FINAL

CITY OF UKIAH
2005 URBAN WATER MANAGEMENT PLAN

Prepared for
City of Ukiah, California
November 26, 2007

201 North Civic Drive
Walnut Creek, California 94596

Tel: (925) 937-9010
Fax: (925) 937-9026
www.brownandcaldwell.com

BROWN AND CALDWELL

December 4, 2007

Ms. Ann Burck
City of Ukiah
411 Clay Street
Ukiah, California 95482

11/128619-001.5

Subject: City of Ukiah
Urban Water Management Plan

Dear Ms. Burck:

Brown and Caldwell is please to submit this Urban Water Management Plan, which was adopted by the Ukiah City Council on November 26, 2007. Please do not hesitate to contact me if you have any questions or comments at (925) 210-2432

Very truly yours,

BROWN AND CALDWELL

Timothy R. Banyai
Project Manager

cc: File

03/28/02 p:\128000\128619 - ukiah uwmp\draft report - november 2007\cvr letter.doc/trb

FINAL

CITY OF UKIAH
2005 URBAN WATER MANAGEMENT PLAN

Prepared for
City of Ukiah, California
November 26, 2007

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY R. BANYAI
No. C 60715
Exp. 12/31/08
CIVIL
STATE OF CALIFORNIA

Dec. 4, 2007

Timothy R. Banyai, PE
EIC: California PE C60715

BROWN AND CALDWELL

201 N. Civic Drive Walnut Creek, California 94596

TABLE OF CONTENTS

LIST OF FIGURES V

LIST OF TABLES V

LIST OF ACRONYMS VII

EXECUTIVE SUMMARY ES-1
- Water System ES-1
- Recycled Water ES-4
- Historical and Projected Water Use ES-5
- Water Supply Versus Demand Comparison ES-6
- Demand Management Practices ES-6

1. INTRODUCTION 1-1
- 1.1 Purpose 1-1
- 1.2 Urban Water Management Planning Act 1-1
- 1.3 Previous Reports 1-1
- 1.4 Public Participation 1-2
- 1.5 Agency Coordination 1-2

2. DESCRIPTION OF EXISTING WATER SYSTEM 2-1
- 2.1 Description of Service Area 2-1
- 2.2 Environmental Setting 2-1
  - 2.2.1 Geography 2-1
  - 2.2.2 Climate 2-4
  - 2.2.3 Hydrology 2-4
- 2.3 Water Supply Facilities and Sources 2-5
  - 2.3.1 Surface Water (Ranney collector and Wells 3 and 5) 2-5
  - 2.3.2 Groundwater 2-6
  - 2.3.3 Water Rights 2-7
  - 2.3.4 Transfers and Exchanges 2-8
- 2.4 Distribution System 2-8

3. WATER SUPPLY QUANTITY AND QUALITY 3-1
- 3.1 Surface Water 3-1
  - 3.1.1 Description 3-1
  - 3.1.2 Physical Constraints 3-1
  - 3.1.3 Regulatory and Legal Constraints 3-2
- 3.2 Groundwater 3-3
  - 3.2.1 Description 3-3
  - 3.2.2 Physical Constraints 3-5
  - 3.2.3 Regulatory and Legal Constraints 3-5

3.3 Desalination 3-6
3.4 Transfer and Exchange Opportunities 3-6
3.5 Water Rights 3-6
3.6 Current and Projected Water Supplies 3-6
3.7 Water Supply Reliability and Vulnerability 3-8
3.7.1 Reliability Comparison 3-8
3.7.2 Wholesaler (Agency) Water Supply Projections 3-10
3.8 Water Quality 3-10
3.8.1 Water Quality of Existing Water Supply Sources 3-11
3.8.2 Water Quality Effects on Water Management Strategies 3-11
3.9 Water Shortage Contingency Plan 3-12
3.9.1 Estimate of Minimum Water Supply for Next Three Years 3-12
3.9.2 Stages of Actions 3-13
3.9.3 Prohibitions, Penalties and Consumption Reduction Methods 3-14
3.9.4 Mechanisms for Determining Actual Reductions 3-15
3.9.5 Revenue and Expenditure Impacts during Shortages 3-15
3.9.6 Catastrophic Supply Interruption Plan 3-16
3.10 Attachment - Effect of Reduced Eel River Imports on Future Water Supply for City of Ukiah Urban Water Management Plan – Prepared by Wagner and Bonsignore 3-16

4. RECYCLED WATER 4-1
4.1 Agency Coordination 4-1
4.2 Wastewater Quantity, Quality, and Existing Uses 4-1
4.3 Current and Projected Recycled Water Use 4-5
4.4 Recycled Water for Agricultural Irrigation 4-6
4.5 Optimization Plan with Incentives 4-7

5. HISTORICAL AND PROJECTED WATER USE 5-1
5.1 Employment, Land Use, and Population 5-1
5.2 Historical Water Use 5-2
5.2.1 Water Use By Connections 5-2
5.2.2 Water Sales to Other Agencies 5-4
5.2.3 Unaccounted-for Water and Additional Water Use 5-4
5.2.4 Total Water Use 5-5
5.3 Water Demand Summary 5-5

6. WATER SUPPLY VERSUS DEMAND COMPARISON 6-1
6.1 Current and Projected Water Supplies vs. Demand 6-1
6.2 Water Shortage Expectations 6-2
6.3 Water Shortage Summary 6-3

7. DEMAND MANAGEMENT PRACTICES 7-1
7.1 California Urban Water Conservation Council 7-1
7.2 Methodology and Assumptions 7-2
7.2.1 Value of Conserved Water 7-3

7.3 Current Water Conservation Program 7-4
7.4 Economic Analysis Results 7-8
7.5 Non-quantifiable DMMs 7-8
7.6 Additional Issues 7-9

APPENDIX A ..... A
California Department of Water Resources Review Sheets ..... A

APPENDIX B ..... B
Public Hearing Notices ..... B

APPENDIX C C
Emergency Interconnection Agreement (July 1, 2002) C

APPENDIX D ..... D
California Department of Water Resources Bulletin 118 ..... D

APPENDIX E ..... E
Water Shortage Emergency Plan ..... E

APPENDIX F ..... F
Demand Management Measure Economic Analysis ..... F

APPENDIX G ..... G
Resolution to Adopt the Urban Water Management Plan ..... G

APPENDIX H ..... H
Effect of Reduced Eel River Imports on Future Water Supply for the City of Ukiah Urban Water Management Plan - Prepared by Wagner and Bonsigore ..... H

APPENDIX I I
Response to Comments I

REFERENCES REF-1

LIST OF FIGURES

Figure 2-1. City of Ukiah Map 2-2
Figure 2-2. City of Ukiah Sphere of Influence Map (Map provided by Wagner and Bosignore) 2-3
Figure 2-3. Ranney Collector Site 2-6
Figure 2-4. System Hydrualic Profile 2-9
Figure 4-1. Ukiah Wastewater Treatment Plant Service Area 4-2
Figure 4-2. City of Ukiah Wastewater Treatment Plant 4-4

LIST OF TABLES

ES-1. Summary of Economic Analysis Results (DWR Table 16) ES-6
Table 1-1. Coordination with Appropriate Agencies (DWR Table 1) 1-4
Table 2-1a. Climate (DWR Table 3)* 2-4
Table 2-1b. Climate Continued (DWR Table 3)* 2-4
Table 3-1. Groundwater Pumping Rights – AFY (DWR Table 5) 3-4
Table 3-2. Amount of Groundwater Pumped – AFY (DWR Table 6) 3-4
Table 3-3. Amount of Groundwater Projected to be Pumped - AFY (DWR Table 7) 3-5
Table 3-4. Opportunities for Desalinated Water (DWR Table 18) 3-6
Table 3-5. Transfer and Exchange Opportunities - AFY (DWR Table 11) 3-6
Table 3-6. Future Water Supply Projects (DWR Table 17) 3-7
Table 3-7. Current and Planned Water Supplies - AFY (DWR Table 4) 3-7
Table 3-8. Projected Normal Water Supply – AFY (DWR Table 40) 3-8
Table 3-9. Basis of Water Year Data (DWR Table 9) 3-8
Table 3-10. Supply Reliability - AFY (DWR Table 8) 3-9
Table 3-11. Description of the Factors in Inconsistency of Supply (DWR Table 10) 3-9
Table 3-12. Wholesaler Identified & Quantified the Existing and Planned Sources of Water- AFY (DWR Table 20) 3-10
Table 3-13. Wholesale Supply Reliability - Percent of Normal AFY (DWR Table 21) 3-10
Table 3-14. Factors Resulting in Inconsistency of Wholesaler's Supply (DWR Table 22) 3-10
Table 3-15. Current & Projected Water Supply Changes due to Water Quality – Percentage (DWR Table 39) 3-11
Table 3-16. Three-Year Estimated Minimum Water Supply - AF Year (DWR Table 24) 3-13
Table 3-17. Water Supply Shortage Stages and Conditions (DWR Table 23) 3-13
Table 3-18. Consumption Reduction Methods (DWR Table 27) 3-14
Table 3-19. Mandatory Prohibitions (DWR Table 26) 3-14
Table 3-20. Penalties and Charges (DWR Table 28) 3-15
Table 3-21. Water Use Monitoring Mechanisms (DWR Table 31) 3-15
Table 3-22. Proposed Measures to Overcome Revenue Impacts (DWR Table 29) 3-15
Table 3-23. Proposed Measures to Overcome Expenditure Impacts (DWR Table 30) 3-16
Table 3-24. Preparation Actions for a Catastrophe (DWR Table 25) 3-16
Table 4-1. Participating Agencies (DWR Table 32) 4-1
Table 4-2. Wastewater Collection and Treatment – AFY (DWR Table 33) 4-4

Table 4-3. Disposal of Wastewater (non-recycled) – AFY (DWR Table 34) 4-4
Table 4-4. Recycled Water Uses – Actual and Potential (AFY) (DWR Table 35) 4-5
Table 4-5. Projected Future Use of Recycled Water in Service Area – AF Year (DWR Table 36) 4-6
Table 4-6. Recycled Water Use – 2000 Projection Compared with 2005 Actual – AFY (DWR Table 37) 4-6
Table 4-7. Methods to Encourage Recycled Water Use (DWR Table 38) 4-7
Table 5-1. Population – Current and Projected (DWR Table 2) 5-2
Table 5-2. Average People Per Connection 5-2
Table 5-3. Average Demand Per Connection (AFY/connection) 5-3
Table 5-4. Past, Current and Projected Water Deliveries (DWR Table 12) 5-3
Table 5-5. Sales to Other Agencies - AF Year (DWR Table 13) 5-4
Table 5-6. Agency demand provided to wholesaler suppliers (DWR Table 19) 5-4
Table 5-7. Additional Water Uses and Losses – AFY (DWR Table 14) 5-4
Table 5-8. Total Water Use - AFY (DWR Table 15) 5-5
Table 6-1. Projected Normal Water Supply – AF Year (DWR Table 40) 6-1
Table 6-2. Projected Normal Water Demand – AF Year (DWR Table 41) 6-1
Table 6-3. Projected Supply and Demand Comparison – AF Year (DWR Table 42) 6-1
Table 6-4. Projected Single Dry Year Water Demand – AF Year (DWR Table 45) 6-2
Table 6-5. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2010 – AF Year (DWR Table 48) 6-2
Table 6-6. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2015 – AF Year (DWR Table 51) 6-2
Table 6-7. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2020 – AF Year (DWR Table 54) 6-3
Table 6-8. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2025 – AF Year (DWR Table 57) 6-3
Table 6-9. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2030 – AF Year (DWR Table 60) 6-3
Table 7-1. Water Conservation Demand Management Measures 7-1
Table 7-2. Definition of Terms Used in the Economic Analysis 7-2
Table 7-3. City of Ukiah Water Utility – Proposed Water Rates 2004/05 – 2008/09 7-4
Table 7-4. Summary of Economic Analysis Results (DWR Table 16) 7-8

LIST OF ACRONYMS

Act	Urban Water Management Planning Act
ADWF	average dry weather flow
AF	acre-feet
AFY	acre-feet per year
AWT	advanced wastewater treatment
AWWA	American Water Works Association
Basin Plan	Water Quality Control Plan for North Coast Region
cfs	cubic feet per second
CII	commercial, industrial, and institutional
CIMIS	California Irrigation Management Information System
City	City of Ukiah, California
County	Mendocino County
CUWCC	California Urban Water Conservation Council
CWD	County Water District
DHS	California Department of Health Services
CDPH	California Department of Public Health
EBRR	East Branch Russian River
FERC	Federal Energy Regulatory Commission
Flood Control District or District	Mendocino County Russian River Flood Control and Water Conservation Improvement District
FWR	Filtered Water Reservoir
DMM	Demand Management Measure
Dr	Drive
DWR	California Department of Water Resources
e.g.	for example
EIR	Environmental Impact Report
Etc.	ecetera
ETo	evapotranspiration
Forks	West and East Forks of the Russian River
gpm	gallons per minute
HSP	High Service Pumps
k	thousand
Lake	Lake Mendocino
lb/day	pounds per day
MCL	maximum contaminant levels
mg	million gallons
mgd	million gallons per day
MOU	Memorandum of Understanding
MSL	mean sea level
N/A	Not Applicable
Notification Plan	Water Quality Emergency Notification Plan
NPDES	National Pollutant Discharge Elimination System
No.	Number
PG&E	Pacific Gas and Electric
Plan	Urban Water Management Plan
ponds	evaporation / percolation ponds

Proj.	Project
Regional Water Board	North Coast Regional Water Quality Control Board
river	Russian River
Sta.	Station
SCADA	Supervisory Control and Data Acquisition
SOI	Sphere of Influence
State	State of California
State Water Board or SWRCB	State Water Resources Control Board
ULFT	Ultra Low Flush Toilets
UVSD	Ukiah Valley Sanitation District
UWMP	Urban Water Management Plan
WTP	water treatment plant
WWTP	wastewater treatment plant

EXECUTIVE SUMMARY

This 2005 Urban Water Management Plan (UWMP) for the City of Ukiah (City), California is an update to the UWMP adopted by the City Council in 2002. The UWMP is prepared in compliance with the Urban Water Management Planning Act (California Water Code Division 6, Part 2.6, Sections 10610 through 10657). This act requires that all urban water suppliers providing water for municipal purposes to more than 3000 customers or supplying more than 3000 acre-feet annually prepare an UWMP update every five years.

The goal of the UWMP is to assure that every effort is made to provide the appropriate level of reliability in water service to meet the needs of the various customers during normal, dry, and multiple dry years. The UWMP documents the City's planning activities for the next 25-years to ensure that this goal is met. The UWMP is submitted to the California Department of Water Resources (DWR) for general compliance with the Urban Water Management Planning Act.

The following sections provide a summary of this UWMP.

Water System

Chapters 2 and 3 of the UWMP present a description of the City's existing water supply and treatment facilities, water rights, and distribution system. Water supply is defined as the amount of water available from a source or combination of sources (e.g., streams, rivers, ponds, lakes, groundwater, etc.) for use by a water purveyor. Water supplies from the Russian River and its underflow are subject to the State Water Resources Control Board (SWRCB or State Water Board) requirements outlined in the City's water right permit. A water right permit or license provides the legal entitlement to divert water from a defined channel by a user from a specified source (water supply) for a beneficial, non-wasteful, use. The permit or license spells out the point of diversion, place of use, purpose of use, the amount or rate of water that can be diverted, and the time allowed for putting water diverted under the permit to beneficial use. Sources, such as percolating groundwater, that are not from the Russian River or its underflow, do not require a permit or license issued by the State Water Board.

In this plan, references to "groundwater" will include both percolating groundwater, which does not require an appropriative water rights permit from the State Water Board and groundwater flowing in a definite channel, which does require a permit. References to "percolating groundwater" will only refer to groundwater not requiring a permit. References to "underflow" will refer to groundwater flowing in a definite channel that does require a permit. Just as a water right permit or license restricts the amount of water available for use, pumping and treatment capacity can also limit the amount of water that can be diverted from a water supply. Pumping capacity is the amount of water the City can physically divert using its diversion works (wells, pumps, storage tanks, etc.) under its water right permit or from non-permitted sources such as percolating groundwater or water subject to pre-1914 water rights. The pumping capacity is dependent on the pump flow rating and aquifer yield. The water treatment and its capacity are regulated by the strict requirements of the California Department of Health Services (DHS).

Water Supply. The City obtains its water supply from groundwater sources under the direct influence of the Russian River, which in this report are treated as surface water sources and one groundwater well which is recognized as percolating groundwater. The pumping sources for the distribution system consist of a Ranney collector and two wells (Wells 3 and 5), which are considered surface water diversions subject to the requirements of the City's water right permit, and one percolating groundwater well (Well 4).

Wells 1, 2, and 6 are no longer used by the City. Well 1 has been out of service since the 1970's. Wells 2 and 6 (Water from Well 6 was pumped into Well 2) were removed from the City's latest domestic water supply permit and may no longer be used as a source of supply. Wells 2 and 6 had to be taken out of service during construction of the new 1.5 million gallon clearwell for the Water Treatment Plant. If a water supply well is removed from service for more than a year, it must comply with current DHS standards. The cost to rehabilitate the wells to meet DHS standards, which would require installation of an annular seal and electrical upgrades make it economically infeasible to return these wells to service. The pumping capacity of Wells 2/6 is only 50 gallons per minute (gpm). Even though it is not cost effective to rehabilitate Wells 2/6 for the City's water supply, Well 6 could be used in its present condition to irrigate the adjacent softball complex fields, which would reduce the potable water used for irrigation.

The Ranney collector, which provides the source of water for the water treatment plant (WTP), has an existing pumping capacity of 3,400 gpm or 4.8 million gallons per day (mgd). The available capacity of the Ranney collector is significantly less than the designed capacity of 13 mgd, which is equal to the City's water right. The maximum capacity obtained from the Ranney collector was 9 mgd, well below its design capacity. The Ranney collector has steadily declined from 9 mgd to its current capacity of 4.8 mgd. The significant loss in capacity of the Ranney collector may be a result of changes in the Russian River channel moving away from Ranney collector and the compaction of clays and silts in the riverbed over the Ranney collector. Another concern is the Ranney collector can only be used approximately six months a year during the drier weather months. During the rainy months, the turbidity in the Russian River increases, which increases the turbidity of the water in the Ranney collector. The Microfloc contact clarification-filtration units located at the WTP cannot be operated efficiently under high turbidity conditions. It is not possible to rely on the Ranney collector as a water supply source during the winter when the turbidity of the Russian River is high.

Well 3 has a pumping capacity of 650 gpm. It is available for use throughout the year.

