each rebate.
- Data on development within the service area. This includes the number of new homes built, commercial properties developed, and acres of new irrigated lands.
- Efforts by the District to conserve water. This may be improvements to the existing irrigation system and watering schedule.
- Feedback from the public. These may include comments from public meetings, correspondence, survey results, etc that provides valuable information on the public's perception of the conservation measures/programs.
- Additional information that may provide valuable insight for the development of a new conservation program

These data will be organized and consolidated in a standardized filing system. Billing data will be downloaded on an annual basis and electronically stored in a format that is easily accessible.

These data will be analyzed on an annual basis to assess the effectiveness of conservation measures/programs. This analysis will include the following elements:

- Accounting of water distribution system – The well production and metered water usage will be compared to evaluate conveyance system losses and unaccounted for water. This information may provide insight into the effectiveness of the leakage detection program.
- Total annual demand data and well production data – These data will be compared to the water conservation goal (Section 5.2) targeting a water savings of 175 to 220 AFY based on 2003 demand patterns. Given that actual demands may differ from the projected 2003 demand projections, previous annual well production and demand data should be included in the assessment to provide an additional reference point. Other factors besides conservation (e.g. weather patterns and changes to surface water supply) should also be disclosed.
- Monthly demand data – This may include monthly well production data and monthly surface water supplies (when applicable). Annual trends in monthly data over the duration of the planning period should be evaluated. For example, conservation measures targeting outdoor use may reduce monthly demands during the summer.

- Per capita demands – These data should be compared to water conservation target of 16 to 20 gpcd (based on 2003 demand patterns and population at buildout). Given that actual demands may differ from the projected 2003 demand projections, previous per capita demand data should be included in the assessment to provide an additional reference point.

- Annual District irrigation usage – These data should be compared to the water conservation target of 5.9 AFY. Information on the amount of irrigation on open space and parks, effort to improve irrigation efficiency, and landscape changes should be disclosed.

- Billing data on metered usage by customer class – The current billing system categorizes customers based on their assigned water budget. See Section 2.1. Total annual usage by these customer categories should be downloaded, and over time, trends may be identified indicating how effective conservation measures are on specific customer category.

- Conclusions – Conclusions from the results presented above will be developed. Successes as well as areas where improvements may be made will be identified. Public feedback as well as staff input will be incorporated into the conclusions. An action plan addressing concerns will be developed for the following year.

9.4 Plan for Updating and Revising the Conservation Plan

Colorado's Water Conservation Statute requires that a covered entity revise their conservation plan at a minimum of every 7 years. The District plans on revising this Plan no later than June of 2012. However, data will be collected and analyzed on an annual basis according to Section 9.3. If monitoring results and/or changes in the water supply system warrant a revised conservation plan prior to the 7 year time period, the District will modify the plan accordingly.

The modified Plan will incorporate findings of the annual data collection and analyses specified in Section 9.4. Historical demand trends, water savings, and conservation costs will be assessed to evaluate the performance of existing conservation measures/programs and identify where changes can be made. Additional conservation measures/programs will also be evaluated and considered for inclusion into the new Plan. Changes in the water supply and wastewater systems will also be included in the analysis.

9.5 Plan Adoption Date, Plan Completed Data, Approved Date

The CPN Conservation Plan was adopted by the District on June 19, 2006. Appendix B provides the formal documentation approving the Plan.

Appendix A
Public Review Process

Appendix A
Public Review Process

Summary of Public Review Process

The District adopted the Conservation Plan on June 19, 2006 at a Public Hearing. A copy of the approval document is provided in Appendix B. Prior to approval, the public had an opportunity to review and provide comments on the Plan. This public outreach is outlined below.

- 30-day Public Review Resolution - On March 20, 2006, the District adopted a resolution on the public review process for adopting water conservation and other water plans. This resolution stipulates that a minimum of a 30-day review public review process is required before a conservation or water plan may be approved by the District. The public has the opportunity to provide comments and feedback that shall be considered for incorporation into plans. A copy of this resolution is provided in Appendix C.

