City of Ukiah

Recycled Water Feasibility Study

December 2012




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City of Ukiah

RECYCLED WATER FEASIBILITY STUDY

FINAL

December 2012

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City of Ukiah

RECYCLED WATER FEASIBILITY STUDY

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LIST OF ABBREVIATIONS

AACE	Association for the Advancement of Cost Estimating
af	Acre Feet
ac	Acre
AFY	Acre Feet per Year
ENR	Engineering News Record
ft	Feet
ft/kft	Feet per Thousand Feet
ft/sec	Feet per Second
gpm	Gallons per Minute
GW	Groundwater
M	million
Max	Maximum
MG	Million Gallons
mgd	Million Gallons per Day
Min	Minimum
Mod	Moderate
psi	Pounds per Square Inch
RRFCD	Russian River Flood Control District
SWRCB	State Water Resources Control Board
UUSD	Ukiah Unified School District
WWTP	Wastewater Treatment Plant

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Chapter 1

STUDY AREA CHARACTERISTICS

1.1 INTRODUCTION

The City of Ukiah (City) contracted with Carollo Engineers to provide engineering services to develop the City's first Recycled Water Feasibility Study (RWFS). The purpose of the RWFS is to determine the feasibility of constructing a recycled water system to replace/augment existing water supplies in Ukiah Valley. Recycled water use within the Valley would offset existing and future water demands for irrigation and frost protection of agricultural land, and in doing so, would support the local agricultural industry. It would also offset urban irrigation demands, ease storage limitations at the Ukiah Wastewater Treatment Plant (UWWTP) and reduce treated wastewater discharges to the Russian River.

The City of Ukiah (City), as shown in Figure 1.1, is located in Mendocino County in the northern coastal region of California. The City is situated in the Ukiah Valley approximately 60 miles north of Santa Rosa, 20 miles south of Willits, and 5 miles south-west of Lake Mendocino, and is surrounded by coastal ranges in southern Mendocino County. The Valley is bordered on the west by the Mendocino Range and on the east by the Mayacamas Mountains. Elevations in the nearby mountains reach over 1,800 feet above mean sea level (MSL), while elevations in the Valley range from about 560 feet above MSL in the south near El Robles Ranch to 670 feet above MSL in the north near Calpella. Interstate Highway 101 runs north to south through the City along its eastern boundary and the Russian River flows from north to south through the Ukiah area. Ukiah is the county seat for Mendocino County.

Originally part of a Mexican Land Grant, the City began its history as a Valley settlement in 1856. Due to the City's moderate climate and productive soil, lumber production became a major industry by the end of the 1940s. Agriculture is currently the largest industry in Ukiah and the rest of Mendocino County (www.cityofukiah.com). Ukiah is home to wineries, grape vineyards, pear orchards, and wood production plants, in addition to up-and-coming non-agricultural manufacturers.

1.1.1 IMPETUS FOR RECYCLED WATER USE

Surface waters, namely the Russian River (River) and Lake Mendocino, and groundwater are the major water resources that sustain the people and industries of Ukiah area. The City and several other water service providers in the area use a combination of these water supplies to support the urban demands within their service area boundaries. Agricultural entities also draw groundwater and surface water to both irrigate their crops and protect them from frost and heat events. Over the years, these water resources have become

Figure 1.1
LOCATION MAP
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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increasingly taxed to meet urban and agricultural demands as well as in-stream flow requirements for endangered species. As a result, the need to procure alternative water supplies, including recycled water, has increased.

Environmental groups have increasingly studied how river and groundwater diversions have negatively affected the species of the Russian River stream system and have requested increased regulation of these diversions. In 2009, The National Oceanic Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) presented the State Water Board with information that water withdrawn from the Russian River for frost protection of agricultural crops poses a threat to federally threatened and endangered salmonids in the Russian River watershed. They documented two episodes of fish stranding mortality that occurred in April 2008, one on Felta Creek in Sonoma County and the second on the mainstream of the Russian River near Hopland in Mendocino County (Draft EIR Russian River Frost Protection Regulation, 2007). NOAA Fisheries requested the State Board take regulatory action immediately to regulate diversions for frost protection to prevent salmonid mortality. The State Board is currently considering regulatory action that would deem any diversions for frost protection from March 15 through May 15 unreasonable, unless approved by the State Water Board through the completion of an extensive Water Demand Management Program (WDMP). In February 2012, the Courts granted a stay of the State Board regulations that declare frost protection diversions unreasonable in Mendocino and Sonoma Counties.

Faced with this future regulatory consideration, farmers in the Ukiah area are looking for alternative water supplies to sustain their agricultural practices. In addition to this, during dry years water service providers in the surrounding area are limited on the amount of water they can withdraw from the River and Lake Mendocino. Developing recycled water supplies in the Ukiah Valley and surrounding area would increase the overall water supply and its reliability under a range of hydrologic conditions.

The recycled water supply that is being considered under this study is the treated wastewater effluent of the UWWTP. While water users are being limited by the water they can take out of the River, the City is limited on the treated effluent they can put in the River. The City must comply with increasingly stringent discharge requirements that regulate both the volume and quality of the water that can be discharged to the Russian River. As a result, when discharging to the River, the City currently discharges very high quality effluent that meets recycled water needs. Limited on the volume and time at which treated effluent can be discharged, the City could benefit from additional disposal alternatives including delivery of recycled water to irrigation customers.

This report includes the City's plan for implementing recycled water use in the City of Ukiah and surrounding area. This report follows the July 2008 State Water Resources Control Board Water Recycling Funding Program Guidelines. These guidelines can be found on the Board's website at the following website:

http://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/docs/final_wrfpguidelines071508.pdf.

1.2 VISIONING WORKSHOP

The City of Ukiah held a visioning workshop on February 28, 2011 early in the master planning process to ensure the RWFS aligned with the goals and values of the City and other potentially affected interests. To ensure the master plan addressed both local and regional issues and provided local and regional benefits, the City of Ukiah invited City engineering, planning, management, and operations staff, water service providers in the surrounding area from Redwood Valley to Willow County Water District, and agricultural entities to partake in the visioning workshop. Attendees included representatives from the following entities:

- City of Ukiah
- Ukiah Valley Sanitation District
- Mendocino County Russian River Flood Control and Water Conservation Improvement District
- Mendocino County Farm Bureau
- Millview Water District
- Rogina Water District
- Willow Water District
- Redwood Valley Water District

The group discussed values and challenges pertaining to the RWFS and identified several goals and objectives. Some of the identified goals and objectives included:

- Implementing a recycled water program that is safe and meets the needs of the City and surrounding communities, including local agricultural businesses.
- Reducing withdrawals from the Russian River and Lake Mendocino surface waters.
- Implementing a program that is financially viable and minimizes costs to ratepayers.

It was agreed during the workshop that implementing recycled water anywhere within Ukiah Valley and the surrounding area would improve the regional water supply from Redwood Valley to Hopland. The attendees also identified major water uses located near the recycled water source – the UWWTP.

1.3 STUDY AREA

As described above, at the onset of the recycled water master planning effort, the City considered the water needs within the entire Ukiah Valley and surrounding areas. Understanding that implementing recycled water anywhere in the Valley would have regional benefits and that minimizing project costs was a major objective, the City narrowed the focus of the master planning effort to the area surrounding the UWWTP. A major cost of recycled water programs can be the infrastructure associated with distributing the water to recycled water customers. The closer the customers are to the source, less distribution is needed, which leads to a more cost effective program.

Through the visioning workshop and preliminary GIS analysis, the City identified major water users within a reasonable distance of the UWWTP and determined a study area that included those users. Figure 1.2 illustrates the RWFS Study Area. For reference, the figure also illustrates the City limits, the City Sphere of Influence (SOI), and the City Planning Area (General Plan).

The City's General Plan, adopted in December 1995 and revised in 2004, identifies boundaries associated with two planning areas: the incorporated area within the City limits and the unincorporated area, which is a combination of the Sphere of Influence (SOI) and an additional planning area. The City limits include the land currently within the City of Ukiah. The City's SOI represents the land limits to which the City may extend its services and project its growth over the next 20 years. The SOI must be adopted by the Local Agency Formation Commission (LAFCo) if the City wants to consider annexing land area. For comprehensive policy planning, the City's General Plan also incorporates an additional planning area, which encompasses the surrounding Ukiah Valley and includes the City of Ukiah. The planning area encompasses land area which is unlikely to be annexed by the City within the next 20 years, including rural communities Calpella, Talmage, and the Forks, and the North State Complex – a central point of business and commerce for portions of the unincorporated County (City General Plan).

1.4 HYDROLOGIC FEATURES

The City of Ukiah and the surrounding area are located in the Ukiah Valley groundwater basin (Basin). For planning purposes, the Department of Water Resources (DWR) has subdivided the State of California into ten separate hydrologic regions, corresponding to the State's major drainage basins. The Ukiah Valley groundwater basin (Number 1-52 as described in DWR Bulletin 118) is located in southeastern Mendocino County and is the largest basin along the Russian River. The Basin is approximately 22 miles long and 5 miles wide, and underlies Ukiah Valley and Redwood Valley, an area over sixty square miles. The groundwater is hydraulically connected to and interacts with surface water flows.

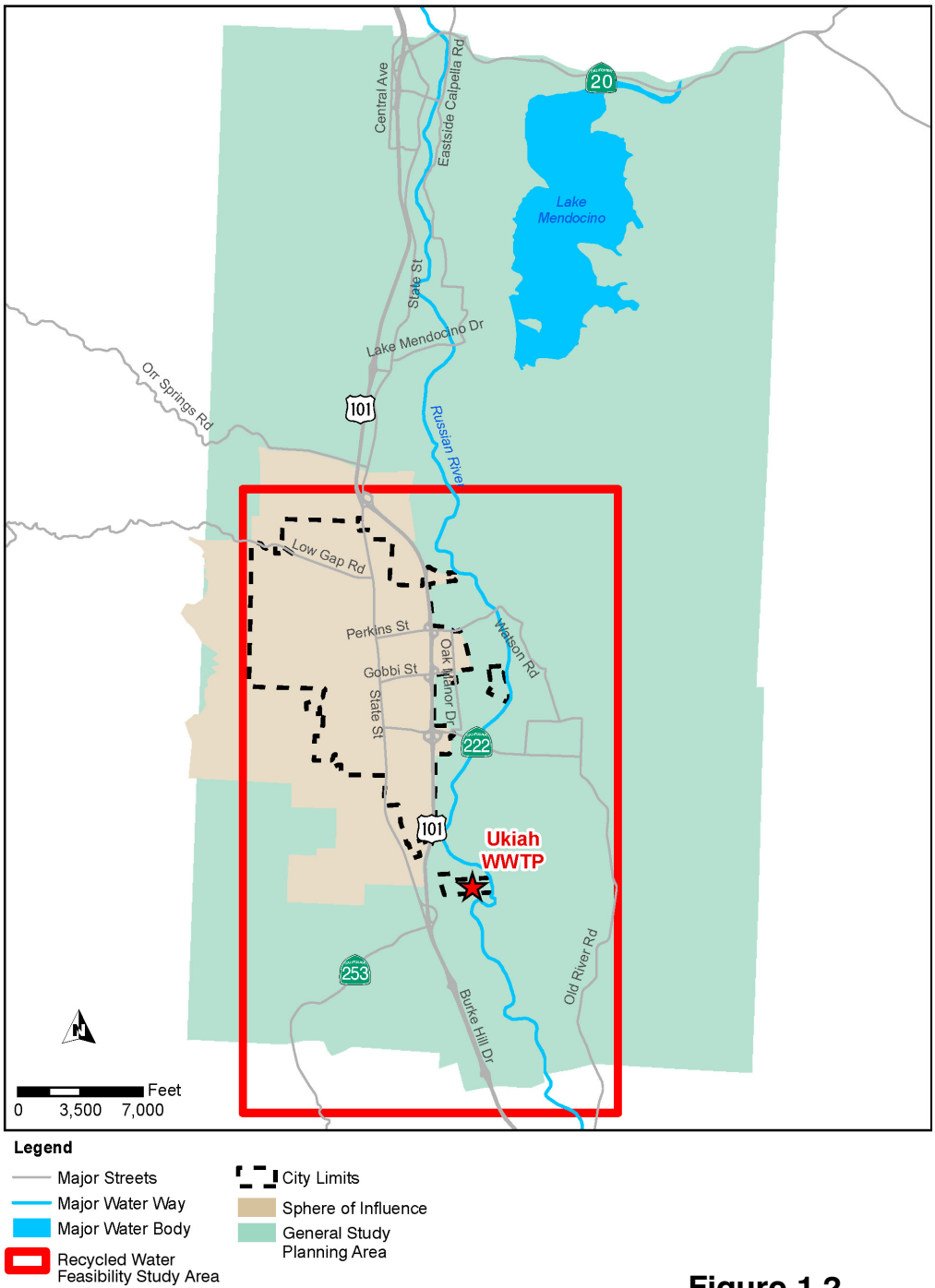

Figure 1.2
RECYCLED WATER FEASIBILITY STUDY AREA
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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Major surface waters in the Ukiah area include the Russian River and Lake Mendocino. The River flows from North to South through the Ukiah Valley. Lake Mendocino is a large reservoir located northeast of the City of Ukiah. The Lake was formed in 1958 with the construction of Coyote Dam. In addition to these hydrologic features, there are a number of minor streams and creeks that flow through the Ukiah area. In the past, the City has managed surface runoff by channelizing creeks passing through the downtown area. For many years, the pear orchards and vineyards along the river have served as de facto detention basis and floodwater storage areas for the City's and County's urbanized land uses (City General Plan) Figure 1.3 illustrates the hydrologic features in the Ukiah area.

1.5 LAND USE AND POPULATION

Land use within the City of Ukiah is predominantly residential, rural residential, and commercial, while land use in the remaining portions of the RWFS Study Area is predominantly agricultural and rural residential with some industrial areas. Figure 1.4 illustrates the land use within the RWFS Study Area. A majority of the agricultural land is grape vineyards and pear orchards. Residential land use is generally located west of the Russian River (City of Ukiah General Plan, 2004).

The UWWTP is the primary source of recycled water considered under this plan. The wastewater supply conveyed to the UWWTP, that is ultimately available for recycled water reuse, is directly impacted by the population served by the UWWTP – the City of Ukiah. The incorporated City of Ukiah has a population of approximately 15,612 as of January 1, 2010[1], and represents approximately 18 percent of Mendocino County. The median annual growth rate between 1995 and 2010 was approximately 0.4 percent, although the City experienced a net decrease from its 2003 population of 15,942. The City population increased by 0.1 percent between 2009 and 2010.

Population projections, shown in Table 1.1 were included in the City's 2010 Urban Water Management Plan and were used to forecast water requirements for the City. Historical population statistics shown on Figure 1.5 are from California Department of Finance (DOF) estimates. These population projections pertain to the population served by the City's water distribution system. The SOI defined in the General Plan represents the ultimate limits to which the City will extend its water services over the next 20 years. The most recent population projection for the City of Ukiah was included in the 2010 Mendocino County General Plan, in which the annual population growth for the City is estimated at one percent through 2020. Based on this most recent estimate by the County, recent periods of slow growth, population decline, future annexation plans, and that build out is expected to occur by 2015; the annual population was projected in the Urban Water Management Plan to increase by 1 percent between 2015 and 2035. A population increase will result in increased wastewater supplies available for recycled water reuse.

[1] California Department of Finance.

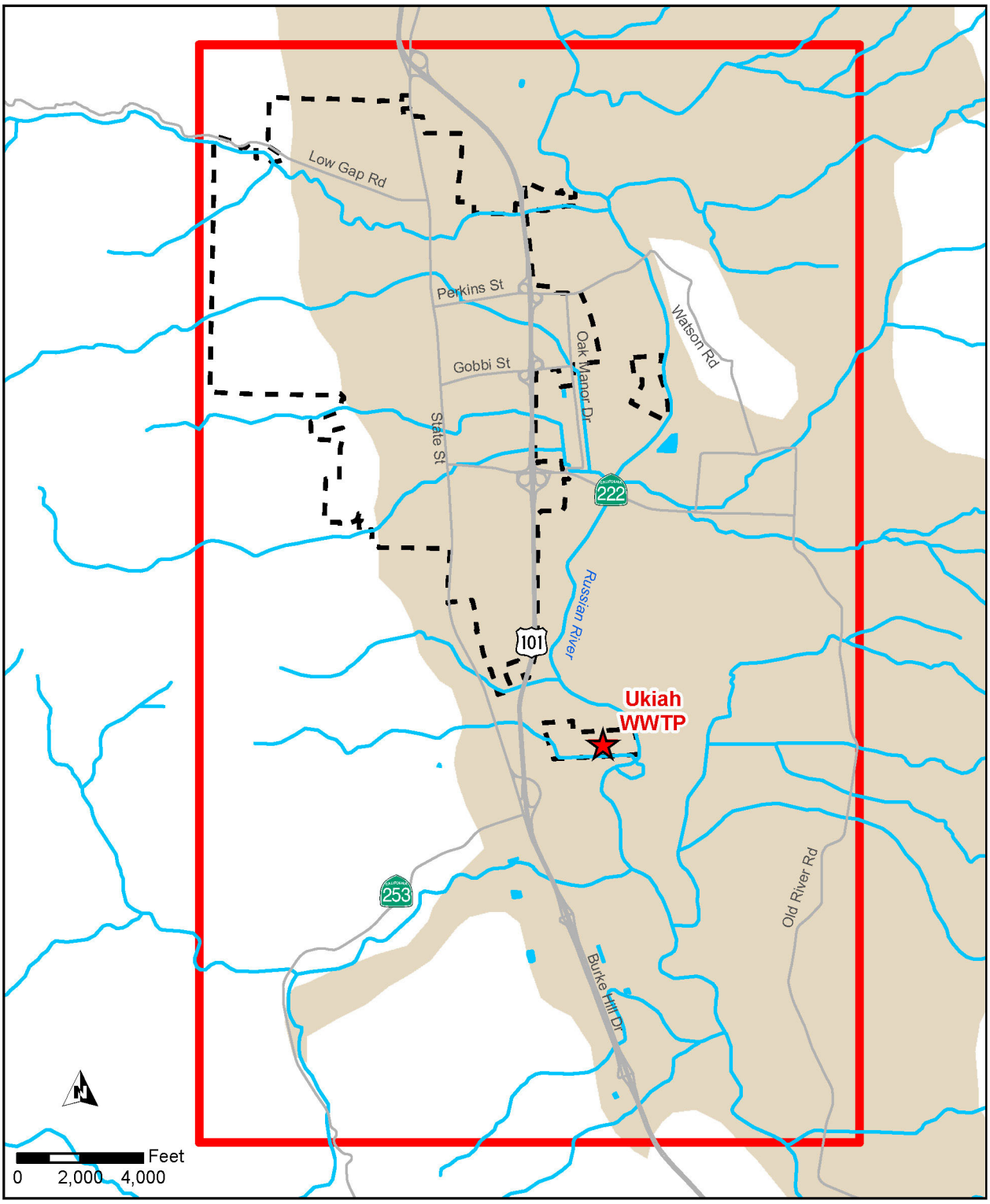

Figure 1.3
HYDROLOGIC FEATURES
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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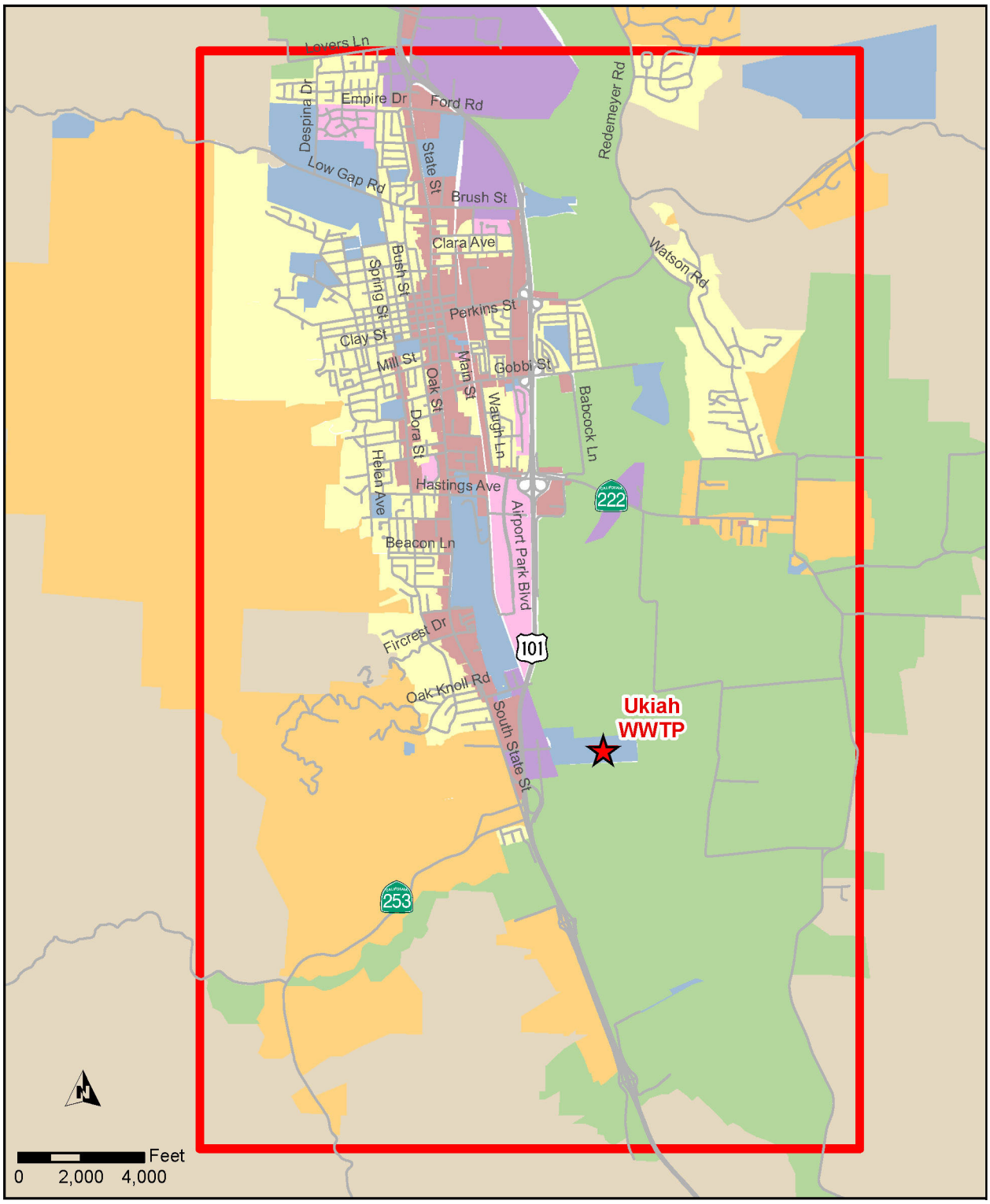

Legend

- Streets
- Recycled Water Feasibility Study Area

Land Use

- Agriculture
- Commercial
- Industrial
- Planned Development
- Public Facilities
- Rangeland
- Residential
- Rural Residential

Figure 1.4
LAND USE
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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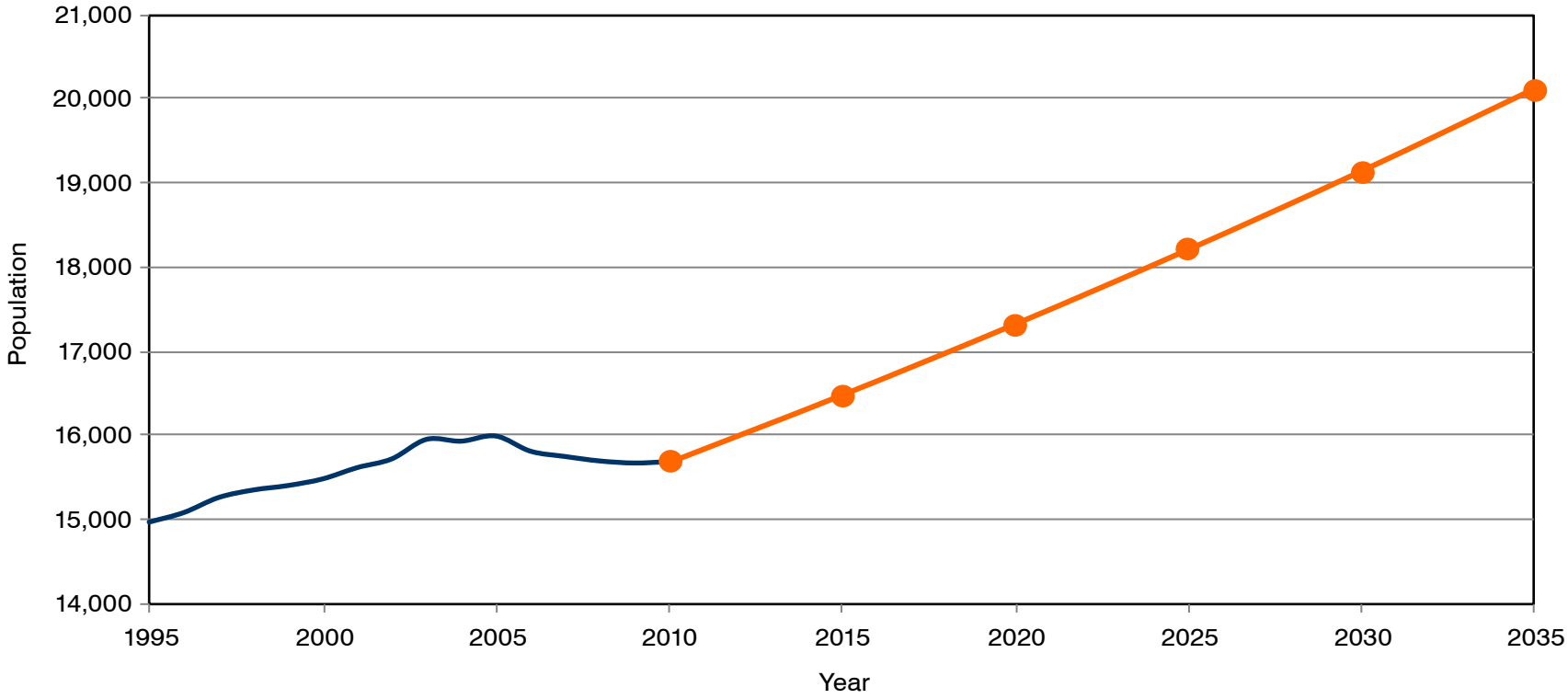

Notes:
(1) Source: California Department of Finance
(2) Source: 2010 Mendocino County General Plan

Figure 1.5
HISTORICAL AND PROJECTED POPULATION
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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Table 1.1 Current and Projected Population
Recycled Water Feasibility Study
City of Ukiah

Years	2010	2015	2020	2025	2030	2035	Data Source
Service Area Population[1]	15,682	16,482	17,323	18,206	19,135	20,111	Source[2]

Notes:
(1) Service area population is defined as the population served by the water distribution system.
(2) Projected estimates based on expected population growth from the Mendocino County General Plan, adopted March 2010. An annual growth rate of one percent was used.

Chapter 2

WATER SUPPLY CHARACTERISTICS AND FACILITIES

2.1 WATER SOURCES

A combination of water supplies are used to meet the needs of the Ukiah Valley area, namely groundwater, surface water from the underflow of the Russian River, and project water available from the Mendocino County Russian River Flood Control and Water Conservation Improvement District.

2.1.1 Overview of Water Sources

The Ukiah Valley area includes four major watersheds: Ukiah Valley, Redwood Valley, Potter Valley, and Hopland Valley. These watersheds are shown in Figure 2.1.