Well 4 has a pumping capacity of 800 gpm. It is available for use throughout the year.

Well 5 has a pumping capacity of 300 gpm. Well 5 is located near the Ranney collector. When the Ranney collector and Well 5 are used at the same time, the pumping capacity of Well 5 is reduced because it is within the cone of water draw down depression of the Ranney collector. Also, Well 5, like the Ranney collector, can be affected by high turbidity in the Russian River. Therefore, Well 5 is used during the winter when the Ranney collector is not used.

The total pumping capacity of the City's water system during the dry months is approximately 4,850 gpm or 6.98 mgd. Most of this water (3,400 gpm) is provided by the Ranney collector. The typical peak day water demand during the dry months is approximately 6 mgd and the peak water demand has been as high as 7.677 mgd (Summer 2000). If the Ranney collector was lost, Well 5 would be operated, but it only has a pumping capacity of 300 gpm. The City does not have the redundant pumping capacity to meet peak demands without the Ranney collector in service. During the rainy months, when the Ranney collector can not be used because of the high turbidity, the pumping capacity is approximately 1,750 gpm or 2.52 mgd. The typical peak day water demand during the rainy months is 2 mgd. The loss of any pumping capacity during the winter months puts the City in a difficult position to meet peak water demands.

Drought conditions also affect the pumping capacity of the water supply system, especially the surface water supplies. The City is evaluating the addition of two groundwater wells to increase the water supply and provide reliability and redundancy to the water supply system.

The Potter Valley Project diversion from the Eel River watershed to the Russian River watershed by Pacific Gas and Electrical (PG&E) has recently been reduced by an estimated 26 to 33 percent. This diversion has been ongoing for almost 100 years with agricultural, municipal, and commercial economies relying on this diversion. A preliminary analysis was conducted to determine the effect reductions in flow would have on

Lake Mendocino, the Russian River, and the City's water supply. The results of the preliminary analysis show that sufficient water supply is available to meet the City's current and projected water demand over the next twenty years and that increased diversions by the City will only have minor effects on Lake Mendocino. The City is exploring opportunities with other agencies to develop a more accurate computer model to predict the impact of reduced Eel River diversions on water users. As new information becomes available, the UWMP should be revised as necessary. The entire analysis for the Eel River diversions is located at the end of Chapter 3 and also Appendix H.

The analysis is based on a continuation of diversions from the Eel River at the reduced rate and continuing releases from Lake Mendocino that, at least, comply with the minimum flow requirements in Water Board Decision 1610. If the Eel River diversion is further curtailed in the future or if Decision 1610 and the operation of Lake Mendocino is significantly changed in the future, additional analysis of those changes would be required. The City's water supply could be significantly affected by such changes.

Water Treatment Facilities. In 1992, the City constructed a water treatment facility for water from the Ranney collector. The water treatment plant is regulated by the DHS. DHS promulgates regulations for public water supply systems, including primary drinking water standards. The water treatment facility has a capacity to treat up to 6 mgd. However, because the Ranney collector system capacity is only 4.8 mgd, the water treatment plant capacity is limited to 4.8 mgd. As mentioned earlier, the water treatment plant is only operated during the dry months when the turbidity is low. It is not feasible to operate the water treatment plant during periods of rainy weather when the turbidity of water in the Russian River is high.

Modifications to the water treatment facility were completed in 2006. The improvements included a 3 mgd Microfloc contact clarification-filtration unit. The purpose of the improvements was to increase reliability and provide redundancy at the water treatment plant. The water treatment plant is designed to expand to treat another 3 mgd with the addition of a fourth Microfloc unit.

Water Rights. Under its permit (Water Right Permit 12952), the City has the right to divert 20 cubic feet per second (cfs), which produces a theoretical maximum of approximately 14,480 AF of water annually, but see §3.10, page 3-17, where it is estimated that at the City's permitted diversion rate of 20 cfs and a peak water use in the month of July, the City would actually use approximately 8,400 AF annually, when it first puts its full permitted entitlement to beneficial use. Approximately 2,027 AF of water diverted by the City is recognized by the State Water Board as a Pre-1949 Appropriative Right. The water rights in the Russian River below Lake Mendocino are divided between pre- and post-1949 because that is the year that the California State Department of Finance filed an application to appropriate water from the East Fork of the Russian River for the Coyote Dam, Lake Mendocino Project.[1] When the State Water Board approved the permits for Lake Mendocino Project Water, it declared that those rights would be junior to water being used by other appropriators on and prior to 1949. The date when an application to appropriate water is filed with the State Water Board is important, because in a year when there is not enough water to satisfy the full amount of water authorized for appropriation, an earlier filing date has priority over a later filing date. There is also a preference for municipal uses over other uses.

The City's Water Right Permit has been assigned number 12952 and has a priority date of 1954. Each water rights permit issued by the State Water Board gives the permittee a set amount of time to actually use the water authorized for diversion under the permit. The City was originally issued the permit in 1961 and the City had 10 years to put the full amount of water to beneficial use. That time has been extended several times. The latest extension gave the City until December 31, 2000. Prior to that date, the City filed another

[1] The City or its predecessor in interest has been supplying water to its residents since the later 1800's. The City has pre-1914 water rights, the full extent of which has not been conclusively determined.

Petition for Extension of Time to put the water to beneficial use. The most recent request asks to extend the time to 2015. That petition is pending before the State Water Board. The City has also petitioned the State Water Board to include Well 5 in the permit. The City is legally entitled to continue putting water available under the permit to beneficial use, pending State Water Board's action on the City's petition for a time extension.

The City also has a contractual agreement with the Mendocino County Russian River Flood Control and Water Conservation Improvement District (Flood Control District) to purchase up to 800 AF of water annually. The Flood Control District can only terminate the contract with five years prior notice to the City.

Water Distribution System. The water distribution system consists of surface water well pumping, percolating groundwater well pumping, water treatment plant high service pumping station, storage reservoirs, and piping to and within the water distribution system. After chlorination, surface water Wells 3 and 5 are pumped directly into the distribution system. Well 4, following chlorination, also pumps directly into the water distribution system. The high service pumps are located at the water treatment plant and take stored treated water and pump it into the water distribution system.

The City has eight reservoirs. The combined storage capacity of the reservoirs is 6.1 million gallons (18.7 AF). The storage provides short term treated water storage to be used on a daily basis and for emergency situations such as fire fighting. It is not recognized as a water supply source.

Water Use. Based on the average water use from 2000 through 2006, the City uses approximately 4,000 AF of water annually.

Reliability. To evaluate the reliability of the system, a four-year drought that would yield 8,400 AFY of water supply on an annual basis or approximately 51% of normal was analyzed as the worst case scenario. This value is based on the analysis in Section 3.10. Depending on Russian River conditions, reduction from the Potter Valley Project diversions, and water releases from Lake Mendocino, and future groundwater pumping capacity added to the system, short term water pumping capacity is a concern. *Based on the analysis, the City has sufficient water rights and water supply but, at times, may not have sufficient pumping capacity to meet peak day demands.*

Recycled Water

Chapter 4 discusses recycled water opportunities for the City's Wastewater Treatment Plant (WWTP). The WWTP serves the City of Ukiah and the Ukiah Valley Sanitation District. The City has set a goal to develop a Water Recycling Master Plan to investigate the economic feasibility of recycled water in the City and Ukiah Valley. The potential quantity of recycled water from the WWTP could be 5,101 AF annually in 2030. Using all the recycled water from the WWTP would require both publicly and privately-owned facilities. However, barriers could limit the feasibility of a recycled water program for privately-owned facilities. Based on discussion with local farmers and the agricultural industry, the perception is that the following barriers exist in the Ukiah area:

1. Seasonal needs for water does not necessarily correspond with times when recycled water is most available, thus requiring additional storage facilities.
2. For organic farmers, the thought is that use of recycled water would remove the organic certification from their products.
3. Private water users who may believe they potentially could lose their existing water rights if they use recycled water.
4. Existing water supplies appear to be sufficient to meet their needs.
5. It is not cost effective to use recycled water without subsidizing the recycle water program.

To fully implement a water recycle program, these barriers will need to be addressed through public education programs.

Historical and Projected Water Use

Chapter 5 discusses the historical and projected water use for the City. Water demand projections provide the basis for future water facilities. Historically, the City has experienced slow population growth and this trend is expected to continue. An annual population growth rate of 1 percent was assumed for the City. Based on a 1 percent population growth rate, the City will reach a build-out population of 17,992 in 2015. This corresponds to a water use of 4,592 AF annually. Based on estimates provided by the City, a rough estimate of unaccounted for water (e.g., water in the system that is un-metered water use such as fire protection and training, system and street flushing, sewer cleaning, construction, system leaks, unauthorized connections, and meter inaccuracies) is 138 AF (three percent unaccounted for water loss). Therefore, the total projected water demand within the present City limits is 4,730 AF.

The City's currently approved sphere of influence includes the entire Ukiah Valley from Burke Hill Road on the south to Highway 20 on the north and ridge top to ridge top on the east and west. In 1995, the City General Plan included a section that designated a much smaller sphere of influence as depicted in purple on Figure 2.2. The City has not applied to the Local Agency Formation Commission (LAFCO) to approve this smaller sphere of influence, but it is the proposed sphere officially adopted in the 1995 General Plan (proposed 1995 SOI). The environmental impacts of including this area within the City's sphere of influence were considered in the environmental review completed and certified, when the 1995 General Plan was adopted.

The City may annex land within its sphere of influence within the next 20 years. For these reasons, the planning area for this plan includes the sphere of influence described in the City's General Plan, adopted in 1995.

For purposes of this Plan, population estimates do not include current water users but evaluate future demand based on projected population increases within the 1995 proposed SOI.

The population within the sphere of influence is expected to increase by 2,503, based on the assumption that the land uses in the 1995 General Plan will be applied to the areas served by the City's water system. This assumption arises from the fact that the City will not serve those areas unless they annex into the City. At that time, the City rather than the County land use designations will apply. Under the 1995 General Plan, for example, the land use designation for the Masonite property is industrial. The Lovers' Lane property is designated for mixed use, but for purposes of this Plan, the assumption was made that the mixed use would apply to agricultural uses only. At 2.86 people per connection, which is the average number of people per connection for the City, the total number of connections for a population of 2,503 is 875. The City's average water use per connection is 0.73 AFY. Using this same average water use for the additional connections within the 1995 proposed SOI, the total additional water use is 639 AFY. Including the 3 percent unaccounted for water loss, this value increases to 658 AFY.

The total water use for the City, including the City's 1995 SOI, is expected to be 5,388 acre-feet per year (AFY) by the year 2030. This projected demand falls below 8,400 AFY which the City expects to use when it puts its 20 cfs water right to beneficial use (See Water Right, p. ES-3.). However, at times, the City has a difficult time meeting demands, especially peak demands during extended periods of hot weather or drought conditions. The reason the City's water system cannot meet the peak water demands during these periods is because the pumping capacity of the existing Ranney collector, surface water wells, and groundwater well is limited. The City has increased storage capacity in the water distribution system that helps with short term emergency capacity. However, DHS does not classify the City's water storage capacity as a water supply. To increase the pumping capacity to provide a more reliable and redundant water supply, the City is conducting a groundwater well siting study to increase groundwater well production by 1,500 gpm. These improvements will help the City meet its peak demands.

The City's water right includes Pre-1949 and Post-1949 water rights. The Pre-1949 Appropriative water right of 2,027 AF annually is senior to Project Water (water stored in Lake Mendocino, see §2.3.3.3). This water right is recognized by the State Water Board.[2] The Post-1949 Appropriative Water Right has a 1954 priority date and is senior to subsequent appropriators.

Water Supply Versus Demand Comparison

Chapter 6 provides a comparison of projected water supplies versus demand. It also discusses water shortage expectations. The water use, including the City's sphere of influence, will be approximately 5,388 AFY compared to 8,400 AFY of water supply expected during a multi-year drought. The 8,400 AFY of water supply is based on the City's water right. This analysis shows that during severe drought conditions, the City has sufficient water supply based on its water right.

Although not likely, if the State Water Board denies the City's petition to extend the time to put water authorized by its permit to beneficial use, the City would have to find other methods to meet water demands. These methods could include use of recycled water, greater water conservation, and use of groundwater wells.

Demand Management Practices

Chapter 7 discusses water conservation and demand management practices. This chapter presents a description of the City's water conservation program. Included in the discussion is an economic analysis of water conservation Demand Management Measures (DMMs) for DMM 1, 2, 6, and 14.

It is likely that previous and ongoing conservation measures have resulted in water saving in the range of approximately 2 to 5 percent of total water production. The water savings already achieved by existing conservation measures will have some impact on the City's ability to further reduce demand. Nevertheless, the City anticipates achieving additional water savings by further implementation of DMMs in the future. Of the four DMMs analyzed, only three appear to be cost effective for the City. DMMs 1, 2, and 14 should be evaluated in the future to assess if the City has the capital to implement them. Table ES-1 summarizes the results from the economic analysis.

ES-1. Summary of Economic Analysis Results (DWR Table 16)

BMP No.	BMP Name	Total Discounted Cost ($)	Total Water Saved (acre-feet)	Benefit / Cost Ratio	Simple Payback Analysis (years)	Discounted Cost / Water Saved ($/acre-feet)	Net Present Value / Water Saved ($/acre-feet)
1	Water Survey Programs for Single-family Residential and Multi-family Residential Customers	27,924	104	1.3	10	268	88
2	Residential Plumbing Retrofit	47,887	229	3.4	4	209	455
6	High-efficiency Washing Machine Rebate Programs	32,557	24	0.4	47	1,356	-778
14	Residential ULFT Replacement Programs	409,099	1,932	2.9	7	212	407

[2] As previously noted, the City also has pre-1914 water rights that pre-dated the Water Commission Act. The full extent of these rights has not been conclusively determined.

1. INTRODUCTION

This chapter provides an overview of the Urban Water Management Plan (UWMP), discussion of previous reports, the City's policy on public participation, and coordination efforts with other agencies. Table 1-1 summarizes the coordination with other agencies.

1.1 Purpose

The purpose of this UWMP is to ensure efficient use and promote conservation of urban water supplies within the City of Ukiah (City), California. The UWMP describes the availability of water and discusses water use, reclamation, and water conservation activities.

1.2 Urban Water Management Planning Act

Brown and Caldwell prepared this plan for submission to the California Department of Water Resources (DWR) on behalf of the City as required by the Urban Water Management Planning Act (Act) (California Water Code Division 6, Part 2.6, Sections 10610 through 10657). Water Code Section 10620 requires any water supplier that provides water to 3,000 or more customers, or that provides over 3,000 acre-feet of water annually, to prepare an Urban Water Management Plan that complies with Water Code Sections 10630 and following. Urban water suppliers are required to develop water management plans to actively pursue the efficient use of available water supplies to meet the needs of its various categories of customers during normal, dry, and multiple dry years. The Act describes the contents of the UWMP as well as how urban water suppliers should adopt and implement the UWMP. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied. For ease of review, the DWR Review Sheets are located in Appendix A.

1.3 Previous Reports

Two reports and the City and Mendocino County (County) general plans were used in preparing this UWMP. Also, Bartle Wells and Wagner and Bonsignore were contacted. Bartle Wells is a consulting firm that specializes in financing and Wagner and Bonsignore specialize in water right issues. Included in this UWMP is a preliminary analysis completed by Wagner and Bonsignore on the reduction of flow in the Eel River. This analysis is located at the end of Chapter 3 and Appendix H. The reports and information obtained from the consulting firms address the water supply and demand for the City. An understanding of the results of these previous documents provides a broader context for preparing an updated water management plan. The following paragraphs provide a summary of the documents.

Water Rate Study and Preliminary Financing Plan, 2005. This financing plan reviews the existing rate structure and evaluates financing alternatives available to the City for water system capital improvements. This financing plan recommends updates to the water utility rate structure and connection fee.

Urban Water Management Plan 2002. The 2002 UWMP was prepared by Kennedy Jenks, an engineering consulting firm hired by the City to fulfill 2000 UWMP requirements. The main purpose of this plan is to analyze the City's water supply and demand for the following 25 years during normal and drought years. The Plan also summarizes the City's water shortage contingency plan and water conservation program.

City of Ukiah General Plan, 1995. The City's General Plan provides the long-term and comprehensive policy program for all aspects of development, growth, and land use in the City and Ukiah Valley. The General Plan addresses seven broad topics called elements that are required by law. The City's General Plan provides guidance to the Planning Commission and City Staff and is the foundation for development and building regulations. Completion of specific projects that have emanated from the goals, policies, and implementation measures contained in the City's General Plan, include the following items:

- Ukiah Airport Master Plan and Comprehensive Land Use Plan
- Landscaping and Streetscape Design Guidelines
- Bicycle and Pedestrian Master Plan
- Commercial Development Design Guidelines
- Riverside Park Master Plan and Phase 1 Development
- Stream and Creek Enhancement Plans for Gibson, Orr, and Doolan Creeks

County of Mendocino General Plan, 1981. The County's General Plan identifies current and future needs for Mendocino County in areas such as land use, housing, transportation, public services, environmental quality, and economic viability. The County's General Plan also is a policy document that embodies the community's goals and guides decisions about physical development over the long term, with a strong focus on sustainability. The County is currently updating its General Plan. The updated County of Mendocino General Plan is anticipated to be adopted in 2008.

1.4 Public Participation

The City encourages public participation in the development of its UWMP. Copies of the draft UWMP were made available for public review at the City offices, on the City's official web site, and the Public Library. Copies of the draft UWMP were sent to the Local Agency Formation Commission, Redwood Valley County Water District, Calpella County Water District, Millview County Water District, Mendocino County Russian River Flood Control and Water Conservation Improvement District, Willow County Water District, Rogina Water Company, Ukiah Chamber of Commerce, Mendocino Environmental Center, Sonoma County Water Agency, Mendocino County Planning Department, Mendocino County Water Agency, California Water Impact Network, Smart Growth Coalition, and Employers' Council of Mendocino County. The City held public meetings on August 15 and September 19 and, a workshop on October 3, 2007 to receive comments to the draft UWMP. In response to comments from the public, agencies, and the City Council, a revised UWMP was prepared. A Public Hearing was commenced on October 17, 2007 to provide for additional review of and comments on the revised draft UWMP prior to completion of the UWMP and adoption by the City Council. Following additional public, agency, and Council comment on October 17, the City Council directed staff to prepare an additional revised draft UWMP and continued the Public Hearing to November 7, 2007 for final review and adoption of the UWMP. At the November 7, continued public hearing, the City Council appointed Mayor Mari Rodin and Council member John McCowen to a subcommittee to work with staff on final revisions to the draft UWMP. The City Council continued the public hearing to a special City Council meeting on November 26, 2007, for adoption of the plan. Notification for the October 17, 2007. Public Hearting was given as required by law, including publication in the Ukiah Daily Journal. Each continuance of the public hearing was announced during the continued hearing.