- Public Meeting - A public meeting was held on April 12, 2006. This meeting presented information on the IWRP as well as the Conservation Plan. Information on the existing conservation program, water supply and demand data, conservation goals, evaluation of the conservation measures and programs, as well as the selected conservation measures and programs were presented. The public was also provided with a general overview on CWCB's Water Conservation Plan Guidelines and notified of the public review process.

- Public Review Period – A public review period was held from May 9, 2006 to the Public Hearing on June 19, 2006. The public was notified via two emails of the opportunity to review and provide comments on the Plan. The Plan was available on the District's website and also hard copies were available at the District's office.

- Public Hearing – A public hearing was held on June 19, 2006. This meeting was posted via email to the public. Meeting attendees had the opportunity to provide comments and ask questions. The Conservation Plan was approved pending that comments received during the public review period and during the public hearing were addressed. A copy of the public comments as well as responses is provided in Appendix D.

Appendix B
Adoption of the Castle Pines North Conservation Plan

Appendix B
Adoption of Castle Pines North Conservation Plan

CASTLE PINES
NORTH
METROPOLITAN DISTRICT

June 27, 2006

Veva McCaig
Section Chief
Office of Water Conservation and Drought Planning
Colorado Water Conservation Board
1313 Sherman St., Rm 721
Denver, CO 80203

Dear Ms. McCaig:

A special public hearing on the proposed Castle Pines North's Water Conservation Plan (Plan) was held on June 19, 2006. Attendees had the opportunity to ask questions and provide comments on the Plan. Following this special hearing, the District Board of Directors convened their regularly scheduled meeting. During the meeting, the Board moved to approve the Plan on the condition that the applicable comments provided at the meeting and during the public review process were incorporated into the Plan. The motion passed unanimously.

Sincerely,
Janet Burnham
Janet Burnham
District Administrator/Secretary to the Board

7404 Yorkshire Dr. Castle Rock, Colorado 80108
(303) 688-8550 Fax (303) 688-2529
cpnmd@cpnmd.org

D R A F T – NOT APPROVED

CASTLE PINES NORTH METROPOLITAN DISTRICT

REGULAR MEETING MINUTES

June 19, 2006

HELD: Monday, June 19, 2006 at 7:00 p.m. at the Castle Pines North Community Center, 7404 Yorkshire Drive, Castle Rock, Colorado.

ATTENDEES: Directors Cortney Brand, Mark Shively, Bruce Thompson were present. Director Ted Lohr arrived at 7:40 p.m. due to travel. Also in attendance were District Manager Jim McGrady, District Administrator Janet Burnham, District Utilities Superintendent Andrew Romano, District Parks and Open Space Manager Charlie Fagan, and District Counsel John Hayes. Accountants Jason Carroll and Cheryl Mitchell were present, as well. Nine residents also attended. Director Brown Eyes was absent (excused).

CONFLICTS: None

APPROVAL OF AGENDA: Approved

QUORUM: Present

PUBLIC COMMENT: Various issues, presented by resident John Ewing, regarding engineering work and water rights were addressed.

ACTION ITEMS:

Director Shively moved to approve the minutes of the regular meeting of May 22, 2006. The motion was seconded by Director Brand and passed unanimously (3 – 0).

Following a review of the monthly financial report by Jason Carroll, a motion was made by Director Shively to approve the May financial report. Director Thompson seconded the motion and all voted in favor (3 – 0).

Director Shively moved to approve the May payables in the amount of $406,090.20. The motion was seconded by Director Thompson and approved by all (3 – 0).

D R A F T – NOT APPROVED

Having received comments from the public at the hearing held just prior to the regular Board meeting, Director Shively moved to approve the Castle Pines North Metropolitan District's Water Conservation Plan prepared in accordance with CWCB's Water Conservation Plan Development Guidelines.

Conservation Board's 2005 Guidelines. Director Thompson seconded the motion and all voted in favor (3 – 0).

Subsequent to a review of historical precedence, Director Shively moved to approve the issuance of a water tap at no charge to the Coyote Crossing Homeowners' Association. The tap will be valid for a period not to exceed three years and is intended for the purpose of establishing self-sustaining landscaping only. The motion was seconded by Director Brand and passed 3 – 0. Director Lohr abstained since he arrived after discussion of the issue.