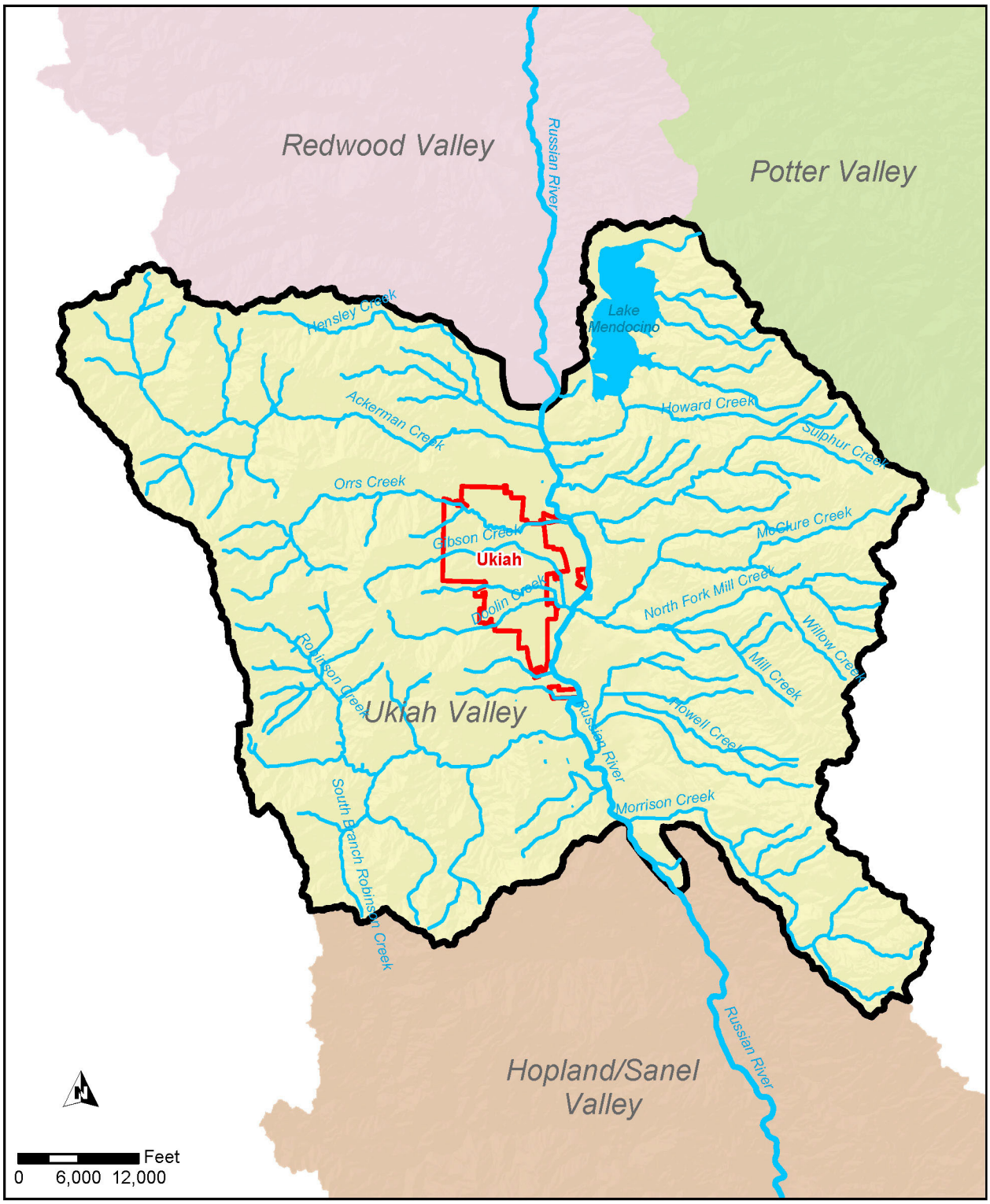
2.1.2 Surface Water

Surface water sources in the Ukiah Valley and surrounding areas (including Redwood Potter, and Hopland Valleys) include the Russian River, the Potter Valley Hydroelectric Project (PVP), and Lake Mendocino. These three sources are the Ukiah area's primary water supply and provide significant recharge of the Ukiah Valley Groundwater Basin (Mendocino County Water Supply Assessment, 2010).

Historically, the Russian River has had high flows in the winter and spring and low or no flows in the summer and fall; however, the construction of the Coyote Dam and Lake Mendocino in 1959 transformed the Russian River into a perennial surface water which has supported agricultural and urban development in Ukiah Valley.

The Potter Valley Hydroelectric Project began operating in 1912 and includes two water impoundments along the Upper Eel River and a diversion tunnel and powerhouse located along the East Fork of the Russian River. Waters from the project are ultimately discharged to the East Fork which runs through Potter Valley and to Lake Mendocino. The PVP has turned the East Fork into a perennial stream, which has allowed agricultural and urban development in Potter Valley.

Lake Mendocino and Coyote Valley Dam is a federal facility that was constructed by the United States Army Corps of Engineers (USACE) in 1959. It is located along the East Fork of the Russian River about three miles north of Ukiah. Lake Mendocino is the Valley's primary water storage facility providing storage for flood control, municipal and industrial water supplies, recreation, and power generation. Lake Mendocino has a maximum storage capacity of 122,000 acre-feet (af), of which 50,000 af is reserved for flood control purposes. The remaining portion is potentially available for water supply storage (Mendocino County Water Supply Assessment, 2010).



Legend

- Waterway
- Water Body
- City Limits

Watersheds

- Ukiah Valley
- Potter Valley
- Redwood Valley
- Hopland/Sanel Valley

Figure 2.1
UKIAH VALLEY AND NEIGHBORING WATERSHEDS
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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2.1.3 Groundwater

In addition to surface water, groundwater is a major water source for municipal and industrial use. As mentioned in Chapter 1, the Ukiah Valley Groundwater Basin (Number 1-52 as described in DWR Bulletin 118) is located in southeastern Mendocino County and is the largest basin along the Russian River. The Basin is approximately 22 miles long and 5 miles wide, and underlies Ukiah Valley and Redwood Valley. This basin is not adjudicated.

The United States Geological Survey (USGS) published a Water Resources Investigation Report 85-4258 in 1986 on the Groundwater Resources in Mendocino County, California (USGS Investigative Report). Storage capacities and groundwater elevations within the Basin were evaluated in the USGS Investigative Report. USGS concluded that groundwater wells in the Basin, monitored over a 30-year period, show no prominent long-term declines. In addition, hydrograph analysis indicates that the Basin is recharged fully each year except when precipitation falls below 60 percent of normal.

DWR Bulletin 118 suggests that groundwater in storage is approximately 90,000 af in the upper 100 feet of the most productive area of the Ukiah Valley, and an additional 45,000 af within the margins of the Ukiah Valley. Therefore, the volume of water available from pumping from the upper 100 feet of the most productive portion of the aquifer is estimated at 90,000 af. Groundwater is hydraulically connected to and interacts with surface flows.

2.2 WHOLESALE AND RETAIL ENTITIES

Water service providers in the Ukiah Valley include:

- Mendocino County Russian River Flood Control and Water Conservation Improvement District (RRFC)
- Calpella County Water District
- Millview County Water District
- The City of Ukiah
- Rogina Water Company
- Willow County Water District
- Redwood Valley County Water District
- Hopland Public Utility District

The service area of each of these entities is illustrated on Figure 2.2.

Property owners without access to the City or one of the district systems obtain water from individual wells or springs (Mendocino County Water Supply Assessment, 2010).

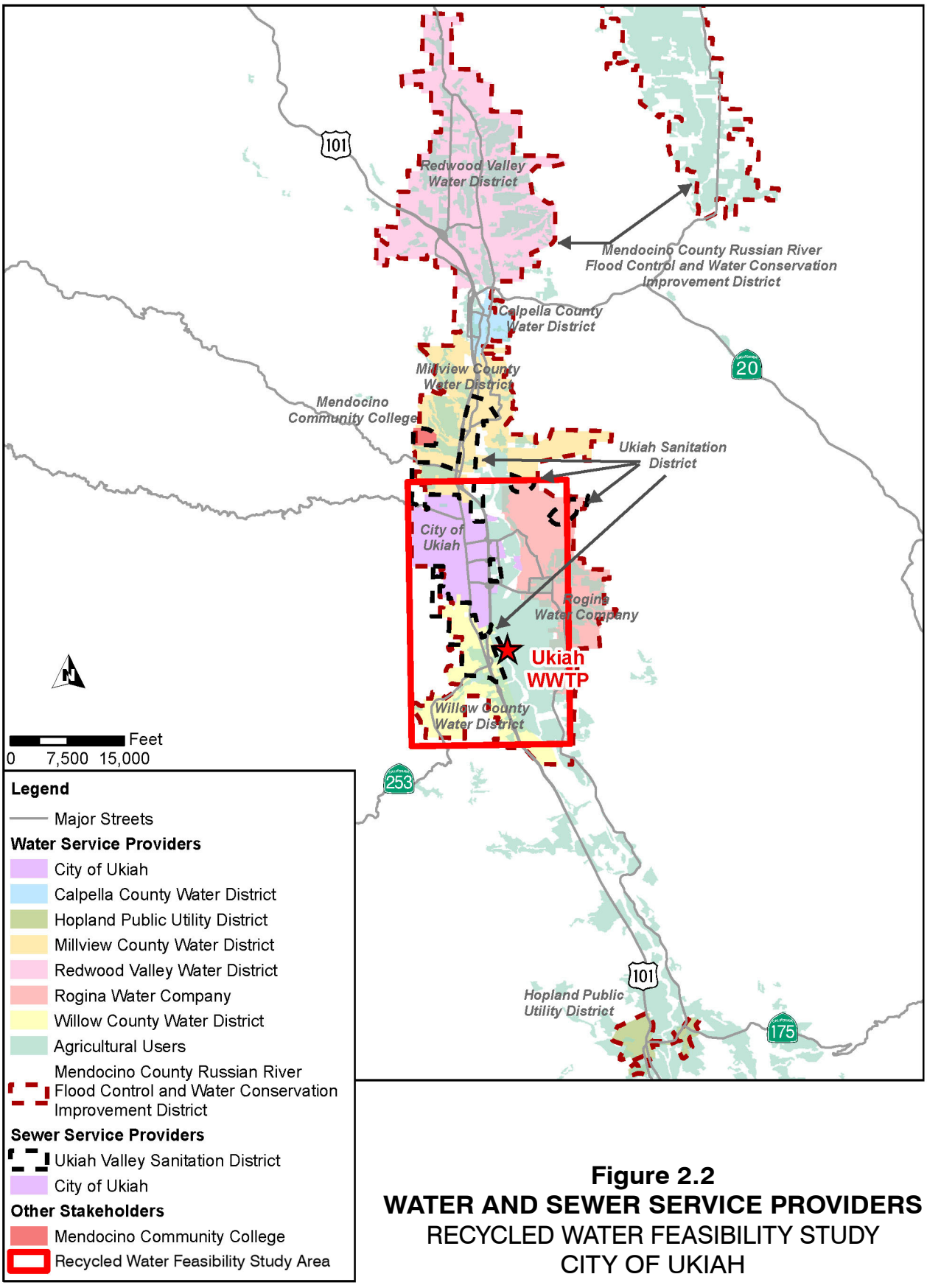

Figure 2.2
WATER AND SEWER SERVICE PROVIDERS
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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2.2.1 RRFC

The RRFC is a wholesale water provider of water to Mendocino County for domestic, municipal, irrigation, and recreational purposes. The RRFC holds Water Right Permit 12947B for storage and use of up to 8,000 af per year. This water supply includes water stored in Lake Mendocino and water directly diverted from the East Fork of the Russian River. The water is sold to public water systems for urban use and to private agricultural entities for irrigation and frost protection. Of the 8,000 af provided each year, only 500 af has yet to be contracted to public water systems and entities. Water that is not contracted is currently sold to Redwood Valley County Water District for municipal and agricultural use.

2.2.2 The City of Ukiah

The City of Ukiah is the largest public water service provider in the Ukiah Valley, providing roughly half of Ukiah Valley's public water supply (Mendocino County Water Supply Assessment, 2010). The City's water supply sources include groundwater, surface water from the underflow of the Russian River, and project water available from the RRFC. During dry periods, when surface and underflows are insufficient the City can purchase up to 800 af of water annually from the RRFC per Water Right Permit 12947B.

2.2.3 Other Water Service Providers

The other water surface providers listed above use a combination of the following water supplies:

- Surface water diverted from the Russian River
- Surface water diverted from Lake Mendocino
- Groundwater
- Water supply contracts with the RRFC

2.3 WATER RIGHTS

Both public and individual agricultural entities have water rights to divert surface water from the Russian River. Appropriate water rights to Lake Mendocino were established on January 28, 1949 and from that point forward, appropriate water rights to Russian River drainage were grouped into three major categories: Pre-1949 rights, Lake Mendocino Rights and Post-1949 rights (Mendocino County Water Supply Assessment, 2010).

2.3.1 Pre-1949 Water Rights

Pre-1949 water rights include approximately 8,000 af that is primarily comprised of direct diversions from the Russian River. These rights are subject to the availability of stream flows during authorized diversion seasons, i.e., water right holders only have water supply if there is stream flow.

Many agricultural entities in the upper Valley have Pre-1949 rights and rely on these rights to supply irrigation and frost protection waters to their crops.

2.3.2 Lake Mendocino Water Rights

Lake Mendocino rights allow for substantial storage of water in Lake Mendocino to accommodate water needs during dry periods. Consequently, there are times when all, or nearly all, of the Russian River flow is attributed to Lake Mendocino releases and the water rights associated with Lake Mendocino. These rights allow diversions from Lake Mendocino even in times when little or no water is legally available to Pre-1949 water right holders. As a result, these water rights make Lake Mendocino an essential water supply source during dry and critically dry years.

2.3.3 Post-1949 Water Rights

Post-1949 rights are junior to Pre-1949 and Lake Mendocino rights. Consequently, during extended or critically dry periods, Russian River flows may be to low to legally exercise these rights.

2.3.4 Water Rights of Public Water Providers

The RRFC has Pre-1949 rights; the City of Ukiah has a combination of Pre-1949 and Post-1949 rights; and the Millview County Water District and Willow County Water District have Post-1949 water rights (Russian River Division of Water Rights 2005).

2.3.5 Legislation and Water Rights

Water availability for all users in Mendocino County is an increasingly contentious and acute issue. Regulations and policies are being implemented In part to reduce impacts to instream habitat, including critical habitat for chinook salmon and steelhead trout in the Russian River. The California State Water Resources Control Board required water purveyors in the Russian River to reduce their water use by 15%. In addition to this, the state passed Assembly Bill 2121 (AB2121) in 2004, which added Water Code section 1259.4 and required the SWRCB to implement guidelines to maintain instream flows in northern California Coastal streams (Mendocino Irrigated Agricultural Water Needs and Management, 2008).

There is concern that the Russian River waters are fully allocated, with no water remaining for future water rights applicants. As a result, agricultural applications for water rights are

being delayed by the SWRCB, in some cases, for over a decade (Mendocino Irrigated Agricultural Water Needs and Management, 2008).

In addition to the lack of water available for future water rights, existing water rights may be further regulated. AB2121 may prohibit Russian River underflow diversions. While this does not impact water rights holders located along the main stem of the Russian River, this will impact water rights holders located along the tributaries of the River.

As discussed in Chapter 1, the National Oceanic and Atmospheric Administration's National Marine Fishers Service has requested the SWRCB address concerns that water diversions from the Russian River stream system for purposes of frost protection of crops will cause significant salmonid mortality. In response to this, the SWRCB is proposing regulation that would provide that diversions from the Russian River stream system for purposes of frost protection from March 15 through May 15 are unreasonable, unless they are in accordance with a Water Demand Management Program (WDMP) approved by the State Water Board. In order to be approved the WDMP would be required to include: (1) an inventory of the frost diversion systems within the area subject to the WDMP, (2) a stream stage monitoring program, (3) an assessment of the potential risk of stranding mortality [of salmonids] due to frost diversion, (4) identification and implementation of necessary corrective actions, and (5) an annual reporting program. The SWRCB is scheduled to hold a public hearing to receive comments and to consider adopting a proposed Russian River frost protection regulation on September 20, 2011.

If the regulation is adopted, agricultural entities may lose the right to divert water from the Russian River for frost protection from March 15 – May 15. While frost season typically occurs from March through May, this regulation could be detrimental to the Ukiah Valley agricultural industry if additional water supplies are not secured for frost protection. (Mendocino Irrigated Agricultural Water Needs and Management, 2008) (SWRCB Notice of Proposed Frost Protection Regulation Hearing, 2011)

2.4 BENEFITS OF RECYCLED WATER USE

Implementation of recycled water in the Ukiah Valley area could provide several regional water resource benefits. Not only could it be used for frost protection to sustain the local agricultural industry, it could also be used for agricultural irrigation and urban irrigation. Any amount of recycled water reuse in the area will decrease water that is diverted from the Russian River and Lake Mendocino. In making more water available in these surface waters, water service providers, including those with junior water rights, will have a more reliable water supply over a wider range of hydrologic conditions.

2.5 CITY OF UKIAH WATER FACILITIES

The City's water supply facilities include five active wells and a Ranney Collector. Table 2.1 below provides a summary of the water supply sources, including description of the type of supply source for each facility.

Table 2.1 Water Supply Sources[1]
Recycled Water Feasibility Study
City of Ukiah

Facility	Type of Supply	Current Status	Production Capacity (GPM)
Ranney Collector[2]	Surface water	Active	3,194
Well #3	Groundwater influenced by surface water	Active	600
Well #4	Groundwater	Active	799
Well #5	Groundwater influenced by surface water	Active	300
Well #7	Groundwater	Active	799
Well #8	Groundwater	Active	694
		Total Active Well Capacity (GPM)	**6,386**
		Total Active Well Capacity (AFY)	**10,308**

Notes:
(1) Source: City staff records.
(2) The Ranney Collector can only be used during the dry season when surface water turbidity is low.

The City's surface water is obtained from the Ranney Collector and Wells 3 and 5, which draw water from an alluvial zone along the Russian River. Water taken from these sources is considered under the influence of surface water by the California Department of Public Health (DPH). Accordingly, water diverted from the Ranney Collector and Wells 3 and 5 is classified as surface water. The City also draws groundwater from Wells 4, 7, and 8.

2.6 AGRICULTURAL WATER FACILITIES

Agricultural farmers within the area maintain their own onsite pumping and distribution systems to supply water to their crops. Depending on their access and water rights, they rely on water from the Russian River and its tributaries as well as groundwater. Some farmers maintain onsite storage ponds. With this storage, farmers are able to divert flows during low demand seasons when river flows are high (e.g., the winter) and store the water for future use during high demand seasons when river diversions are more restricted (e.g., frost season).

Farmers typically have two types of distribution systems: one for irrigation, and a second for frost protection. The irrigation system usually includes a small, electric pump(s) that distributes water to one irrigation block at a time and rotates through each irrigation block. The frost protection system usually includes a lager pump(s) that distributes water to the entire lot at one time.

2.7 GROUNDWATER MANAGEMENT, RECHARGE AND OVERDRAFT PROBLEMS

2.7.1 Groundwater Management Plan

A groundwater management plan has not been prepared for the City, Ukiah Valley, or Mendocino County. In the future, the City may consider coordination with other agencies within the Basin to develop a more comprehensive groundwater management plan.

2.7.2 Groundwater Levels and Historical Trends

In general, the Basin experiences seasonal and year-to-year variation in groundwater elevations due to relative rainfall and pumping, as described in Bulletin 118 and the USGS Investigative Report. However, these variations tend to be small and water levels, in general, recover.

Groundwater elevations fluctuate seasonally, being the highest level in March or April at the end of the wet season and lowest in October at the end of the dry season. Seasonal fluctuations range on the order of about 5 to 20 feet. Long-term measurements are taken and recorded from several wells within the Ukiah Valley.

The USGS Investigative Report found that, from the available hydrographs of the Basin, none of the hydrographs show prominent long-term declines. In fact, water levels measured during the 1980s are similar to those measured during the 1960s and 1970s.

DWR Bulletin 118 concurs with this assessment. According to Bulletin 118, groundwater levels in the Basin have remained relatively stable in the past 30 years. As expected, there is increased drawdown during summer months and less recovery in winter months when the area experiences drought conditions. Post-drought groundwater conditions rebound to approximately the same levels as pre-drought conditions.

Based on historical information available for the Basin, groundwater supplies are expected to adequately meet existing and future demands.

2.7.3 Groundwater Overdraft

The current and historical groundwater trends for this Basin indicate that there is no long-term decline in water levels that suggest water shortage or overdraft. The Basin is not considered to be in a state of overdraft by DWR, and is not projected to be in a state of overdraft in the near future.

2.8 WATER USE TRENDS

Table 2.2 summarizes the City's current and projected water supply sources, excluding potential, future recycled water sources. As shown in the table, the City's water supply is not expected to increase in the future.

Table 2.2 Water Supplies - Current and Projected[1]
Recycled Water Feasibility Study
City of Ukiah

Water Supply Sources		Projected Water Supply (AFY)					
Water purchased from:	**Wholesale Supplied Volume**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Project Water (Mendocino County Russian River Flood Control and Water Conservation Improvement District)	Yes	800	800	800	800	800	800
Supplier-produced groundwater[2]	No	3,705	3,705	3,705	3,705	3,705	3,705
Supplier-produced surface water[3]	No	14,480	14,480	14,480	14,480	14,480	14,480
Supplier-produced surface water (pre-1914 Rights)	No	2,027	2,027	2,027	2,027	2,027	2,027
Transfers In	No	0	0	0	0	0	0
Exchanges In	No	0	0	0	0	0	0
Desalinated Water	No	0	0	0	0	0	0
Total		**21,012**	**21,012**	**21,012**	**21,012**	**21,012**	**21,012**

Notes:
(1) Excluding potential, future recycled water sources.
(2) Based on groundwater pumping capacities provided by the City.
(3) Permit 12952 (Application 15704) authorizes diversion of 20 CFS, with no annual limit. Therefore, the City's potential water right is reported above.

2.9 WATER COSTS

Current water costs are summarized in Table 2.3.

Table 2.3 Current Water Costs
Recycled Water Feasibility Study
City of Ukiah

Water Source	Cost
City of Ukiah Potable Water(1)	$963/acre-foot ($2.21/unit)
Water Purchased from RRFC	$47/acre-foot

Note:
(1) Based on July 2011 water rates (see table in appendix).

2.10 QUALITY OF WATER SUPPLIES

As reported in the 2010 Urban Water Management Plan, water quality issues are not anticipated to have significant impact on water supply reliability. Unforeseen future occurrences of chemical contamination or the lowering of maximum contaminant levels (MCLs) for naturally-occurring constituents can be mitigated with proper treatment. If water quality becomes an issue for water supply reliability in the future, the City will evaluate the need for upgrades to its current treatment system or construction of a new water treatment facility.

The City continually takes the necessary steps to comply with existing and future groundwater quality regulations and to continue to provide reliable water service to its residents.

2.11 PLANS FOR NEW FACILITIES OR ADDITIONAL WATER SOURCES

There are no current plans in the Ukiah Valley for new water facilities or additional water sources. As discussed in the Urban Water Management Plan, the City's firm water supply capacity is approximately 43 percent higher than the maximum projected demand through 2035. The total current supply capacity is 65 percent higher than projected 2035 demands. Therefore, the City has no planned projects to increase its water supply production capacity. Maintenance and well replacement projects may be performed on an as-needed basis.

WASTEWATER CHARACTERISTICS AND FACILITIES

3.1 WASTEWATER ENTITIES

There are several wastewater entities in the Ukiah Valley; however this study focuses on two wastewater entities – The City of Ukiah and the Ukiah Valley Sanitation District (UVSD) – because these two entities collect the wastewater flows that can potentially be used to provide recycled water to the Valley. The City of Ukiah and the UVSD provide sewerage collection and treatment services for a population of about 20,000 residential, commercial, and industrial customers.

3.2 WASTEWATER COLLECTION SYSTEM FACILITIES

The City collection system receives wastewater from about 82 percent of the City's service area and serves about 75 percent of the City's population. The UVSD serves the remaining portion of the City's service area and about 25 percent of the City's population, as well as an additional 5,000 residential customers from the urban areas surrounding the City. Both collection systems convey the collected wastewater to the Ukiah Wastewater Treatment Plant (UWWTP).

3.3 WASTEWATER TREATMENT FACILITIES

The Ukiah Wastewater Treatment Plant (UWWTP) is owned and operated by the City. The UWWTP includes primary, secondary, and tertiary treatment facilities, as well as solids handling facilities. The tertiary treatment facilities are referred to as the Advanced Wastewater Treatment (AWT) System. Table 3.1 summarizes the treatment capacity of the UWWTP and Table 3.2 summarizes the major components of the UWWTP facilities.

Table 3.1 Treatment Capacity of UWWTP
Recycled Water Feasibility Study
City of Ukiah

Design Flow Criterion	Units	Secondary Treatment	AWT System[(1)] (Tertiary Treatment)
Average Dry Weather Flow (ADWF)	mgd	3.01	N/A[(2)]
Average Wet Weather Flow (AWWF)	mgd	6.89	4
Peak Wet Weather Flow (PWWF)	mgd	24.5	8

Notes:
(1) The Advanced Wastewater Treatment (AWT) Facility produces effluent that meets Title 22 recycled water requirements.
(2) The AWT system is not operated during dry weather flows.

Table 3.2 Major Components of UWWTP Facilities Recycled Water Feasibility Study City of Ukiah		
Primary and Secondary Treatment Facilities	**AWT System (Tertiary Treatment Facilities)**	**Solids Handling Facilities**
• Influent pump station • Bar screen facility and grit removal system • Primary clarifiers • Trickling filter pump station and trickling filters • Solids contact tanks • Secondary clarifiers • Chlorine disinfection system • Effluent pump station	• AWT pump station • Coagulation system • Tertiary multimedia filters and backwash pump station • Chlorine contact basins • Dechlorination system	• Dissolved air flotation thickeners • Anaerobic digesters • Belt filter press for dewatering

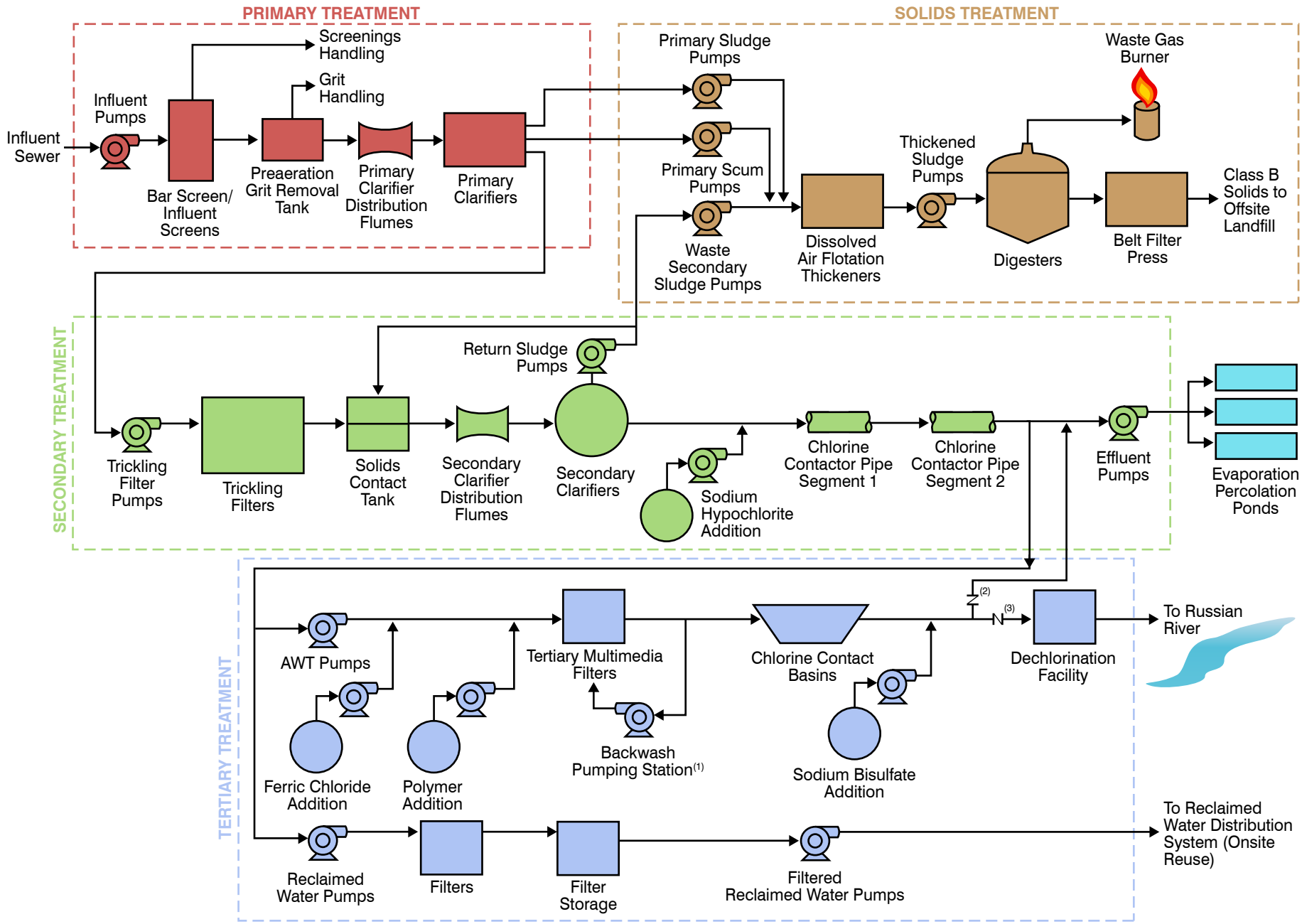
3.3.1 Treatment Process Description

A process flow diagram of the existing liquid and solids handling facilities is presented in Figure 3.1.