1.5 Agency Coordination

Table 1-1 summarizes the efforts the City has taken to include additional agencies and citizens in its planning and preparation process of the UWMP. Copies of the draft UWMP were available for public review and comment at the City's offices, web site, and the Public Library. Copies of the draft UWMP were also sent to

the Local Agency Formation Commission, surrounding water districts, Ukiah Chamber of Commerce, Mendocino Environmental Center, Mendocino County Water Agency, and Sonoma County Water Agency. Legal public notices for City Council adoption hearings were published in the Ukiah Daily Journal newspaper and posted at related agencies and City facilities. A copy of the public hearing notice is included in Appendix B.

Table 1-1. Coordination with Appropriate Agencies (DWR Table 1)							
Check at least one box on each row	Participated in developing the plan	Commented on the draft	Attended public meetings	Was contacted for assistance	Was sent a copy of the draft plan	Was sent a notice of intention to adopt	Not Involved / No Information
DWR					x	x	
Ukiah Wastewater Treatment Plant (WWTP)				x	x		
General Public Civic Center Lobby Utilities Building Lobby City's Website Public Library		x	x		x		
Mendocino County Planning Department				x	x		
Ukiah Utilities	x	x	x		x		
Bartle Wells		x			x		
Wagner and Bonsignore	x	x	x		x		
Local Agency Formation Commission		x	x		x	x	
Redwood Valley County Water District					x		
Willow County Water District					x		
Millview County Water District					x		
Calpella County Water District					x		
Rogina Water Company					x		
Ukiah Chamber of Commerce					x		
Mendocino Environmental Center					x		
Mendocino County Russian River Flood Control and Water Conservation Improvement District		x	x		x	x	
Mendocino County Water Agency					x		
Sonoma County Water Agency		x			x	x	
California Water Impact Network					x	x	
Smart Growth Coalition					x		
Employers' Council of Mendocino County					x		

2. DESCRIPTION OF EXISTING WATER SYSTEM

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

2.1 Description of Service Area

The City is a general law city incorporated in 1876. The City has been providing reliable, safe drinking water to Ukiah residents since 1880. The City was granted a water supply permit by the Division of Water Resources (a division of the Department of Public Works) in 1939 to supply domestic water to the City and vicinity. The permit was revised and reissued in 1953, and again in April 1962. In 1987, a temporary permit was issued to the City that expired on December 1, 1989. A requirement of the temporary permit was to submit a report demonstrating that the City's Ranney collector provided effective and reliable treatment for the removal and inactivation of enteric viruses and *Giardia Lamblia* organisms. The City decided not to complete the report, and instead, decided to construct a water treatment plant for use with the Ranney collector. Construction of the water treatment plant was completed in April 1992. The City currently operates the water treatment plant under DHS Water Supply Permit No. 09-93-007.

The service area for the water system is not conterminous with the City's boundaries. The City serves a small number of customers outside its limits and its place of use. A petition to include these areas, among others, in the City's place of use is pending before the State Water Board. A location map of the City is shown in Figure 2-1.

Three other water systems bound the City. Millview County Water District (CWD) is located to the north, Willow CWD is located to the south, and Rogina Water Company is located to the east. Of these four water systems, the City serves the largest population, with a population over 15,600. The total number of connections is approximately 5,700.

As previously discussed, for purposes of water planning, the City assumes that within the next 20 years, the City will annex and provide water services to land within its sphere of influence as described in the 1995 General Plan. The sphere of influence used for these planning purposes is shown in Figure 2-2.

2.2 Environmental Setting

The majority of the information in this chapter is from the Mendocino County General Plan, which is available online at http://www.co.mendocino.ca.us/planning/GenPlan/GPContents.htm and the City of Ukiah's website at http://www.cityofukiah.com/.

2.2.1 Geography

The City is located on U.S. Highway 101 approximately 100 miles north of San Francisco in the northern coastal region of California. The area is centrally located between San Francisco, Eureka, and Sacramento. The City is surrounded by coastal ranges in southern Mendocino County and situated in the fertile Yokayo Valley with rich vineyards and pear orchards. The valley is bordered on the west by the Mendocino Range and on the east by the Mayacamas Mountains. Elevations in the mountains are over 1,800 feet mean sea level

(MSL), while elevations in the valley range from about 670 feet MSL in the north near Calpella to about 560 feet MSL in the south near El Robles Ranch. The Russian River flows from north to south through the Ukiah area.

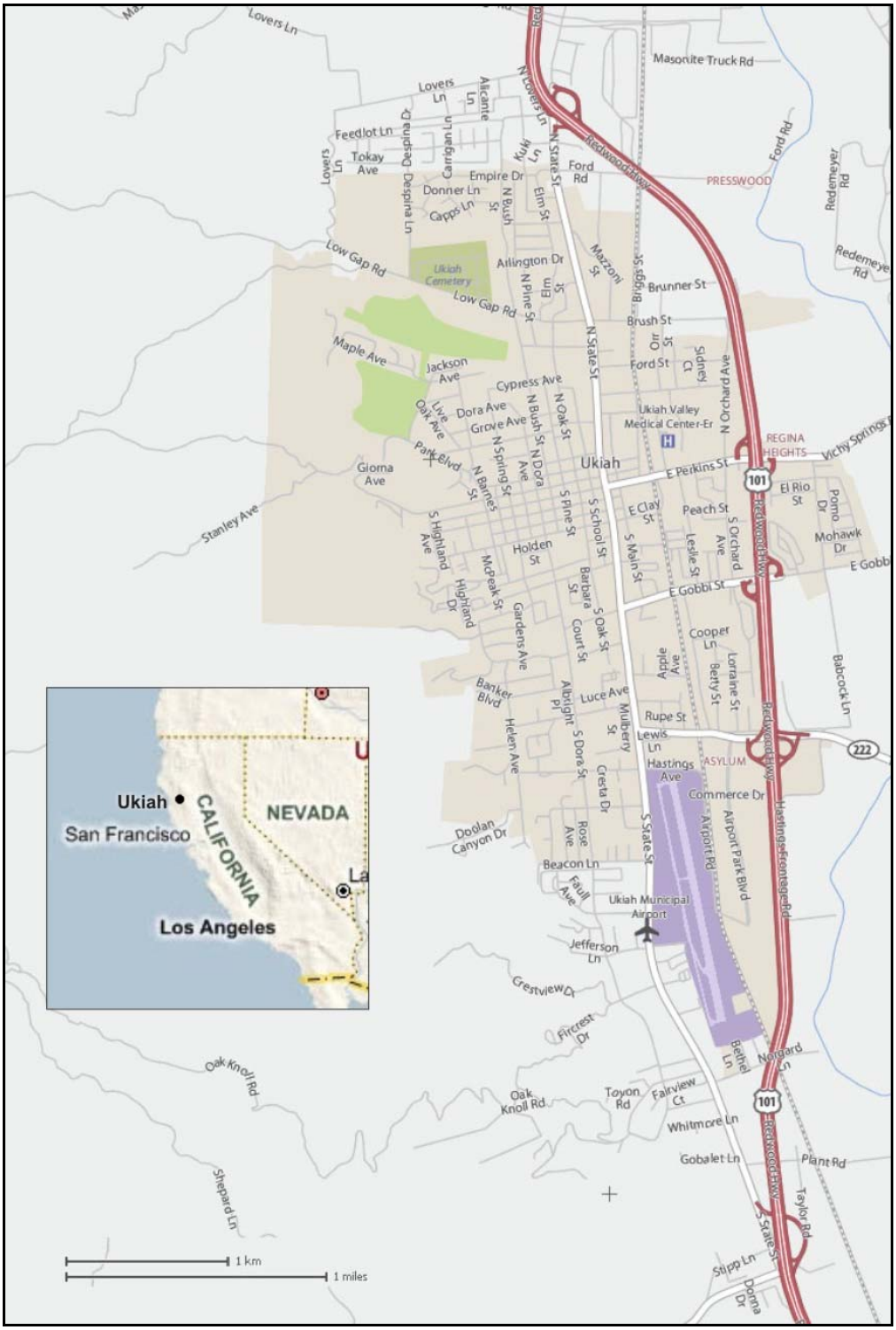

Figure 2-1. City of Ukiah Map

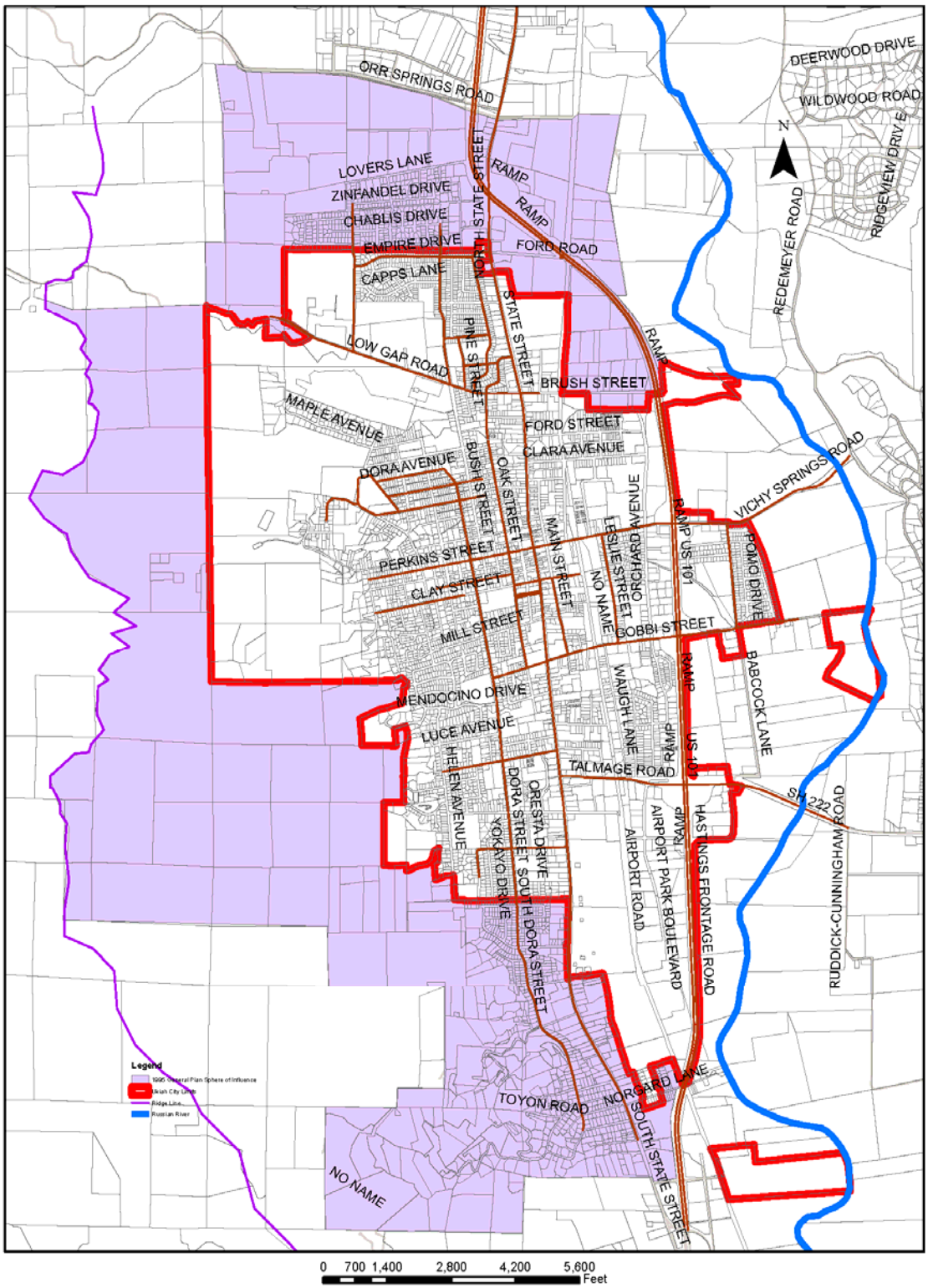

Figure 2-2. City of Ukiah Sphere of Influence Map

2.2.2 Climate

Unlike many other cities close to the coast, Ukiah is relatively fog-free. This fact, coupled with warm days and cool evenings, gives Ukiah a moderate range of temperatures. Annual rainfall in the City is about 35 inches. Most of the precipitation falls from December through April, and only at higher elevation is there substantial snowfall. Rainfall is often from intense rains caused by large storms that move in from the northwest. Virtually no rainfall occurs during the summer months. The average growing season is about 260 days on the coast, 210 days in the interior valleys including the Ukiah area, and 180 days in Round Valley (Mendocino County General Plan).

Table 2-1a and 2-1b summarizes monthly averages taken from 1989 to 2005. Data were obtained from the California Irrigation Management Information System (CIMIS) website for the Hopland Station in Mendocino County (Station Numbers 85 and 106). Information from CIMIS can be located at the following website: (http://wwwcimis.water.ca.gov/cimis/frontMonthlyReport.do). The table provides information on evapotranspiration (ETo), rainfall, and average temperature. ETo is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is an indicator of how much water is used by crops, lawns, gardens, and trees need to sustain healthy growth and productivity.

Table 2-1a. Climate (DWR Table 3)*

	January	February	March	April	May	June
Standard Average ETo (in.)[a]	1.1	1.7	3.3	4.6	6.2	7.2
Average Rainfall (in.)	6.7	6.8	4.7	2.3	1.7	0.8
Average Temperature (°F)	45.6	47.2	50.8	52.9	59.4	65.2

** Source: CIMIS 1989 to 2005*

[a] The CIMIS ETo values are calculated using the modified Penman (also known as the CIMIS Penman) and the Penman-Monteith equations. Most CIMIS weather stations are located on actively growing grass. Hence, reference evapotranspiration is commonly referred to as ETo on the CIMIS web site.

Table 2-1b. Climate Continued (DWR Table 3)*

	July	August	September	October	November	December
Standard Average ETo (in.)[a]	8.0	7.1	5.3	3.5	1.5	1.0
Average Rainfall (in.)	0.1	0.2	0.3	1.1	3.8	7.3
Average Temperature (°F)	70.6	69.8	68.0	59.3	50.0	45.7

** Source: CIMIS*

[a] The CIMIS ETo values are calculated using the modified Penman (also known as the CIMIS Penman) and the Penman-Monteith equations. Most CIMIS weather stations are located on actively growing grass. Hence, reference evapotranspiration is commonly referred to as ETo on the CIMIS web site.

2.2.3 Hydrology

Surface runoff in the City's basin is derived almost entirely from rainfall, although snow does fall in the mountains of the eastern part of the Eel watershed, which is a watershed located north of the Russian River. Stream flow responds directly to the rainfall pattern; high flows will drop quickly without sustaining rainfall. During the dry summer months, stream flow consists of groundwater seepage, channel storage, or reservoir storage. In the Russian River Basin, 93 percent of the average seasonal runoff occurs in a five-month period beginning in December and ending in April (Mendocino County General Plan).

2.3 Water Supply Facilities and Sources

Water supply is defined as the amount of water available from a source or combination of sources (e.g., streams, rivers, ponds, lakes, groundwater, etc.) for use by a water purveyor. The City currently obtains all of its water supply from the underflow of the Russian River and one percolating groundwater well. The City is not a wholesaler. Pursuant to a Water Supply Contract, the City can purchase up to 800 acre feet annually of project water from the Mendocino County Russian River Flood Control and Water Conservation Improvement District. Additional details regarding sources of water are included in Chapter 3.

2.3.1 Surface Water (Ranney collector and Wells 3 and 5)

The City's surface water supply is obtained from a Ranney collector and Wells 3 and 5, which draw water from an alluvial zone (underflow from the Russian River) along the Russian River. Even though the City is not taking water directly from the Russian River, these water supplies have been determined by the California Department of Public Health (CDPH) as groundwater under the direct influence of surface water pursuant to 22 CCR §64651.10 of the California Water Works Standards, primarily because the turbidity in these sources fluctuates with the turbidity in the Russian River. Accordingly, they are classified as surface water sources in this UWMP, even though they divert water from Russian River underflow and may also be considered groundwater sources. The following paragraphs describe each of these surface water sources.

Ranney collector. The City collects underflow from the Russian River through its Ranney collector located along the river's banks. The Ranney collector was constructed in 1966 with a design capacity of 13 million gallons per day (mgd), which is equal to the City's water right. The maximum capacity obtained from the Ranney collector was 9 mgd, well below its design capacity. The Ranney collector has steadily declined from 9 mgd to its current capacity of 4.8 mgd. The significant loss in capacity of the Ranney collector may be a result of changes in the Russian River channel moving away from the Ranney collector and the compaction of clays and silts in the riverbed over the Ranney collector. Another concern is the Ranney can only be used approximately six months a year during the drier weather months. During the rainy months, the turbidity in the Russian River increases, which increases the turbidity of the water in the Ranney collector. The Microfloc contact clarification-filtration units located at the WTP cannot be operated efficiently under high turbidity conditions. Therefore, it is not possible to rely on the Ranney collector as a water supply source during the winter when the turbidity of the Russian River is high.

Well 3: This well has an estimated pumping capacity of 650 gpm. It is used throughout the year.

Well 5: The capacity of Well 5 is 300 gpm. This well can only be used when the Ranney collector is not in service. This well is equipped with a standby engine-driven pump.

Well 1, 2 and 6: Wells 1, 2, and 6 are no longer used by the City. Well 1 has been out of service since the 1970's. Wells 2 and 6 (Water from Well 6 was pumped into Well 2) were removed from the City's latest domestic water supply permit and may no longer be used as a source of supply. Wells 2 and 6 had to be taken out of service during construction of the new 1.5 million gallon clearwell for the Water Treatment Plant, because the power source for that well had to be disconnected during construction. The tank site was located in the path of the power line serving the pump house and it was not feasible to provide an alternate source of electrical power during construction. If a water supply well is removed from service for more than a year, it must comply with current DHS standards. The cost to rehabilitate the wells to meet DHS standards, which would require installation of an annular seal and electrical upgrades, made it economically infeasible to return these wells to service. The pumping capacity of Wells 2/6 is only 50 gallons per minute (gpm). Even though it is not cost effective to rehabilitate Wells 2/6 for the City's water supply, Well 6 could be used in its present condition to irrigate the adjacent softball complex fields, which would reduce the potable water used for irrigation.