A subsequent motion was made by Director Shively to direct Counsel to draft a resolution regarding District policy on no-charge water taps. The resolution is intended to establish that the District is under no obligation to provide such taps, historical precedence notwithstanding. Director Thompson seconded the motion and it passed by a vote of 3 – 0. Director Lohr abstained.

DISCUSSION ITEMS:

By consensus, the Board agreed that it would meet in a workshop for the purpose of providing background information to the new Members and to initiate future planning. It was agreed that they would meet at the District office from 1 – 5 pm on Wednesday, July 5th, pending Director Brown Eyes' availability. A back up date of Friday, July 7th was established. Direction was given to Manger McGrady to confirm the date with all Board members and Counsel.

After a presentation by Gardner Turfgrass, Inc., in conjunction with CoCal Landscape, the Board reached a consensus to test a low maintenance turf called Reveille. The one-acre test site would be in the area of the Monarch Boulevard roadside improvements project where there have been problems establishing new landscaping.

In appreciation of the efforts made by various homeowners' associations to replace blue grass turf with xeriscaping, the Board will present commemorative plaques to the HOA's at the regular August meeting. Direction was given to Staff accordingly.

D R A F T – NOT APPROVED

A field trip for the District and Master Homeowners' Association Boards to tour the Reuter-Hess reservoir site was tentatively set for Wednesday, July 5th, following the Board workshop. Manager McGrady will confirm pending availability of Parker Water & Sanitation staff.

Manager McGrady's management/staff update included:

- upgrade to Lift Station 3 is complete;
- the new streetlight at Hidden Pointe should be functioning by June 23rd

Resident Janet Connor informed the Board that, due to numerous sightings of wildcats in the area, the Master Homeowners' Association will be hosting a meeting for residents on co-existing with wildlife. There will also be a meeting with the South Metro Fire Department and the Douglas County Emergency Preparedness to establish emergency evacuation plans.

Direction was given to Manager McGrady to draft a formal written arrangement with Castle Pines Metropolitan District regarding back-up water supplies. Staff was also directed to research costs and benefits of transfer switches versus permanent back-up generators at the wells and the water treatment plant.

At 8:50 p.m. Director Shively made a motion to go into executive session per §24-6-402(4)(e) – Negotiations. The motion was seconded by Director Thompson and all voted in favor.

The regular session was reconvened at and forthwith adjourned at

D R A F T – NOT APPROVED

Appendix C
30-Day Public Review Process Resolution

Appendix C
30-Day Public Review Process Resolution

RESOLUTION NO. 2006-004
SERIES OF 2006

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE CASTLE PINES NORTH METROPOLITAN DISTRICT ESTABLISHING A PUBLIC HEARING PROCESS FOR MATTERS INVOLVING ADOPTION OF WATER CONSERVATION AND OTHER WATER PLANS

WHEREAS, the Board of Directors of the Castle Pines North Metropolitan District desires to formulate and adopt a public hearing process which will be applicable to the consideration and adoption of water conservation and other water development plans and projects so that reasonable opportunities will be available for the input of public comment by members of the Castle Pines North community and for receipt and consideration of such input by members of the Board of Directors as to the creation and implementation of water conservation and other water development plans and projects.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE CASTLE PINES NORTH METROPOLITAN DISTRICT, AS FOLLOWS:

Section 1. In all matters involving the creation, adoption and/or implementation of a water conservation plan or a plan for any water development project, the staff of the District is directed to post a copy or detailed summary of such proposed plan, and to place a notice of any scheduled public hearing on such plan, on the Districts' website no less than 30 days prior to the date of such scheduled public hearing.

Section 2. During the 30 day notice period identified in Section 1 of this Resolution, the District shall maintain a copy of the proposed plan in the District office, which copy of such proposed plan shall be available for review by any member of the general public during regular District business hours.

Section 3. Any property owner or resident of the Castle Pines North Metropolitan District may submit written comments relating to such proposed plan during the 30 day review period identified and established herein. In addition, any such resident or owner may appear at the scheduled public hearing and provide verbal comments relating to such plan.

Section 4. Any written or verbal comments received either within the 30 day notice period or at the public hearing shall be considered by the Board of Directors in making its decision as to adoption of such proposed plan.