The UWWTP produces disinfected secondary effluent which is discharged to three percolation/evaporation ponds, and disinfected, dechlorinated tertiary effluent that is discharged to the Russian River. As shown in Figure 3.2, raw wastewater enters the plant through two gravity influent lines: one 42-inch influent line enters from the north, and one 18-inch influent line enters from the west. Wastewater entering the facility is pumped to influent screens and manually cleaned bar screens which remove large solids from the effluent. It then flows through a pre-aeration grit removal tank which removes grit and other solids from the flow. Screenings and grit slurry from the bar screens and grit tank are washed and discharged offsite.

The primary wastewater treatment process facilities include four primary clarifiers where additional solids settle from the effluent. Two primary sludge and two scum pumps pump sludge and scum to two dissolved air flotation thickeners for solids treatment, while four trickling filter pumps pump the clarified primary effluent to the trickling filters.

Secondary treatment is achieved with a fixed film biological treatment process followed by an activated sludge process. Primary effluent is pumped to the top of two trickling filters where it subsequently falls by gravity through the trickling filter media. A biofilm on the



Notes:
(1) Includes backwash pumps and surface wash pump.
(2) Valve normally closed.
(3) Valve normally open.

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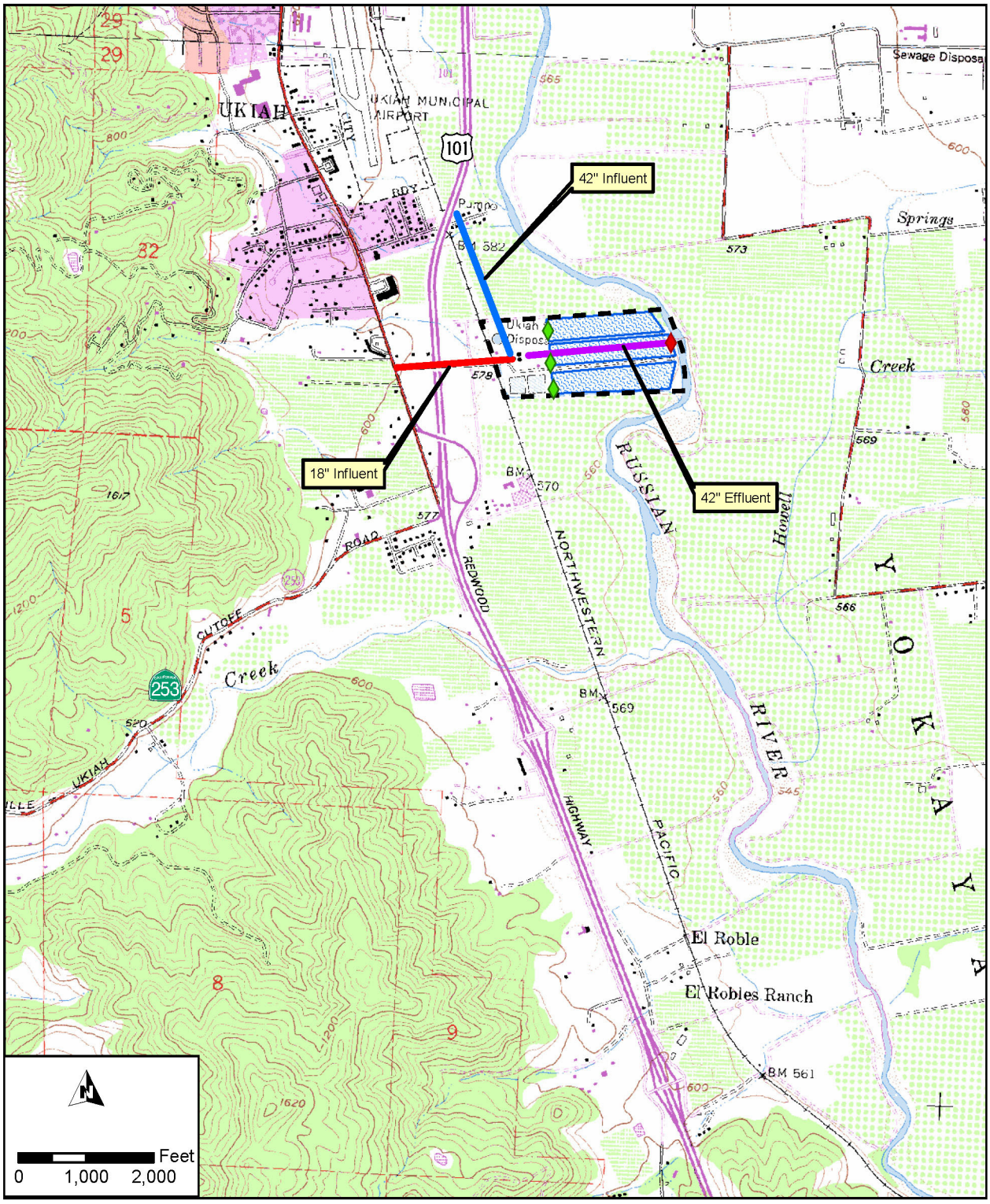
Figure 3.1
UKIAH WWTP TREATMENT PROCESS SCHEMATIC
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH



Legend

Pipelines

- 18" Influent
- 42" Effluent
- 42" Influent

- Discharge Point 001 - Russian River
- Discharge Point 002 - Percolation/Evaporation Ponds
- Ukiah WWTP

Figure 3.2
UKIAH WWTP OVERVIEW
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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surface of the media removes organic compounds from the primary effluent through absorption and adsorption. As the biofilm layer thickens, it sloughs off and passes with the trickling filter effluent to two aerated solids contact tanks. In the tanks, the flow undergoes further biological treatment through an activated sludge process. Effluent from the solids contact tanks then flows to two circular secondary clarifiers where solids settle from the effluent. Four pumps pump recycled activated sludge from the secondary clarifiers to the solids contact tank. A portion of the recycled activated sludge is wasted and pumped by waste secondary sludge pumps to the dissolved air flotation thickeners for further solids treatment.

Following secondary treatment, the effluent is chlorinated. The chlorine disinfection facilities include two chlorine contactor pipes and a sodium hypochlorite addition system. The effluent pump station, which includes two pumps, then pumps the disinfected secondary effluent to three evaporation/percolation storage ponds where the effluent ultimately evaporates or percolates through the bottom of the ponds. The City can discharge up to 4 million gallons per day (mgd) to the ponds which have a combined storage capacity of 115 million gallons (MG). To maximize percolation, the bottom of one pond per summer is alternately ripped to increase the ponds permeability.

A portion of the disinfected, secondary treated effluent undergoes additional filtration and is stored in storage units for various onsite reuse including: landscape irrigation, process washdown, and spray water. Approximately 300 – 325 af is reused onsite per year.

When the UWWTP is discharging effluent to the Russian River, all flows that are discharged to the river undergo tertiary treatment immediately following secondary treatment. Disinfected, secondary flows are pumped by three advanced water treatment pumps from the recycled water pump station to the Advanced Water Treatment System (AWT). Ferric chloride and polymer are added to the effluent as it is pumped to four tertiary, multimedia filters. Effluent from the filters then flows to two chlorine contact basins for disinfection. A sodium bisulfite feed pump dechlorinates the tertiary disinfected effluent as it flows by gravity to the Russian River discharge point. If needed, the tertiary disinfected effluent can be routed to the three evaporation/percolation ponds. The tertiary treatment facilities are further described in Table 3.3.

The solids handling facilities include: two dissolved air flotation thickeners and various ancillary pumps and equipment, three thickened sludge pumps, two anaerobic digesters and ancillary equipment, and a belt filter press. The solids handling facilities produces Class B solids that are disposed of at a landfill.

3.3.2 History of Expansions

The original wastewater treatment facility was constructed in 1958 and provided secondary treatment at an average dry weather flow capacity of 2.5 mgd and a peak wet weather flow capacity of 10.5 mgd. At that time, all treated effluent was discharged to the Russian River.

Table 3.3 Tertiary Facilities Design Criteria
Recycled Water Feasibility Study
City of Ukiah

Element	Existing[1]	Future
Applied Water Pumps		
Type	Vertical Turbine	
Number	3	TBD
Capacity, each	4 mgd	
Polymer Feed System		
Storage Tote Capacity	275 gallon	
Number	1	TBD
Polymer Feed Pump Capacity	4.5 gph	
Flocculation Basins		
Number of basins	4	
Design capacity, each	2 mgd	TBD
Detention time	~ 14 min at 2 mgd	
Tertiary Multimedia Filters		
Number of filters	4	
Area, each	25 ft 9 in x 12 ft	
Anthracite media depth	18 inches	TBD
Sand, garnet sand, and gravel media depth	26.5 inches	
Capacity, at 5 gpm/sq ft, each	2 mgd	
Chlorine Disinfection		
Number of basins	2	
Design capacity, each	8 mgd	
Detention time	90 minutes	
Dose[2]	~ 5 mg/L	TBD
Dechlorination		
Type	In-pipe	
Dose	X mg/L	TBD
Effluent/Recycled Water Pumps		
Type	Vertical Turbine	
Number	3	
Capacity, each	360 gpm at 230 TDH	
Firm Capacity	720 gpm at 230 TDH	TBD

Notes:
(1) Source: California Regional Water Quality Control Board Order No. R1-2006-0049, NPDES No. CA0022888.
(2) Chlorine is dosed as needed for coliform removal.

The UWWTP has been expanded and upgraded several times since then. In 1983, the facility was expanded to increase the treatment capacity to an average dry weather flow capacity of 2.8 mgd and a maximum wet weather capacity of 7 mgd. In 1986, the third percolation/evaporation pond was constructed to increase the treated effluent storage capacity, and in 1989 an effluent pump station was constructed to convey secondary treated effluent to the third pond. In 1989, the Regional Water Quality Control Board (RWQCB) required tertiary treatment of all river discharges and secondary treatment for all

discharges to the evaporation/percolation ponds. To meet this requirement, the plant was upgraded again in 1995. The project included the construction of the fourth secondary clarifier, a new solids handling facility, and the AWT system, as well as upgrades to the headworks.

The most recent upgrade to the facility occurred in 2009 to expand the facility to its current treatment capacity and to upgrade the AWT system to meet Title 22 tertiary recycled water standards. This upgrade included a new headworks facility, a new bar screen facility and grit removal system, conversion of the existing secondary clarifiers to primary clarifiers, a new trickling filter pump station and upgrades to the trickling filters, conversion of the existing primary clarifiers to solids contact tanks, modifications to the chlorine disinfection facilities, and other miscellaneous upgrades.

3.3.3 Future Expansions

Although no expansion projects are planned for the near term, the City is expected to grow and the UWWTP will need to be expanded to accommodate this growth. In 2003, the City developed 2025 Design Criteria for the City's wastewater treatment capacity and projected that the total wastewater flows of the service area would increase steadily over the next few decades. The total flow in 2025 was projected to be approximately 6,363 AFY, equivalent to an average annual flow of about 5.7 mgd.

3.3.4 Water Recycling Facilities

The UWWTP's AWT system produces disinfected, tertiary treated effluent that meets Title 22, Division 4, Chapter 3, California Code of Regulations (CCR) for recycled water. The AWT system is currently operated as needed during wet weather months (October through mid May) to treat flows in excess of that which can be stored in the onsite percolation/evaporation ponds. If operated at full capacity, the AWT could provide an average annual flow of 7 mgd given sufficient wastewater flows were available. Table 3.3 presents a summary of the tertiary treatment facilities design criteria.

3.4 EXISTING WASTEWATER QUALITY

The UWWTP's effluent discharges are regulated by a National Pollutant Discharge Elimination System (NPDES) permit – Order No. R1-2006-0049, NPDES No. CA0022888. The permit was adopted on September 20, 2006 and expires on November 9, 2011. Permit effluent limits are summarized in Table 3.4. A new permit is currently under negotiation and expected to be finalized in fall/winter 2012.

The UWWTP discharges disinfected secondary effluent to three percolation/evaporation ponds located at the UWWTP on a year-round basis, and discharges disinfected tertiary effluent to the Russian River as allowed during wet weather months. The UWWTP is only permitted to discharge disinfected tertiary wastewater to the Russian River from October 1

Table 3.4 Ukiah WWTP Effluent Limits in 2006 NPDES Permit[1]
Recycled Water Feasibility Study
City of Ukiah

Constituent	Units[2]	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Discharge Point 001 – Direct Discharge to Russian River[3][4][5]						
Biochemical Oxygen Demand (5 day at 20°C)[6]	mg/L	10	15	---	---	---
	lbs/day (wet weather)[7]	580	880	---	---	---
Total Suspended Solids	mg/L	10	15	---	---	---
	lbs/day (wet weather)[7]	580	880	---	---	---
pH	standard units	---	---	---	6.5	8.5
Nitrate (as N) [8]	mg/L	10	---	---	---	---
Copper[8]	µg/L	1.55	---	3.11	---	---
Dichlorobromomethane[8]	µg/L	0.56	---	1.1	---	---
Discharge Point 002 –Discharge to Evaporation/Percolation Ponds[9][10]						
Biochemical Oxygen Demand (5 day at 20°C)[6]	mg/L	30	45	60	---	---
Total Suspended Solids	mg/L	30	45	60	---	---
pH	standard units	---	---	---	6.0	9.0

Notes:

(1) Limits included in Waste Discharge Requirements Order No. R2-2006-0049, NPDES Permit No. CA0022888.

(2) Abbreviations: mg/L = milligrams per liter; µg/L = micrograms per liter.

(3) The advanced treated wastewater shall be adequately oxidized, filtered and disinfected as defined in Title 22, Division 4, Chapter 3, California Code of Regulations (CCR).

(4) The median coliform concentration shall not exceed a Most Probable Number (MPN) of 2.2 per 100 milliliters, using the bacteriological results of the last seven days for which analyses have been completed, nor shall the MPN exceed 23 per 100 milliliters in any sample.

(5) The effluent shall not contain detectable levels of total chlorine, any measureable settelable solids, or acute toxicity.

(6) The average monthly percent removal of BOD (5-day 20°C) shall not be less than 85 percent.

(7) Mass-based effluent limitations are based on the peak design flow of the AWT filters when the permit was issued (7.0 mgd).

(8) Limits presented are final effluent limits. Interim limits are: average monthly nitrate (as N) limit of 26.6, maximum daily copper limit of 30 µg/L, average monthly dichlorobromomethane limit of 0.68 µg/L, and maximum daily dichlorobromomethane limit of 1.1 µg/L. Interim copper and dichlorobromomethane limits were effective until May 18, 2010. Interim nitrate limitations shall be effective until September 20, 2011.

(9) The secondary treated wastewater shall be adequately oxidized and disinfected as defined in Title 22, Division 4, Chapter 3, CCR.

(10) The median coliform concentration shall not exceed a MPN of 23 per 100 milliliters, using the bacteriological results of the last seven days for which analyses have been completed, nor shall the MPN exceed 240 per 100 milliliters in any sample.

through May 14 at a discharge rate of up to one percent of the total Russian River flow. The Water Quality Control Plan for the North Coast Region (Basin Plan) prohibits the discharge of treated wastewater from the UWWTP from May 15 through September 30.

As mentioned above, the AWT system produces disinfected tertiary treated effluent suitable for recycled water use. This water is currently only produced during the river discharge season, October 1 through May 14.

3.5 ADDITIONAL FACILITIES NEEDED

No additional facilities are needed in the foreseeable future to comply with the existing waste discharge requirements.

3.6 PROBLEM CONSTITUENTS AND CONTROL MEASURES

There are no significant sources of industrial or problem constituents nor necessary control measures of such constituents at this time.

3.7 CURRENT AND PROJECTED WASTEWATER GENERATION

Table 3.5 includes the historical and projected wastewater flows collected and treated within the service area. Projected wastewater flows are based on actual wastewater flow data from 2001 – 2010 and population data and projections presented herein.

3.8 WASTEWATER FLOW VARIATIONS

Discharge of treated wastewater effluent is a critical component of the City's water balance. Wastewater flow and disposal varies seasonally, as depicted in Figures 3.3 and 3.4. During dry weather months, wastewater flows to the UWWTP are low enough that the full flow is stored in the percolation ponds. During these months, the AWT System is not in operation. During wet weather flows, the AWT System is operated to provide tertiary treatment of flows in excess of that which can be stored in the ponds. Flows in excess of that which can be stored in the ponds and that which can be discharged to the Russian River must be disposed of by other means including reuse of treated effluent onsite. The UWWTP currently reuses an average of about 0.3 mgd of treated effluent onsite (323 AFY). In recent wet years, the UWWTP has discharged the maximum flow that can be stored in the ponds and discharged to the river. As flows increase in the future, additional pond storages will be needed or an additional discharge alternative, such as distribution to recycled water customers, must be developed.

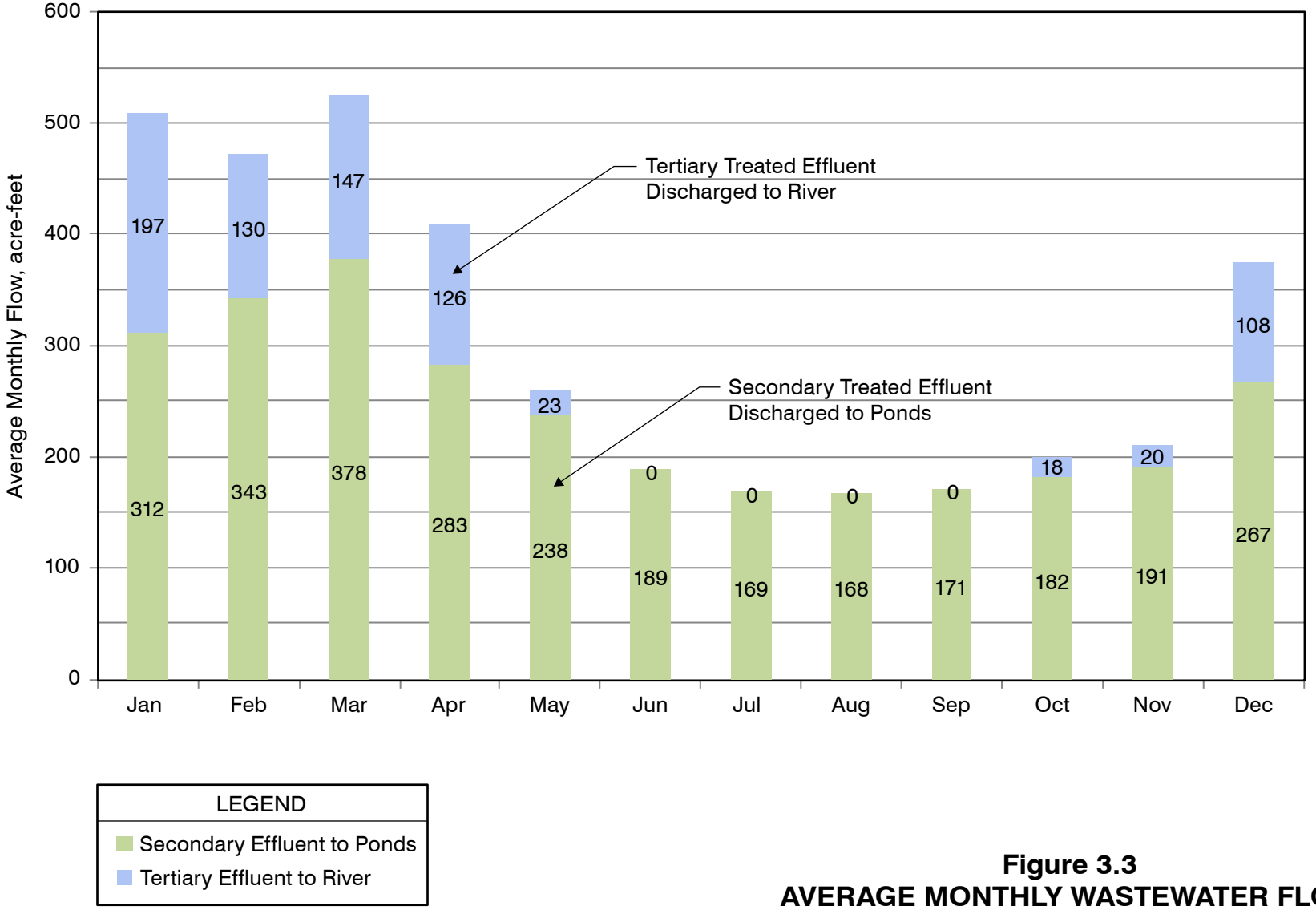

Figure 3.3
AVERAGE MONTHLY WASTEWATER FLOW IN ACRE-FEET FROM 2001 - 2011
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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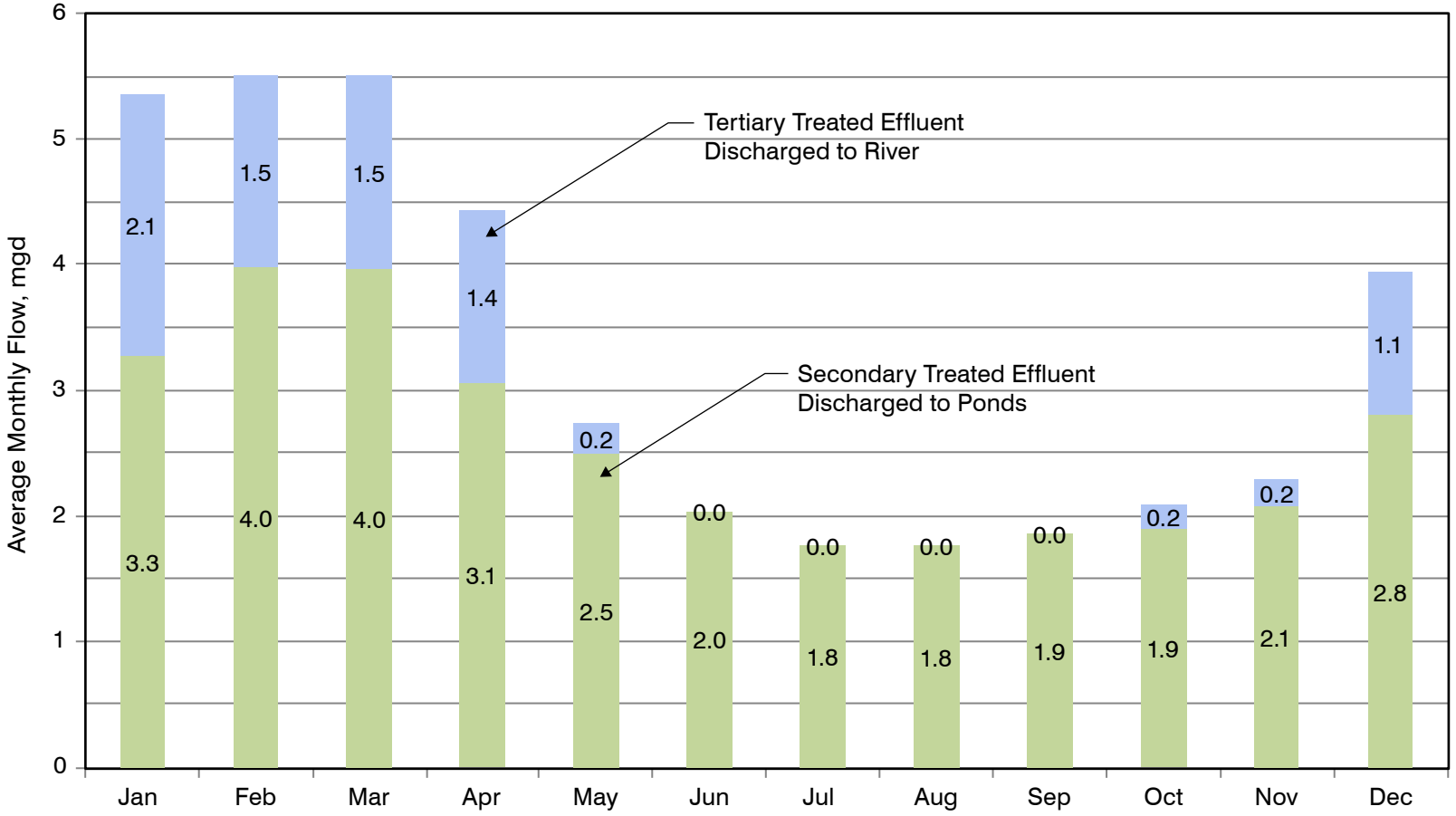

Figure 3.4
AVERAGE MONTHLY WASTEWATER FLOW IN MGD FROM 2001 - 2011
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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Table 3.5 Historical and Projected Wastewater Flows Recycled Water Feasibility Study City of Ukiah							
	Volume (AFY)						
Type of Wastewater	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Wastewater Collected and Treated in Service Area	4,570	4,650	4,650	4,780	4,910	5,060	5,200

Notes:
(1) 2005 and 2010 wastewater flows based on actual plant data.
(2) Wastewater flow projections for 2015 – 2035 based on wastewater flows from 2001 – 2010 and population projections presented herein.

3.9 EXISTING RECYCLED WATER USERS

The City's only existing recycled water user is the UWWTP. The UWWTP reuses treated effluent produced at the UWWTP for on-site landscape irrigation, process water, and spray down.

3.10 RECYCLED WATER RIGHTS

Ukiah Valley water users do not have existing rights to use treated effluent after discharge.

TREATMENT REQUIREMENTS FOR DISCHARGE AND REUSE

4.1 TREATMENT REQUIREMENTS

The Ukiah wastewater treatment plant (UWWTP) produces tertiary treated water in the wet months when river discharge requirements can be met. Otherwise, the UWWTP produces secondary effluent and discharges the effluent to evaporation/percolation ponds. Tertiary treated recycled water approved uses include irrigation of all types, including food crops and pastures for milking animals, commercial uses such as toilet/urinal flushing, process uses such as in cooling towers, supply for impoundments, and many more. The UWWTP's AWT system produces disinfected, tertiary treated effluent that meets Title 22, Division 4, Chapter 3, California Code of Regulations (CCR) for recycled water. The City is currently developing this study to determine how this effluent can be put to its highest and best use to increase the reliability and maximize the capacity of the City's wastewater treatment facilities. Detailed analysis of the tertiary effluent water quality is underway to determine the various applications the recycled water could be used for, especially with respect to irrigation.

The AWT system is currently operated as needed during wet weather months (October through mid May) to treat flows in excess of that which can be stored in the onsite percolation/evaporation ponds.

The primary regulation governing recycled water use is the California Water Code Regulations, Title 22. The primary laws regulating water quality are the Clean Water Act (CWA) and the California Water Code. Under the CWA, the Environmental Protection Agency or a delegated State agency regulates the discharge of pollutants to waterways through the issuance of National Pollutant Discharge Elimination System (NPDES) permits. NPDES permits set limits on the amount of pollutants that can be discharged into the waters of the United States. The State Water Resources Control Board (SWRCB) is the state agency that has jurisdiction over water quality throughout California. Under the SWRCB, nine Regional Water Quality Control Boards (RWQCB's) have authority to exercise rulemaking and regulatory activities by water basins. The UWWTP is located in the North Coastal Region (Region 1) and is regulated by the North Coastal RWQCB. The SWRCB and the RWQCBs have regulatory authority along with the California Department of Public Health (DPH) over projects using recycled water. The roles of the SWRCB, RWQCB, and DPH are further discussed in the following paragraph.

The SWRCB establishes general policies governing the permitting of recycled water projects consistent with its role of protecting water quality and sustaining water supplies. The SWRCB also exercises general oversight over recycled water projects, including review of RWQCB permitting practices. The DPH is charged with protection of public health and drinking water supplies and with the development of uniform water recycling criteria

appropriate to particular uses of water. The RWQCB is charged with protection of surface and groundwater resources and with the issuance of permits that implement DPH recommendations.

4.2 WASTEWATER DISCHARGE REQUIREMENTS

As discussed in Chapter 3, the UWWTP's effluent discharges are regulated by a National Pollutant Discharge Elimination System (NPDES) permit – Order No. R1-2006-0049, NPDES No. CA0022888. The discharge limitations defined by this permit are described in further detail in Chapter 3, Section 3.4 of this report.

The UWWTP's Advanced Water Treatment system AWT produces disinfected, tertiary treated effluent that meets Title 22, Division 4, Chapter 3, California Code of Regulations (CCR) for recycled water. The AWT system is currently operated as needed during wet weather months (October through mid May) to treat flows in excess of that which can be stored in the onsite percolation/evaporation ponds. Although this effluent meets recycled water standards, it is not distributed to any recycled water users and is instead entirely discharged by gravity to the Russian River. Provided wastewater influent to the UWWTP was high enough, and recycled water demands were high enough, the AWT system could be operated on a daily basis to produce approximately 7.0 mgd of recycled water. However, during dry weather months the AWT can produce 4 mgd due to the limited flow volume.