Since 2003, the City has undertaken an aggressive rehabilitation program of the existing surface water wells. The capacity of the wells has increased as a result of the work but increased demands are pushing the water production capabilities beyond their pumping capacity.

Figure 2-3. Ranney Collector Site

2.3.2 Groundwater

The City currently diverts percolated groundwater at Well 4 and may add other groundwater sources in the future. Until those future wells are developed, the City does not know whether they will be considered percolating groundwater or groundwater flowing in a definite channel ("underflow"). If it is determined that the future wells are pumping percolating groundwater they will not be subject to the permitting authority of the State Water Board. However, it is possible that future wells in the areas being considered by the City will be considered underflow, in which case they would be subject to the permitting authority of the State Water Board. In that event, those wells would have to be added as points of diversion under the City's appropriative water rights permit and the water pumped from those wells would have to be reported as water diverted under the City's permit. Once the future wells are developed, the City will determine whether they are pumping percolated groundwater or underflow.

2.3.3 Water Rights

Prior to 1914, a right to use surface water could be established without filing for a permit from the State Water Board under the Water Commission Act. After 1914, a right to divert water from a surface water source or underground water flowing in a definite channel, requires a permit from the State Water Board. Water can be pumped from percolating groundwater without a state issued permit. A water right is the legal entitlement that authorizes water to be diverted by a user from a specified source (water supply) for a beneficial, non-wasteful, use. The water right under a state issued permit spells out the point of diversion, amount or rate of water that can be diverted, place of use, and the purpose of use.

Wagner and Bonsignore, an engineering firm specializing in water rights, was consulted to determine the details of the City's water rights. The following additional sources were consulted:

- State Water Resources Control Board files for City of Ukiah's Water Right Application 15704 (Appropriative Permit)
- City of Ukiah's water supply agreement with Mendocino County Russian River Flood Control and Water Conservation Improvement District (Contract or Project Water)
- Ann Burck, Public Utilities Project Engineer, City of Ukiah (Groundwater).

2.3.3.1 Appropriative Water Rights

Pre-1949 Appropriative Right. The City has Pre-1949 Appropriative Right for 2.8 cubic feet per second (cfs) for diversion from the Russian River for a maximum of 2,027 acre-feet (AF) annually. This water right is recognized in State Water Rights Board (predecessor to State Water Resources Control Board) Decision 1030.

Water Right Permit 12952 – Post-1949 Appropriative Right. Water Right Permit 12952 (Application 15704) provides for the diversion of Russian River underflow for municipal purposes. Under this Permit, water can be diverted at a rate not to exceed 20.0 cfs (9,000 gpm) from January 1 through December 31 (with no annual limit). The face value of the City's Pre-1949 and Post-1949 appropriative rights is approximately 14,480 AF annually (but see discussion in Section 3.10 and Appendix H, which assumes that the City will use approximately 8,400 acre-feet annually, when it first pumps 20 cfs at its peak usage time). The Permit is considered a Post-1949 water right, which is a right that was initiated subsequent to the authorization to construct Coyote Valley Dam in 1949. The Permit expired on December 31, 2000 and the City filed a Petition for Extension of Time with the SWRCB. The Permit is valid while the Petition for Extension of Time is processed. Currently, the Permit covers Wells 2 (no longer in use) and 3 and the Ranney collector. The City has filed a Petition with the SWRCB to add Well 5 and expand its place of use under Permit 12952. Section 3.2.1 provides a description of the Ukiah Valley groundwater basin.

2.3.3.2 Groundwater

See Section 2.3.2 for a description of the City's present and future groundwater sources and the rights to use water from these groundwater sources.

2.3.3.3 Project Water

Mendocino County Russian River Flood Control and Water Conservation Improvement District (District) holds Water Right Permit 12947B for storage and use of up to 8,000 AF annually of water stored in Lake Mendocino and/or directly diverted from the East Fork of the Russian River. The City has a water supply agreement with the District that allows the City to purchase up to 800 AF of water annually under the District's permit.

2.3.4 Transfers and Exchanges

Three water districts bound the City. The City uses the greatest amount of water and serves the largest population in the Ukiah Valley. While the City's water system is physically interconnected with Willow County Water District to the south and Millview County Water District to the north, and Millview is physically interconnected to Calpella County Water District, the interconnections between the City and the adjacent districts are used exclusively for emergencies. See Appendix C for Emergency Interconnection Agreement dated July 1, 2002. Moreover, the Millview and Willow County Water Districts do not have excess water to deliver to the City's distribution system, except in emergencies.

2.4 Distribution System

Eight distribution reservoirs, with a combined capacity of 6.1 million gallons (mg), provide short term treated water storage to be used on a daily basis and for emergency situations such as fire fighting. These include a 2.5 mg concrete tank, a 100,000 gallon steel tank, a 13,000 gallon redwood tank, a 30,000 gallon steel tank constructed in 1996, a 135,000 gallon concrete clearwell with transfer pump station, three new storage tanks completed in 2005 (two at 1.5 mg and one at 315,000 gallons), and a high service pump station.

The distribution system is divided into four pressure zones. The main zone, Zone 1, (approximately 97 percent of the system) is served by gravity from the 2.5 mg and 1.5 mg storage tanks. These tanks are supplied by all system resources via the main distribution system. There is also a 1.5 mg clearwell and high service pump station in Zone 1.

The remaining three smaller zones are supplied by booster pump stations via the main distribution zone. Zone 2 is served by gravity from the 100,000 gallon and 315,000 gallon storage tanks. This zone is supplied by the Golf Course Booster Pump Station at a rate of 350 gpm.

Zone 3, which has four service connections, is served by a 30,000 gallon bolted steel storage tank. This zone is supplied by a 100 gpm booster pump.

Zone 4 with three service connections is served by the 13,000 gallon redwood storage tank. This zone is supplied by the 40 gpm Lookout Drive Booster Pump Station.

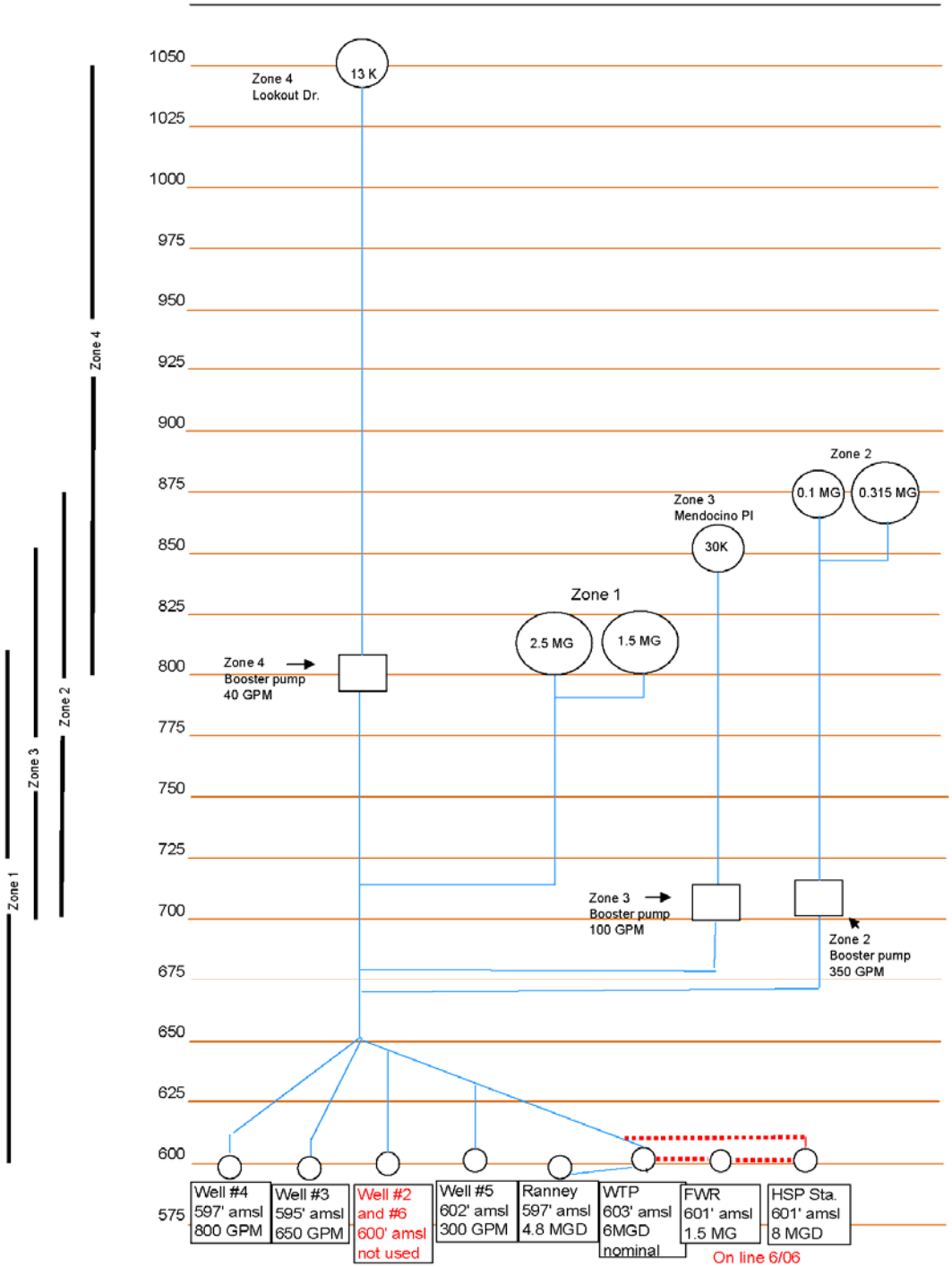

Figure 2-4. System Hydraulic Profile

3. WATER SUPPLY QUANTITY AND QUALITY

As noted in Chapter 2, the City uses both surface water and percolated groundwater as its supply sources. This chapter describes the surface water and percolated groundwater sources, quantities, supply constraints, and the water quality of the water supply sources. In addition, this chapter describes current and projected water supplies, water supply reliability and vulnerability, water shortage expectations, and water shortage revenue and expenditure impacts.

3.1 Surface Water

Section 3.1 provides a description of the City's surface water supply as well as the physical and legal constraints of this supply. Currently, the City uses surface water sources diverted from the underflow of the Russian River. The surface water sources consist of the Ranney collector and Wells 3 and 5. These surface water sources are located along the Russian River on the east side of the service area.

3.1.1 Description

Water Right Permit 12952 (Application 15704) provides for the diversion of Russian River underflow for municipal purposes. Under this Permit, water can be diverted at a rate not to exceed 20.0 cfs from January 1 through December 31. The City collects underflow from the Russian River through its Ranney collector and Wells 3 and 5, which are located along the river's banks, pursuant to its Permit 12952. The Ranney collector has an existing capacity of 3,400 gallons per minute (gpm) or approximately 4.8 million gallons per day (mgd). The available capacity of the Ranney collector is significantly less than the designed capacity of 13 mgd, which is equal to the City's water right. The maximum capacity obtained from the Ranney collector was 9 mgd, well below its design capacity. The Ranney collector has steadily declined from 9 mgd to its current capacity of 4.8 mgd. The significant loss in capacity of the Ranney collector may be a result of changes in the Russian River channel moving away from the Ranney collector and the compaction of clays and silts in the riverbed over the Ranney collector (See Appendix H, pp. 9-10). Another concern is the Ranney can only be used approximately six months a year during the drier weather months. During the rainy months, the turbidity in the Russian River increases, which increases the turbidity of the water in the Ranney collector. The Microfloc contact clarification-filtration units located at the water treatment plant (WTP) cannot be operated efficiently under high turbidity conditions. Therefore, it is not possible to rely on the Ranney collector as a water supply source during the winter when the turbidity of the Russian River is high.

The WTP was placed into service in April 1992. The source of water for the WTP is the Ranney collector. Water is pumped from the Ranney collector to the WTP. The WTP has a name plate capacity of 6.0 mgd and was designed to be expanded to 9 mgd. In 2006, a third filtration unit was added to provide reliability and redundancy as required by DHS. The third unit does not increase treatment capacity.

3.1.2 Physical Constraints

The Ranney collector was constructed in 1966 with nine laterals that extended beneath and along side the Russian River. One of the laterals, believed to be increasing water turbidity, was plugged and abandoned in April 1981. The Ranney collector currently produces about 4.8 mgd (approximately 3,400 gpm). The laterals

were cleaned in 2002 and four new laterals were constructed in 2003. Ranney capacity improved, but not nearly as much as expected. The reduction in Ranney collector capacity is believed to be due to two factors:

1. The river channel moving away from the Ranney collector impacting the flow of water to the laterals.
2. Compaction of clays and silts in the riverbed over the laterals reducing the permeability of the soil around the laterals and permanently lowering the pumping capacity in this area of the riverbed.

To address the impact of turbidity on the City's ability to use the Ranney collector in the winter, the City is exploring the possibility of using pre-filtration units with the existing Microfloc filtration units at the City's WTP. The City is exploring this option versus additional groundwater wells.

3.1.3 Regulatory and Legal Constraints

The City's Water Right Permit 12952 expired on December 31, 2000 and the City filed a Petition for Extension of Time with the State Water Board. The Permit is still valid while the Petition for Extension of Time is processed. The City has begun the process of preparing an environmental impact report (EIR) in support of its application for an extension of time and the City's pending Petitions to change its points of diversion and place of use. It has completed an initial study, conducted a scoping session and is currently evaluating its response to comments on the proposed scope of the EIR.

The City has steadily increased its use and has been diligent about maintaining its water right. The State Water Board is empowered to grant an extension of time to put water to beneficial use upon a showing to the State Water Board's satisfaction that due diligence has been exercised, that failure to comply with previous time requirements has been occasioned by obstacles that could not reasonably be avoided, and that satisfactory progress will be made if an extension of time is granted. (See 23 CCR §844.) According to City's Water Right Engineer, Robert C. Wagner, the City should be able to make the required showing of due diligence, since through no fault of the City, the demand for water has not developed as quickly as was anticipated when the City's permit was issued. The State Water Board wrote in WRO 2000-13, In the Matter of the Petition for Extension of Time of the City of San Luis Obispo, Permit 5882 (A10216)… "a municipality such as San Luis Obispo is to be afforded some latitude in putting water to beneficial use, because the municipality must be able to plan for, and meet, the needs of its existing and future citizens (Water Code section 106.5, 1203.)" In Mr. Wagner's opinion, it is reasonable to expect that similar latitude would be granted to the City of Ukiah to develop full beneficial use of its water rights. Water Board approvals of successive extensions of time for municipalities to allow for gradual development has been the norm. As a matter of statutory policy (Water Code, sec. 106.5), municipal water rights are to be "protected to the fullest extent necessary for existing and future uses…" The greater deference shown a municipality is counter balanced by the allowance of temporary permits for the use of excess municipal water by other parties pending the expansion of the municipality's use (Water Code, sec. 1203). There does not appear to be any obstacles to approval of the changes in points of diversion and place of use, subject to California Environmental Quality Act review. The City's request for an extension of time to make full beneficial use of water under its permit does not require a showing of water availability since such a finding was made by the predecessor to the State Water Board in Decision 1030. However, the City conducted and has included herein an analysis showing there is water available to meet its projected ultimate demands. The Water Board's declaration that this segment of the Russian River is fully appropriated takes into account the City's 20 cfs permit amount as well as other pre-existing rights (Water Right Order 98-08).

In order to grant the City's Petition to change points of diversion and place of use, the State Water Board will need to make a finding that "the change will not operate to the injury of any legal user of water involved" (Water Code, sec. 1702). In relation to junior appropriators, the City has a priority right to the beneficial use of water up to the full volume or rate authorized in its appropriative permit. Beneficial use within that volume and rate does not in itself equate to injury to juniors under the "non-injury" rule. The State Water Board has discretion under appropriate circumstances to condition change orders for the protection of other users. The

City knows of no reasonable basis for negative action by the State Water Board concerning the Petition change.

3.2 Groundwater

This section provides a description of the City's groundwater supply, including percolating groundwater, as well as the physical and legal constraints of this supply.

3.2.1 Description

The Ukiah Valley groundwater basin (Number 1-52 as described in California Department of Water Resources Bulletin 118) is located in southeastern Mendocino County and is the largest basin along the Russian River. It is approximately 22 miles long and 5 miles wide. The basin encompasses part of the Ukiah and Redwood Valleys to the north and their tributary valleys. This basin is not adjudicated.

A groundwater management plan has not been prepared for the Ukiah Valley or Mendocino County. Based on information currently available to the City, the groundwater supplies are adequate to meet existing and future demands. There is published data available providing information on the storage capacity and groundwater levels within the Ukiah Valley Groundwater Basins. United States Geological Survey (USGS) published Water Resources Investigation Report 85-4258, "Groundwater Resources in Mendocino County, California" states the following:

- Groundwater wells in the Ukiah Valley Groundwater Basin monitored over a 30 year period show no prominent long-term declines.
- Hydrograph analysis indicates the Basin is recharged fully each year except when precipitation falls below 60 percent of normal.
- During the drought of 1976/77 when rainfall was less than 60 percent of normal, the groundwater wells recovered to normal levels by the end of the 1978 rainfall season.

Further, California Department of Water Resources Bulletin 118 "California's Groundwater" states the following:

- Groundwater in storage in the upper 100 feet of the most productive area of the Ukiah Valley is estimated at 90,000 acre-feet.
- Groundwater storage located within the margins of the Ukiah Valley is estimated at an additional 45,000 acre-feet.
- Groundwater levels in the Ukiah Valley Groundwater Basin for the past 30 years have remained relatively stable.
- During drought conditions there is increased drawdown of groundwater levels, but the levels recover in post-drought conditions.

In general, the Ukiah Valley groundwater basin will experience seasonal and year to year variation in water levels due to climate and pumping stresses. However, these variations tend to be small. Water levels decline in the dry months and some wells may experience declines during successive dry years. But water levels in general have always recovered. There does not appear to be a long term decline that would suggest shortage or overdraft in the Ukiah Valley. The basin is not considered overdrafted and is not currently projected to be overdrafted. The preparation of a groundwater management plan is not merited at this time because of the modest increases in demand. At this time the City's access to these groundwater supplies and the ability to

use those supplies are subject to physical and legal constraints. Until new wells are developed, it is not known whether the City will have physical access to highly productive portions of the groundwater aquifer. If groundwater that is accessed is determined to flow in a definite channel underflow, the wells will have to be added as points of diversion under the City's permit and the water pumped from those wells will be reported as diversions under the City's permit.