3/17/06
2006-004 PUBLIC HEARING PROCESS.DOC

PASSED, ADOPTED AND APPROVED this 20th day of March 2006.

CASTLE PINES NORTH
METROPOLITAN DISTRICT

By: _____
Mark Shively, President

ATTEST:

_____
James C. McGrady, District Manager

3/17/06
2006-004 PUBLIC HEARING PROCESS.DOC

Appendix D
Public Comments

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This appendix provides comments and responses from members of the public. Comments were received via email and at the public hearing. Responses to the comments are in italic format.

1) On page ES-2, the section titled 'Profile of Proposed Facilities': should this section/paragraph be deleted? This paragraph is identical to the first paragraph on the previous page (page ES-1).

Paragraph was modified. It was disclosed that conservation will be a component of the IWRP.

2) On page 4-4, I have some questions on Table 4-1:

   2a) Why are the Capital Costs the same from years 2011 through 2015? I would expect sharp rises and falls in capital costs relative to major capital improvement projects.

   - I thought that because the groundwater level is dropping, we will have to install additional wells, probably pipelines to the Rueter Hess reservoir, and probably water treatment plant upgrades. The paragraph immediately above Table 4-1 states "It is important to note that assuming groundwater levels continue to decline, the expense of additional wells and pumping could significantly increase in the long term." But the table doesn't appear to indicate increased capital costs for new projects.

Economic analysis in Table 4-1 was updated to analysis conducted for IWRP. Capital costs from 2011 through 2015 increase in new analysis.

   2b) Why don't the Operating Costs change from years 2011 through 2015?

   - Since the groundwater level is dropping, we either use more power to pump the same amount of water higher, or we pump less water and have to power new well facilities to get more water (however no new facility costs appear to be shown in the capital cost column - see comment 2.a). The paragraph immediately above the table states "It is important to note that assuming groundwater levels continue to decline, the expense of additional wells and pumping could significantly increase in the long term." But the table doesn't indicate a consistent increase in operating costs due to new wells. Are we assuming the conservation efforts will reduce water demand by an amount equal to the reduced well production rates?

Economic analysis in Table 4-1 was updated to analysis conducted for IWRP. O&M costs from 2011 through 2015 increase in new analysis.

2c) Why bother having both the 'Undiscounted total annualized incremental cost' column and the 'Present value of supply cost in nominal dollars' column if they're the same numbers? It's not clear to me why the report has distinguished between an "escalation rate" and a "discount rate". The report uses a simple (and appropriate) economic analysis, so there is no need to complicate it with two different terms that yield the same result in the end: the result is I = 0.05. Describing the terms separately seems an unnecessarily confusing exercise in semantics. Consider deleting the last column with the duplicate numbers. Consider deleting the future worth costs unless they are used elsewhere in the report.

Economic analysis in Table 4-1 was updated to analysis conducted for IWRP. There are more details presented in table.

2d) Table 4-1's column headings all sound very technical but are confusing because of it. Consider renaming the columns to make the table more readable to a broader audience. For example, the 'annualized' nature of the figures is indicated by the years listed in the first column, so labeling the column as such is unnecessary. Consider renaming the columns FROM:

Annualized incremental capital cost, Annual operating cost, Un-discounted total annualized incremental cost, Escalated value of supply cost in nominal dollars, Present value of supply cost in nominal dollars (delete this column per comment 2.c?)

(Note: 'Annualized incremental' is redundant - choose one, the other, or neither.)

(Note: for consistency, the third and fourth columns should both use either 'Annualized' or 'Annual' - using both is confusing, as it implies there is a difference.)

(Note: I would think 'Un-discounted total annualized incremental cost' should actually be labeled 'Un-escalated total annualized incremental cost' per the supplied logic to make it easier to understand. Also "in nominal dollars" should probably be added to the end.)

TO: Capital Costs in Nominal Dollars, Operating Costs in Nominal Dollars, Total Costs in Nominal Dollars, Total Escalated Costs, Total Costs in Nominal Dollars (delete this column per comment 2.c?)