A potential, future change to the current discharge requirements includes prohibition of all river discharges. The current permit allows discharge of disinfected, tertiary wastewater to the Russian River from October 1 through May 14 at a discharge rate of up to one percent of the total Russian River flow; river discharges from May 15 through September 30 are prohibited. If river discharges are prohibited year-round in the future, the City will need to determine alternative methods for disposing of its treated wastewater effluent. The City may need to construct additional pond storage or distribute treated effluent to recycled water customers.

4.3 WATER QUALITY-RELATED REQUIREMENTS

No water quality-related requirements are expected. Implementation of this project is anticipated to improve surface and groundwater water quality due to the reduced dependence on the groundwater basin.

4.4 SALT/NUTRIENT MANAGEMENT PLANS

Some groundwater basins in the state contain salts and nutrients that could threaten Basin Plan water quality objectives, whether the cause be natural soils/conditions, waste discharges, irrigation using surface or recycled water, or through groundwater. The State's recently adopted Recycled Water (RW) Policy requires that salt/nutrient management plans

for every basin in California be developed and adopted as Basin Plan Amendments by 2015. These Management Plans will be developed by local water and wastewater entities and stakeholders, and funded by the regulated community. Each salt and nutrient management plan shall include the following components:

- A basin-wide monitoring plan.
- A provision for annual monitoring of constituents of emerging concern (CECs).
- Water recycling use goals and objectives.
- Salt and nutrient source identification, basin assimilative capacity and loading estimates.
- Implementation measures to manage salt and nutrient loading in the basin.
- An antidegradation analysis.

After salt/nutrient management plans are developed, they will govern whether anti-degradation analyses are necessary for specific projects. While the plans are in the process of being drafted, antidegradation analyses will be required for recycling projects where the discharge will use more than 10 percent of the Basin's available assimilative capacity for one project, or 20 percent for multiple projects. It is assumed that this will not be the case in the City of Ukiah's area and therefore a salt/nutrient management plan will most likely not be needed. The RW program can proceed with permitting now, even though a salt/nutrient management plan has not been done. It is not the intent of the RW policy to hold up recycling projects to wait on those plans.

4.5 GENERAL USE GUIDELINES

4.5.1 Title 22 Use Area Requirements

Title 22 has two main requirements that could affect the potential users and will need to be considered on a case-by-case- basis during the design phase of the project. Per Title 22, no irrigation with disinfected tertiary recycled water shall take place within 50 feet of any domestic water supply well unless the well meets certain criteria such as:

- An annular seal.
- Well housing to prevent recycled water spray from contacting the wellhead.
- The owner approves of the elimination of the buffer zone, etc.

Also per Title 22, no impoundment of disinfected tertiary recycled water shall occur within 100 feet of any domestic water supply well. This will need to be considered during design where landowners have existing irrigation water storage on-site.

4.5.2 General Irrigation Use Guidelines

The successful long-term use of irrigation water depends more on rainfall, leaching, soil drainage, irrigation water management, salt tolerance of plants, and soil management practices than upon water quality itself. Figure 4.1 shows the typical monthly rainfall for the Ukiah Valley area, and since there is a considerable amount of rain it is assumed that salt build up would not be a problem with the use of the recycled water.

Since salinity problems may eventually develop from the use of any water, the following guidelines are given, should they be needed, to assist water users to better manage salinity in either agricultural or community-based irrigation:

- Irrigate more frequently to maintain an adequate soil water supply.
- Select plants that are tolerant of an existing or potential salinity level.
- Routinely use extra water to satisfy the leaching requirements.
- If possible, direct the spray pattern of sprinklers away from foliage. To reduce foliar absorption, try not to water during periods of high temperature and low humidity or during windy periods. Change time of irrigation to early morning, late afternoon, or night.
- Maintain good downward water percolation by using deep tillage or artificial drainage to prevent the development of a perched water table.
- Salinity may be easier to control under sprinkler and drip irrigation than under surface irrigation. However, sprinkler and drip irrigation may not be adapted to all qualities of water and all conditions of soil, climate, or plants.

General management/use guidelines are shown for landscape and crop irrigation based on the average constituent quantity. A wastewater sample of the UWWTP effluent was collected on May 23, 2011 and analyzed for typical irrigation constituents. These constituents and management/use guidelines compared to the UWWTP sample are summarized in Table 4.1. When comparing the information in Table 4.1 it can be seen that the Ukiah effluent is very high quality recycled water that is in the acceptable range for irrigation. It is recommended the City do additional water quality sampling at various times during the year to determine any seasonal variations in treated effluent quality.

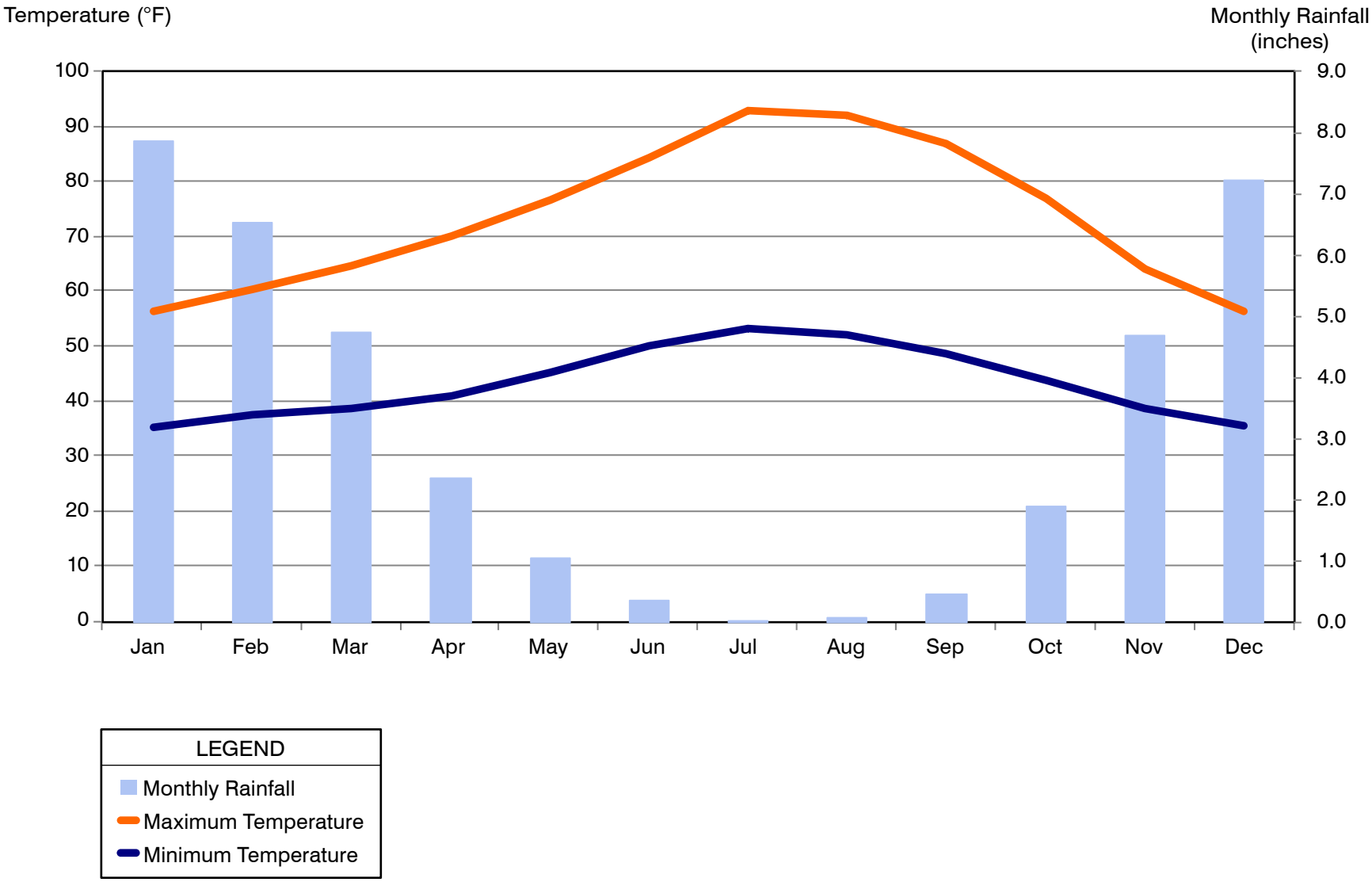

Figure 4.1
AVERAGE PRECIPITATION AND TEMPERATURE
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

Source: Ukiah Station #049122 Data from the Western Regional Climate Center Precipitation Gauges, 1893-2010.

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Table 4.1 Comparison of City of Ukiah Water Quality with Established Guidelines for Interpretations of Water Quality for Irrigation
Recycled Water Feasibility Study
City of Ukiah

Parameter	Units	Established Criteria Degree of Use Restriction[1,2] None	Slight	Severe	Ukiah WWTP Effluent [3]
Salinity					
Electrical Conductance	ds/m	**<0.7**	0.7 - 3.0	>3.0	0.5
Total Dissolved Solids (TDS)	mg/L	**<450**	450 - 2000	>2000	250
Permeability					
aSAR = 0 - 3 and EC		>0.7	**0.7 - 0.2**	<0.2	(Based on
= 3 - 6 and EC		>1.2	1.2 - 0.3	<0.3	SAR = 1.6;
= 6 - 12 and EC		>1.9	1.9 - 0.5	<0.5	EC = 0.5)
= 12 - 20 and EC		>2.9	2.9 - 1.9	<1.9	
= 20 - 40 and EC		>5.0	5.0 - 2.9	<2.9	
Sodium					
Root Absorption	SAR	**<3**	3 - 9	>9	1.9
Foliar Absorption	mg/L	**<70**	>70		43
Chloride					
Root Absorption	mg/L	**<140**	140 - 355	>365	38
Foliar Absorption	mg/L	**<100**	>100		38
Boron	mg/L	**<0.7**	0.7 - 3.0	>3.0	0.2
pH[4]	–	**6.5 - 8.4 (normal range)**			6.5 - 7.5
Ammonia (NH_4)[4]	mg/L	(see combined N values below)			7.1
Nitrate (as NO_3)	mg/L	(see combined N values below)			9.3
Nitrate (as N)[4]	mg/L	(see combined N values below)			2.1
Total Kjeldahl Nitrogen (N)[5]	mg/L	<5	**5 - 30**	>30	12
Bicarbonate (HCO_3)[6]	mg/L	**<90**	90 - 500	>500	68

Notes:
(1) Adapted from University of California Committee of Consultants (1974) and Water Quality for Agriculture (Ayers and Westcot 1984).
(2) Definition of the "Degree of Use Restriction" terms:
None = Reclaimed water can be used similar to the best available irrigation water.
Slight = Some additional management will be required above that with the best available irrigation water in terms of leaching salts from the root zone and/or choice of plants.
Severe = Typically cannot be used due to limitations imposed by the specific parameters.
(3) The Ukiah WWTP effluent data is based on secondary effluent sampling done May 23, 2011, unless noted otherwise.
(4) pH, ammonia, and nitrate (as N) data are based on average effluent values measured at the Ukiah WWTP.
(5) Total Kjeldahl Nitrogen (TKN) is the sum of the ammonia nitrogen and organic nitrogen. Organic nitrogen is bound in living material. Ammonia and nitrate are inorganic forms of nitrogen.
(6) Presence of bicarbonate can result in unsightly foliar deposits.

RECYCLED WATER MARKET

This chapter summarizes the market identification and quantification process and the landscape irrigation requirements for the City of Ukiah and the surrounding Ukiah Valley area.

5.1 MARKET ASSESSMENT PROCEDURES

Over 30 potential recycled water customers were identified within the study area, many representing multiple parcels and several acres of land that could be served with recycled water. The customers were identified using multiple sources including:

- Previous reports.
- Discussions with City engineering and planning staff.
- GIS mapping.
- Discussions with various regulatory industrial agencies including the Mendocino County Russian River Flood Control and Water Conservation Improvement District and the Mendocino County Farm Bureau.
- A recycled water questionnaire.

The types of acceptable uses identified include urban irrigation (i.e., school yards, parks, cemeteries, golf courses, Home Owners Associations (HOAs)) and agricultural irrigation (i.e., vineyards, orchards and miscellaneous row crops).

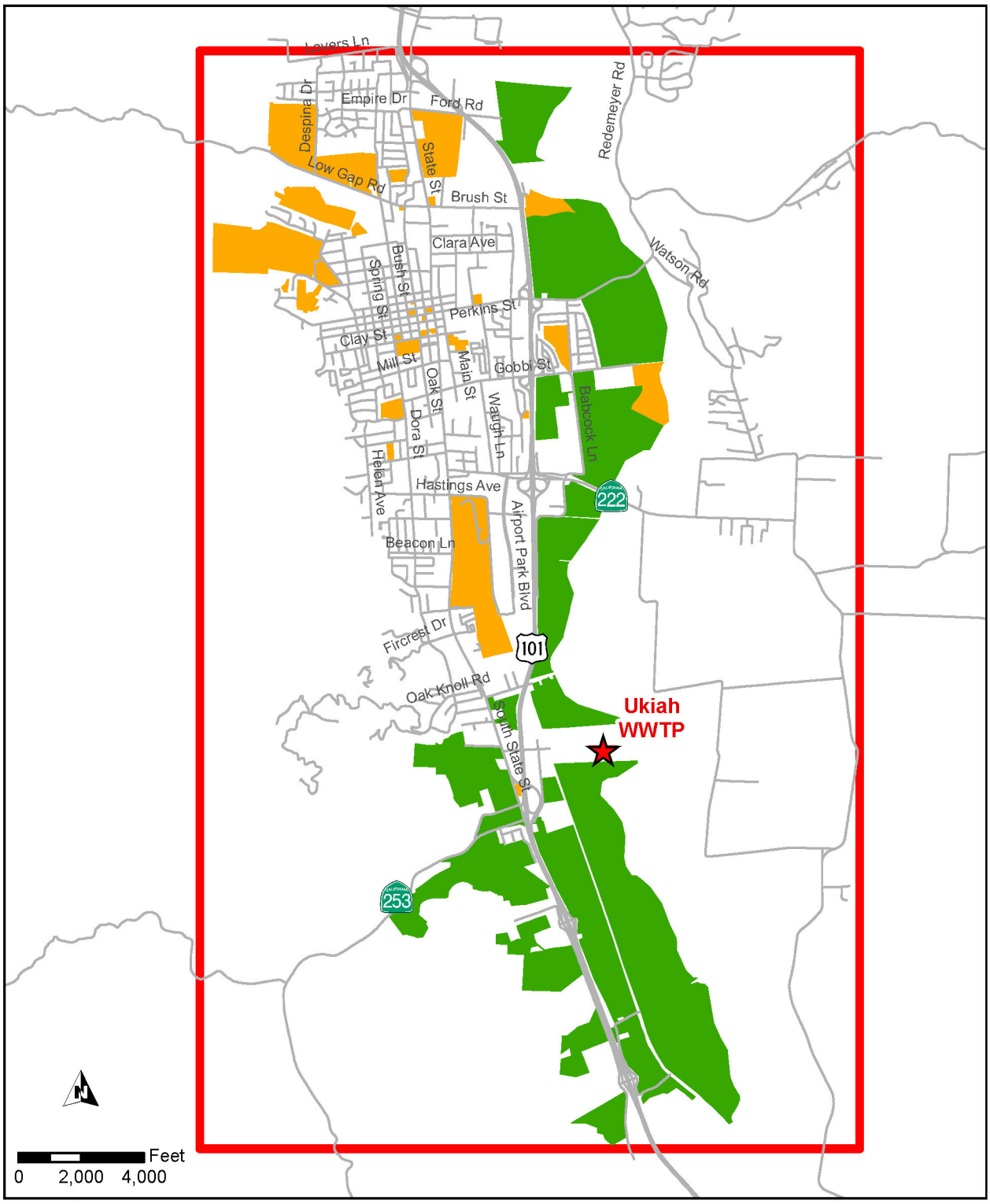
The potential recycled water use sites are shown on Figure 5.1 and listed in Appendix B.

5.1.1 Recycled Water Questionnaire

A recycled water questionnaire was delivered to approximately 20 key potential recycled water users in the area surrounding the wastewater treatment plant and the City to determine local interest in using recycled water and to assess current water use practices. These key potential recycled water users account for approximately 144 irrigable or agricultural parcels (about 1,180 acres) within the City of Ukiah and surrounding area. The questionnaire and summaries of the questionnaire responses are located in Appendix A.

The following information was requested on the questionnaires:

- Irrigation type (e.g. vines, orchard, grass/landscaping, pasture).
- Existing and planned additional irrigated acreage.
- Water source for irrigation and frost protection.



Legend

Streets

Recycled Water Feasibility Study Area

Potential Recycled Water Use Sites

Agricultural

Urban Landscaping

Figure 5.1
POTENTIAL RECYCLED WATER USE SITES
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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- Existing and planned storage for irrigation.
- Interest in using recycled water.
- Concerns and comments.

5.1.1.1 Questionnaire responses

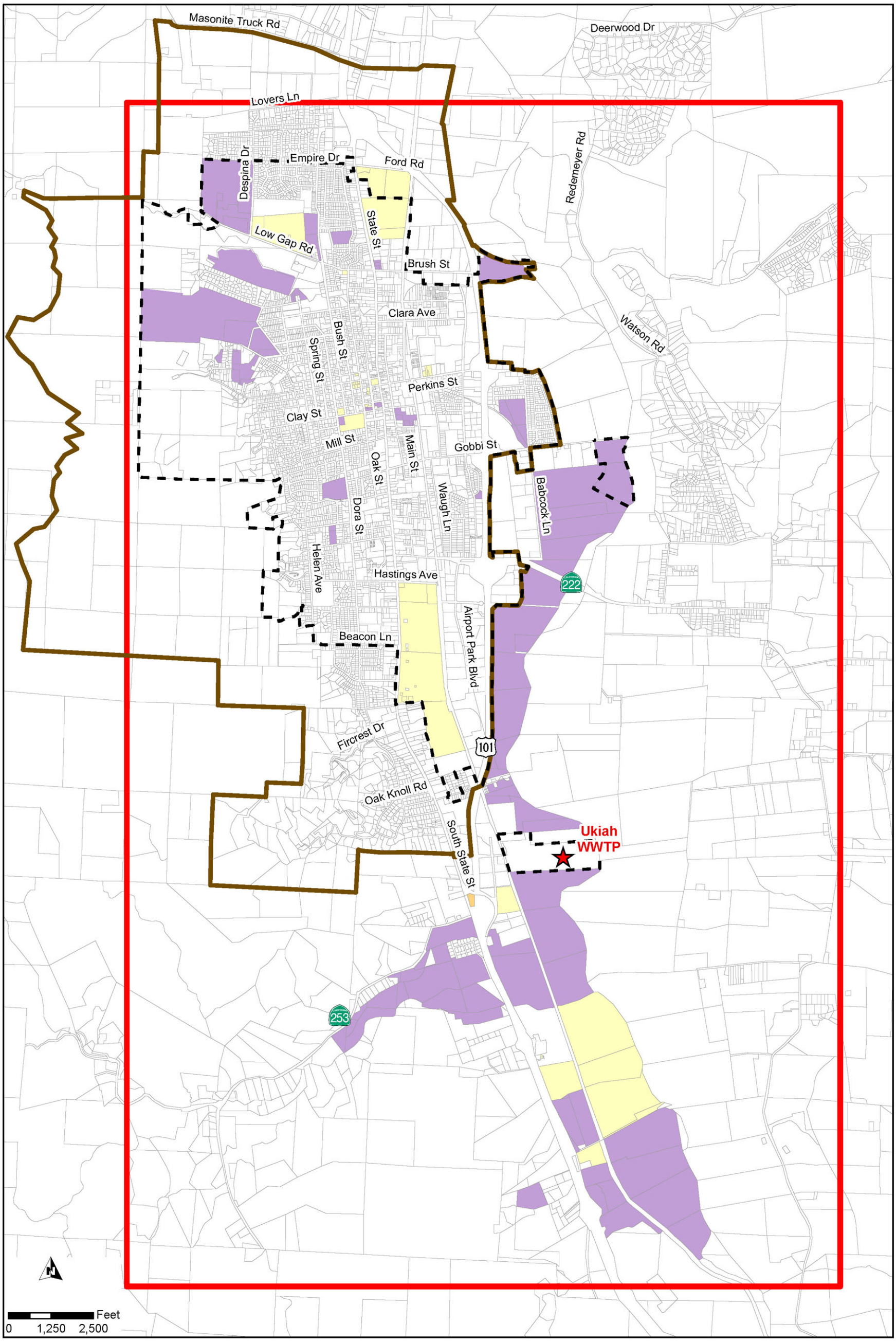
The questionnaire responses are illustrated in Figure 5.2 and summarized by irrigation type in Table 5.1. The Study Area is comprised of mostly vineyards and orchards, urban landscaping and some row crops and pasture irrigation. For properties where a questionnaire response was not received, GIS data was used to estimate irrigable acreage and type of irrigable acreage.

As can be surmised from Table 5.1, 80 percent of the questionnaires were returned, which represented over 66 percent of the parcels and 76 percent of the land area considered in the study. Of the questionnaires returned, owners and managers of 99 percent of the parcels were interested in using recycled water to meet their irrigation needs. These parcels account for 100 percent of the acreage reported in the returned questionnaires. Appendix A provides further analysis of the questionnaire responses.

5.1.1.2 Frequent Responses

Many of the questionnaire responses contained similar feedback and formed overall trends. The most frequent concerns/comments were:

- They are interested in using recycled water.
- How much will recycled water and a recycled water delivery system cost.
- How will the use of recycled water impact their water rights.
- Uncertainty about the recycled water quality (i.e., salts, nutrients).
- Pressure and daily/seasonal timing of supply (i.e.,: main need is in spring for frost protection).
- Will recycled water use be compatible with fresh fruit and cannery markets, and wineries.
- Compatibility with organic certification requirements.
- Will a recycled water program be feasible based on recycled water programs implemented in the region (e.g., Sonoma).



Legend

- Interested in RW
- Not Interested in RW
- Did Not Respond
- Parcels
- Recycled Water Feasibility Study Area
- City Limits
- Sphere of Influence

Figure 5.2
RECYCLED WATER (RW)
QUESTIONNAIRE RESPONSES
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

uk712f14-8660.ai

Table 5.1 Summary of Questionnaire Responses by Irrigable Area
Recycled Water Feasibility Study
City of Ukiah

Irrigation Type	Questionnaires			Corresponding Number of Parcels			Corresponding Irrigable Acreage[1]			Percent of Respondents Interested in Using Recycled Water	
	Total Number Sent	Number Responded	% Responded	Total Number Sent	Number Responded	% Responded	Total Acres Sent	Acres Responded	% Responded	Parcels	Acreage
Agriculture	13	11	85%	60	52	87%	860	730	85%	100%	100%
Landscaping[2]	7	5	71%	84	43	51%	320	170	53%	98%	100%
Total	**20**	**16**	**80%**	**144**	**95**	**66%**	**1180**	**900**	**76%**	**99%**	**100%**

Notes:

(1) GIS data was use to approximate the parcels, irrigable acreage and type of irrigable acreage corresponding to land owners for which a questionnaire was not received.

(2) Landscaping includes grass, gardens and other non-agricultural irrigation.

5.2 MARKET QUANTIFICATION

The potential recycled water demand was quantified for each of the recycled water customer sites indentified through the market assessment based on irrigable acreage and crop type. To estimate the annual and peak water requirements of each site, the total irrigable acreage of each site was multiplied by assumed water use parameters (included in Table 5.2). The irrigable acreage and type of irrigable acreage of each site was determined using both GIS mapping and the questionnaire responses. Expected landscape irrigation demands were estimated using landscape irrigation requirements for the Ukiah Valley area based on evapotranspiration and rainfall data. Expected agricultural irrigation and frost protection demands were developed based on water use data included in regional agricultural publications and discussions with local agricultural and water agencies and industries.

Crop types for evaluated agricultural parcels within the study area are shown on Figure 5.3. The estimated annual water use and peak water use of the identified potential customers are summarized in Appendix B.

5.2.1 Agricultural Water Demands

Irrigation and frost protection are the two primary agricultural water demands in Ukiah Valley. Agricultural irrigation requirements are subject to numerous variables, including crop selection, irrigation method (i.e., flood, drip, etc), field rotation, planting season, planting date, and other farmer-specific factors.

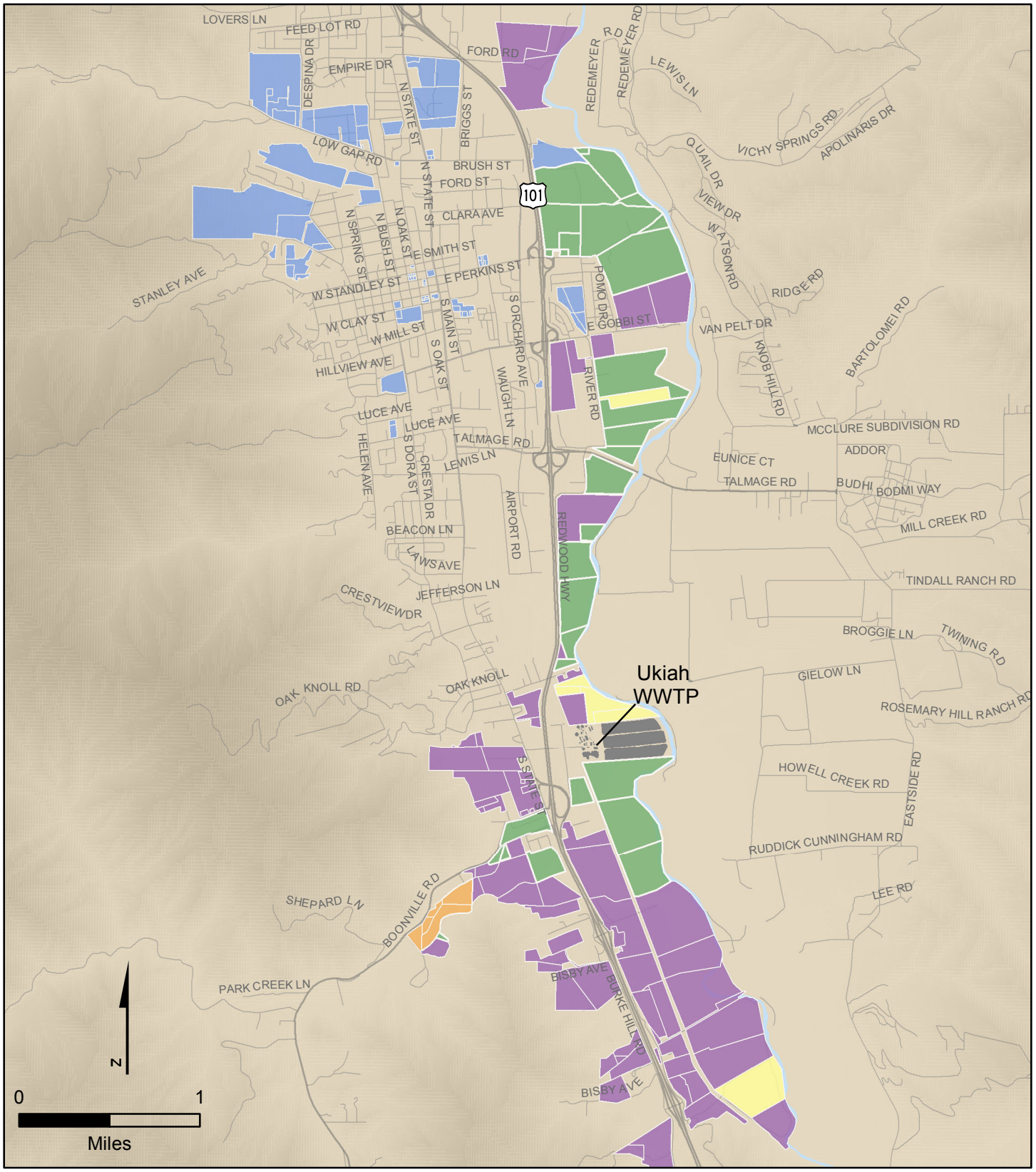
In addition to meeting irrigation demands, farmers in the Ukiah Valley apply water to their crops to protect them from damage during frost events. During typical frost conditions, known as radiant frost conditions, heavier cold air settles in the lower parts of the landscape and can potentially damage crops grown in these areas. During adjective frost conditions, which occur infrequently, the entire Ukiah Valley is impacted regardless of elevation. While radiant frost conditions are more typical of the area, frost protection is typically implemented on crops that are in the lower parts of the landscape - below about 700 feet in elevation. (Mendocino Irrigated Agricultural Water Needs and Management, 2008)

Table 5.2 summarizes the parameters that were used to quantify agricultural water demands. Several discussions were held with local agricultural and water supply agencies and industries including Mendocino County Farm Bureau, Mendocino County Russian River Flood Control and Water Conservation Improvement District, and AG Unlimited, to determine agricultural water use parameters that were representative of most agricultural practices in the Ukiah Valley. In addition to this, several agricultural publications were referenced as sited in Table 5.2.