The City will explore the development with other affected agencies of a groundwater monitoring program to develop more information about the Ukiah groundwater basin and as a first step toward developing a groundwater study.

Excluding its Ranney Collector and Well Nos. 3 and 5 (treated in this plan as surface water sources, see §2.3.1, p. 2-5), the City's groundwater supply consists of Well 4 with a capacity of 1,290 AFY. Table 3-1 lists groundwater pumping for the City. Since the Ukiah Valley has not been adjudicated, the table is not applicable as is indicated in the table. Table 3-2 states the amount of groundwater pumped by the City from 2000 through 2006. Table 3-3 states the total amount of groundwater to be pumped in future, excluding the Ranney collector and Well Nos. 3 and 5.

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

Basin Name	Pumping Right - AFY
Ukiah Valley	not adjudicated
Total	N/A

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

Basin Name (s)	2000	2001	2002	2003	2004	2005	2006
Total Water Use	4,108	4,070	4,165	3,874	4,131	3,755	3,831
Percolating Groundwater (Well 4)	340	810	906	1,030	976	1,048	1,075
% of Total Water Use[a]	8.3	19.9	21.8	26.6	23.6	27.9	28.1

[a] *This represents the percentage of the City's total water use that has been derived from its groundwater source, excluding the Ranney Collector and Well Nos. 3 and 5, treated in this plan as surface water sources, because they are under the direct influence of the Russian river. Data provided by City's water treatment plant.*

The City began a well siting study in May 2006 to add two groundwater wells with a total projected capacity of 1,500 gpm. It is not known at this time if the new wells will be pumping percolated groundwater, groundwater subject to the State Water Board jurisdiction or underflow which is under the direct influence of the Russian River within the meaning of 22 CCR §64651.10. Table 3-3 lists the total amount of groundwater projected to be pumped from 2010 to 2030 and its relative percentage of total water supply based on the assumption of an additional 750 gpm pumped from groundwater wells of all types 180 days of the year (605 AFY) above the maximum amount of groundwater that can be pumped (1,290 AFY). If the City annexes land within its sphere of influence, additional groundwater wells will most likely be needed to meet the increased demands.

Table 3-3. Amount of Groundwater Projected to be Pumped - AFY (DWR Table 7)					
Basin Name(s)	2010	2015	2020	2025	2030
Total Water Supply[a]	17,175	17,175	17,175	17,175	17,175
Groundwater (Well 4 and two new wells)	1,895	1,895	1,895	1,895	1,895
% of Total Water Supply	11	11	11	11	11

[a] *Total Water Supply is equal to the City's theoretical maximum water rights and future groundwater pumping projections. The water availability analysis in Section 3.10 is based on 8,400 afy rather than this theoretical maximum. Well No. 4 pumps percolating groundwater at the rates shown in Table 3-2. Future groundwater wells may pump percolating groundwater or underflow. The groundwater figures in this Table do not distinguish between percolating groundwater and groundwater which is underflow subject to State Water Board jurisdiction. It should also be noted that the City does not have the pumping capacity to provide this total.*

3.2.2 Physical Constraints

The physical constraint on the groundwater supply available under the City's permit is the pumping capacity. The physical constraint on the percolated groundwater supply is that only Well No. 4 has been identified as a source of percolating grounded. The combined pumping capacity of the City's surface water and percolated groundwater well is not sufficient to supply the City's current peak demand.

3.2.3 Regulatory and Legal Constraints

Based on the available evidence, it is believed that Well 4 pumps percolating groundwater, which is not subject to the permitting authority of the SWRCB and, therefore, is not included in the City's Water Rights Permit. Future diversions by the City are likely to be from groundwater sources, either "percolating groundwater" or groundwater confined to a subterranean stream within a known and definite channel. Absent sufficient evidence to the contrary, groundwater is presumed to be percolating groundwater.

The 1999 State Water Resources Control Board Decision No. 1639 *In the Matter of Garrapata Water Company* in Monterey County set forth criteria regarding the legal classification of groundwater. According to the Garrapata decision, for groundwater to be classified as surface water subject to appropriation, the following conditions must exist:

1. A subsurface channel must be present;
2. The channel must have relatively impermeable bed and banks;
3. The course of the channel must be known or capable of being determined by reasonable inference; and
4. Groundwater must be flowing in the channel.

The Garrapata decision, interpreting section 1200 of the Water Code, was followed and applied in the 2006 opinion of the First District Court of Appeals in the case, *North Gualala Water Company v. State Water Resources Board* (139 Cal. App. 4th 1577). That decision was left standing by the California Supreme Court.

In the Ukiah Valley, increased interest in the issue of legal classification has arisen since the Division of Water Rights took the position that the groundwater pumped at the wells of the Hopland Public Utilities District (PUD) and the Willow County Water District is subject to SWRCB permitting authority. However, no formal decision has been rendered by the State Water Board itself.

As to the City of Ukiah, there has been no legal classification by the State of California on the ground water that might be pumped by the City in the future. The burden is on the party asserting that groundwater is flowing in a definite channel. The legal presumption is that well water is percolating groundwater. Using the applicable legal standards and the available data, the City will make a determination regarding whether future wells require an appropriative water rights permit from the SWRCB. There has been general acceptance by the Division of Water Rights staff that existing Well 4 pumps percolating groundwater.

3.3 Desalination

There are no reasonable opportunities for the development of desalinated water within the City's service area as a future water supply source because of the City's location relative to a source for desalination. Table 3-4 lists opportunities for desalinated water and reflects the fact that there are no opportunities for desalinated water.

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

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

3.4 Transfer and Exchange Opportunities

Currently, the City does not transfer or exchange water with any of the surrounding water suppliers. While there are connections between the City and Millview CWD and the City and Willow CWD, these connections are used only for emergencies and are not included in the City's supply totals.

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

Transfer Agency	Transfer or Exchange	Short term	Proposed Quantities	Long term	Proposed Quantities
Millview County Water District	0	0	0	0	0
Willow County Water District	0	0	0	0	0
Rogina Water Company	0	0	0	0	0
Total	0	0	0	0	0

The City may purchase water, when adequate water supply is available, from the Mendocino County Russian River Flood Control and Water Conservation Improvement District (District). The City has a water supply agreement with the District that allows the City to purchase up to 800 AF of water annually under the District's permit. This water purchase is considered project water.

3.5 Water Rights

A detailed discussion on the water rights for the City is presented in Section 2.3.3.

3.6 Current and Projected Water Supplies

Even though the City has water rights and ample water supply to meet the water needs for its customers, the City does not have sufficient pumping capacity from its Ranney collector, surface water wells, and percolating

groundwater well during peak flow demands and drought periods. The City has completed or will complete in the near future several projects to help offset the lack of pumping capacity. The City began a well siting study in May 2006 to add two groundwater wells with a total capacity of 1,500 gpm. Those new groundwater wells will increase pumping capacity to reliably meet present peak demands and water demands during drought conditions. However, additional water supply will be needed to meet water demands within the City's sphere of influence. The City recently constructed three new storage tanks to meet DHS regulations. Improvements to the City's WTP were completed in September 2006. The WTP improvements comply with new California DHS regulations to ensure adequate reliability and redundancy. Table 3-6 lists water projects as they relate to the overall supply of the City.

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

Project Name	Projected Start Date	Projected Completion Date	Normal-Year AF to City	Single-Dry-Year yield AF	Multiple-Dry-Year 1 AF	Multiple-Dry-Year 2 AF	Multiple-Dry-Year 3 AF
Two New Wells	5/06	2008	605[a]	605[a]	605[a]	605[a]	605[a]
WTP Improvements		9/06	Treatment improvements	N/A[b]	N/A[b]	N/A[b]	N/A[b]
High Service Pump Station		3/06	Increased reliability	N/A[b]	N/A[b]	N/A[b]	N/A[b]
TOTAL			605	605	605	605	605

[a] *Assumes 1,500 gpm pumped from two percolated groundwater wells at 50 percent capacity for 50 percent of the time.*

[b] *These projects do not offer additional supply.*

Table 3-7 lists the current and planned water supplies for the City for the years 2005 through 2030. Note that this table lists the water available to the City from its water rights and percolated groundwater. The City's pumping capacity from its Ranney collector, surface water wells, and percolated groundwater well is limited.

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

Water Supply Sources	2005	2010	2015	2020	2025	2030
Supplier surface diversions (Water Right 12952)	14,480	14,480	14,480	14,480	14,480	14,480
Project Water (Mendocino County Russian River Flood Control and Water Conservation Improvement District)	800	800	800	800	800	800
Supplier produced groundwater (current & future wells)	1,290	1,895	1,895	1,895	1,895	1,895
Transfers in or out	0	0	0	0	0	0
Exchanges in or out	0	0	0	0	0	0
Recycled water (projected use)[a]	0	0	tbd[b]	tbd[b]	tbd[b]	tbd[b]
Desalination	0	0	0	0	0	0
TOTAL	16,570	17,175	17,175	17,175	17,175	17,175

[a] *Projected recycled water usage is calculated in Section 4.0*

[b] *tbd - to be determined after City completes its Recycled Water Master Plan.*

Table 3-8 lists the projected normal water supply in acre-feet per year.

Table 3-8. Projected Normal Water Supply – AFY (DWR Table 40)						
	2010	2015	2020	2025	2025	2030
Supply	17,175	17,175	17,175	17,175	17,175	17,175
% of year 2005[a]	104	104	104	104	104	104

[a] *from Table 3-9 base year for normal water year.*

3.7 Water Supply Reliability and Vulnerability

The City has completed various projects to increase reliability and reduce vulnerability to meet anticipated water demands. These projects have included the following: 1) cleaned existing Ranney collector laterals, 2) added four laterals in the Ranney collector to replace lost capacity, 3) improved water distribution system for reliability and redundancy, 4) added a High Service Pump Station to increase reliability, and 5) increased water storage for emergencies and fire fighting capability.

The City continues to explore various alternatives to improve reliability and reduce vulnerability. The City is currently investigating additional groundwater well sites. That investigation will include a determination as to whether the groundwater is percolating groundwater or groundwater flowing in a definite underground channel. To the extent the City is able to develop additional percolating groundwater wells, this would enable the City to rely more on percolated groundwater than it does at present.

3.7.1 Reliability Comparison

California has experienced two droughts over the past 30 years, one severe drought in 1976/1977 and a prolonged drought from 1987 to 1993. During both drought periods, the City did not experience any shortages in its water supply. Customers voluntarily cut back their water usage during this time to help the City meet demands and demonstrate their concern for the statewide drought conditions. In 1992, City water demands were less than the previous year even though the number of connections and population increased. Table 3-9 lists the basis of water year data for the following section.

Table 3-9. Basis of Water Year Data (DWR Table 9)	
Water Year Type	Base Year(s)
Average Water Year	1962
Single Dry Water Year	1976/1977
Multiple Dry Water Years	1990 through 1992

As noted above, the City did not experience any shortages in water supply during the two most recent drought periods. The City has developed a hypothetical four-year worst-case scenario to prepare for any conditions that may cause water supply shortages. From this scenario, a four-year drought has been analyzed. It was assumed that the severity of this hypothetical period would yield 8,400 AFY of water supply on an annual basis, approximately 51 percent of normal. This value is based on the analysis in Section 3.10. The estimated water supply and resulting water supply deficiencies caused by this extreme case are shown in Table 3-10. It can be seen from this example that deficiencies in overall water supplies would not create a shortage

for City customers based on approximately 4,000 AF normal water demand as might be expected to occur in 2005 – 2006.

However, the City's pumping capacity from its Ranney collector, surface water wells, and percolated groundwater well may be affected. During peak flow or drought periods, when the water table is lower, the pumping capacity may be limited even more than normal water years. The City has water rights to meet its demand, however, only the Pre-1949 2,027 AFY are considered senior rights. The City also has, on a contractual basis, 800 AFY from the Flood Control District. The remaining water right is Post 1949 and is not senior to project water for the East Fork of the Russian River and Russian River underflow. Demands are discussed in greater detail in Chapter 5.

Table 3-10. Supply Reliability - AFY (DWR Table 8)

		Multiple Dry Water Years			
Average / Normal Water Year	Single Dry Water Year 2006	Year 1 2007	Year 2 2008	Year 3 2009	Year 4 2010
16,490	8,400	8,400	8,400	8,400	8,400
% of Normal	51	51	51	51	51

Conditions resulting in inconsistency of water supply are summarized in Table 3-11. Water quality issues are not anticipated to have significant impact on water supply reliability. If applicable in the future, chemical contamination and the lowering of maximum contaminant levels (MCLs) for naturally occurring constituents can be mitigated by constructing new treatment facilities prior to water delivery into the water distribution system.

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

Name of supply	Regulatory/Legal	Environmental	Water Quality	Climatic
Surface Water	Change in rights to Russian River water diversion	None	None	Drought that reduces the flow in the Russian and Eel River significantly
Groundwater	Change in pumping rights	None	None	Multiple dry years that lower groundwater table
Recycled water	None	None	None	None

The Potter Valley Project diversion from the Eel River watershed to the Russian River watershed by Pacific Gas and Electrical (PG&E) has recently been reduced by estimates ranging from 26 percent to 33 percent. (The City's preliminary analysis estimates 26 percent. See §3.10 for the preliminary analysis.) This diversion has been ongoing for almost 100 years with agricultural, municipal, and commercial economies relying on this diversion. A preliminary analysis was completed to determine the effect reductions in flow would have on Lake Mendocino and the Russian River. The results of the preliminary analysis show that sufficient water supply is available for the City and that increased diversions by the City will only have minor effects on Lake Mendocino. The analysis is based on a continuation of diversions from the Eel River at the reduced rate and continuing releases from Lake Mendocino that, at least, comply with the minimum flow requirements in Water Board Decision 1610. If the Eel River diversion is further curtailed in the future or if Decision 1610

and the operation of Lake Mendocino is significantly changed in the future, additional analysis of those changes would be required. The City's water supply could be significantly affected by such changes.

3.7.2 Wholesaler (Agency) Water Supply Projections

The City does not receive any of its supply from a wholesaler. For this reason, Tables 3-12 through 3-14 have been filled in with zeros and "N/A" for not applicable.

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

Wholesaler sources	2010	2015	2020	2025	2030
N/A	0	0	0	0	0

Table 3-13. Wholesale Supply Reliability - Percent of Normal AFY (DWR Table 21)

	Multiple Dry Water Years				
Wholesale	Single Dry	Year 1	Year 2	Year 3	Year 4
Surface Water	0	0	0	0	0
Groundwater wells	0	0	0	0	0
Recycled water	0	0	0	0	0
% of Normal	0	0	0	0	0

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

Name of supply	Legal	Environment	Water Quality	Climatic
N/A	0	0	0	0
N/A	0	0	0	0

The City may purchase, on a contractual basis, water from the Mendocino County Russian River Flood Control and Water Conservation Improvement District (District). The City has a water supply agreement with the District that allows the City to purchase up to 800 AF of water annually under the District's permit. This water purchase is considered project water.

3.8 Water Quality

The WTP was placed into service in April 1992. The WTP was constructed to treat water collected in the Ranney collector. Water is pumped from the Ranney collector to the WTP, which is located approximately 300 feet west of the Ranney collector. The WTP uses the Microfloc contact clarification-filtration technology. This technology is classified as an alternative filtration technology under the State Surface Water

Treatment Regulations. Treatment processes include prechlorination, adsorption, clarification, mixed-media gravity filtration, and disinfection. Filter backwash water generated from the water treatment plant processes is discharged to two 216,000-gallon clarification reservoirs for recycling. Treated water is pumped to a new 1.5 mg clearwell /reservoir for post chlorination. From the clearwell, the water is pumped into the distribution system by vertical turbine high service pumps. Operation of the treatment plant is controlled through the use of a pressure transducer in the City's new 1.5 mg reservoir.

Surface water Wells 3 and 5, along with percolated groundwater Well 4, are equipped with gas chlorination facilities. In addition, Well 4 is equipped with a continuous reading turbidimeter. After chlorination, water from the surface water and percolated groundwater well is pumped directly into the distribution system.

Improvements to the WTP were completed in September 2006. The improvements include an additional Microfloc contact clarification-filtration unit for reliability and redundancy, new chlorine scrubber, new sodium hydroxide tank and dispensing system, new water distribution SCADA system, and high service pumps.

3.8.1 Water Quality of Existing Water Supply Sources

The quality of the City's water system is regulated by DHS, which requires regular collection and testing of water samples to ensure that the water quality meets regulatory standards and does not exceed MCLs. The City performs water quality testing, which has consistently met or exceeded regulatory standards.

The quality of existing surface water and percolated groundwater supply sources over the next 25 years is expected to be adequate. Surface water will continue to be treated to drinking water standards, and no surface water or groundwater quality deficiencies are foreseen to occur in the next 25 years. This plan will be subject to five year updates that can include new information concerning surface or groundwater contamination, if it becomes available. If new information becomes available in less than five years, the plan can be updated at that time to include that information and any revised water plans to address that information. Table 3-15 summarizes the current and projected water supply changes due to water quality.

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

Water Source	2005	2010	2015	2020	2025	2030
Russian River	0	0	0	0	0	0
Project Water	0	0	0	0	0	0
Groundwater	0	0	0	0	0	0
Recycled water	0	0	0	0	0	0

3.8.2 Water Quality Effects on Water Management Strategies

The City has a Water Quality Emergency Notification Plan (Notification Plan) for use when it is determined that an imminent danger to the health of the water users exists. Within the Notification Plan, City staff is directed to contact local authorities, radio stations, television stations, and newspapers. If necessary, City personnel are available to make door-to-door notifications during the hours that other media sources are not available to broadcast a warning.

The City also has developed a water treatment plant disinfection failure emergency plan, which describes the automatic shutdown of the chlorination system in the case of equipment malfunction. If the chlorination system cannot be rapidly repaired, the City has the following options:

1. Start a manual auxiliary chlorinator,
2. Prechlorinate at the Ranney collector and manually chlorinate at the clearwell if required
3. Start percolating groundwater Well 4 with an alternative dedicated chlorination system, and/or
4. Purchase water from the Millview CWD or the Willow CWD through the emergency intertie agreements.

Although the City does not have a formal emergency plan in place in the event that water cannot be pumped from the Ranney collector, surface water wells, or its percolated groundwater well, the City would initiate either Option 3 or Option 4 as described above, to provide water to its customers.

3.9 Water Shortage Contingency Plan

In 1977, the City of Ukiah adopted a Water Shortage Emergency Plan (see Appendix E), which recognized the possibility of long or short-term water shortages. The ordinance is intended to prohibit all nonessential water uses, and to allocate the available water supply during any water shortage emergency. The City has not needed to declare any water shortage emergencies due to lack of water supply.