OR, if the future worth costs aren't necessary elsewhere in the report, rename the columns TO: Capital Costs, Operating Costs, Total Costs (and add a table footnote indicating all costs are in nominal dollars)

Economic analysis in Table 4-1 was updated to analysis conducted for IWRP. Column headings were changed.

3) On page 7-2, for Table 7-2, can additional calculation description be provided? The calculations are difficult to follow. Please consider the following:

3a) On Low Flow Toilets: does the Target Number of Units per year number listed of 48 mean that 48 toilets will be replaced, or that 48 homes will replace all of their toilets? If the latter, then an estimate of number of toilets per home is necessary to complete the water savings calculation per the method shown in the report. 1.7% of 3,261 = 55.4, which is significantly more than 48.

The target water number of units means the number of homes where toilets would be replaced. (See comment 3c in regards to the number of Target Number of Units). Given that historically the majority of homes that have received a toilet rebate only purchased one toilet, water savings presented in the public review draft may be overestimating the water savings. This is because there is no guarantee that residents would purchase low flush toilets for their entire home. Water savings calculations assume that all residents within a home would use low flush toilets. Residents may still use their higher flush toilets further reducing water savings. In order to compensate for this, changes were made to the toilet retrofit water savings calculations. Water savings were multiplied by a reduction factor of 50% (water savings are reduced by one half).

3b) On Low Flow Toilets: The Calculation of Water Savings column shows how to calculate the gallons saved/home/day - this is different from the listed savings units of gallons saved/year.

- I tried to see if I could "flush" the method out myself: First I reviewed the information provided. The Assumptions column indicates 5 flushes/person/day, 2.88 people/home, and a 1.9 gallon/flush savings with low flow toilets. The Calculation of Water Savings column indicates the average flush/person/day x average people per home x gallons/flush savings with low flow toilets = gallons saved/home/day. Using the numbers provided, this equals 5 x 2.88 x 1.9 = 27.36 gallons saved/home/day.

- Then I tried to calculate the Annual Savings in 2005 number listed of 180,000 gallons saved per year. Assume the intent of the 1.7% Annual Penetration is that 1.7% of the 3,261 homes at build out will install low flow toilets each year during the 10 year period of this evaluation. This implies that all 479 homes built prior to 1994 will install low flow toilets in the next 10 years (applying the reports assumption that 17% pf the build out homes were constructed prior to 1994 - see comment 3.c below). That would mean 1.7% x 3,261 = 55.4 homes per year will install low flow toilets. This is higher than the Target Number of Units

per year listed of 48 (refer to comment 3.a above). 27.36 gallons saved/home/day x 55.4 homes x 365 days/year = 553,616 gallons saved per year. This is 3 times higher than the listed number.

The calculation/assumption columns pertain to water savings per unit. Actual water savings presented in the table are cumulative water savings where savings acquired through previous year retrofits/conservation measures are added to savings acquired for the year presented in the table. The calculation columns were simplified to show per unit savings, given that a description of cumulative calculations would be far too detailed and confusing for the reader. The title of the calculation column was renamed to Calculation of Water Savings per Unit. Explanation was added in text saying that water savings presented in the table are cumulative.

3c) On Low Flow Toilets: the Assumptions column indicates 17% of the build out homes were constructed prior to 1994 (refer to Table 7-2 footnote 1). Table 2-1 on page 2-3 indicates 479 homes were constructed up to 1994, and the table indicates 3,261 homes at build out. This percentage (479 / 3261) equals 14.7 percent, which is lower than the listed number of 17 percent.

The 17% is based on the number of 2,805 single family homes (this does not include townhomes or apartments shown in Table 2-1). Single family homes were chosen because it is assumed that there are 2.88 people per single family home. This may not be applicable to townhomes and apartments. The majority of townhomes and apartments were constructed post 1994. A footnote was added to explain penetration rate in Table 7-2.

3d) On Low Usage Washers: The Calculation of Water Savings column shows how to calculate the gallons saved/home/day - this is different from the listed savings units of gallons saved/year, however given 52 weeks/year this is an easy calculation.

- First I reviewed the information provided. The Assumptions column indicates 7 washes/week, and a 15 gallon/wash savings with low usage washers. The Calculation of Water Savings column indicates the average washes/week/household x gallons/wash savings with low usage washers = gallons saved/week. I believe this actually should read "gallons saved/week/household". Using the numbers provided, this equals 7 x 15 = 105 gallons saved/week/household.