Table 5.2 Assumed Water Use Parameters
Recycled Water Feasibility Study
City of Ukiah

Water Use Parameter	Vineyard[1,2]	Orchard (Pears)[1,3]	PTL (Pasture)[4]	Row Crops[4]	Grass[5]
Frost Protection					
Frost Months	Mar – May	Apr – May	NA	NA	NA
Duration of Frost Season, months	3	3	NA	NA	NA
Average frost events per max month	2	2	NA	NA	NA
Frost event duration, days	3	3	NA	NA	NA
Frost event duration, hrs. per day	8	6.5	NA	NA	NA
Rate of application, gal/min/acre	55	65	NA	NA	NA
Max Month Frost Demand, af/acre/month	0.5	0.5	NA	NA	NA
Max Day Frost Demand, af/acre/day	0.08	0.08	NA	NA	NA
Average Total Demand During Frost Season	0.50	0.50	NA	NA	NA
Irrigation					
Irrigation Months	Jun – Oct	May - Sep	May – Sep	May – Sep	Apr – Oct
Duration of irrigation season, months	5	5	5	5	7
Avg. annual demand[1], af/acre/yr	0.75	2.0	2	2	2.03
Avg. monthly demand, af/acre/mo	0.15	0.45	0.40	0.40	0.29
Avg. daily demand, af/acre/day	0.02	0.22	0.01	0.01	0.01
Total Demand[5] (afy)	**1.3**	**2.5**	**2.0**	**2.0**	**2.0**

Notes:
(1) Vineyard and pear frost and irrigation requirements from local farmers and Lewis, David et.al., Irrigated Water Needs and Management in the Mendocino County Portion of the Russian River Watershed, July 2008, Tables 1, 2 and 9. http://ucanr.org/sites/Mendocino/files/17223.pdf
(2) Rate of application for frost protection of vineyards from Mendocino County Farm Bureau and Mendocino County Russian River Flood Control and Water Conservation Improvement District.
(3) Rate of application for frost protection of pears from UC Cooperative Extension, 2006 Sample Costs to Establish and Produce Pears, 2006, pg. 4. http://coststudies.ucdavis.edu/files/pearnc2006.pdf
(4) Pasture and row crop irrigation requirements from Lewis, David et. al., Irrigated Water Needs and Management in the Mendocino County Portion of the Russian River Watershed, July 2008, Tables 5. http://ucanr.org/sites/Mendocino/files/17223.pdf
(5) Grass irrigation requirement calculated using temperature, rainfall, and evapotranspiration data obtained from the Western Regional Climate Center and the Guide to Estimating Irrigation Water Needs of Landscape Plantings in California by the California Department of Water Resources.
(6) Annual water use for vineyards and pears from Mendocino County Farm Bureau and Mendocino County Russian River Flood Control and Water Conservation Improvement District and local agricultural industries.



Legend

- Other Row Crop Parcels
- Pasture Parcels
- Orchard Parcels
- Vineyard Parcels
- Potential Landscape Parcels
- WWTP Ponds and Buildings
- River
- Major Roads
- Local Streets

Proposed Pipeline by Diameter

- 12" and smaller
- 16" to 24"
- larger than 24"

Figure 5.3
AGRICULTURAL PARCELS BY CROP TYPE
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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5.2.2 Landscape Irrigation Requirements

In many cases, landscape irrigation customers use less water than necessary because of conservation practices and cost considerations. Conversely, some customers over-irrigate because of uneven sprinkler coverage or overly conservative watering practices. Therefore, expected landscape irrigation requirements for the Ukiah Valley area were calculated based on evapotranspiration and rainfall data. Calculated irrigation requirements, as defined below, were used to estimate irrigation use at the sites. Calculated irrigation requirements were also used to estimate peak month demand, peak day demand, and peak hour demand for distribution considerations.

The amount of irrigation required for the potential irrigation customers is directly dependent on precipitation quantities in the region. The amount of precipitation, evapotranspiration, and irrigation required for the potential irrigation customers are listed in Table 5.3. To calculate the amount of evapotranspiration occurring in the study area, the following formula was used:

$$ET_L = K_L * ET_o$$

Where: ET_L = Evapotranspiration of landscaped areas (in inches)

K_L = Landscaped area crop coefficient

ET_o = Reference evapotranspiration (in inches)

The reference Evapotranspiration was obtained from the California Irrigation Management Information System (CIMIS) Evapotranspiration zoning map. The City is located in Zone 8: Inland San Francisco Bay Area characterized as inland areas near San Francisco with some marine influence.

To calculate the landscape evapotranspiration, the landscaped area crop coefficient was estimated using information contained in the Guide to Estimating Irrigation Water Needs of Landscape Plantings in California by the California Department of Water Resources. The landscaped area crop coefficient is the product of an average species factor (k_s), density factor (k_d), and microclimate factor (k_{mc}). These were estimated to be 0.6, 1, and 1, respectively. The landscape coefficient was then multiplied by the reference evapotranspiration to determine the average landscape evapotranspiration for the study area.

Therefore, the net annual average landscape irrigation requirement in the study area is approximately 24.3 inches per year or 2.0 feet per year. The irrigation season is roughly April through October, a period of 214 days. Landscape irrigation demand peaks in the month of July at 6 inches, 25 percent of the annual total.

Table 5.3 Average Annual Landscape Irrigation Requirements
Recycled Water Feasibility Study
City of Ukiah

Month	Landscape Area Evapotranspiration[(1)] (Inches)	Average Rainfall[(2)] (Inches)	Net Irrigation Requirement[(3)] (Inches)	Percent of Annual Net Irrigation Requirement[(4)] (%)
January	0.74	4.75	0.0	0%
February	1.01	6.52	0.0	0%
March	2.05	4.75	0.0	0%
April	2.88	2.35	0.7	3%
May	3.72	1.05	3.6	15%
June	4.14	0.35	5.1	21%
July	4.46	0.04	6.0	25%
August	3.91	0.08	5.2	21%
September	3.06	0.46	3.5	14%
October	2.05	1.9	0.2	1%
November	1.08	4.69	0.0	0%
December	0.56	7.22	0.0	0%
Total	**29.65**	**34.16**	**24.3**	**100%**
			2.0 feet	

Notes:

(1) Evapotranspiration (ETL) = Reference Evapotranspiration (ETo) x Landscaped Crop Area Coefficient (KL). Reference evapotranspiration values obtained from the California Irrigation Management Information System Reference Evapotranspiration Zone Map and rates included in the Guide to Estimating Irrigation Water Needs of Landscape Plantings in California by the California Department of Water Resources (Guide). The City of Ukiah is located in Zone 8 (Inland San Francisco Bay Area). Landscaped crop coefficient (KL) = Average Species Factor (Ks) x Density Factor (Kd) x Microclimate Factor (Kmc). Ks, Kd, Kmc estimated using data in the Guide.

(2) Source: Ukiah Station #049122 Data from the Western Regional Climate Center Precipitation Gauges, 1893-2010.

(3) Net Irrigation Requirement = (Evapotranspiration - Rainfall)*1.15/0.85. Where 0.85 = 85% Irrigation Factor (Average Value from Carlos and Guitijens, University of Nevada) and 1.15 = 15% Leaching Fraction (Average value from Ayers and Westcot, "Water Quality for Agriculture", Food and Agriculture Organization of the United Nations).

(4) Current month net irrigation requirement divided by total net irrigation requirement.

5.2.3 Potential Customer Storage

As discussed in Section 5.1.1, several agricultural parcels have existing storage ponds or plans to construct storage ponds. Since frost protection is a significant demand, it is anticipated that storage at the site of potential customers will extend the potential coverage of frost protection supply from the Ukiah WWTP.

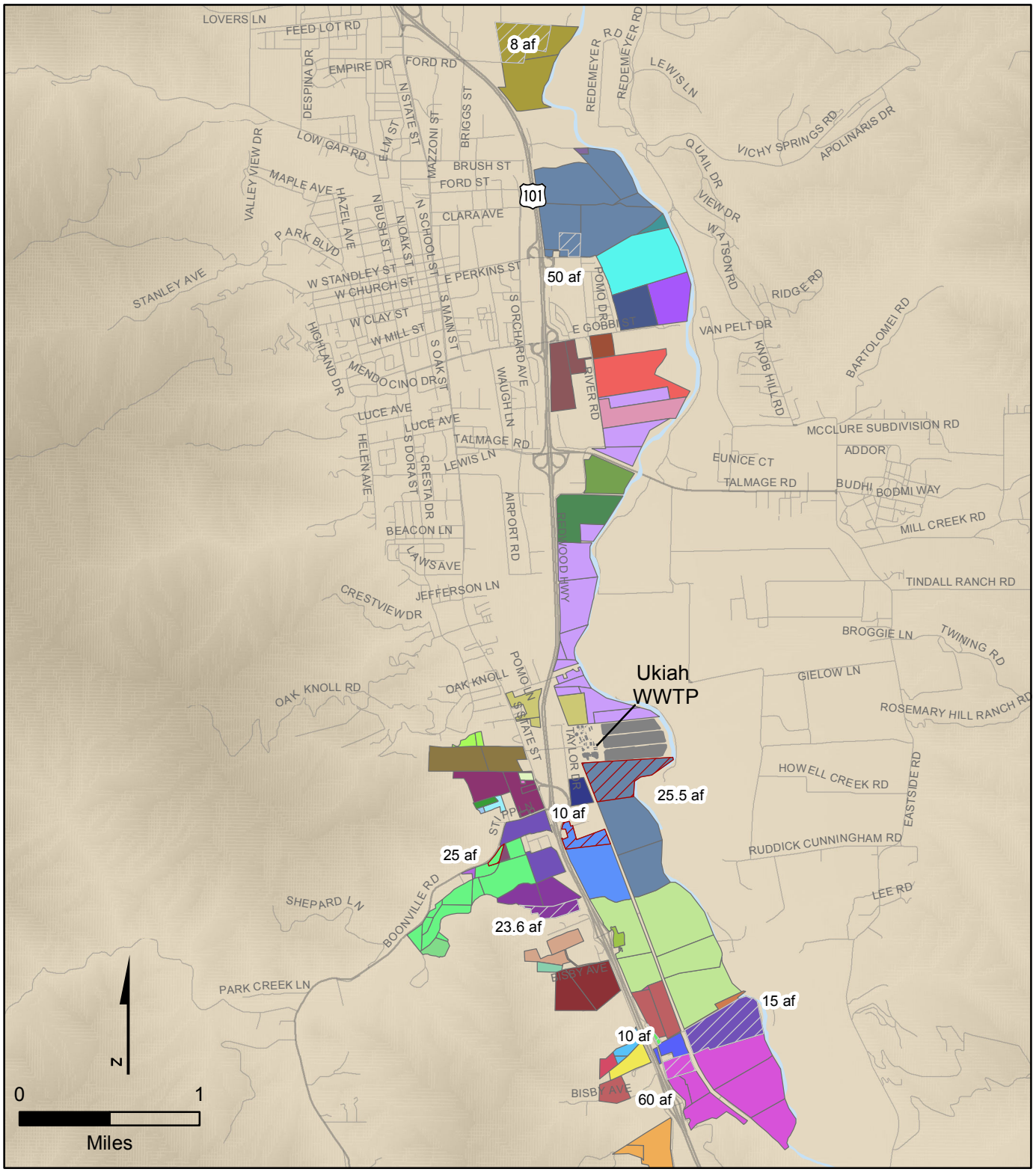
Agricultural parcels with storage ponds are presented in Figure 5.4. Whether a parcel has a storage pond was determined based on the results of the questionnaire and discussions with City and RRFCD staff. It should be noted that some of the responses on questionnaires did not seem feasible and were thus revised accordingly. While the sizing of individual storage ponds was considered the responsibility of the farmer and was not evaluated within this study, the aggregate size of the storage ponds were used to determine the potential seasonal storage available. This will be discussed in detail in Chapter 6.

5.3 STAKEHOLDER OUTREACH

In addition to the mailing of questionnaires to larger and local possible users, two Stakeholder Workshops were held to inform the public of the project and obtain feedback. The Stakeholder Workshops were used to describe the project and the process, present recycled water alternatives, and obtain feedback. The workshops were held at key milestones during the planning process and had approximately 10 to 20 attendees at each. Besides the potential users, attendees from the City also participated. No meeting minutes were developed and no public comments were received from the workshop attendees.

The first Stakeholder Workshop was held on June 8, 2011 and presented a recycled water overview, project timeline, description of the master plan and its focus, discussion of expected irrigation water quality, brief review of funding options, and closed with the next steps in the process. The purpose of this meeting was to introduce the project to the attendees and describe the process being conducted. The main questions focused around cost of the project, cost of the water, timing of project implementation, and was it used by other areas with similar crops. As the meeting closed, the attendees were highly considering using the recycled water and there were no concerns regarding water quality or safety.

Stakeholder Workshop No. 2 was held on October 6, 2011. The goals were to present the background information, schedule, and work-to-date, present the alternatives analyzed, review the recommended project and costs, review possible funding options, and again close with the next steps in the process. Five alternatives were presented along with their screening and ranking based on the criteria established at the Visioning Workshop at the beginning of the Plan. Based on input from one stakeholder, a six alternative was added that combined serving the agricultural interests as well as serving the large urban irrigation sites like the sports park and golf club.



Legend

- Parcels w/ Existing Storage Pond
- Parcels w/ Future Storage Pond

Agricultural Parcels Colored by Grower or Owner Name (Adjacent parcels with the same color are likely able to share storage)

- WWTP Ponds and Buildings
- River
- Major Roads
- Local Streets

Figure 5.4
EXISTING AND PLANNED AGRICULTURAL STORAGE
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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A presentation to the City Council was conducted on December 7, 2011 to present the project status, the recommended alternative, and associated costs (capital and O&M). The Council had several questions about the project timing and need. The Public Works Director reinforced that the main need for a recycled water project is centered on the limited disposal/storage pond capacity for the treated water and that the RWQCB has requested the WWTP begin a recycled water project for beneficial reuse of their effluent.

PROJECT ALTERNATIVE ANALYSIS

6.1 WATER RECYCLING ALTERNATIVES EVALUATED

A total of six alternatives were evaluated in this study. The alternatives were selected based on providing recycled water along different alignments and prioritization of different use types. The alternatives vary by area/acreage served, use types served, and storage configuration. Pipelines for each alternative was routed and sized in Innovyze's H_2OMap Water hydraulic modeling software.

First, Alternatives 1 through 3 (a total of 5 different alternatives) were preliminarily developed and presented to City staff and potential agricultural users at a workshop. Through input at the workshop, the alternatives were refined and Alternative 4 was developed to prioritize supplying recycled water to urban sites, including City parks, schools, and the golf course. A complete description of the alternatives follows. Planning level cost estimates for each alternative are presented and discussed following the alternative descriptions. Planning assumptions are discussed in more detail in Section 6.2.

6.1.1 Alternative 1

The Baseline Alternative, Alternative 1, was routed to the south and west to maximize use of the existing off-site storage while minimizing length and size of pipelines. It was considered as the minimum pipeline alternative that could be constructed while utilizing the full dry weather recycled water supply of 4 mgd. This alternative maximized supplying recycled water to meet frost protection demands. This alternative serves only agricultural needs.

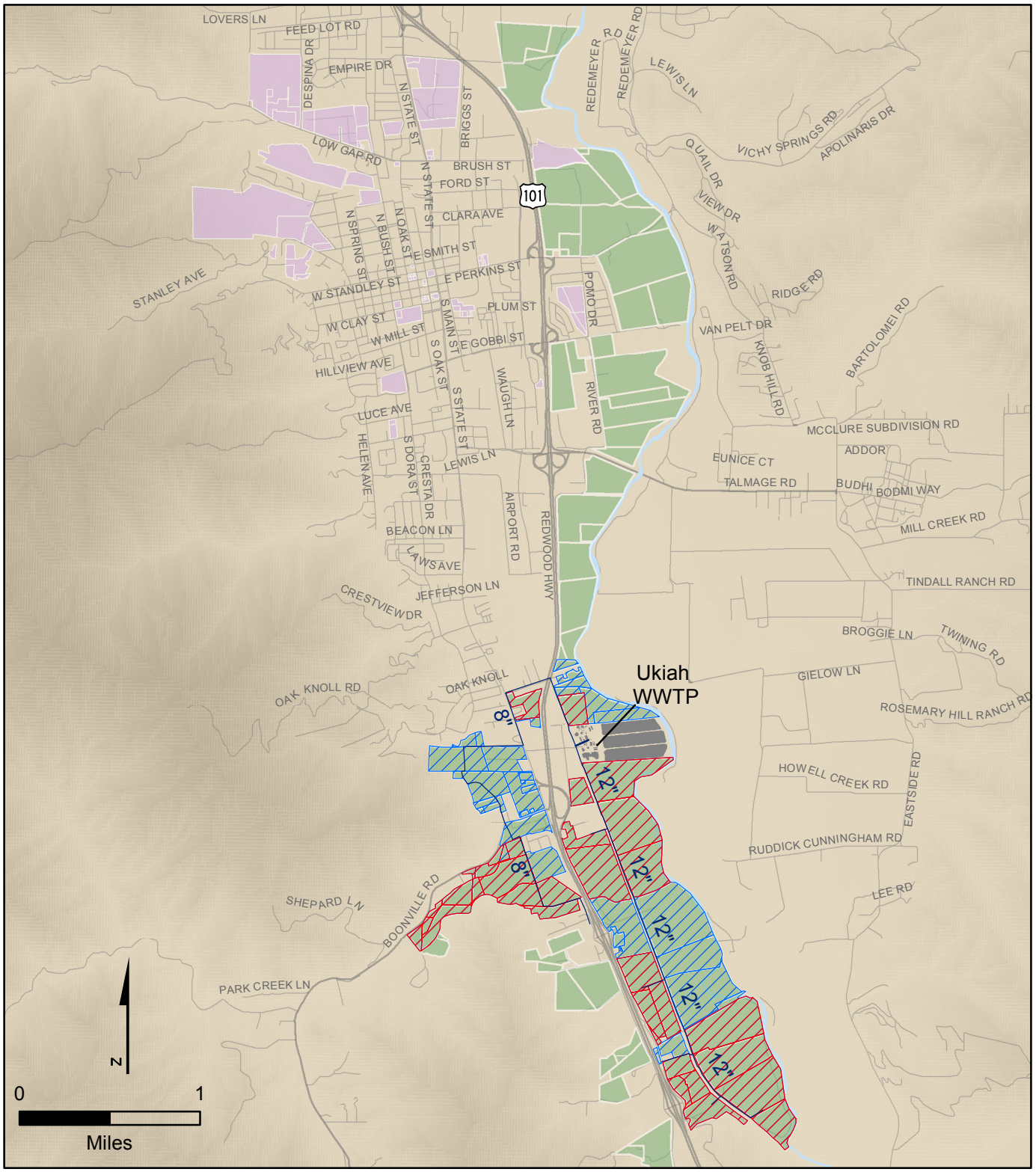
A total of 68 parcels covering 793 acres would be supplied with irrigation in this alternative with an irrigation demand of 830 AFY. About 483 acres representing 35 parcels (corresponding to about 10 farmers) would be supplied with frost protection water, with an estimated annual frost protection demand of 242 AFY. This alternative includes just under 6 miles of pipeline, with diameters ranging between 8 and 16 inches.

This alternative would utilize 5 farmer owned storage ponds, totaling 99 af in size. In addition, 19 parcels representing about 5 farmers not having ponds, covering 134 acre (ac) of land, are provided frost protection during frost events.

Figure 6.1 illustrates the pipeline routing and properties served by Alternative 1.

6.1.2 Alternative 1B

Alternative 1B follows a similar alignment to Alternative 1, but extends north to supply irrigation to additional parcels. This alternative prioritizes supplying agricultural parcels with recycled water for irrigation. This alternative serves only agricultural needs.



Legend

- Parcels Provided Frost Protection and Irrigation
- Parcels Provided Irrigation
- Potential Agriculture Parcels
- Potential Landscape Parcels
- WWTP Ponds and Buildings
- River
- Major Roads
- Local Streets

Proposed Pipeline by Diameter

- 12" and smaller
- 16" to 24"
- larger than 24"

Figure 6.1
ALTERNATIVE 1
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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A total of 75 parcels covering 915 acres, representing about 12 farmers, would be supplied with irrigation in this alternative with an irrigation demand of 1,027 AFY. Similar to Alternative 1, 483 acres would be supplied with frost protection water, with an estimated annual frost protection annual demand of 242 AFY.

This alternative includes just over 7 miles of pipeline, with diameters ranging between 8 and 16 inches. Similar to Alternative 1, this alternative would utilize 5 farmer based storage ponds, totaling 99 af in size. Figure 6.2 illustrates the pipeline routing and properties served by Alternative 1B.

6.1.3 Alternative 2

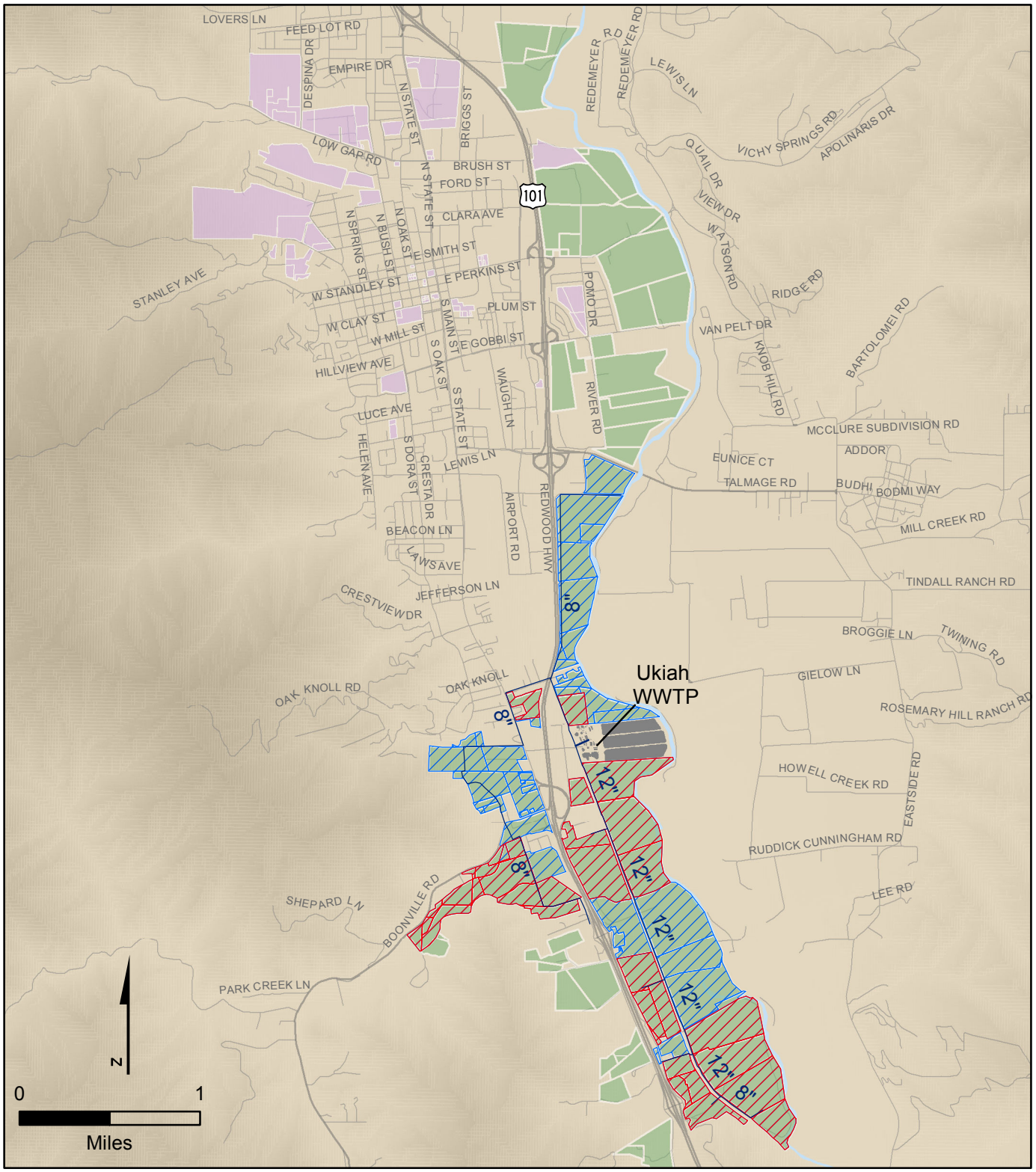
Alternative 2 investigates the feasibility of farmers constructing their own storage ponds with which to provide their own peaking for frost protection.

Based on discussions with Russian River Flood Control District (RRFCD), many farmers are considering adding storage due to the new possible State Board river withdrawal schedule, making this alternative likely. This would save the WWTP money in storage facilities, but would cost the farmers more and it would rely on the farmers being proactive in building storage facilities. This alternative serves only agricultural needs.

While Alternative 1 focused on supplying frost protection water to farmers with existing or planned storage ponds, Alternative 2 was developed to determine the effective maximum extent of acreage provided frost protection assuming farmers built a typical amount of storage.

The limiting factor for this alternative is the recharging of farmer ponds between frost events. Based on results of the questionnaire, a typical storage factor of 0.3 af/ac was applied to all the parcels to determine the minimum volume of storage each farmer would construct. The recycled water distribution system was sized assuming that the ponds could be refilled during the non-frost hours of each day during a frost protection event and over a period of seven days between frost events (as discussed in Chapter 5, frost events are assumed to last three days). Based on the assumptions discussed in Chapter 5, a single frost event (occurring over 3 days) will require between 0.23 and 0.24 af/ac of storage. In this scenario, recharge demands between frost events are calculated as 2,982 gallons per minute (gpm). A storage pond sized for 0.3 af/ac would include sufficient storage to make up for the difference between the recharge flows and the projected flow from the Ukiah WWTP.

A total of 35 parcels covering 494 acres, representing about 10 farmers, would be supplied with frost protection in this alternative with an estimated frost protection demand of 247 AFY. About 619 acres would be supplied with irrigation water, with an estimated annual annual irrigation demand of 699 AFY. This alternative includes about 4 miles of pipeline, with diameters ranging between 8 and 16 inches. Figure 6.3 illustrates the pipeline routing and properties served by Alternative 2.



Legend

- Parcels Provided Frost Protection and Irrigation
- Parcels Provided Irrigation
- Potential Agriculture Parcels
- Potential Landscape Parcels
- WWTP Ponds and Buildings
- River
- Major Roads
- Local Streets

Proposed Pipeline by Diameter

- 12" and smaller
- 16" to 24"
- larger than 24"

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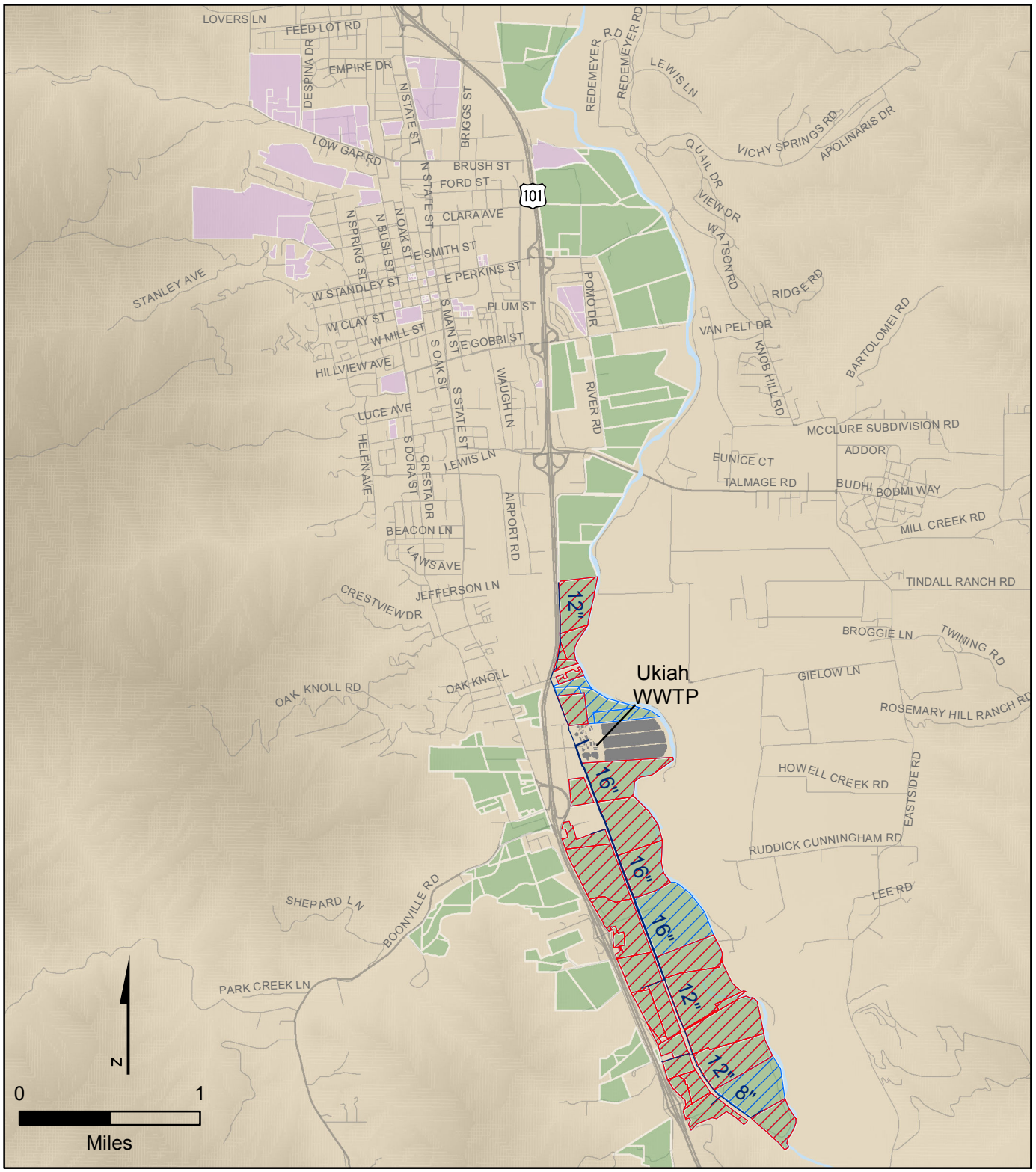
Figure 6.2
ALTERNATIVE 1B
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH



Legend

- Parcels Provided Frost Protection and Irrigation
- Parcels Provided Irrigation
- Potential Agriculture Parcels
- Potential Landscape Parcels
- WWTP Ponds and Buildings
- River
- Major Roads
- Local Streets

Proposed Pipeline by Diameter

- 12" and smaller
- 16" to 24"
- larger than 24"

Figure 6.3
ALTERNATIVE 2
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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It should be noted that if the storage ponds were sized for the average annual frost protection demand of 0.5 af/ac (as discussed in Chapter 5) plus evaporation or other losses, and filled at the start of the frost season, the farmers could theoretically require no recharge during frost events. While it was assumed that this level of storage may be too large for most farmers, this strategy could potentially be used to provide frost protection to any farmers not supplied frost protection in any of the alternatives.