Emergency situations that have been declared have been the result of problems with water treatment or distribution facilities. The City has been able to manage these emergency situations by restricting the watering of City parks and landscaped areas.

Notification of any water shortage emergency condition in the City will follow the guidelines set forth in the City's Water Shortage Emergency Plan. The City will first notify local authorities, radio, newspaper, and television media to inform them of the current status of the emergency. If needed, the City will contact neighboring water districts for mutual aid. If no other means is available, the City will notify customers on a house-to-house basis of the emergency and what voluntary or mandatory measures need to be implemented.

3.9.1 Estimate of Minimum Water Supply for Next Three Years

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

As was demonstrated by the hypothetical four-year minimum water supply scenario in Section 3.7.1, a reduction in the City's overall water supply does not require the City to declare voluntary or mandatory rationing of water because of a shortage of water supply. It should be noted that conditions that may produce reduction in water supply may lower the pumping capacity of the Ranney collector, surface water wells, and percolated groundwater well. Demands for the multiple dry water year scenarios were held constant because of the history of customers voluntarily reducing water use. Table 3-16 outlines the City's minimum supply for the next three years.

Table 3-16. Three-Year Estimated Minimum Water Supply - AF Year (DWR Table 24)				
Source	Normal 2005	Year 1 2006	Year 2 2007	Year 3 2008
Surface Water	14,480	7,355	7,355	7,355
Project Water	800	400	400	400
Groundwater	1,290	645	645	645
Recycled	0	0	0	0
Total	16,570	8,400	8,400	8,400

3.9.2 Stages of Actions

Per California Water Code Section 10632 (a), the Water Shortage Emergency Plan adopted by the City is divided into three stages. The three stages include both voluntary and mandatory rationing depending on the severity of the water supply shortage emergency. Table 3-17 shows the three stages and their representative shortages.

Table 3-17. Water Supply Shortage Stages and Conditions (DWR Table 23)		
Stage No.	Water Supply Conditions	Type of Program
I	Initiated when 15 percent water conservation needs to be met	Voluntary
II	For further conservation and/or stage I is not being met	Mandatory
III	Implemented if stage II is not achieving sufficient reduction	Mandatory

The City is responsible for supplying water for the health and safety needs of the community. If it appears the City may be unable to supply the normal demands and requirements of the water customers, the City Council may, by resolution, declare a water emergency. Based on the severity of the predicted shortage, the City will take the following actions:

Stage I: Voluntary Restrictions. When the City Council declares that a Stage I water shortage exists, the City will issue a proclamation urging citizens to institute water conservation measures on a voluntary basis.

Stage II: Nonessential Water Use. When the City Council declares that a Stage II water shortage exists, the City will institute mandatory water conservation measures. The City's Municipal Code includes prohibition on use such as: fire hydrant use restrictions; exterior irrigation restrictions; requirements for correction of leaks, breaks or malfunctions within a user's plumbing system; restrictions on washing cars, boats, buildings, and mobile homes; restrictions on washing of sidewalks, driveways, and other hard surfaced areas; restriction on filling swimming pools; and restrictions of potable water use for dust control purposes.

Stage III: Further Nonessential Water Use. All of the mandatory Stage II water use restrictions will continue to be enforced when the City Council declares a Stage III water shortage exists. In addition to the Stage II restrictions, the City will implement the following measures: daily usage allotment of 50 gallons per permanent resident for single family or duplex and 45 gallons per permanent resident for multi-residential units, all other uses will be limited to fifty percent of prior water use for a similar period, restriction on irrigation water, and restrictions for hand-watering.

California Water Code Section 10632 (e) requires the water supplier to provide consumption reduction methods in the most restrictive stages of a water shortage. Table 3-18 summarizes the consumption reduction methods and their projected reductions.

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

Consumption Reduction Methods	Stage When Method Takes Effect	Projected Reduction (%)[a]
Voluntary Reductions	I	10
Prohibition of non-essential uses	II	15
Mandatory Allotments	III	25

[a] *As the City has never been in a critical situation, these values have been assumed based on reductions observed in other cities.*

3.9.3 Prohibitions, Penalties and Consumption Reduction Methods

California Water Code Section 10632 (d) requires mandatory prohibitions against specific water use practices that may be considered excessive during water shortages. The City's Municipal Code includes prohibition on various wasteful water uses during a declared water shortage emergency. These mandatory prohibitions are implemented during a Stage II or Stage III water shortage emergency and are listed in Table 3-19.

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

Examples of Prohibitions	Stage When Prohibition Becomes Mandatory
Use of water from public hydrants for any other purpose than fire protection/prevention	II, III
Use of water through any meter when the consumer has been given 2 days notice to repair any leaks and has failed to complete repairs	II, III
Use of water by golf course to irrigate any grounds except those designated as tees and greens	II, III
Use of water to irrigate grass, lawns, ground cover, shrubbery, vegetable gardens, trees, or other outdoor vegetation	II, III
Use of water for the construction of any structure including such use in dust control	II, III
Use of water to wash sidewalk, driveway, street, parking lot, tennis court, or other hard surfaced area by hosing or by other direct use of water from faucets or other outlets	II, III
Use of water to fill or refill any swimming pool	II, III
Use of water to add to any swimming pool not equipped with and using a pool cover	II, III
Use of water in excess of the daily usage allotment set forth as: Single family or duplex – 50 gallons per permanent resident Multi-residential units – 45 gallons per permanent resident	III
All other uses not expressed above shall be limited to 50 percent of prior use for a similar period as determined by the City from its records	III
Water to irrigate	III
Use of water for hand-watering	III

Any customer violating the regulations and restrictions on water use receives a written warning from the City for the first violation. If the violation continues and the Director determines there has been a "willful failure to comply" with the regulations, the City may shut off a customer's water service. Table 3-20 lists the specifics of these charges and in what stages they may occur.

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

Penalties or Charges	Stage When Penalty Takes Effect
Penalty for use beyond restrictions as described in Stages II and III[a]	II, III
Penalty for use of water for prohibited uses described in Table 3-18[a]	II, III

[a] *Both first and second violations of this ordinance within any one year period shall be infractions. Any violations that continue after notice shall be a separate offense and shall be punishable as such hereunder; further, each day such violation continues shall be considered a separate offense (Ordinance 691, §1, adopted 1977).*

3.9.4 Mechanisms for Determining Actual Reductions

California Water Code Section 10632 (i) requires the water supplier to develop a mechanism for determining actual reductions in water use in the course of carrying out the water supply shortage contingency analysis. Water meter monitoring will be used to determine the amount of water reductions achieved during droughts.

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

Mechanisms for determining actual reductions	Type data expected
Water meter readings	Frequent meter readings

3.9.5 Revenue and Expenditure Impacts during Shortages

Section 10632 (g) of the California Water Code requires an analysis of the impacts of each of the actions taken for conservation and water restriction on the revenues and expenditures of the water supplier. To date, the City has not experienced shortages where it has implemented restrictions or prohibitions. In the Association of Bay Area Governments 2005 Water and Wastewater Revenue Bonds, Series A (2005), a rate stabilization fund was establish to allow the City to use money within this fund during a period of decreased revenue or increased expenditures until the City can implement a rate increase. The City would increase its rates as a measure to overcome revenue impacts.

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

Names of measures	Check if Discussed
Rate adjustment	✓
Development of reserves	✓

Table 3-23. Proposed Measures to Overcome Expenditure Impacts (DWR Table 30)	
Names of measures	Check if Discussed
Reserve Fund	✓

3.9.6 Catastrophic Supply Interruption Plan

California Water Code Section 10632 (c) requires actions to be undertaken by the water supplier to prepare for and implement adopted procedures during a catastrophic interruption of water supplies. The City has described its emergency response plan in Division 6, Chapter 2 – Emergency Services of the *City of Ukiah City Municipal Code*.

Table 3-24. Preparation Actions for a Catastrophe (DWR Table 25)	
Possible Catastrophe	Check if Discussed
Air pollution	✓
Fire	✓
Flood	✓
Storm	✓
Epidemic	✓
Earthquake	✓
Power Outages	
War	✓
Hazardous materials	✓
Environmental disaster	✓

3.10 Attachment (See Appendix H) - Effect of Reduced Eel River Imports on Future Water Supply for City of Ukiah Urban Water Management Plan – Prepared by Wagner and Bonsignore

4. RECYCLED WATER

This chapter discusses recycled water. Included in this chapter are discussions on agency coordination, existing wastewater facilities, current and projected recycled water use, agricultural irrigation, and recycled water optimization plan.

4.1 Agency Coordination

The City's Wastewater Treatment Plant (WWTP) treats residential and commercial wastewater from two entities, the City and the Ukiah Valley Sanitation District (UVSD). The UVSD serves Mendocino College, El Dorado Estates, Vichy Springs, 18 percent of the accounts within the City limits, and other areas contiguous to the City. Figure 4-1 shows the service area boundaries for the City and UVSD.

The City has set a goal to develop a Water Recycling Master Plan to investigate the economic feasibility of recycled water in the City and Ukiah Valley and to identify potential uses for recycled water to reduce the demand on its drinking water supplies. In 2005 and 2006, the City and UVSD submitted applications for state and federal grants to conduct a feasibility study and a Water Recycling Master Plan study. Although the specific roles in the study's development have not been determined, the agencies listed in Table 4-1 are assumed to play important roles.

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

Participating Agencies	Role in Development
City of Ukiah	to be determined
Ukiah Valley Sanitation District	to be determined

4.2 Wastewater Quantity, Quality, and Existing Uses

The City collects wastewater from approximately 82 percent of the area within the current City limits, while the UVSD collects wastewater from the remaining portion of the City and from most of the urbanized areas surrounding the City. The populations of the City and UVSD are approximately 15,600 and 5,000, respectively. Collected wastewater is transported by gravity through a main trunk sewer that is located along the west bank of the Russian River from the north end of the valley to the City's WWTP located on the south end of the City. The WWTP discharges advanced, tertiary treated water to the Russian River from October 1 through May 14 at a rate that does not exceed one percent of the Russian River flow. From May 15 through September 30, discharge is only to three evaporation/percolation ponds (ponds). The Water Quality Control Plan for the North Coast Region (Basin Plan) prohibits wastewater discharge to the Russian River between May 15 and September 30.

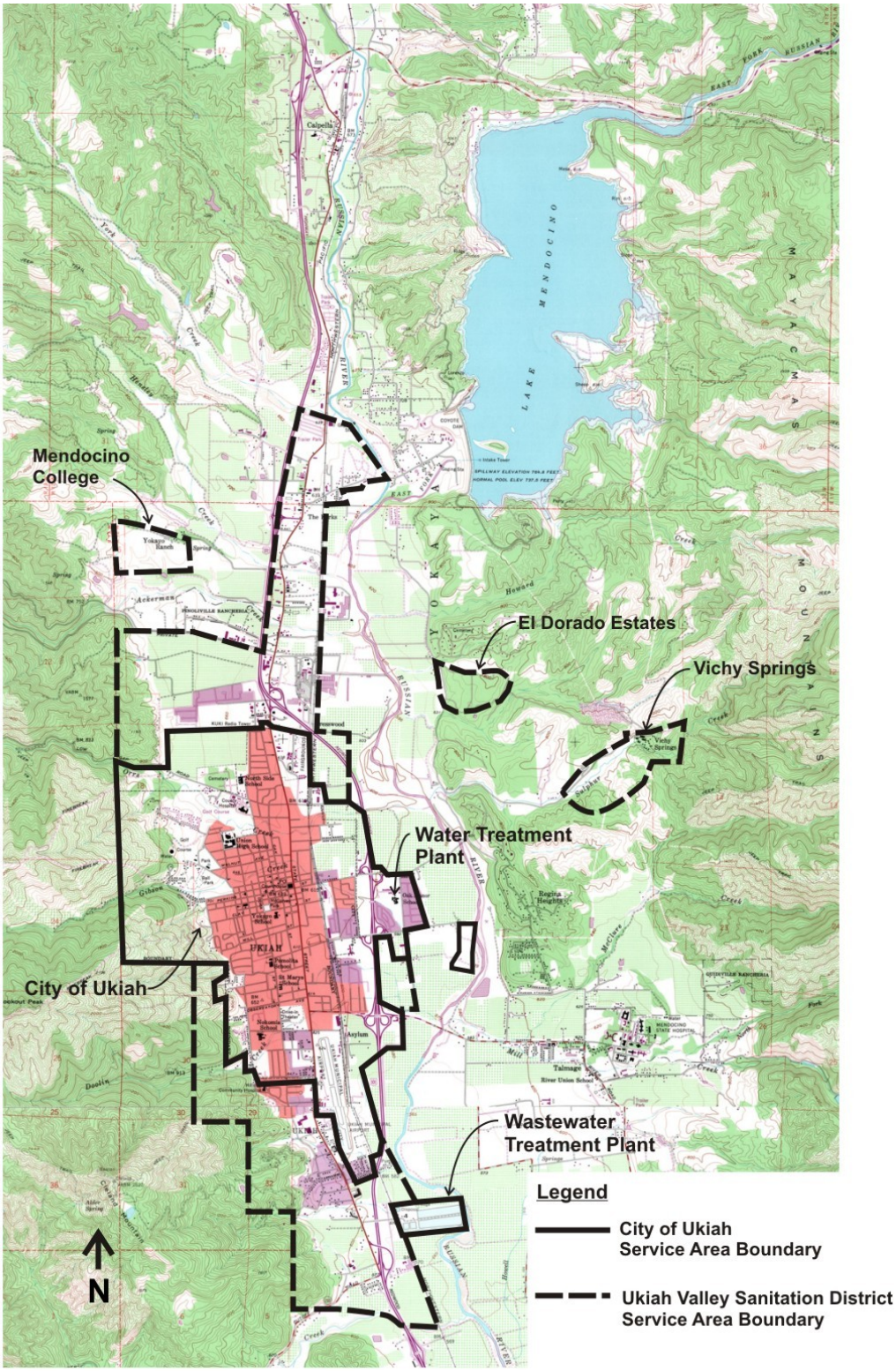

Figure 4-1. Ukiah Wastewater Treatment Plant Service Area

Wastewater Collection System. The collection system for the City and UVSD consists of gravity pipes that range from 6 inches to 42 inches in diameter. The total length of gravity pipe is approximately 67 miles. Most of the collection system is served by gravity; however, two areas on the east side of the City require pumping stations to convey the flow to the gravity sewers.

The age and condition of the City's sewer collection system varies by location. A portion of the collection system in the downtown area was installed in the 1890s. Approximately one-half of the City's collection system was installed before 1957 and 90 percent was installed before 1977.

Wastewater Treatment System. Construction of the original WWTP was completed in 1958. The original plant consisted of a headworks facility (one barminutor and four influent pumps), pre-aeration grit tanks, one primary clarifier, one trickling filter, one secondary clarifier, a chlorine contactor pipe, two anaerobic digesters, two oxidation ponds or evaporation/percolation ponds, and two sludge lagoons. The original plant capacity was 2.5 mgd average dry weather flow (ADWF) with a peak wet weather flow of 10.5 mgd. Discharge was to the Russian River. The design organic and solids loadings were 5,400 pounds per day (lb/day) and 5,400 lb/day, respectively.

The North Coast Regional Water Quality Control Board (Regional Water Board) of California modified discharge requirements in 1974 to allow only seasonal (October 1 through May 14) discharge to the Russian River at a discharge rate of one percent of the river flow. Flow above one percent of the Russian River flow between these dates and all flow from May 15 through September 30 is disposed of by a combination of evaporation and percolation from the ponds and by reuse of treated effluent onsite.

In 1983, the plant capacity was increased to 2.8 mgd ADWF with a maximum wet weather flow discharge to the Russian River of 7.0 mgd. The improvements included conversion of the secondary clarifier into a second primary clarifier, construction of a biological tower in addition to the trickling filter, three new secondary clarifiers, a new chlorine contactor pipe, new dechlorination facilities, addition of emergency generator facilities, and a new direct outfall. In addition, an earthen levee was constructed around the WWTP site and sludge lagoons at an elevation of 580 feet MSL to protect against the 100-year flood level.

In 1986, a third evaporation/percolation pond was constructed to the north of the two existing ponds, and in 1989, an effluent pumping station was constructed to transfer secondary effluent to the third pond. Also in 1989, the Regional Water Board revised the Basin Plan to require advanced wastewater treatment (AWT) of the effluent discharged to the Russian River. Secondary treatment was also required for discharge to the ponds. In 1995, the barminutors in the headworks were replaced with channel screen comminutors, and a fourth secondary clarifier, a new AWT system, and a new solids handling facility, including a belt filter press for processing solids, were constructed.

Currently, the City's WWTP discharges treated effluent under the National Pollutant Discharge Elimination System (NPDES) Permit No. CA0022888 issued by the Regional Water Board. Two discharge points are permitted as described above, one to the Russian River and the other to the three ponds. Figure 4-2 is an aerial view of the WWTP. Tables 4-2 and 4-3 summarize historical and projected wastewater flow from the collection, treatment, and disposal systems.

Figure 4-2. City of Ukiah Wastewater Treatment Plant

Table 4-2. Wastewater Collection and Treatment – AFY (DWR Table 33)							
Type of Wastewater	2000	2005	2010	2015	2020	2025	2030
Wastewater collected & treated in the service area	3,710[a]	4,483[a]	4,762[b]	5,295[b]	5,829[b]	6,362[c]	6,895[b]
Volume that meets recycled water standards	876[a]	441[a]	1,016[d]	1,129[d]	1,244[d]	1,357[d]	1,471[d]

[a] *Actual plant data.*

[b] *Interpolation of data between 2000 and 2030.*

[c] *2025 Design Criteria from TM 29, Technical Memoranda for the Wastewater Treatment Improvement Project, Volume 2, June 2003.*

[d] *Based on average recycled water produced for the period between 1997 and 2002.*

The City is constructing improvements to the WWTP facilities that will improve the effluent discharged. Completion of the improvements is expected in June 2009. The improvements to the WWTP will allow the AWT facilities to meet recycled water standards. The volume of recycled water for this UWMP was estimated based on plant data from the AWT facility discharge to the Russian River from 1997 through 2002. The WWTP discharged approximately 21.3 percent of its flow to the Russian River during that time period. Therefore, it was assumed that the WWTP would discharge 21.3 percent through 2030.