- Then I tried to calculate the Annual Savings in 2005 number listed of 437,000 gallons saved per year. Assume the intent of the Target Number of Units per year means 39 households per year. That would mean 105 x 52 x 39 = 212,940 gallons saved per year. This is 2 times lower than the listed number.

- Can clarification be provided on what the Annual Penetration of 1.4% means?

The calculation/assumption columns pertain to water savings per unit. Actual water savings presented in the table are cumulative water savings where savings acquired through previous year retrofits/conservation measures are added to savings acquired for the year presented in the table. The calculation columns were simplified to show per unit savings, given that a description of cumulative calculations would be far too detailed and confusing for the reader. The title of the calculation column was renamed to Calculation of Water Savings per Unit. Explanation was added in text saying that water savings presented in the table are cumulative.

Table 4-1 is the basis for Table 4-3, the District's present value costs over the next 10 years. Table 7-2 is the basis for Table 7-3, the analysis of conservation measures and programs, which is used to compare and prioritize the evaluated measures. After noticing the issues I commented on above, I did not review the entire document out of concern for the report's economic calculations.

I assume the document will receive a thorough review for sentence structure and meaning clarification prior to final release. For example, on page ES-1, in the first sentence, the first occurrence of "Basin" should probably be deleted. On page ES-1, in the second sentence, the word "in" should probably be added after 'increase'. On page ES-1, in the third sentence, it is unclear if the second occurrence of "these" refers to existing wells or to new wells - presumably new, such that I might suggest replacing "groundwater but these wells" with "groundwater, however new wells".

Suggested changes were incorporated into revised text.

4) I have briefly reviewed the Draft Plan. I have run out of time, and will send you what I have. In particular the Cost Table 4-1 received only a brief glance. One wonders what the basis is for the annualized capital costs.

5) Overall I thought CDM did a fine job. Though I was surprised at the new information that is not in the IWRP reports. For example, metering of Metro water only started recently. It is a Draft report and I am sure that some of my comments will be caught in the CDM review process.

6) Having been around for too many years I wonder how much 'muscle' is in the Plan, or will it be filed at the State level and gather dust.

7) On page 9-5 it states that an annual review will be conducted. However there is not enough detail to determine if there is any enforcement and audit in the process.

This is more of a policy question for CWCB. No changes were made.

8) There is an inconsistency in values in many places.

The majority of this inconsistency is a lack of understanding of terms and how certain calculations were made. Clarification was provided were it was noted in Walt's hard copy comments.

9) Water rates for ALL consumers should be given, not just for residential customers. Yes, about 2/3' rds of the water is used by residents, but there is a potentially large savings in the water for open spaces, metro district land including the Club house.

The presentation of water rates for ALL customer types is not necessary given that although the water budgets differ, the water rates are the same for all customers. This point was added to the text.

10) I am neutral on recirculating hot water lines. From studies I have seen they are only of a cost-benefit for new construction, and since CPN is essentially built out there would be little application.

The recirculating hot water lines are being taken out of CPN's existing conservation program. They are not in the implementation plan presented in this Plan.

11) There always seems to be the topic of expansion of CPN in the background. This report, except for CC-20, is silent on this topic.

The expansion of CPN was not included in the Conservation Plan given the uncertainty of how much CPN would expand and the timing of this expansion. The IWRP will address the expansion. The Conservation Plan will need to be revised within the next 7 years (given CWCB guidelines). If applicable, expansion of CPN will be addressed in the revision.

12) How much did and does the 240 ac-ft or so of water cost the Metro district? This should be put to rest once and for all.

The cost is presented in Table 7-3. The Annual cost for pumping 240 AF is $86,025 at $1.10 per gallon.

These and other comments are noted on noted on the sheets that I am delivering to your office

These comments were mainly editorial and incorporated into the document. A hard copy of the comments is available.

13) Clarify where the District is responsible for leak detection.

This was clarified.

14) Sod replacement and water audits should be incorporated into District irrigated lands as well as resident and HOA property.

This was incorporated.