6.1.4 Alternative 3

Alternative 3 investigates the feasibility of supplying frost protection through centralized storage. In this alternative, a large centralized storage facility would be constructed at the WWTP. This reservoir would then feed the demands as needed to meet frost protection and some irrigation needs. This would allow instantaneous supply of demands much larger than the 4-mgd dry weather tertiary capacity. The main issue with this alternative is that the infrastructure required to convey instantaneous frost protection demands is very substantial in size and cost.

A total of 54 parcels covering 891 acres would be supplied with irrigation in this alternative with an irrigation demand of 1,081 AFY. A total of 50 parcels, representing about 11 farmers and covering 837 acres would be supplied with frost protection water, with an estimated annual frost protection demand of 419 AFY.

The centralized storage at the Ukiah WWTP was assumed as a 200 af pond. Since this alternative includes centralized storage at the Ukiah WWTP, the infrastructure is sized to supply the full frost protection demand instantaneously to all farmers. Thus, this alternative includes about 6 miles of pipeline, with diameters ranging between 8 and 48 inches. Instantaneous demand supplied to farmers without storage during the frost event is estimated as 28,600 gpm, representing 489 acres of land provided frost protection. In addition, recycled water could be supplied between frost events to farmers with storage ponds. This would enable an additional instantaneous supply of about 20,200 gpm from farmer ponds, protecting another 348 acres. Accounting for the hours of frost protection required for each type of crop, the effective supply to the system from storage and the WWTP would be 21.8 mgd for each of the three days of a frost protection event.

As with Alternative 2, the limiting factor for this alternative regarding the number of parcels supplied with frost protection is the recharge time between frost events of both the centralized storage pond and the individual farmer ponds. While the limiting effect of this recharge time could be reduced by increasing the size of the storage, a larger storage pond was assumed not to be feasible within this study.

An additional benefit of this alternative is the large storage pond, in that the Ukiah WWTP could use the pond to increase its operational flexibility when discharge to the Russian River is limited.

This alternative would utilize 4 farmer owned storage ponds, totaling over 50 af in size (size for one is unknown). In addition, 35 parcels representing 7 farmers not having ponds, covering 489 acres of land, are provided frost protection during frost events.

Figure 6.4 illustrates the pipeline routing and properties served by Alternative 3. This alternative serves mainly agricultural needs and two small urban sites, Oak Manor Park and Oak Manor School.

6.1.5 Alternative 3B

Alternative 3B follows a similar alignment as Alternative 3, but extends the recycled water distributions system to supply irrigation to additional parcels. This alternative prioritizes supplying agricultural parcels with recycled water for irrigation. The benefits and issues are primarily the same for this alternative as with Alternative 3.

A total of 69 parcels representing about 11 farmers and 2 urban users covering a total of 1,210 acres would be supplied with irrigation in this alternative with an irrigation demand of 1,598 AFY. Substantially more irrigation water is available in this scenario as the centralized storage can be used for seasonal storage in the summer, when the Ukiah WWTP's capacity constrains the available irrigation water.

While slightly more acreage could be provided frost protection due to the additional existing or planned storage ponds that can be reached based on the irrigation driven pipeline alignment, the flow from the Ukiah WWTP is not sufficient to recharge the centralized storage pond in addition to the additional farmer storage ponds. Thus, the frost protection acreage and demand are the same as Alternative 3. This alternative includes over 8 miles of pipeline, with diameters ranging between 8 and 48 inches.

Figure 6.5 illustrates the pipeline routing and properties served by Alternative 3B. This alternative serves mainly agricultural needs and three small urban sites. When compared with Alternative 3B, an additional urban site, the Ukiah Sports Complex, can be supplied with recycled water since the pipeline extends further north in Alternative 3B.

6.1.6 Alternative 4

Alternative 4 was developed following input from the community at the second Stakeholder Workshop. This alternative is intended to supply a combined set of agricultural and urban landscape irrigation demands. The alignment is routed to the northeast, then extends west to supply urban landscape irrigation demands at several City parks and schools.

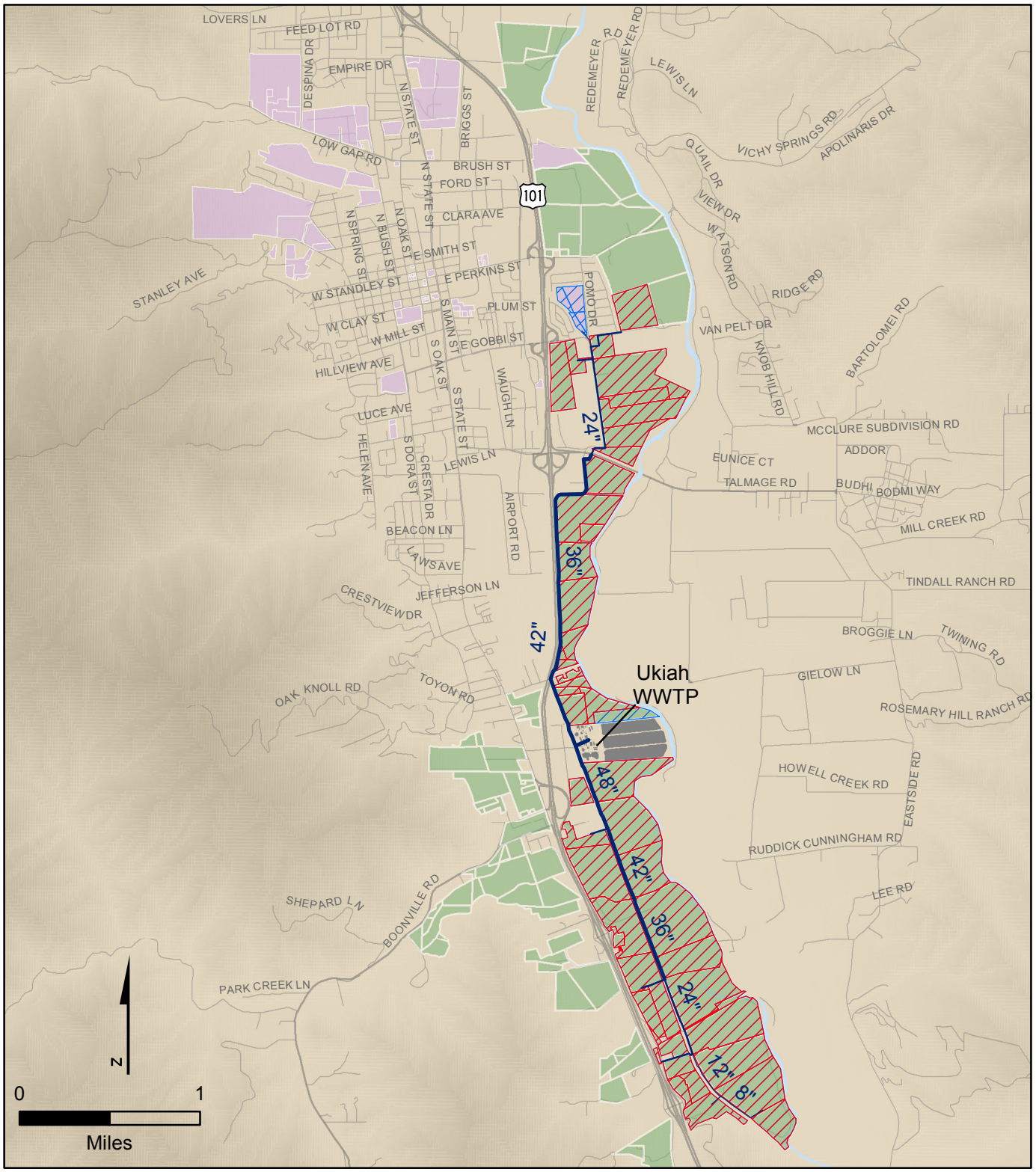
A total of 60 parcels covering 703 acres would be supplied with irrigation in this alternative with an irrigation demand of 1,234 AFY. About 284 acres would be supplied with frost protection water, with an estimated annual frost protection demand of 142 AFY. This alternative includes 9 miles of pipeline, with diameters ranging between 8 and 16 inches.

This alternative would utilize 2 farmer based storage ponds, totaling approximately 75 af in size. In addition, 9 parcels representing 3 farmers not having ponds, covering 50 acres of land, are provided frost protection during frost events.

Figure 6.6 illustrates the pipeline routing and properties served by Alternative 4.

Table 6.1 Alternative Parameter Summary
Recycled Water Feasibility Study
City of Ukiah

Parameter	Alternative 1	Alternative 1B	Alternative 2	Alternative 3	Alternative 3B	Alternative 4
Irrigation Demand (AFY)	830	1,027	699	1,081	1,598	1,234
Irrigated Area Served[(1)] (Acres)	793	915	619	891	1,210	703
Parcels Provided Irrigation (Number)	68	75	37	54	69	60
Frost Protection Demand (AFY)	242	242	247	419	419	142
Frost Protected Land (Acres)	483	483	494	837	837	284
Parcels Provided Frost Protection (Number)	35	35	35	50	50	17
Pipeline (Miles)	5.8	7.3	3.9	6.0	8.4	9.4
Diameter (Inches)	8 – 16	8 – 16	8 – 16	8 – 48	8 – 48	8 – 16
Pump Stations (Number)	1	1	1	1	1	1



Legend

- Parcels Provided Frost Protection and Irrigation
- Parcels Provided Irrigation
- Potential Agriculture Parcels
- Potential Landscape Parcels
- WWTP Ponds and Buildings
- River
- Major Roads
- Local Streets

Proposed Pipeline by Diameter

- 12" and smaller
- 16" to 24"
- larger than 24"

Figure 6.4
ALTERNATIVE 3
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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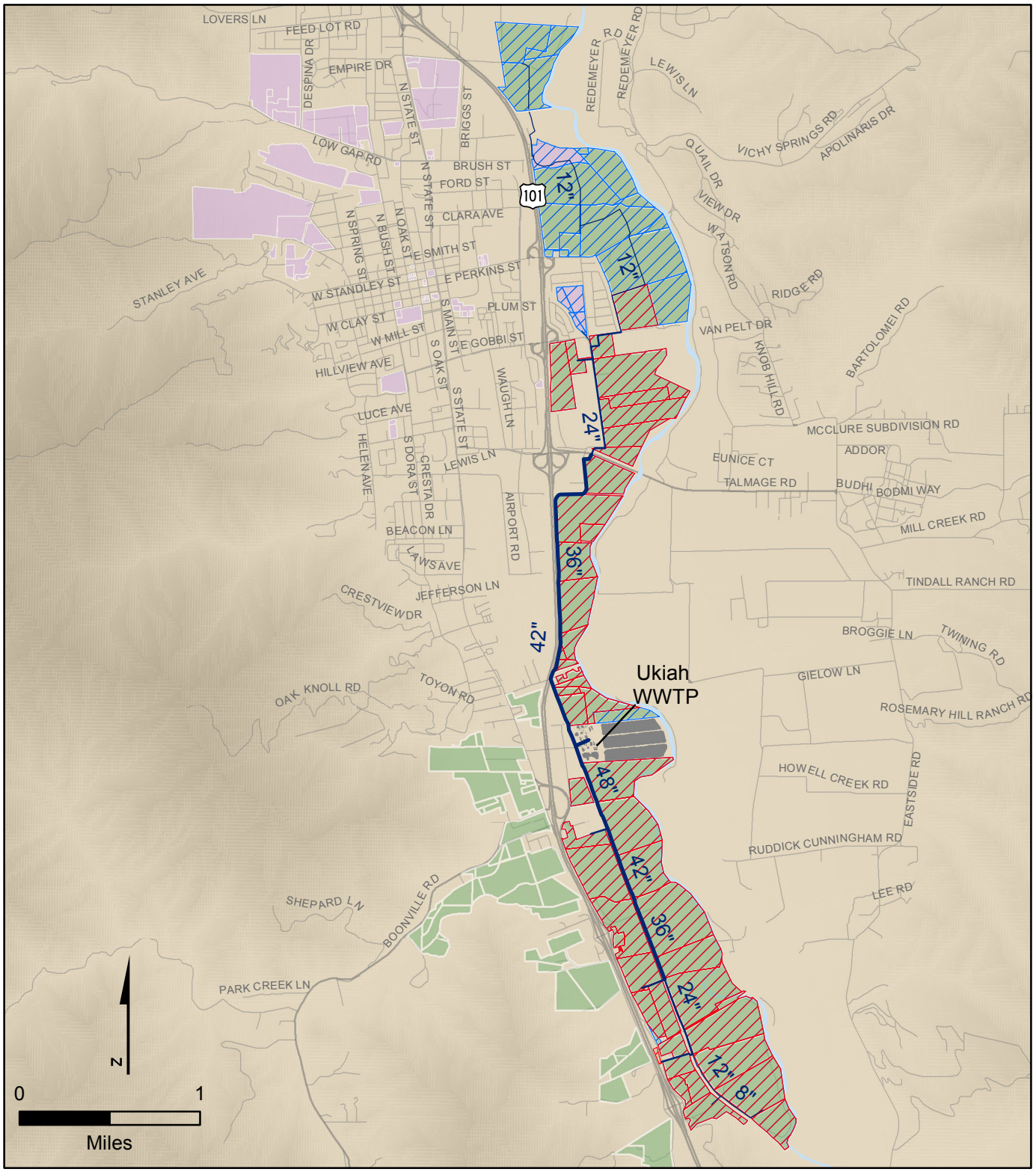

Legend

- Parcels Provided Frost Protection and Irrigation
- Parcels Provided Irrigation
- Potential Agriculture Parcels
- Potential Landscape Parcels
- WWTP Ponds and Buildings
- River
- Major Roads
- Local Streets

Proposed Pipeline by Diameter

- 12" and smaller
- 16" to 24"
- larger than 24"

Figure 6.5
ALTERNATIVE 3B
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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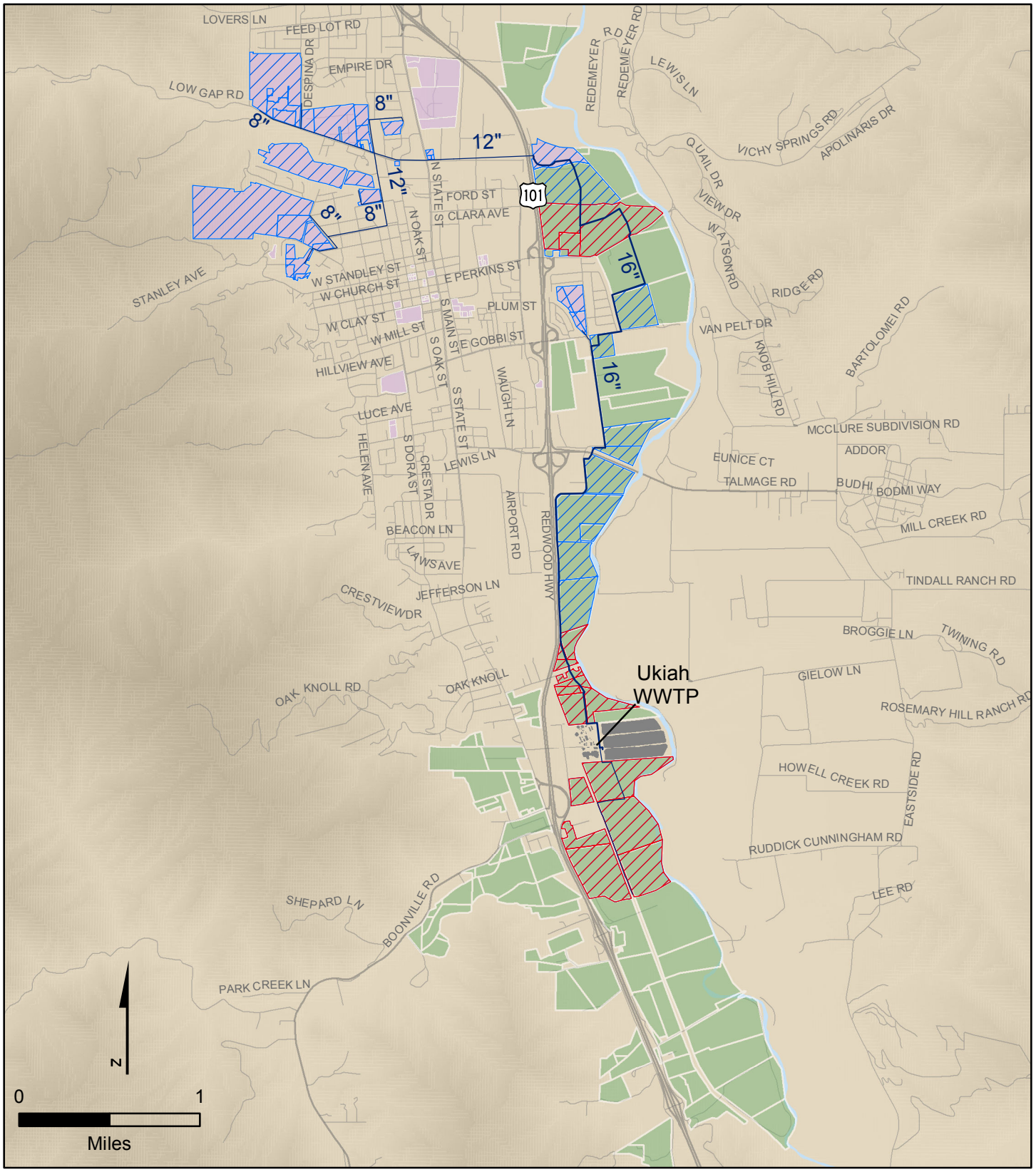

Legend

- Parcels Provided Frost Protection and Irrigation
- Parcels Provided Irrigation
- Potential Agriculture Parcels
- Potential Landscape Parcels
- WWTP Ponds and Buildings
- River
- Major Roads
- Local Streets

Proposed Pipeline by Diameter

- 12" and smaller
- 16" to 24"
- larger than 24"

Figure 6.6
ALTERNATIVE 4
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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6.2 PLANNING LEVEL COST ESTIMATES

Planning level cost estimates were developed for each of the alternatives discussed above. Assumptions regarding costs are discussed, followed by a presentation of the costs for each alternative.

6.2.1 Assumptions

Several assumptions were used in the development of cost estimates. Scope and anticipated range of accuracy are discussed, followed by a discussion of the markups and contingencies and a presentation of the unit costs used in this study.

6.2.1.1 Scope and Accuracy Range

The cost estimating criteria presented herein develop a consistent methodology for comparing alternatives. This methodology allows for different alternatives to be evaluated on the same cost basis.

Cost estimates presented in this feasibility study are based on the Engineering and News Record (ENR) San Francisco cost index of 10,199 published in October 2011. Future adjustments of cost estimates presented in this report can be estimated by increasing the estimated capital cost by the ratio of the future ENR to 10,199.

The cost estimates presented in the CIP have been prepared for general master planning purposes and for guidance in project evaluation and implementation. The actual costs of a project will depend on actual labor and material costs, competitive market conditions, final project scope, implementation schedule, and other variable factors such as preliminary alignment generation, detailed utility surveys, and environmental and local considerations.

The Association for the Advancement of Cost Engineering (AACE) defines an order-of-magnitude estimate for master plan studies as an approximate estimate made without detailed engineering data. It is normally expected that an estimate of this type would be accurate within +100 percent to -50 percent. This section presents the assumptions used in developing order of magnitude cost estimates for recommended facilities.

The AACE International defines five different class estimate categories as summarized in Table 6.2.

The budgeting level estimates needed for planning purposes and CIPs are usually based on Class 5. However the costs developed in this feasibility study shall be considered Class 4 estimates, due to the greater level of project understanding. A definition of the Class 4 estimate is described below.

Table 6.2 Class Estimates Recycled Water Feasibility Study City of Ukiah			
		Accuracy Range	
Class	Status of Design	Low Side	High Side
5	N/A	-20% to -50%	+30% to +100%
4	1% to 5%	-15% to -30%	+20% to +50%
3	10% to 40%	-10% to -20%	+10% to +30%
2	30% to 70%	-5% to -15%	+5% to +20%
1	80% to 110%	-3% to -10%	+3% to +15%
5	Rough Order-of-Magnitude Planning Estimate		
4	Detailed Planning Level Estimate		
3	Project Budget Estimate		
2	Detailed Project Control Estimate		
1	Bid Check Estimate		
Note: Percentages are based on the construction cost value and not on an incremental subtotal after each percentage category			

Class 4. This estimate is prepared based on information where the preliminary engineering is 1 to 5 percent complete. Detailed strategic planning, business development, project screening, alternative scheme analysis, confirmation of economic and/or technical feasibility, and preliminary budget approval are needed to proceed with this class estimate. Examples of estimating methods used would include equipment and/or system process factors, scale-up factors, as well as parametric and modeling techniques. This estimate requires more time to develop. The typical expected accuracy range for this class estimate is -15 to -30 percent on the low side and +20 to +50 percent on the high side.

A Class 4 estimate may also be justified by the methods presented for this cost evaluation if suitable definitions of project components, individual consideration of special project components/conditions, and independent cost verifications are conducted. Commensurate reductions in project contingencies should also be considered for the Class 4 estimate.

All classes of cost estimates described, and any resulting conclusions on project financial or economic feasibility or funding requirements, are prepared for guidance in project evaluation and implementation. The final costs of the project, and resulting feasibility, will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, continuity of personnel and engineering, and other variable factors. Therefore, the final project costs will vary from the estimate developed using the information in this master plan. Because of these factors,

project feasibility, cost-benefit ratios, risks, and funding needs must be carefully reviewed prior to making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding.

This evaluation is concerned with alternatives analysis and project screening, as well as technical feasibility. Therefore, Class 4 estimates have been developed. For the development of the project costs, a construction cost contingency, estimating contingency, and other markups will be applied consistent with Table 6.3. The markups are intended to account for costs of engineering, design, administration, and legal efforts associated with implementing the project. It should be noted that construction contingency, estimating contingency, and markups are applied incrementally; that is, the percentage for each component is applied to the previous subtotal.

Table 6.3 General Cost Estimating Assumptions
Recycled Water Feasibility Study
City of Ukiah

Description	Percent of Construction Cost[(1)]
Construction Cost	100.0%
Construction Cost Contingency	20.0%
Subtotal: Construction Cost + Construction Contingency	**120.0%**
Estimating Contingency	20.0%
Subtotal of Estimating Contingency	20.0%
Subtotal w/ Estimating Contingency[(2)]	**144.0%**
Engineering and Design	21.0%
Project Administration	5.0%
Legal	5.0%
Subtotal of Total Markups	31.0%
Total Project Cost	**188.6%**

Note:
(1) Percentages are based on the construction cost value and an incremental subtotal after each category for contingencies and total markup cost. Total Project Cost = Construction Cost x (1 + (Construction Cost Contingency x Estimating Contingency)) x (1 + Total Markups).
(2) Estimating Contingency multiplied by Subtotal of Construction Cost plus Construction Contingency.

6.2.1.2 Markups and Contingency

The cost estimates are based on current perceptions of conditions at the project locations. These estimates reflect Carollo's professional opinion of costs at this time and are subject to change as the project details are defined. Carollo has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding, or market conditions, practices, or bidding

strategies. Carollo cannot, and does not, warrant or guarantee that proposals, bids, or actual construction costs will not vary for the costs presented as shown.

6.2.1.3 Unit Construction Costs

The construction cost estimates presented in this report are based on the unit construction costs listed in Table 6.4. Construction costs for recycled water system pipelines include pipe material, valves, appurtenances, excavation, installation, bedding material, backfill material, transport, and paving where applicable. The costs of acquiring easements for pipeline construction are not included in the unit costs, but will be estimated for the recommended alternative in Chapter 7.

For booster pumping stations (PS), unit costs are included based on the required horsepower assuming the project involves a new PS requiring new piping and all associated appurtenances. If a PS project only requires the replacement or addition of a pump to an existing PS, the unit costs will be evaluated on a per site basis at that time. Unit costs for PSs are estimated per horsepower of design size.

6.2.1.4 Excluded Costs

There are several other components that may be needed to support the development of major recycled water supply facilities. Since most of these items are unique and project specific, they should be applied on a project-by-project basis. Therefore, no unit costs were included in Table 6.4 for the following items:

- **Power transmission lines.** The cost of these to support a major pumping or treatment is often on a shared cost basis with the power utility.
- **Maintenance roads.** If pipelines are installed in remote areas, maintenance roads are sometimes required to access the facilities.
- **Overall program management.** If the sheer magnitude of the capital cost program exceeds the capacity of City of Ukiah staff to manage all of the work, then the services of a program management team may be required.
- **Public information program.** Depending on the relative public acceptability of a major recycled water facility or a group of facilities, there may be a need for a public information program, which could take many different shapes.

Table 6.4 Unit Construction Cost Recycled Water Feasibility Study City of Ukiah	
Category	**Unit Construction Cost**
Pipelines – Paved Streets	**$/lineal ft**
8-inch diameter	136
12-inch diameter	204
16-inch diameter	272
20-inch diameter	340
24-inch diameter	408
30-inch diameter	510
36-inch diameter	612
42-inch diameter	714
48-inch diameter	816
54-inch diameter	918
60-inch diameter	1,020
72-inch diameter	1,224
Pipelines – Unpaved Easements (Agricultural Land, Site Piping)	**$/lineal ft**
8-inch diameter	109
12-inch diameter	163
16-inch diameter	218
20-inch diameter	272
24-inch diameter	326
30-inch diameter	408
36-inch diameter	490
42-inch diameter	571
48-inch diameter	653
54-inch diameter	734
60-inch diameter	816
72-inch diameter	979
Special Pipeline Construction	**Markup (%) or $/lineal ft**
Jack and Bore	$1,200 /lineal ft
Booster Pumping Stations – New Construction	**$/hp**
Less than 100 hp	9,800
100 to 500 hp	7,400
500 to 3,000 hp	6,400
3,000 to 5,000 hp	3,100
Greater than 5,000 hp	3,000
Storage	**$/gallon**
Pond	$0.10
Steel Tank	$0.70

- **Customer retrofits.** Retrofit costs are associated with separating the customer's existing potable water system from a new recycled water system. An example would be a park where restroom and drinking fountain water supply pipes would need to be isolated from an existing irrigation system. Additional costs include posting signage, which identifies where recycled water is being used. Customer retrofits are one-time costs and are dependent upon the complexity of existing irrigation systems at each individual site. This cost estimate excludes cost of customer retrofits.
- **Foundation requirements.** Foundation reinforcement or support requirements are very site specific with regard to necessary method and type, and a geotechnical study is typically needed to determine such requirements. These costs, therefore, have not been included in any of the unit cost curves.
- **Other costs.** These costs may be necessary on some projects and could include environmental mitigation and permitting costs; special legal, administrative, or financial assistance; easements or rights-of-way and land acquisition costs; and expediting costs, such as separate material procurement contracts. These *other* costs typically range from 5 to 15 percent of construction cost.