Table 4-3. Disposal of Wastewater (non-recycled) – AFY (DWR Table 34)							
Method of disposal	Current treatment level	2005	2010	2015	2020	2025	2030
Discharge to Russian River	Tertiary	441	1,016[a]	1,129[a]	1,244[a]	1,357[a]	1,471[a]
Evaporation/Percolation from Ponds	Secondary	4034	3,423[a]	3,843[b]	4,262[b]	4,682[b]	5,101[b]
Reuse within Plant	Secondary	8[c]	323[c]	323[c]	323[c]	323[c]	323[c]
Total		4,484	4,762	5,295	5,829	6,362	6,895

[a] *Based on average recycled water produced for the period between 1997 and 2002.*

[b] *Value of recycled water with no percolation from ponds. Assumes evaporation from ponds would be minimal.*

[c] *Estimated use of plant water within the WWTP property boundaries.*

4.3 Current and Projected Recycled Water Use

Only a small portion of the treated effluent is currently reused onsite at the WWTP. It is used for landscape irrigation, process washdown, and spray water. Because the flow that is reused is relatively small, it is not measured.

Potential publicly owned recycled water sites within and near the City include the Ukiah Municipal Airport, Highway 101 median, Ukiah Golf Course, city parks, schools, Anton Stadium, City's softball complex, City Civic Center, City and County Fairgrounds, and Mendocino College. Potential privately owned recycle water sites include vineyards and orchards.

The estimated acreage of land that could be irrigated from publicly owned sites is approximately 236 acres. There are not sufficient publicly owned facilities for use of all the recycle water and any recycled water program would require the participation of privately owned facilities. The Ukiah Municipal Airport and Highway 101 median are located close to the WWTP site and are the most feasible sites for recycled water. Most of the other sites are located in the northern part of the City, while the WWTP is located in the southern part of the City. This makes the cost to use recycled water significantly higher.

Privately owned facilities such as vineyards and orchards are the most likely users of recycled water. However, significant barriers were identified when local farmers and agricultural industry representatives were consulted. These barriers could limit the feasibility of a recycled water program for privately owned facilities. These barriers include the following: 1) seasonal need for water does not necessarily correspond with times when recycled water is most available, thus requiring additional storage facilities, 2) for organic farmers, the thought is that the use of recycled water would remove the organic certification from their products, 3) privately owned facilities fear the possibility of losing their existing water rights if recycled water is used, 4) existing water supplies appear to be sufficient to meet their needs, and 5) it is not cost effective to use recycled water without subsidizing the recycle water program. To fully implement a water recycle program, these barriers will need to be addressed through public education programs.

Tables 4-4, 4-5, and 4-6 list the actual, potential, and predicted recycled water use within the City.

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

User type	Treatment Level	2005	2010	2015	2020	2025	2030
Agriculture	Tertiary	0	0	tbd[a]	tbd[a]	tbd[a]	tbd[a]
Landscape	Tertiary	0	0	tbd[a]	tbd[a]	tbd[a]	tbd[a]
Wildlife Habitat		0	0	0	0	0	0
Wetlands		0	0	0	0	0	0
Industrial		0	0	0	0	0	0
Groundwater Recharge		0	0	0	0	0	0
Consumptive Reuse within Plant	Tertiary	8[b]	323[b]	323[b]	323[b]	323[b]	323[b]
Golf Course Irrigation		0	0	tbd	tbd	tbd	tbd
	Total Potential Recycled Water	8	323	3,843	4,262	4,682	5,101

[a] *The uses for recycled water have not been determined. The total amount will be divided amongst these uses.*

[b] *This quantity of flow reused at the plant is not measured. It is a relatively small quantity. Estimated use of plant water within the WWTP property boundaries.*

Table 4-5. Projected Future Use of Recycled Water in Service Area – AF Year (DWR Table 36)					
	2010	2015	2020	2025	2030
Projected use of Recycled Water	0	tbd[a]	tbd[a]	tbd[a]	tbd[a]

[a] *The uses for recycled water have not been determined.*

Disposal of wastewater is a vital part of the overall water balance for the City. The first step to understanding the role that recycled water has in the water balance is to complete a Water Recycling Master Plan, which the City plans to complete in the future. One component of the Water Recycling Master Plan will evaluate the economic feasibility and financing options for a recycled water system.

Table 4-6. Recycled Water Use – 2000 Projection Compared with 2005 Actual – AFY (DWR Table 37)		
User type	2000 Projection for 2005	2005 Actual use
Agriculture	0	0
Landscape	0	0
Wildlife Habitat	0	0
Wetlands	0	0
Industrial	0	0
Groundwater Recharge	0	0
Other (user type)	0	0
Total	0	0

4.4 Recycled Water for Agricultural Irrigation

The Ukiah Valley around the City has extensive farming operations and potential candidate customers /end users for the City's recycled water. Two principal issues are important for potential reuse - effluent quality and implications for water rights.

Effluent Quality. Once the WWTP improvements are completed, the AWT effluent from the City's WWTP will meets DHS requirements for unrestricted reuse (Title 22, California Administrative Code), specifically effluent filtration and disinfection to achieve total coliform concentrations of less than 2 most probable number per 100 milliliters. Such effluent would generally be acceptable for most agricultural applications, e.g., irrigation of pasture lands or fields used to forage. However, because of the AWT treated effluent total nitrogen concentration, vineyard owners may have some reservations regarding such reuse. Also, the Ukiah Valley has a high percentage of organic farmers. At this time, organic farmers may fear losing their organic certification if they use recycled water.

Water Rights. Some farmers have expressed concern that use of recycled water in place of their current water supplies could jeopardize surface water rights. However, California Water Code Section 1010 provides that no claim of water right (riparian, pre-1914 appropriative, post-1914 appropriative) will be reduced or lost as a result of the use of recycled water, and that the use of recycled water in lieu of surface water is equivalent to maintaining that right and shall constitute beneficial use. Further, Water Code Section 13550 states that

certain conditions must be met before the SWRCB can require a right holder to accept recycled water. The source must be of adequate quality, furnished at a reasonable cost, and not be detrimental to public health, prior rights, or the environment. The SWRCB is responsible for making a determination on each of these conditions and cannot require such use until after proper notice and a hearing is held.

4.5 Optimization Plan with Incentives

The City will develop a Water Recycling Master Plan in the future that will address optimizing the use of recycled water. The City is also investigating the use of dual distribution systems to promote re-use. Methods to encourage recycled water use will be considered, but have not been determined yet. Table 4-7 cannot be completed until after the completion and adoption of a Water Recycling Master Plan.

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

Actions	AF of use projected to result from this action				
	2010	2015	2020	2025	2030
To Be Determined	tbd[a]	tbd[a]	tbd[a]	tbd[a]	tbd[a]
Total	tbd[a]	tbd[a]	tbd[a]	tbd[a]	tbd[a]

[a] *These numbers cannot determined until completion and adoption of a Water Recycling Master Plan.*

5. HISTORICAL AND PROJECTED WATER USE

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

5.1 Employment, Land Use, and Population

The following paragraphs discuss the employment characteristics, land use characteristics, and population projects.

Employment Characteristics. Employment in Ukiah and the surrounding area is provided largely by the local hospital, retail, and service businesses. Agriculture also is a major employer in Mendocino County, including wineries, vineyards, orchards, and wood products. The number of small non-agricultural types of manufacturers and service industries continue to rise, while timber industry activities are in decline. As with many rural communities, state, county, and local government agencies also constitute a significant part of local employment (Ukiah Chambers of Commerce http://www.ukiahchamber.com/demographics.html).

Land Use Characteristics. Land use within the City region is characterized as suburban. Additional land uses in the region and service area include agriculture, industrial, commercial, and recreational.

Land use within the Russian River watershed is primarily agricultural with the greatest emphasis on vineyards, livestock, and orchard crops. Major orchard crops consist of apples, pears, and prunes, while some production of other crops such as olives and walnuts also occurs. The Russian River watershed contains both dry and irrigated pastures, with both hay and grain production. (Ukiah Chambers of Commerce http://www.ukiahchamber.com/demographics.html).

Population Projections. Ukiah has experienced slow population growth with a 2.9 percent total increase between 2000 and 2004. In 1995, the General Plan estimated an average annual growth rate of 4.5 percent. More recent data from the California Department of Finance indicates an average annual growth rate of 0.77 percent from 1999 to 2003. For the future water production analysis, an annual growth rate of 1.0 percent was assumed in the population projections in the City. Build-out for the City is expected in 2015 at a population of 17,992. For water planning purposes, the City also assumes that it will annex the land within the 1995 sphere of influence depicted in Figure 2-2 within the next 20 years. The population within this sphere of influence is expected to increase by 2,503. Table 5-1 summarizes the current and projected growth for the City assuming the City will gradually annex land within the sphere of influence for a 20 year period starting in 2011. Table 5-1 shows the current and projected population within the current City limits plus only the projected population growth within the 1995 proposed SOI. It is assumed for planning purposes that the current population within the proposed SOI is already receiving water to meet its current needs.

Table 5-1. Population – Current and Projected (DWR Table 2)							
	2000[a]	2005[b]	2010[b]	2015[b,c]	2020[b,c]	2025[b,c]	2030[b,c]
Service Area Population	15,497	16,288	17,118	18,618	19,244	19,869	20,495

[a] *Data from California Department of Finance 2003.*

[b] *Population estimated from data provided by the City. City buildout expected to be reached in 2015.*

[c] *Projections include population estimates from within the 1995 General Plan sphere of influence depicted in Figure 2-2.*

5.2 Historical Water Use

Water production is the volume of water measured at the source, which includes all water delivered to residential, commercial, and public authority customers, as well as unaccounted-for water. Records of historical water production obtained from Bartle Wells Associates serve as the basis for developing unit water demands for the City. The City recently restructured its water rate schedule and is also updating its accounting system. Current data does not support an accurate basis for developing unit water demands by user type.

5.2.1 Water Use By Connections

In 2005, the City served about 15,600 residents through approximately 5,700 connections. Current City accounting practices do not identify separate account types such as single family residential, multi-family residential, industrial, institutional/commercial, or landscape. The number of connections was projected based on the average number of people per connection from years 2002 to 2004. It was assumed that the City would begin annexing land within its sphere of influence in 2011 and that this process would span 20 years. This is reflected in Table 5-2 through 5-4. The total number of connection is shown in Table 5-2.

Table 5-2. Average People Per Connection		
Year	Total connections	People/Connection
2002	5,511	2.87
2003	5,558	2.87
2004	5,684	2.84
2005*	5,718	2.85
2010*	5,985	2.86
2015*	6,510	2.86
2020*	6,728	2.86
2025*	6,947	2.86
2030*	7,166	2.86
AVERAGE	6,549	2.86

** indicates projected values*

Based on the projected number of connections, an average production per connection was calculated for future water production through 2030. Table 5-3 shows this data. Because of the limitations of the City's accounting system, the water demands for industrial and commercial accounts can not be accurately determined, and therefore, are factored into the 2.86 people per connection value. This is also reflected in

the 0.73 AFY per connection. If a large water user enters the City's system, the UWMP should be updated to reflect this.

Table 5-3. Average Demand Per Connection (AFY/connection)

Year	Total production [AFY]	Connections	AFY/Connection
2000	4,223.87	5,511	0.77
2001	4,068.67	---	---
2002	4,163.37	5,511	0.76
2003	3,872.56	5,558	0.70
2004	4,129.93	5,685	0.73
2005	3,756	5,718	0.66
2006	3,831	5,771	0.66
2010*	4,369	5,985	0.73
2015*	4,752	6,510	0.73
2020*	4,912	6,728	0.73
2025*	5,072	6,947	0.73
2030*	5,231	7,166	0.73
AVERAGE	4,781	6,549	0.73

** indicates projected values*

Based on the average number of people per connection and the average water use per connection, the City's per capita usage is about 228 gpd. Because the City does not have data available to divide the water production into categories, only the total water deliveries and accounts are shown in Table 5-4.

Table 5-4. Past, Current and Projected Water Deliveries (DWR Table 12)

Year		Water use sectors	Single family	Multi-family	Commercial	Industrial	Institutional / Gov	Landscape	Agriculture	Total
2000	meter	# of accounts	---[a]	---	---	---	---	---	---	5,511
		Deliveries AFY	---	---	---	---	---	---	---	4,224
2005	meter	# of accounts	---	---	---	---	---	---	---	5,718
		Deliveries AFY	---	---	---	---	---	---	---	3,756
2010	meter	# of accounts	---	---	---	---	---	---	---	5,985
		Deliveries AFY	---	---	---	---	---	---	---	4,369
2015	meter	# of accounts	---	---	---	---	---	---	---	6,510
		Deliveries AFY	---	---	---	---	---	---	---	4,752
2020	meter	# of accounts	---	---	---	---	---	---	---	6,728
		Deliveries AFY	---	---	---	---	---	---	---	4,912
2025	meter	# of accounts	---	---	---	---	---	---	---	6,947
		Deliveries AFY	---	---	---	---	---	---	---	5,072
2030	meter	# of accounts	---	---	---	---	---	---	---	7,166
		Deliveries AFY	---	---	---	---	---	---	---	5,231

[a] Because the City's accounting system did not differentiate among connection types, the number of connections have been left out of this table.

5.2.2 Water Sales to Other Agencies

As stated in Section 3.7.2, the City is not a wholesaler and does not sell water to any of the local county water districts or water companies, except in emergencies under emergency intertie agreements with Millview and Willow County Water Districts. Because the City is not a wholesaler, Tables 5-5 and 5-6 are filled in with zeros.

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

Water distributed	2000	2005	2010	2015	2020	2025	2030
Millview County Water District	0	0	0	0	0	0	0
Willow County Water District	0	0	0	0	0	0	0
Rogina Water Company	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Table 5-6. Agency demand provided to wholesaler suppliers (DWR Table 19)

Wholesaler	2010	2015	2020	2025	2030
N/A	0	0	0	0	0

5.2.3 Unaccounted-for Water and Additional Water Use

Unaccounted-for water is un-metered water use such as fire protection and training, system and street flushing, sewer cleaning, construction, system leaks, and unauthorized connections. Unaccounted-for water can also result from meter inaccuracies. Based on estimates provided by the WTP, unaccounted-for water for this UWMP is assumed to be three percent of total water production.

Table 5-7 shows the results of unaccounted-for water and additional water use. The City does not use water as a saline barrier, groundwater recharge, or other conjunctive use. It also does not use its raw water for other purposes.

Table 5-7. Additional Water Uses and Losses – AFY (DWR Table 14)

Water Use	2000	2005	2010	2015	2020	2025	2030
Saline barriers	0	0	0	0	0	0	0
Groundwater recharge	0	0	0	0	0	0	0
Conjunctive use	0	0	0	0	0	0	0
Raw Water	0	0	0	0	0	0	0
Recycled[a]	0	0	0	tbd	tbd	tbd	tbd
Other (define)	0	0	0	0	0	0	0
Unaccounted-for system losses (~3%)	127	113	131	143	147	152	157
Total	127	113	131	143	147	152	157

[a] *Recycled water is not considered a loss and is not included in the total.*

5.2.4 Total Water Use

Table 5-8 shows the total combined water use from Tables 5-4, 5-5, and 5-7 (DWR Tables 12, 13, and 14).

Table 5-8. Total Water Use - AFY (DWR Table 15)

Water Use	2000	2005	2010	2015	2020	2025	2030
Total of DWR Tables 12, 13, 14	4,351[a]	3,869[a]	4,500	4,895	5,059	5,224	5,388

[a] *Data from WTP records*

5.3 Water Demand Summary

The City's demand is lower than its available water rights and water supply as discussed in Chapter 3. Based on the demand projections provided, the City's demand falls below its water supply up through 2030. The per capita demand of 228 gpd is relatively high but not out of line for similar communities given the warm summer climate and degree of landscaping.

However, at times, the City has a difficult time meeting demands, especially peak demands during extended periods of hot weather. The reason the City's water system cannot meet the peak water demands during these periods is because the pumping capacity of the existing Ranney collector, surface water wells, and percolated groundwater well is limited. Also, during drought conditions, the water table is lower, which reduces the yield of the wells. The City is conducting a groundwater well siting study to increase groundwater well production by 1,500 gpm to help the City meet its peak demands. However, additional pumping capacity will be needed to meet future growth within the 1995 General Plan sphere of influence depicted in Figure 2-2.

6. WATER SUPPLY VERSUS DEMAND COMPARISON

This chapter provides a comparison of projected water supplies and demand and water shortage expectations.

6.1 Current and Projected Water Supplies vs. Demand

This section provides a comparison of normal, single-dry, and multiple-dry water year supply and demand for the City. Water demands are addressed in Chapter 5, water supply is addressed in Chapter 3, and recycled water supply is addressed in Chapter 4 of this UWMP.

The projected normal water year supplies are compared to the current demand for the City in Table 6-1.

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

(from Table 3-7)	2010	2015	2020	2025	2030
Supply (16,570 AF for 2005)	17,175	17,175	17,175	17,175	17,175
% of year 2005	104	104	104	104	104

The current and projected water demands are compared to the current demands for a single dry year for the City in Table 6-2.

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

(from Table 5-8)	2010	2015	2020	2025	2030
Demand (3,869 AF for 2005)	4,500	4,895	5,059	5,224	5,388
% of year 2005	116	127	131	135	139

The projected water supply and demand are compared to the demands for a normal water year for the City in Tables 6-3. The projected demand goes up more between 2010 and 2015 than in future time periods, because it is anticipated that the City will begin serving a portion of the 1995 proposed SOI in 2010 and the City will have built out its existing City limits by 2015.

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

	2010	2015	2020	2025	2030
Supply totals	17,175	17,175	17,175	17,175	17,175
Demand totals	4,500	4,895	5,059	5,224	5,388
Difference	12,675	12,280	12,116	11,951	11,787
Difference as % of Supply	74	71	71	70	69
Difference as % of Demand	282	251	239	229	219

Based on Tables 6-1, 6-2, and 6-3, the City will have adequate water supply during normal years through 2030. Note that this comparison does not account for water saved as DMMs. Increased participation in DMMs could lower demand.

6.2 Water Shortage Expectations

The projected water supply and demand for normal, single dry year, and multiple dry years are shown in Tables 6-4 through 6-9. Even though the water supply totals exceed the water demand totals, it was assumed that water conservations within the City and the sphere of influence depicted in Figure 2-2 would occur with multiple dry years. This is a practice that the City has operated in the past because of the limited pumping capacity from the City's water supply sources. Also, during multiple dry years, the water levels drop, making it more difficult to pump. For Tables 6-5 through 6-9, the analysis assumed that after the first year of a drought, the City would reduce water use to 87.5 percent of normal use, the second year after a drought, the City would reduce its water use to 83.5 percent of normal use, and the third and fourth years, the City would reduce its water use to 75 percent of normal use.