While land acquisition costs are not included in the unit costs, cost of land acquisition will be estimated for the recommended alternative in Chapter 7.

6.2.2 Cost Estimates for Alternatives

Preliminary capital cost estimates for each of the alternatives discussed in Section 6.1 were developed for relative comparison between the alternatives. Components included in the cost estimates for each alternative include pipelines, storage provided by the City, and pump stations. The sizing of the components is presented in Table 6.5.

Preliminary cost estimates for capital costs for each alternative are presented in Table 6.6. Cost estimates do not account for operations and maintenance costs. Some operations and maintenance costs will be included in the financial analysis of the recommended alternative in Chapter 8.

Capital costs were amortized to compare the relative advantages on a unit cost basis assuming an interest rate of 6 percent and a payback period of 30 years. It should be noted that, although the frost protection demand is included in the annual demands used to develop the unit costs, the unit costs do not reflect the value of frost protection, as whether or not frost protection is provided is much more critical than the actual quantity of frost protection demand supplied.

As shown in Table 6.6, Alternative 2 is the least costly, on both a capital and unit cost basis. However, the cost to the individual farmers of on-site storage is not included in this estimate. Alternative 1 and 1B are the next least expensive on both a capital and unit cost basis. The additional pipeline length included in Alternative 1B is offset by the increase in demand, making the two alternatives comparable on a unit cost basis. Alternative 3 and 3B

Table 6.5 Summary of Project Components
Recycled Water Feasibility Study
City of Ukiah

Alternative	Irrigation Acreage	Frost Protection Acreage	Pipeline Length (mi.)	Pump Station (hp)	Storage Pond[(1)] (MG)
1	793	483	5.8	150	0.65
1B	915	483	7.3	150	0.65
2	619	494	3.9	75	1.60
3	891	837	6.0	1,400	200.00
3B	1,210	837	8.4	1,400	200.00
4	703	284	9.4	400	1.60

Note:

(1) Costs for farmer provided storage were not included in this analysis. While all alternatives utilize farmer provided storage, Alternative 2 relies the most heavily on farmer provided storage. Based on discussions during the Stakeholder Workshops, farmers may be able to construct frost protection storage ponds more economically than the unit costs used within this study. However, it is important to recognize this unseen cost. For Alternative 2, based on the unit costs used in this study of $0.10 per gallon, the estimated project cost for the 58.8 af of farmer provided storage would be $3.6 M.

Table 6.6 Preliminary Cost Estimates
Recycled Water Feasibility Study
City of Ukiah

Alternative	Capital Cost ($M)	Annual Demand[(1)] (AFY)	Annual Cost[(2)] ($ per year)	Estimated Unit Cost[(1)] ($ per AF)
1	$10.3	1,071	$680,000	$635
1B	$12.3	1,268	$810,000	$639
2	$8.0	946	$530,000	$560
3	$58.4	1,499	$3,800,000	$2,535
3B	$67.0	2,017	$4,360,000	$2,162
4	$25.3	1,376	$1,650,000	$1,199

Notes:

(1) Annual demand is based on the combined demand of landscape irrigation, agricultural irrigation, and frost protection. It should be noted that the value associated with the frost protection demand is whether or not frost protection is provided rather than the quantity of actual demand.

(2) Amortization assumes interest rate of 6% and 30-year payback period.

are predicted to be the most expensive, with unit costs exceeding $2,000 per af. Estimated costs for Alternative 4 fall between the centralized storage costs and the lower cost alternatives. Detailed cost estimates are included in Appendix C.

6.3 PLANNING AND DESIGN ASSUMPTIONS

The alternatives for the City's recycled water system are planned based on the project flows and planning and design criteria defined in this chapter. The developed criteria addressed the recycled water system capacity, pipe roughness, maximum velocity, minimum velocity, maximum headloss, and demand factors.

Demand factors and other customer specific factors were discussed in detail in Chapter 5, and will only be summarized here.

The planning and design criteria are presented in Table 6.7. A discussion of several of these criteria follows.

Table 6.7 Planning and Design Criteria
Recycled Water Feasibility Study
City of Ukiah

Description	Criteria
Delivery Pressure – Agricultural Irrigation	20 psi
Delivery Pressure – Landscape Irrigation	40 psi
Minimum System Pressure	5 psi
Maximum Pipeline Velocity(1)	5 ft/sec
Maximum Pipeline Headloss (Diameter <= 12-inches)	10 ft/1,000 ft (ft/kft)
Maximum Pipeline Headloss (Diameter > 12-inches)	3 ft/kft(2)
Pipeline Roughness (C Factor)	130
Seasonal Peaking for Irrigation	1.00
Agricultural Irrigation Schedule	Continuous
Landscaping Irrigation Schedule	6 pm to 5 am (Continuous)
Customers with Storage Frost Protection Schedule	Recharge for 16 hours a day for 3 days, then continuous for 7 days
Customers without Storage Frost Protection Schedule	8 hours a day for 3 days

Notes:
(1) A higher pipeline velocity criteria of 10 ft/sec was used to accommodate the significant frost protection demands. A pipeline velocity criteria of 5 ft/sec was used for irrigation scenarios.
(2) Under frost protection scenarios, headloss of up to 5 ft/kft was considered acceptable in pipelines over 12-inches in diameter.

6.3.1 Supply Availability

As discussed in Chapter 3, the projected wastewater available for use as recycled water is projected to grow by about 550 AFY over the next 25 years. The wastewater flow varies seasonally, with minimum flows occurring during the summer months. Since the minimum flow coincides with peak irrigation demands (due to evapotranspiration, as discussed in Chapter 5), the irrigation demands supplied by the recycled water system will be limited by the available flow during summer months. Table 6.8 presents projected available supplies for both average annual and August conditions.

Table 6.8 Projected Wastewater Flow
Recycled Water Feasibility Study
City of Ukiah

Year	Average Annual Wastewater Flow (AFY)	Average Annual Wastewater Flow (mgd)	Projected August Flow[1] (mgd)	Ukiah WWTP Demand (mgd)	Available Recycled Water Supply[2] (mgd)
2010	4,650	4.15	1.99	0.14	1.85
2015	4,650	4.15	2.25	0.16	2.09
2020	4,780	4.27	2.31	0.16	2.15
2025	4,910	4.39	2.38	0.17	2.21
2030	5,060	4.51	2.45	0.17	2.28
2035	5,200	4.65	2.52	0.18	2.34

Notes:

(1) Predicted minimum monthly flow based on the month of August, the minimum month for the period 2001 through 2010. Average seasonal flow pattern for August when compared with average flows was 0.54. Actual flow for the month of September 2010, the minimum flow month for 2010, was 1.99 mgd.

(2) During month of August (predicted to have the minimum available wastewater flow).

As discussed in Chapter 3, the Ukiah WWTP is the only existing recycled water user. Based on discussions with City staff, annual usage by the Ukiah WWTP is estimated at 323 AFY or about 0.3 mgd. Assuming the demand of the treatment plant varies according to the plant flow, the projected August flow is included in Table 6.8 and deducted from the plant flow in order to calculate the available supply.

As shown in Table 6.8, estimated available supply is projected to increase from 1.85 mgd to 2.34 mgd by 2035. The alternatives developed in this chapter will be constrained by this available recycled water supply.

6.3.2 Alignments

Routing of pipelines was assumed through agricultural land and along the railroad easement to minimize the cost associated with laying pipeline in paved streets. Pipelines routed within agricultural land were aligned to farmers' access paths from aerial photographs.

6.3.3 Seasonal Demand Variation

While irrigation is expected to vary by season, based on discussions with City staff, the Mendocino County Farm Bureau, and the RRFCD, irrigation demands are assumed to be relatively flat seasonally. This is believed to be partially due to the limited number of months for which irrigation is used. As discussed in Chapter 5, vineyards are typically irrigated between June and October and Orchards are typically irrigated between May and September. When compared to irrigation occurring year round, the seasonal peaking during this irrigation season may appear relatively flat. Thus, a seasonal peaking factor of 1.0 will be used for development of the alternatives in this chapter. However, irrigation will be assumed to occur for only a limited number of months out of the year.

6.3.4 Daily Demand Variation

Based on discussions with City staff, the Mendocino County Farm Bureau, and the RRFCD, irrigation demands for agricultural crops vary significantly by crop type and individual farmer. It was noted that farmers would most likely be accustom to irrigating for a few days continuously every couple weeks. For the purposes of developing alternatives, the assumption was made that agricultural irrigation would be continuous and relatively flat, with no hourly fluctuation.

Demands for urban landscape irrigation are assumed to occur between 6 p.m. and 5 a.m. It is assumed that demand will be evenly distributed over this period. It should be noted that if irrigation is concentrated simultaneously within a couple hours, the sizing of the distribution system would need to be increased. This can be averted by staggering the scheduling of irrigation timers, especially those within the City's control, such as those for City parks. Based on discussions with City staff, potential urban landscape irrigation users, such as the golf course, do not have on-site storage capabilities, and thus could not accept water during daytime hours (golf courses often can use on-site ponds to accept irrigation water during off-peak hours, reducing the required sizing of the recycled water distribution system).

6.3.5 Frost Protection Demands

As discussed in Section 6.1, the limiting factor for many of the alternatives is the plant flow and corresponding recharge time for replenishing storage, whether farmer provided storage or centralized storage. As discussed in Chapter 5, typical frost event durations are estimated as three days, with two frost events occurring during a typical peak month of the frost season. It is assumed that the two frost events occurring during a typical month occur

at least one week apart, allowing time for the plant to recharge the applicable storage. While some frost events in a worst case scenario are anticipated to occur for more than three consecutive days, or occur less than a week apart, sizing of the storage for such events is anticipated to be prohibitively expensive or reach too few farmers to be justified.

6.4 NO PROJECT ALTERNATIVE

Since this project has multiple beneficiaries, the effect of a "No-Project" Alternative is discussed separately for each. The beneficiaries for the various alternatives in this study include the wastewater users (since Ukiah WWTP is restricted from discharging to the Russian River during specific times), agricultural farmers (for frost protection and irrigation), and landscape irrigation users (as a lower cost alternative to potable water).

For the wastewater users, a "No-Project" Alternative would necessitate the Ukiah WWTP to build additional percolation ponds to accommodate effluent flow during periods in which discharge is restricted.

For agricultural farmers, based on recent developments regarding restrictions on use of water from the Russian River for frost protection, without recycled water as an alternative source for water for frost protection demands, agricultural parcels in the area may not be provided frost protection using water. The farmers are outside of the City service area to receive potable water supplied by the City, and the City currently has no plans to expand their service area in order to serve them. And it is highly unlikely any of the other water purveyors in the area have additional supplies to serve the farmers. It is anticipated that potable or groundwater sources for frost protection water would be economically unfeasible. While not evaluated within the scope of this study, without water for frost protection, agricultural farmers may be forced to utilize alternative methods of frost protection, such as heaters or wind machines (Snyder, 2001), which may not be economically viable or feasible due to the type of frost situations the Valley is accustomed to. Effects of the "No-Project" Alternative on farmer irrigation use is assumed to be minimal.

For landscape irrigation uses, effects of the "No-Project" Alternative include continuing to use potable water for landscape irrigation at potable water rates. It is not anticipated that the City will face shortages of water supplies within the planning horizon of this study.

6.5 COMPARISON OF ALTERNATIVES

The six alternatives were compared on their technical and non-technical merits.

Screening criteria were developed at the Visioning Workshop held at the beginning of the master planning process. Both quantitative and qualitative criteria were used to compare and rank the alternatives. A summary of the criteria is show in Table 6.9.

Table 6.9 Screening Criteria
Recycled Water Feasibility Study
City of Ukiah

Criteria	Definition	Quantitative Measure	Qualitative Measure
Cost	Planning-level estimate of capital cost	$ and $/af	-
Water Offsets	Reduction in water use: - Potable* - River/groundwater*	AFY	-
System Flexibility	Variety and quantity of benefits and uses	Ac (irrigation) and Ac (frost)	-
Implementation Considerations	Political will, project phasing, and timing	-	Description
Public Acceptance	Public support of project (aesthetics and social benefits)	-	Description
Funding	State and Federal funding	-	Description
Environmental Considerations	Improves environment, CEQA requirements	-	Description
Regulatory Implications	Meets regulatory requirements	-	Description

The quantitative parameters were straightforward in their ranking. As shown in Table 6.10, Alternatives 1B and 4 rank best in the quantitative scoring, while Alternative 3 ranks worst.

Table 6.10 Quantitative Scoring
Recycled Water Feasibility Study
City of Ukiah

	System Flexibility		Water Offsets		Costs		
Alternative	Irrigated Area	Frost Protected Area	Potable	River or GW	Capital	Unit	Overall Quantitative Score
1	1.7	2.1	5.0	2.3	0.8	1.2	13.0
1B	1.2	2.1	5.0	1.8	0.9	1.2	12.0
2	2.4	2.1	5.0	2.6	0.6	1.1	14.0
3	1.3	0.0	4.5	1.3	4.4	5.0	16.0
3B	0.0	0.0	4.0	0.0	5.0	4.3	13.0
4	2.1	3.3	0.0	2.0	1.9	2.4	12.0

Note:
(1) Scores are weighted based on the relative quantities for each criteria. A score of 0 meets the criteria best of the alternatives, while a score of 5 meets the criteria worst out of the alternatives.

Table 6.11 presents the comparison of alternatives on a qualitative basis, with the associated scoring results in Table 6.12. For the qualitative parameters, a description was provided and then a general ranking of minimum, moderate, or maximum was provided depending on how the alternative met the criteria relative to the other alternatives. A discussion of the specific qualitative rankings and scores follows.

Table 6.11 Qualitative Comparison
Recycled Water Feasibility Study
City of Ukiah

Alternative	Difficulty of Implementation	Public Acceptance	Funding	Environmental Considerations	Regulatory Impacts
1	Min	Max	Mod	Min	Min
1B	Min-Mod	Max	Mod	Min	Min
2	Max	Max	Max	Mod	Mod
3	Mod	Max	Min	Max	Mod
3B	Mod	Max	Min	Max	Mod
4	Mod-Max	Max	Mod	Min	Mod

Note:
(1) Assessment based on discussion above. Min = minimal, Mod = moderate, Max = maximal.

Table 6.12 Qualitative Scoring
Recycled Water Feasibility Study
City of Ukiah

Alternative	Ease of Implementation	Public Acceptance	Funding	Environmental Considerations	Regulatory Impacts	Overall Score
1	1	1	3	1	1	**7**
1B	2	1	3	1	1	**8**
2	5	1	1	3	5	**15**
3	3	1	5	5	3	**17**
3B	3	1	5	5	3	**17**
4	4	1	3	1	3	**12**

A matrix showing the quantitative scoring was developed and is presented in Table 6.10.

As shown in Table 6.12, Alternatives 1 and 1B have the lowest qualitative scores, while Alternatives 3B and 4 have the highest qualitative scores. Overall scores are presented in Table 6.13.

Table 6.13 Total Scoring
Recycled Water Feasibility Study
City of Ukiah

Alternative	Quantitative Score	Qualitative Score	Overall Score	Rank
1	14	7	21	1
1B	13	8	21	1
2	14	15	29	4
3	17	17	34	6
3B	14	17	31	5
4	12	12	24	2

6.5.1 Difficulty of Implementation

Difficulty of implementation accounts for difficulty of design and construction, as well as effort required to coordinate construction and implementation between parties.

Alternative 1 was ranked minimal, meaning that relative to the other alternatives, Alternative 1 represents the least effort with implementation, due to its smaller footprint. Alternative 1B requires slightly more effort to implement, due to increased length of pipeline. Alternatives 3 and 3B were ranked as moderate difficulty to implement, since these projects would require extensive design and construction. Difficulty of implementation was scored moderate to maximal for Alternative 4, due to construction considerations in the urban areas and coordination between agricultural and landscape irrigation. Alternative 2 was considered to have the least ease of implementation due to the necessity of individual farmers constructing their own individual storage.

6.5.2 Public Acceptance

Since each of the alternatives assists with providing a point of discharge while the wastewater discharge limitations are in effect and helps to preserve agricultural character of the City and Valley, all alternatives were scored maximal.

6.5.3 Funding

Assessment of funding was based on the anticipated ease of obtaining funding for the alternative. Alternative 2 was considered to have the least difficulty with funding, as some grants are available to individual farmers for construction of ponds. Alternatives 3 and 3B are ranked minimal since they have the greatest cost, and are anticipated to have the greatest difficulty with financing out of the alternatives.

6.5.4 Environmental Considerations

Alternatives 1 and 1B are anticipated to encounter the least environmental issues when compared to the other alternatives. Alternatives 3 and 3B include construction of a 200 af pond, with associated environmental considerations, and were thus ranked maximal.

6.5.5 Regulatory Impacts

Because of their smaller footprint, Alternatives 1 and 1B are anticipated to have the least difficulty with regulatory impacts out of the alternatives. The remaining alternatives are anticipated to have fairly similar regulatory impacts.

6.5.6 Qualitative Scoring

Based on the qualitative issues described, scores were assigned to each alternative, as presented in Table 6.12.

6.5.7 Overall Scoring

The combined scoring, incorporating both the quantitative and qualitative scores, is presented in Table 6.13. As shown in Table 6.13, Alternatives 1 and 1B rank the best out of the alternatives, while Alternatives 3 and 3B ranked the least favorable. Alternative 4 ranked just after Alternatives 1 and 1B.

6.5.8 Recommended Alternative

The preferred alternative was selected using the screening and ranking outcome as a basis, but also considered relative importance of each criteria. During the ranking process, each criteria was considered to be equal and hold the same level of importance as the others. This however, was not the case when a bigger picture view was considered, such as the importance of offsetting potable water demands. Alternatives 1 and 1B met most of the screening criteria the best, but did not contain any potable water offsets. Alternative 2 had the most implementation concerns and regulatory concerns as its success relies on the farmers developing storage. Alternatives 3 and 3B were the least desirable with the highest costs, highest operations and maintenance due to the large pump station required, and very minimal potable water offsets. Alternative 4 has a relatively low cost to implement the first two phases of the sites adjacent to the WWTP, and then a bit of a higher cost when all sites are served, including the City sites at the north end of the City. Therefore, based on the ranking process, discussions with City staff, and since it serves the most users, and also has the most potential for potable water offsets, Alternative 4 was selected as the preferred alternative.

RECOMMENDED FACILITIES PROJECT PLAN

7.1 RECOMMENDED ALTERNATIVE

After considering the screening and ranking outcome of the six projects analyzed, discussions with City staff, input gathered from two stakeholder meetings, and a presentation to the City Council; the City selected Alternative 4 as the recommended recycled water project. This alternative combines agricultural frost protection and irrigation usage with eventual urban landscape irrigation. This alternative is presented in Figure 7.1. The recycled water would be pumped from the Ukiah Wastewater Treatment Plant (WWTP) to those landowners with storage, and would also be available up to the WWTP and pump station capacity to those landowners without storage facilities. Optimization in this analysis will be focused on further development of alternative details and phasing of the recommended alternative. This alternative is recommended because it provides the greatest benefits, including the option for eventual urban landscape irrigation, at a lower cost than many of the other alternatives.

7.1.1 Preliminary Design

The design conditions and criteria for the recommended alternative are summarized in Table 7.1. The pipeline routing and potential customers and parcels served are discussed in the sections that follow.

7.1.1.1 Planning and Evaluation Criteria

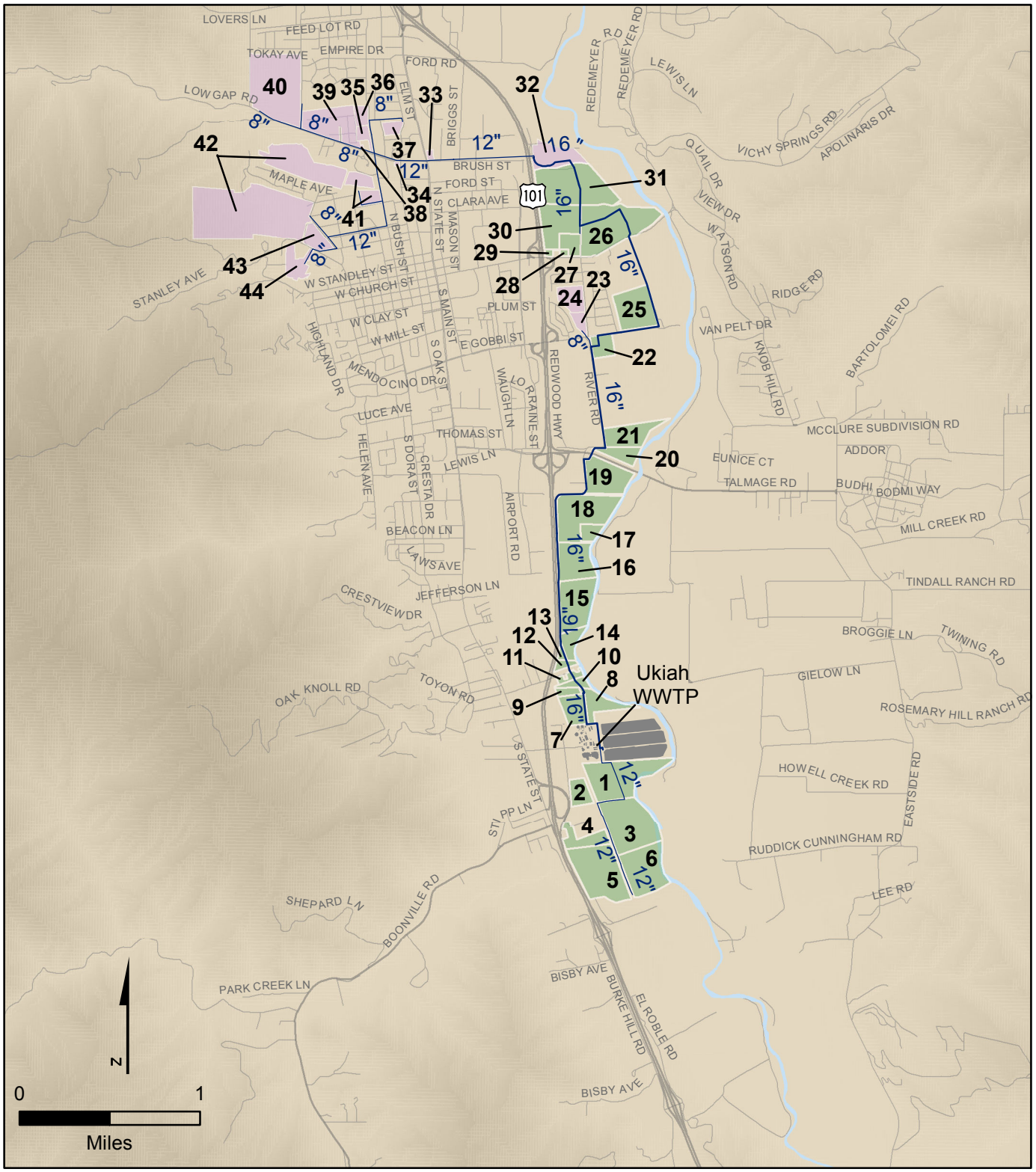
Planning and evaluation criteria were used to develop the preliminary design in the following sections. This criteria is listed in Table 7.1. In addition, the criteria discussed in Chapter 6 was used to develop demands.

Several of the criteria listed in Table 7.1 represent conservative planning assumptions. During more detailed design, and as the commitment of potential customers becomes more certain, these planning and evaluation criteria may be further refined.

As in the preliminary alternatives analysis, it is assumed that the individual potential customers are responsible for their customer laterals. It is also assumed that the farmer's are individually responsible for sizing of their frost protection ponds and pumping and pipelines from their ponds.

7.1.1.2 Pipeline Route

The proposed recycled water system includes 9.4 miles of recycled water pipelines ranging between 8 and 16-inches in diameter. The preliminary pipeline alignment for the recommended alternative is presented in Figure 7.1. In order to reduce construction costs, the pipeline is planned to be constructed partially within the right-of-way of some of the agricultural land that it provides frost protection to. Major transmission pipelines are routed



Legend

Proposed Pipeline by Diameter

- 12" and smaller
- 16" to 24"
- larger than 24"

- WWTP Ponds and Buildings
- Landscape Parcels
- Agricultural Parcels
- River
- Major Roads
- Local Streets

Figure 7.1
RECOMMENDED ALTERNATIVE
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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Table 7.1 Planning and Evaluation Criteria Recycled Water Feasibility Study City of Ukiah	
Description	**Criteria**
Delivery Pressure – Agricultural Irrigation	20 psi
Delivery Pressure – Landscape Irrigation	40 psi
Minimum System Pressure	5 psi
Maximum Pipeline Velocity(1)	5 ft/sec
Maximum Pipeline Headloss (Diameter <= 12-inches)	10 ft/kft(1)
Maximum Pipeline Headloss (Diameter > 12-inches)	3 ft/kft(2)
Pipeline Roughness (C Factor)	130
Storage	5 af (1.6 MG) at Ukiah WWTP
Seasonal Peaking for Agricultural Irrigation	1.00
Seasonal Peaking for Landscape Irrigation	1.73
Agricultural Irrigation Schedule	Continuous
Landscaping Irrigation Schedule	6 pm to 5 am (Continuous)
Customers with Storage Frost Protection Schedule	Recharge for 16 hours a day for 3 days, then continuous for 7 days
Customers without Storage Frost Protection Schedule	8 hours a day for 3 days

Notes:
(1) A higher pipeline velocity criteria of 10 ft/sec was used to accommodate the significant frost protection demands. A pipeline velocity criteria of 5 ft/sec was used for irrigation scenarios.
(2) Under frost protection scenarios, headloss of up to 5 ft/kft was considered acceptable in pipelines over 12-inches in diameter.

north through the east part of the City along Hastings Road and through agricultural right of way. Assuming the optional urban landscape irrigation would be developed, Highway 101 would be crossed using trenchless construction techniques at Brush Street to serve urban landscape irrigation demands on the west side of the City.

A previous recycled water study evaluated the feasibility of a recycled water pipeline installed through the City downtown along State Street. At the time of that study, other utilities were being constructed along the State Street alignment, minimizing the disruption and cost associated with constructing a recycled water pipeline along that alignment. However, that route focused on offsetting urban irrigation, and did not maximize agricultural uses. The alignment shown in Figure 7.1 is routed to the east of the City to maximize the potential for agricultural benefit AND minimize costs associated with construction through the developed downtown area.

A summary of the pipeline lengths associated with the alignment shown in Figure 7.1 are presented in Table 7.2.

Table 7.2 Pipeline Length
Recycled Water Feasibility Study
City of Ukiah

Type of Alignment[(1)]	Diameter (in)	Length (ft)
Agricultural Land / Site Piping	16	14,500
Agricultural Land / Site Piping	12	6,000
Paved Public Street	16	9,600
Paved Public Street	12	8,600
Paved Public Street	8	10,900
	Total	**49,600**

Note:
(1) Laterals to individual agricultural parcels are assumed to be the responsibility of the farmer or landowner and are not included in the lengths presented here.

As shown in Table 7.2, a total of approximately 49,600 feet, or 9.4 miles, of pipeline is included in the alignment shown in Figure 7.1.

7.1.1.3 Potential Users

There are two categories of potential users, agricultural and landscape irrigation. Based on discussions with City staff, it is anticipated that the City will pursue a phased approach to implement the recommended recycled water system. Total estimated demand by phase and type is presented in Table 7.3. Table 7.4 lists the agricultural users by irrigable area, annual irrigation and frost protection demands, and instantaneous demand. Table 7.5 lists landscape irrigation demands by parcel, and includes the estimated instantaneous irrigation demand, annual irrigation demand, and name. The Map IDs in Table 7.4 and Table 7.5 correspond to Figure 7.2.