Table 6-4. Projected Single Dry Year Water Demand – AF Year (DWR Table 45)

	2010	2015	2020	2025	2030
Supply totals	8,400	8,400	8,400	8,400	8,400
Demand totals	4,500	4,895	5,059	5,224	5,388
Difference	3,900	3,505	3,341	3,176	3,012
Difference as % of Supply	46	42	40	38	36
Difference as % of Demand	87	72	66	61	56

Table 6-5. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2010 – AF Year (DWR Table 48)

	2006	2007	2008	2009	2010
Supply totals	8,400	8,400	8,400	8,400	8,400
Demand totals	3,946	3,822	3,684	3,342	3,375
Difference	4,454	4,578	4,716	5,058	5,025
Difference as % of Supply	53	54	56	60	60
Difference as % of Demand	113	120	128	151	149

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

	2011	2012	2013	2014	2015
Supply totals	8,400	8,400	8,400	8,400	8,400
Demand totals	4,578	4,075	3,954	3,611	3,671
Difference	3,822	4,325	4,446	4,789	4,729
Difference as % of Supply	45	51	53	57	56
Difference as % of Demand	83	103	112	133	129

Table 6-7. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2020 – AF Year (DWR Table 54)					
	2016	2017	2018	2019	2020
Supply totals	8,400	8,400	8,400	8,400	8,400
Demand totals	4,928	4,340	4,169	3,770	3,794
Difference	3,472	4,060	4,231	4,630	4,606
Difference as % of Supply	41	48	50	55	55
Difference as % of Demand	70	94	101	123	121

Table 6-8. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2025 – AF Year (DWR Table 57)					
	2021	2022	2023	2024	2025
Supply totals	8,400	8,400	8,400	8,400	8,400
Demand totals	5,092	4,484	4,307	3,893	3,918
Difference	3,308	3,916	4,093	4,507	4,482
Difference as % of Supply	39	47	49	54	53
Difference as % of Demand	65	87	95	116	114

Table 6-9. Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2030 – AF Year (DWR Table 60)					
	2026	2027	2028	2029	2030
Supply totals	8,400	8,400	8,400	8,400	8,400
Demand totals	5,257	4,628	4,444	4,016	4,041
Difference	3,143	3,772	3,956	4,384	4,359
Difference as % of Supply	37	45	47	52	52
Difference as % of Demand	60	81	89	109	108

Based on the information shown in Tables 6-4 through 6-9, the City has adequate supply during multiple dry years. However, the City's pumping capacity is limited. The City plans on adding two groundwater wells in the near future and will need to add more wells as needed for connections within the 1995 General Plan sphere of influence depicted in Figure 2-2.

6.3 Water Shortage Summary

The City is not expected to have any water shortages in terms of water rights within the next 25 years. However, the City is currently limited by its pumping capacity, not its water supply. This analysis shows that even with a reduction in water supply, the City still has sufficient water supply to meet its forecasted demands without any water conservation.

7. DEMAND MANAGEMENT PRACTICES

Water conservation is a method available to reduce water demands, thereby reducing water supply needs for the City. This chapter presents a description of the City's water conservation program, an economic analysis of water conservation Demand Management Measures (DMMs) 1, 2, 6, and 14, and a description of the methods and assumptions used to conduct the analysis.

7.1 California Urban Water Conservation Council

The unpredictability of its water supplies and ever increasing demand on California's complex water resources have resulted in a coordinated effort by DWR, water utilities, environmental organizations, and other interested groups to develop a list of urban water conservation DMMs for conserving water. This consensus-building effort resulted in a Memorandum of Understanding (MOU) Regarding Urban Water Conservation in California, as amended September 16, 1999, among parties, which formalizes an agreement to implement these DMMs and makes a cooperative effort to reduce the consumption of California's water resources. The DMMs as defined by the MOU are presented in Table 7-1. The MOU is administered by the California Urban Water Conservation Council (CUWCC). The City is not currently a MOU signatory.

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

Table 7-1. Water Conservation Demand Management Measures

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

7.2 Methodology and Assumptions

An economic analysis is conducted for four of the 14 DMMs that are described in the MOU, DMMs 1, 2, 6, and 14. Economic analyses are not completed for DMMs 3, 7, 8, 12, and 13 because they are non-quantifiable, yet essential to the success of those DMMs that are quantifiable. Non-quantifiable DMMs are those that have no quantifiable amount of dollars that need to be spent to implement these programs. The amount of water saved from these DMMs is also not quantifiable. DMM 4, 7, 8, 11, and 12 are not analyzed because they are currently implemented; DMMs 5 and 9 are not analyzed because the City has very limited large landscape, commercial, industrial, and institutional customers. DMM 10 is not analyzed because the City is not a wholesaler.

Assumptions used in the economic analysis for each DMM analyzed are described in Appendix F. Directly beneath each assumption is a brief description of the rationale and/or supporting evidence for that assumption. Common assumptions for all DMMs are that the value of conserved water is $1,206/AF, the real discount rate is 6.15 percent, and the overhead rate is 13 percent. The real discount rate is calculated from the assumed real cost of money (8.67 percent) and the assumed long-term inflation rate (2.52 percent) using the precise conversion method (A&N Technical Services 2000, pg A-2).

The economic analysis was performed using Microsoft® Excel 2003, a spreadsheet program. A separate, customized worksheet for each DMM is presented in Appendix F. Each DMM economic analysis spreadsheet calculates, on an annual basis, the number of interventions and the dollar values of the benefits and costs that would result from implementing a particular DMM. Terms and formulas that are common to all the worksheets are defined in Table 7-2.

Table 7-2. Definition of Terms Used in the Economic Analysis

Term	Definition	Comments
BENEFITS		
Avoided Capital Costs	Capital costs that are avoided by implementing the DMM.	An example is the cost of a well that would not have to be installed due to implementation of the DMM.
Avoided Variable Costs	Variable costs that are avoided by implementing the DMM.	An example is the cost of electricity that would be saved if the DMM were implemented.
Avoided Purchase Costs	Purchase costs that are avoided by implementing the DMM.	An example is the cost of purchasing water that would not be needed due to implementation of the DMM.
Total Undiscounted Benefits	The sum of avoided capital costs, avoided variable costs, and avoided purchase costs.	
Total Discounted Benefits	The present value of the sum of avoided capital costs, avoided variable costs, and avoided purchase costs.	An annual percentage rate consisting of the cost of borrowing money minus the inflation rate.
COSTS		
Capital Costs	Capital costs incurred by implementing the DMM.	For example, the cost to purchase and install meters for DMM 4.
Financial Incentives	The cost of financial incentives paid to connections.	Co-pay or distribution for purchasing low-flow plumbing devices or washing machines are examples of financial incentives.
Operating Expenses	Operational expenses incurred during implementation of the DMM.	

Table 7-2. Definition of Terms Used in the Economic Analysis		
Term	Definition	Comments
Total Undiscounted Costs	The sum of capital costs, financial incentives, and operating expenses.	
Total Discounted Costs	The present value of the sum of capital costs, financial incentives, and operating expenses.	The discount rate is used to calculate discounted costs from undiscounted costs.
Net Present Value	Total discounted benefits minus total discounted costs.	A value greater than zero indicates an economically justifiable DMM.
RESULTS		
Benefit / Cost Ratio	The sum of the total discounted benefits divided by the sum of the total discounted costs.	A ratio greater than one indicates an economically justifiable DMM.
Simple Pay-Back Period	The number of years required for the benefits to pay back the costs of the DMM, calculated as the sum of the total discounted costs divided by the average annual total discounted benefits.	A low value is considered economically attractive.
Discounted Cost / Water Saved	The present-value cost to save one acre-foot of water, calculated as the sum of the total discounted costs divided by the total acre-feet of water saved over the study period.	A low value is considered economically attractive because it indicates a low implementation cost. Value must be less than the marginal cost of new water to be cost effective.
Net Present Value / Water Saved	The net value of saving one acre-foot of water, calculated as the sum of the net present value divided by the total acre-feet of water saved over the study period.	A high value is considered economically attractive.

7.2.1 Value of Conserved Water

The value of conserved water is based on the rate that the City charges its customers for water, plus the cost to treat the water at the wastewater treatment plant. The November 2008 rate of $1.29 per 748 gallons (see Table 7-3) was used plus $2,471 per million gallons to treat the water when it becomes wastewater. Because 80 percent of treatment costs are attributed to flow, only 80 percent of the cost to treat the wastewater was used. The remaining 20 percent of the wastewater treatment costs are associated with organic and solids loading. This equated to a total value of water of $1,206 per acre-foot.

This calculated value for conserved water does not include the capital cost for improvements to the wastewater treatment plant to recycle all of City's wastewater in the future if the City is not allowed to discharge into the Russian River. Based on the total annual water savings calculated, it is estimated that the City may be able to reduce the design flow for future wastewater treatment needs by 6 percent.

Table 7-3. City of Ukiah Water Utility – Proposed Water Rates 2004/05 – 2008/09				
Meter Size/Class Description	Proposed Monthly Service Charge Effective			
	November 2005	November 2006	November 2007	November 2008
¾"	14.36	14.64	14.94	15.24
1"	21.58	22.97	24.41	25.90
1 ½"	37.85	41.85	45.99	50.28
2"	58.10	65.38	72.93	80.75
3"	105.72	120.70	136.25	152.36
4"	173.40	199.43	226.44	254.45
6" & Up	341.13	394.53	449.92	507.37
Fire Service 2" & Under	11.62	13.08	14.59	16.15
Fire Service 3"	21.14	24.14	27.25	30.47
Fire Service 4"	34.68	39.89	45.29	50.89
Fire Service 6"	68.23	78.91	89.98	101.47
Proposed Consumption Rate ($/unit; 1 unit is 748 gallons)	0.91	1.07	1.20	1.29

7.3 Current Water Conservation Program

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

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

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

Schedule: The City offers to test customer meters upon request. The City does not track the number of tests performed annually.

Evaluation of DMM Effectiveness: Effectiveness of this DMM will be evaluated by program penetration and by comparison of prior audited customer water use to future water use. Table 7-4 summarizes the economic analysis for this DMM. The benefit to cost ratio is 1.3. See Appendix F for full economic results for this DMM.

DMM 2. Residential plumbing retrofit.

Description: Plumbing retrofit of existing residential accounts consists of providing low flow showerheads, faucet aerators, and toilet leak detection tablets to customers. This includes working with local programs and businesses to offer free water conservation information and materials to residents.

Schedule: The City has offered water savings kits in the past. However, due to lack of interest by customers, the City has discontinued this program.

Evaluation of DMM Effectiveness: The City offers retrofit kits if requested by the public, but has not seen significant savings as a result from these kits. Table 7-4 summarizes the economic analysis for this DMM. The benefit to cost ratio is 3.4. See Appendix F for full economic results for this DMM.

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

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

Schedule: The City performs leak detection and repair on an ongoing basis. The City, also, calculates system water losses annually and reports this information to DWR. In addition to calculating system losses, the City is currently replacing old meters in the system. The new meters will provide a more accurate reading of water use within the City.

Evaluation of DMM Effectiveness: The City's annual report to DWR tracks the unaccounted for water losses in the system. Any reductions in water loss due to the replacement of old meters and water leak detection and repairs will be reflected in the annual report. The City does not record the number of miles of distribution lines surveyed, nor the expenditures. This DMM is non-quantifiable and therefore, no results are provided in the economic analysis.

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

Description: The City water distribution system is fully metered. The City is currently replacing old meters in the system in an effort to provide more accurate readings of water use within its service area.

Schedule: The City will continue to install and read meters on all new services and replace aging meters.

Evaluation of DMM Effectiveness: Effectiveness of this DMM will be evaluated by comparison of prior water use to future water use. However, the City does not record the number of meter retrofits, metered and un-metered accounts, or the number of accounts without commodity rates. The City recently went through a rate re-structuring that is believed will reduce water uses in the future.

DMM 5. Large landscape conservation programs and incentives.

Description: The large landscape conservation program will consist of identifying all irrigation accounts and commercial, industrial, and institutional (CII) accounts with landscape of one acre and larger, and recording this information into a database.

Schedule: The City's Planning Department reviews all landscape plans proposed for new developments. Included in the City's Municipal Code is a requirement for all landscape planting to be "those which grow well in Ukiah's climate without extensive irrigation."

Evaluation of DMM Effectiveness: No economic analysis is performed on this DMM as the City has very few CII accounts. The City does not track the water use by large landscape customers, and can not evaluate the effectiveness of this DMM.

DMM 6. High-efficiency washing machine rebate programs.

Description: The high-efficiency washing machine rebate program would consist of distributing rebates to those customers who purchase a water conserving washing machine.

Schedule: The City does not currently have a high efficiency washing machine rebate program.

Evaluation of DMM Effectiveness: Effectiveness of this DMM is not evaluated because the City does not track the number of rebates. Table 7-4 summarizes the economic analysis for this DMM. The benefit to cost ratio is 0.4. See Appendix F for full economic results for this DMM.

DMM 7. Public information programs.

Description: Public information programs would consist of conservation news articles, fliers, media coverage, community events, etc.

Schedule: The City believes public awareness of water conservation issues is an important factor in ensuring a reliable water supply. The City promotes public awareness of water conservation through occasional bill stuffers, distribution of the Consumer Confidence Report, radio broadcasts, and the City web-site. In addition, City employees discuss with customers how they can conserve water.

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

The activities performed in this program fall under the conservation budget for the City. The conservation budget is $2,000.

DMM 8. School education programs.

Description: The City would prepare water conservation programs to target children at school.

Schedule: The City offers local schools tours of its water treatment plant and also provides educational materials. Four science classes on public water supply at the high school are offered once a year. The cost of this program comes out of the City's conservation budget.

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

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

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

Schedule: The City has only two industrial customers: Maverick Industries and Red Tail Ale Brewery. The City surveys the water usage of these industries. Any new commercial, industrial, or institutional developments will be reviewed by the City Planning Department and must meet all requirements of the Municipal Code. Due to the lack of CII accounts, this DMM has not been economically analyzed.

DMM 10. Wholesale agency assistance programs.

Description: Wholesaler water suppliers would provide financial incentives, or equivalent resources, as appropriate, beneficial, and mutually agreeable to their retail water agency customers to advance water conservation efforts and effectiveness.

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

DMM 11. Conservation pricing.

Description: Conservation pricing requires that water rates encourage conservative water use by all customers.

Schedule: The City recently increased and re-structured its water rates to encourage more conservation, see Table 7-3. The City has simplified its rate structure by eliminating rate codes and classifying customers according to their meter size. The new rate structure incorporates the American Water Works Association (AWWA) demand capacity guidelines so that price increases across meter size in proportion to the potential demand a customer can place on the water system.

Evaluation of DMM Effectiveness: Effectiveness of this DMM will be evaluated by comparison of City water use prior to and following the implementation of conservation pricing. Because the City has just implemented a new rate schedule, the effectiveness can not be evaluated.

DMM 12. Conservation coordinator.

Description: A conservation coordinator is an ongoing component of a City's water conservation program. The conservation coordinator would be responsible for implementing and monitoring a City's water conservation activities.

Schedule: In practice, all staff members encourage water conservation implementation. Water conservation coordination for the City is established by the policies determined by the City Council and includes answering questions of the public by maintenance and meter readers while in the field.

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

DMM 13. Water waste prohibition.

Description: Water waste prohibition will require the City to adopt its own set of water conservation regulations.

Schedule: The City has adopted regulations that state in part: "Where negligent or wasteful use of water exists on a customer's premises…the City may discontinue the service…" (City Municipal Code Article 7, Section 3571). The City first sends customers a letter calling their attention to the wasteful practice and asking for correction. If the condition is not corrected within five days after the written notice, service may be discontinued if necessary.

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

DMM 14. Residential ULFT replacement programs.

Description: Since October 1992, the sale of toilets using more than 1.6 gallons per flush has been prohibited by State and Federal regulations. The residential ULFT replacement program will require the City to hand out rebates to those who buy an ULFT toilet.

Schedule: These regulations are enforced in the City.

Evaluation of DMM Effectiveness: Effectiveness of this DMM has not been evaluated as the City does not track the number of rebates or expenditures. Table 7-4 summarizes the economic analysis for this DMM. The benefit to cost ratio is 2.9. See Appendix F for full economic results for this DMM.

7.4 Economic Analysis Results

An estimate of existing conservation savings is not available. It is likely that previous and ongoing conservation measures have resulted in water savings of approximately 2 to 5 percent of total water production. The water savings already achieved by existing conservation measures will have some impact on the City's ability to further reduce demand. Nevertheless, the City anticipates achieving additional water savings by further implementation of DMMs in the future. Of the four DMMs analyzed, three appear to be cost effective for the City. DMMs 1, 2, and 14 should be evaluated in the future to assess if the City has the capital to implement them. Table 7-4 summarizes the economic analysis results.

Table 7-4. Summary of Economic Analysis Results (DWR Table 16)

BMP No.	BMP Name	Total Discounted Cost ($)	Total Water Saved (acre-feet)	Benefit / Cost Ratio	Simple Payback Analysis (years)	Discounted Cost / Water Saved ($/acre-feet)	Net Present Value / Water Saved ($/acre-feet)
1	Water Survey Programs for Single-family Residential and Multi-family Residential Customers	27,924	104	1.3	10	268	88
2	Residential Plumbing Retrofit	47,887	229	3.4	4	209	455
6	High-efficiency Washing Machine Rebate Programs	32,557	24	0.4	47	1,356	-778
14	Residential ULFT Replacement Programs	409,099	1,932	2.9	7	212	407

With implementation of DMM 1, 2, and 14, the City could save an average of 130 AF per year at a cost of about $38,000 per year for the next 20 years. These costs do not account for recycled water pumping, which could add savings of about $5,250 per year on energy if energy costs $0.14 per kilowatt/hour. The City may also choose to run these programs on a less aggressive schedule to reduce the capital costs during the first few years. The ULFT toilet replacement program saves the City the most water. Due to natural attrition, many toilets will be replaced in the future even without a rebate program. The results of this economic analysis are similar to the results of other economic analyses conducted for cities of similar population.

7.5 Non-quantifiable DMMs

Because the water savings from DMMs 3, 7, 8, 11, 12, and 13 are not quantifiable, an economic analysis was not completed. The schedules and implementation strategies must be determined by the City based on information provided in the MOU to determine the best water conservation practices. The MOU provides examples of implementation strategies for these DMMs along with implementation schedules, coverage requirements, criteria to determine DMM implementation status, and requirements for documenting DMM implementation.

7.6 Additional Issues

Non-economic factors, including environmental, social, health, customer impacts, and technological are not thought to be significant in deciding which DMMs to implement. The City has the legal authority to implement the DMMs.