Table 7.3 Annual Demand Summary
Recycled Water Feasibility Study
City of Ukiah

	Estimated Annual Demand (afy)				
	Irrigation				
Phase	Agricultural	Urban Landscape	Frost Protection	Total for Phase	Cumulative Total
1	309.2	0.0	94.6	403.8	403.8
2	210.4	0.0	4.8	215.1	618.9
3	311.8	22.2	42.3	376.3	995.2
4	0.0	380.6	0.0	380.6	1,375.8
Total	**831.4**	**402.8**	**141.7**	**1,375.8**	

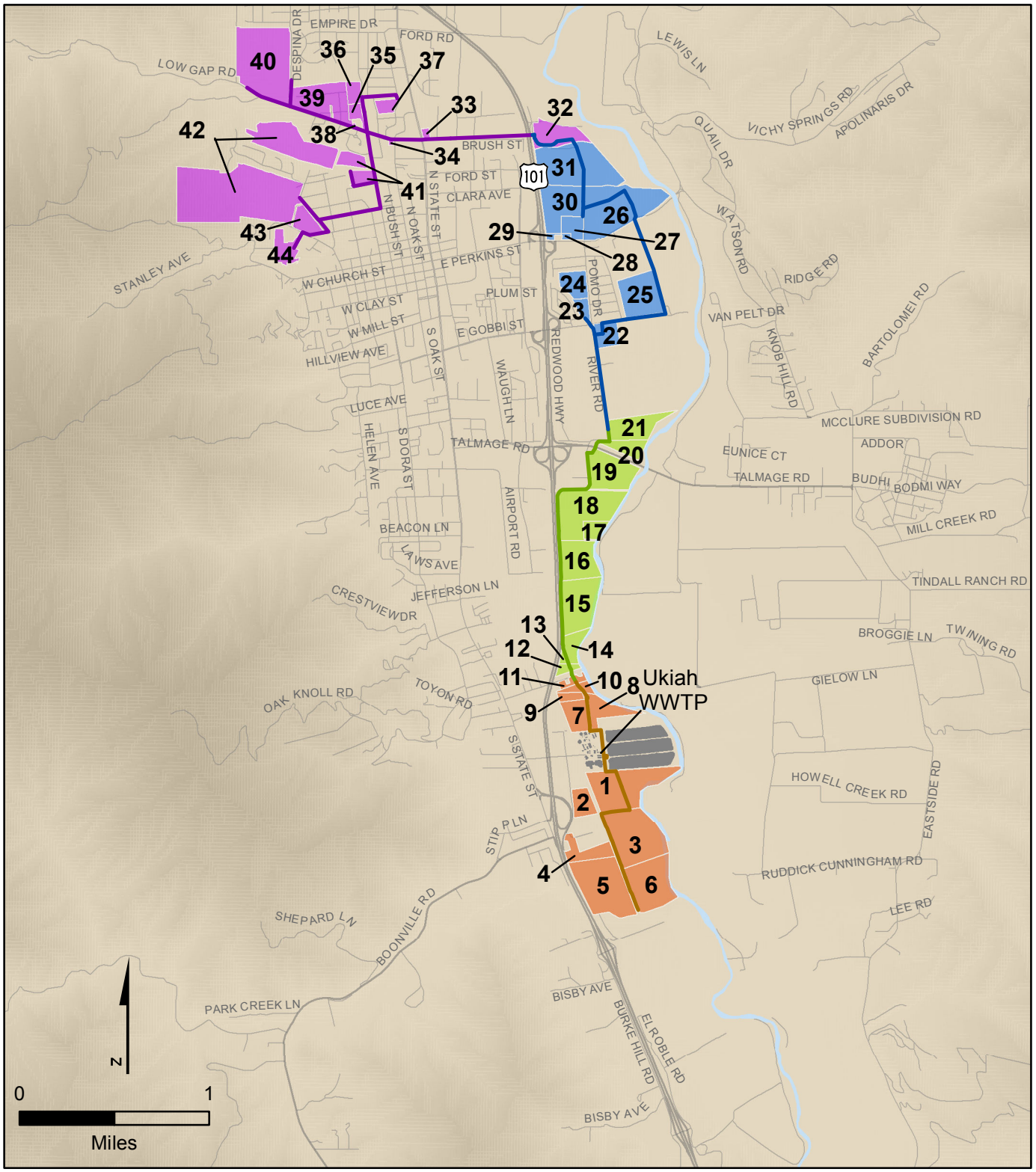
Table 7.4 Potential Agricultural Customers
Recycled Water Feasibility Study
City of Ukiah

Map ID	Name	Provided Irrigation Water	Provided Frost Protection	Storage Pond	Estimated Demand (afy)		Irrigable Acreage by Crop			
					Irrigation	Frost Protection	Vineyard	Orchard	Pasture	Other Row Crop
Phase 1										
1	Koball	Y	Y	Y	70.5	17.6	0.0	35.2	0.0	0.0
2	Gannon	Y	Y	N	18.5	4.6	0.0	9.2	0.0	0.0
3	Koball	Y	Y	Y	81.3	20.3	0.0	40.5	0.0	0.0
4	Milovina	Y	Y	Y	7.9	5.2	10.5	0.0	0.0	0.0
5	Milovina	Y	Y	Y	33.0	22.0	44.0	0.0	0.0	0.0
6	Koball	Y	Y	Y	57.0	14.2	0.0	28.4	0.0	0.0
7	City	Y	Y	N	10.3	6.9	13.8	0.0	0.0	0.0
8	Norgard	Y	Y	N	21.7	1.5	0.0	3.0	7.8	0.0
9	Norgard	Y	Y	N	4.4	1.5	2.0	0.9	0.6	0.0
10	Norgard	Y	Y	N	4.6	0.8	1.4	0.2	1.5	0.0
Phase 2										
11	Norgard	Y	Y	N	0.5	0.3	0.6	0.0	0.0	0.0
12	Norgard	Y	Y	N	2.0	1	1.5	0.5	0.0	0.0
13	Norgard	Y	Y	N	0.7	0.5	1.0	0.0	0.0	0.0
14	Norgard	Y	Y	N	12.1	3	0.0	6.0	0.0	0.0
15	Norgard	Y	N	N	54.4	0	0.0	27.1	0.0	0.0
16	Norgard	Y	N	N	43.4	0	0.0	21.6	0.0	0.0
17	Norgard	Y	N	N	10.2	0	0.0	5.1	0.0	0.0
18	Hildreth	Y	N	N	27.6	0	36.8	0.0	0.0	0.0
19	Hildreth	Y	N	N	48.4	0	0.0	24.1	0.0	0.0
20		Y	N	N	11.0	0	0.0	5.5	0.0	0.0
Phase 3										
21		Y	N	N	26.9	0	0.0	13.4	0.0	0.0
22		Y	N	N	4.5	0	6.1	0.0	0.0	0.0
25		Y	N	N	19.2	0	25.5	0.0	0.0	0.0
26		Y	Y	Y	98.9	24.7	0.0	49.3	0.0	0.0
27		Y	Y	Y	15.8	3.9	0.0	7.9	0.0	0.0
28		Y	N	Y	0.9	0	0.0	0.4	0.0	0.0
29		Y	N	N	2.2	0	0.0	1.1	0.0	0.0
30		Y	Y	Y	55.0	13.7	0.0	27.4	0.0	0.0
31		Y	N	N	88.4	0	0.0	44.1	0.0	0.0
Total					**831.4**	**141.7**	**143.3**	**351.2**	**9.9**	**0.00**

Table 7.5 Potential Landscape Irrigation Customers
Recycled Water Feasibility Study
City of Ukiah

Map ID	Name	Type	Irrigated Acreage	Estimated Annual Irrigation Demand[1] (afy)	Peak Demand[2] (gpm)	Current Potable Demand[3] (afy)
Phase 3						
23	Oak Manor Park	Park	3.4	6.9	27.9	10.4
24	Oak Manor School	School	7.5	15.3	61.2	9.6
Phase 4						
32	Ukiah Sports Complex[4]	Park	11.5	23.4	93.8	19.7
33	UUSD District Office	School	0.3	0.6	2.3	1.5
34	Brush Street Fountain	Park	0.3	0.7	2.8	
35	Ukiah Adult School	School	0.9	1.8	7.1	0.6
36	Frank Zeek School	School	3.5	7.0	28.1	2.3
37	Vinewood Park	Park	4.4	8.9	35.6	15.1
38	UUSD Special Education and Preschool	School	0.1	0.1	0.6	0.9
39	Russian River Cemetery	Other	26.6	53.9	216.3	18.5
40	Ukiah High School	School	39.6	80.4	322.4	62.4
41	Track and Baseball Fields (near Bus Barn)	Park	12.4	25.2	100.9	
42	City Golf Course	Golf Course	73.5	149.0	597.8	139.4
43	Todd Grove Park	Park	7.2	14.7	58.8	14.2
44	Anton Stadium	Park	7.4	14.9	59.9	12.8
Total			**198.6**	**402.7**	**1,615.4**	**307.4**

Notes:
(1) Based on irrigable acreage estimated from aerial photograph and water demand factors discussed in Chapter 5.
(2) Instantaneous demand based on seasonal peaking of 1.73, seven months of irrigation annually, and irrigation demands distributed evenly over 11 hours each night.
(3) Based on average usage from 2008 to 2010 billing data. Provided for reference; it should be noted that some potential customers, such as smaller schools, may not have dedicated irrigation meters, thus potential demand may be lower than that shown here.
(4) Ukiah Sports Complex is located at the north end of the pipeline proposed for Phase 3 and could be included in Phase 3 or Phase 4 depending on whether the City intends to implement Phase 4.



Legend

Pipelines by Phase	Potential Parcels by Phase	
1	1	WWTP Ponds and Buildings
2	2	River
3	3	Major Roads
4	4	Local Streets

Figure 7.2
PHASING OF
RECOMMENDED ALTERNATIVE
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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As shown in Table 7.4, the annual irrigation demand associated with irrigation of agricultural land for the recommended alternative is 831 acre-feet per year (AFY). Peak demand is estimated as 2,284 gpm based on flat seasonal peaking of irrigation demands and a 13-hour irrigation cycle in order to coordinate with the landscape irrigation schedule. If a 24-hour irrigation schedule were used, the peak demand is estimated at 1,237 gpm. Based on discussions with farmers, it is anticipated that scheduling of irrigation demands would be feasible.

As discussed in Chapter 6, an estimated supply of 2.34 mgd is projected to be available from the Ukiah WWTP during the month of August under 2035 conditions. Adding the landscape and agricultural irrigation demands results in peak seasonal demand of 2.85 mgd, anticipated to occur in July. By comparing the available monthly supply to the monthly demand variation (based on monthly irrigation requirements from evapotranspiration as discussed in Chapter 5), it is estimated that 18.6 MG (57 af) of seasonal storage would be required. In order to maximize the amount of irrigable land, it is anticipated that the City could coordinate irrigation of agricultural parcels with frost protection ponds to store irrigation water for their parcels in lieu of irrigation water from the distribution system for these peak periods. Alternatively, the City could construct a storage pond at the Ukiah WWTP to be used for seasonal irrigation storage, or fewer irrigation customers would need to be served.

It should be noted that the total number of customers listed in Table 7.4 and Table 7.5 differs slightly from the number of parcels listed in Alternative 4 in Chapter 6. Landscape irrigation customers with the same owner name for adjacent parcels were combined into a single customer, reducing the number from 60 parcels to 44 customers.

As shown in Table 7.5, the annual irrigation demand associated with landscape irrigation for the recommended alternative is 403 acre-feet per year (AFY). Peak demand for the landscape irrigation is estimated as 1,615 gpm, based on an assumed seasonal peaking factor of 1.73 and scheduling of landscape irrigation from 6 pm to 5 am. It should be noted that if demand management is not applied, landscape irrigation demands could be significantly higher (e.g., if City park sprinklers are set by timer to irrigate between 10 pm and 11 pm, demands would be significantly higher than if City park irrigation timer setpoints are evenly distributed between 6 pm and 5 am).

As will be discussed later, it is anticipated that landscape irrigation and agricultural demand schedules will be coordinated to maximize use of the pipeline network such that agricultural demands will be supplied between 5 am and 6 pm and landscape irrigation demands will be supplied between 6 pm and 5 am. If this coordination is not realized, additional storage may be required to buffer irrigation demands.

Instantaneous frost demand for the acreage provided frost protection would be estimated as 17,700 gpm. However, the majority of provided frost protection will be through farmer

provided frost protection storage ponds. Assuming recharge of farmer provided storage ponds during non-frost protection hours during the three days of a peak frost protection event and during a seven day recharge period between peak frost protection events is estimated as 520 gpm. Instantaneous frost protection demand for the parcels provided frost protection without storage ponds is estimated as 2,410 gpm. It should be noted that the sizing of individual farmer's frost protection ponds is assumed the responsibility of the individual agricultural parcel and was not evaluated as a part of this study.

Sizing of pipelines included in the pipeline alignment was based on the design criteria presented in Table 7.1. Pipeline length by phase, diameter, and construction condition is presented in Table 7.6.

Table 7.6 Pipeline Length by Phase
Recycled Water Feasibility Study
City of Ukiah

Phase	Type of Alignment[(1)]	Pipe Material	Diameter (in)	Length (ft)
1	Ukiah WWTP Site Piping	PVC C905	16	1,300
1	Agricultural / Railroad Easements	PVC C900	12	5,600
2	Paved Street	PVC C905	16	5,600
2	Agricultural / Railroad Easements	PVC C905	16	4,200
3	Agricultural / Railroad Easements	PVC C905	16	9,000
3	Paved Street	PVC C905	16	4,000
3	Agricultural / Railroad Easements	PVC C900	12	400
3	Paved Street	PVC C900	8	1,000
4	Paved Street	PVC C900	12	4,700
4	Paved Street	PVC C900	8	13,800
Total				**49,600**

Note:
(1) Laterals to individual agricultural parcels are assumed to be the responsibility of the farmer or landowner and are not included in the lengths presented here.

As shown in Table 7.6, pipelines installed in the first phase are anticipated to be entirely within the treatment plant or along agricultural or railroad easements and would not be along paved roads. Phases 2 and 3 would be along both agricultural easements where possible, or along paved roads, primarily River Road, Babcock Lane, and Hastings Frontage Road. Pipelines installed as a part of the optional Phase 4 would be along paved streets, and are routed to enter the urban area from the east to minimize the total length of pipeline along paved streets.

7.1.1.4 Pump Station

A single pump station is included in the alignment shown in Figure 7.1 at the Ukiah WWTP. Recommended sizing for this pump station based on the criteria outlined in Table 7.1 is presented in Table 7.7.

Table 7.7 Pump Station Units by Phase
Recycled Water Feasibility Study
City of Ukiah

Phase	New Units	Elevation Served (ft-msl)	Head (ft)	Flow (gpm)	Power (hp)
1	2	560 - 580	310	800	200
2	2	580 - 590	310	800	200
3	-	600 - 610	-	-	-
4	-	610 - 710	-	-	-

Initially, it is planned that two pump units be installed in the pump station, with spare bays for two additional units, which would be installed in Phase 2. Phase 3 and 4 are not anticipated to require additional pump units, since the demands for frost protection are significantly higher than what would be required for urban landscape irrigation.

It should be noted that the recommended pump sizing is based on ultimately serving the urban uses in Phase 4, which are about 100 feet higher in elevation than the potential agricultural parcels. If only Phases 1 through 3 are implemented, the pump head could be reduced. Alternatively, a smaller booster pumping station could be implemented along with Phase 4 near the freeway crossing.

The elevation at the Ukiah WWTP is approximately 580 feet above mean seal level (ft-msl).

7.1.1.5 Storage

Storage is anticipated to include individual storage ponds at specific farmers, as well as a single storage pond at the wastewater treatment plant sized at 5 af (1.6 MG). The storage pond at the wastewater treatment plant is recommended both to accommodate the variation in potential customer demand patterns and as an equalization basin to buffer the potential variation in effluent flow at the WWTP.

It should be noted that as hourly flow data from the Ukiah WWTP was not available, sizing is estimated based on one third of the projected 2035 average annual wastewater flow volume of 4.65 mgd.

Increasing the size of the storage pond at the Ukiah WWTP beyond 5 af would allow additional users to be provided frost protection and increase operational flexibility related to the discharge limitations on Ukiah WWTP. If a sufficiently large pond is built, increasing the

size could also allow additional recycled water users to be supplied irrigation water during the summer, as the peak irrigation demand coincides with the minimal plant flows as discussed in Chapter 6.

7.1.1.6 Scheduling of Demands

In order to maximize use of the pipeline network, it is recommended that coordinated scheduling between landscape irrigation users and agricultural irrigation users be used. For the analyses included in this study, it was assumed that landscape irrigation users would schedule their demands between 6 p.m. and 5 a.m., and that the irrigation for all users would be spread out over this entire period. Agricultural irrigation users were scheduled between 5 a.m. and 6 p.m. While agricultural irrigation users were assumed within this study to continuously irrigate simultaneously, it is likely that the agricultural irrigation users would coordinate irrigation schedules to irrigate at different times for several days in a row. The scheduling of individual users would need to consider pipeline sizing and geographic distribution.

If irrigation times are reduced, increasing peak demands, larger pipeline sizes may be required (at increased capital cost).

7.1.1.7 Easement

The pipeline alignment was selected to limit the amount of pipeline running through paved streets to reduce construction costs. In order to estimate required easement costs, it was assumed that a 50-foot easement would be needed during construction, with 10-feet of permanent easement required thereafter (so that agricultural operations do not damage the pipeline). It was assumed that easements would not be required along public roads (paved streets). Table 7.8 presents the length of roadway easement and agricultural easement, along with the estimated area of each based on the assumptions listed above.

Table 7.8 Easement
Recycled Water Feasibility Study
City of Ukiah

Phase	Roadway Easement Length (ft)	Agricultural Easement Length (ft)	Estimated Agricultural Construction Easement (ac)	Estimated Agricultural Permanent Easement (ac)
1	6,900	0	7.9	1.6
2	4,200	5,600	4.8	1.0
3	9,400	5,000	10.8	2.2
4	0	18,500	0.0	0.0
Total	**20,500**	**29,100**	**23.5**	**4.7**

Note:
(1) Laterals to individual agricultural parcels are assumed to be the responsibility of the farmer or landowner and are not included in the lengths presented here.

As shown in Table 7.8, the total area of the construction easement is estimated as 23.5 acres, with the permanent easement estimated as 4.7 acres.

7.1.1.8 Land Acquisition

No land acquisition was assumed to be required for the storage pond at the treatment plant since the City recently acquired about 40 acres on the south side of the WWTP. The pond is sized at 5 af (1.6 MG). Based on an assumed depth of 5 feet and 50-percent buffer for berms, etc., the 5 af storage pond would require an estimated 1.5 acres. It was assumed the recycled water pump station would require an additional acre, bringing the total required land acquisition to 2.5 acres.

7.2 COST ESTIMATE

The construction cost of the recommended recycled water system is summarized in Table 7.9 by phase. The total construction cost, including a construction contingency of 20 percent and an estimating contingency of 20 percent of the entire system, is estimated to be $18.7 million. As discussed in Chapter 6, project costs were estimated using an engineering/legal/administrative markup of 31 percent. The total project cost including contingency is estimated at $24.5 million (ENR of 10,199, October 2011, San Francisco).

Table 7.9 Cost Summary
Recycled Water Feasibility Study
City of Ukiah

Phase	Construction Cost (w/ Contingency)	Project Cost[(1)]
1	$3,797,300	$4,975,300
2	$5,353,120	$7,013,120
3	$4,677,680	$6,128,680
4	$4,897,800	$6,416,800
Total	**$18,725,900**	**$24,533,900**

Note:
(1) Includes markups for legal, administration, engineering, and design. Assumptions regarding costs are included in Chapter 6.

It should be noted that the total cost shown for the recommended alternative differs slightly from the cost shown in Chapter 6. This difference is due to the breakdown of construction into multiple phases and incorporation of estimated easement and land acquisition costs.

Cost estimate details for each phase are included in Appendix D.

Estimated costs for easements and land acquisition are summarized in Table 7.10. Based on discussions with the City, it was assumed that the agricultural owners would be receptive to the use of existing agricultural roads for routing the pipeline as a condition to receiving recycled water. A factor of 50 percent was included to account for this potential discount.

Table 7.10 Easement and Land Acquisition
Recycled Water Feasibility Study
City of Ukiah

Phase	Land Acquisition	Permanent Easements	Total
1	$20,000	$6,336	$26,336
2	$0	$3,857	$3,857
3	$0	$8,632	$8,632
4	$0	$0	$0
Total	**$20,000**	**$18,825**	**$38,825**

Note:
(1) Based on an assumed 50 percent cost to the City and 50 percent cost born by agricultural users.

As shown in Table 7.10, estimated costs for land acquisition and permanent easements are estimated at about $40,000.

Operations and maintenance costs will be discussed in more detail in Chapter 8, and will be dependent upon the volume of recycled water production.

Energy usage associated with pumping water from the Ukiah WWTP through the recycled water distribution system was estimated based on typical head conditions and projected average annual flows, electricity costs of $0.10 per kWh, and total plant efficiency of 70 percent.

Staffing costs for maintenance, inspections, billing, etc., were assumed based on a full time equivalent staff rate of $100,000 annually, and estimated staffing requirements discussed in more detail in Chapter 8.

Treatment related costs, including chemicals and electricity, are estimated at $12.37 per af, based on the actual costs from running the advanced water treatment plant in 2010 and 2011.

An overview of potential operations and maintenance costs are presented in Table 7.11.

Table 7.11 Operations and Maintenance Cost Summary Recycled Water Feasibility Study City of Ukiah	
Description	**Annual Cost (2010 Dollars)**
Staffing[(1)]	$85,000
Recycled Water Pumping[(2)]	$100,000
Treatment[(2)]	$12,311
Total	**$197,311**

Note:
(1) Assumes Full Time Equivalent (FTE) = $100,000 per year for salary and benefits.
(2) Varies based on flow; cost shown is estimated for Phase 3. Cash balance analysis incorporates variation in flow. For treatment, energy and chemical usage is dependent on flow, and is estimated using a unit cost of $12.37 per af. For pump station, increased head is required for later phases, and costs are estimated based on $0.10 per kWh and 70% total plant efficiency.

As shown in Table 7.11, potential operations and maintenance costs are estimated at just under $200,000 annually for labor, additional treatment, and power based on the total system flow after Phases 1 through 3 are implemented. An annual cash balance calculation is included in Chapter 8, incorporating the variations in recycled water flow as phases are built.

7.3 IMPLEMENTATION PLAN

The City will need to address the following project components in implementing the recycled water project (listed in no specific order):

- Design and construct the recommended alternative.
- Receive firm commitments and Agreements from landowners to use recycled water.
- Obtain permits and clearances from applicable regulatory agencies (RWQCB, CDPH, etc). Also includes the RW Policy Salt/Nutrient Management Plan development (defined in section 4.1.3).
- Conduct environmental process (CEQA) and develop compliance documents.
- Conduct a Proposition 218 process.
- Adopt a resolution for recycled water use.
- Prepare a cost of service rate study.

An implementation schedule is shown in Figure 7.3.

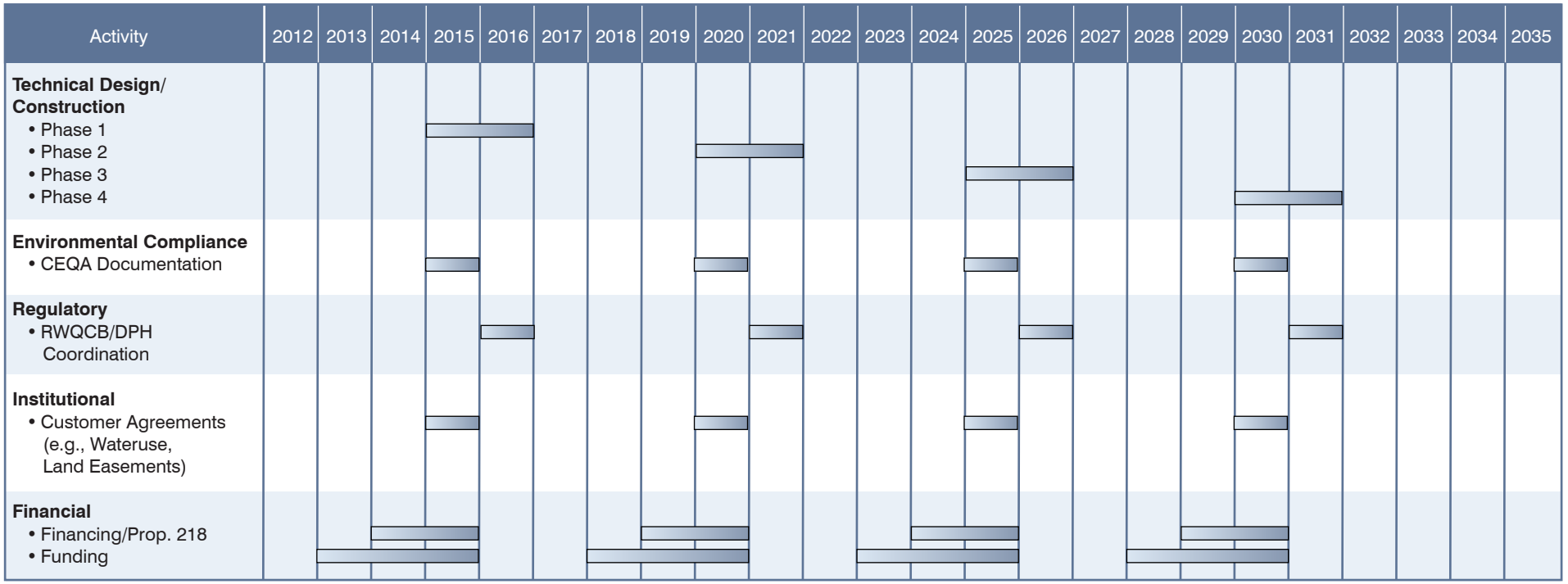

Figure 7.3
IMPLEMENTATION SCHEDULE
RECYCLED WATER FEASIBILITY STUDY
CITY OF UKIAH

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7.3.1 Recycled Water State Policy

The SWRCB recognizes that a burdensome and inconsistent permitting process can impede the implementation of recycled water projects. The SWRCB adopted a Recycled Water Policy (RW Policy) in 2009 to establish more uniform requirements for water recycling throughout the State and to streamline the permit application process in most instances.

The newly adopted RW Policy includes a mandate that the State increase the use of recycled water over 2002 levels by at least 200,000 AFY by 2020, and by at least 300,000 AFY by 2030. Also included are goals for stormwater reuse, conservation and potable water offsets by recycled water. The onus for achieving these mandates and goals is placed both on recycled water purveyors and potential users.

Absent unusual circumstances, the RW Policy puts forth that recycled water irrigation projects that meet CDPH requirements and other State or Local regulations, be adopted by Regional Boards within 120 days. These streamlined projects will not be required to include a monitoring component.

Chapter 8

CONSTRUCTION FINANCING PLAN AND REVENUE PROGRAM

8.1 FUNDING SOURCES AND CONSIDERATIONS

The adequate funding of capital costs is a primary constraint in implementing any construction project, especially water recycling projects. Recycled water projects have several State, Federal, and local funding sources available. Some are available directly to the City of Ukiah while others are available to individual water users.

This chapter describes potential funding opportunities and financing mechanisms for capital and operations costs, including an outline of current applicable grants and loan opportunities. The term “funding” refers to the method of collecting funds; the term “financing” refers to methods of addressing cash flow needs.

The recommended recycled water project is attractive for funding agencies for two primary reasons.

1. The project provides integrated benefits and meets various objectives:
    a. Helps meet State recycled water objectives.
    b. Improves environmental habitat.
    c. Protects surface water resources.
    d. Reduces cost associated with wastewater discharge management.
    e. Promotes a vibrant agricultural region.
    f. Demonstrates regional cooperation.
2. The project involves regional partnerships and provides benefits to numerous stakeholders:
    a. Calpella County Water District.
    b. Hopland Public Utility District.
    c. Millview County Water District.
    d. Redwood Valley Water District.
    e. Rogina Water Company.
    f. Willow County Water District.
    g. Agricultural Users.
    h. Ukiah Valley Sanitation District.
    i. Mendocino County Russian River Flood Control and Water Conservation Improvement District.

The pursuance of alternate funding is highly competitive. Competitive funding programs require enhanced recycled water programs to meet as many of the following objectives as possible:

- Regional partnerships.
- Integrated project benefits.
- Water conservation.
- Renewable energy improvements.
- Economic stimulus:
  - Job creation.
  - Job preservation.

Of the above objectives, the recommended City project meets all but the renewable energy improvement objectives.

8.2 FUNDING SOURCE IDENTIFICATION

Costs of the City's recycled water project consist of two components – capital cost for construction of distribution facilities and operation and maintenance (O&M) costs of the treatment and distribution systems.

The funding sources available range from traditional funding options such as pay-as-you go funding and bond funding to non-traditional funding sources such as grants and loans and market based programs. The sections that follow outline the mechanisms available to recover both capital and O&M costs.

The main instruments available for funding the capital costs include:

- Pay-as-you-go financing or upfront collection of project costs from existing and new users for future capital improvement projects.
- Debt financing or the acquisition of funds through borrowing mechanisms.
- Grants and loans or alternate source of funds at no or minimal interest cost. Examples include federal, state, and local programs that provide funding at zero interest for projects that meet select criteria.
- Market based programs that refer to financing through funds obtained from tax credits, purchase agreements, voluntary programs, and trading and offset programs.

All of these funding sources are discussed in additional detail in the following sections.

8.2.1 Pay-As-You-Go Financing

Pay-as-you-go financing involves periodic collection of capital charges or assessments from customers within the utilities jurisdiction for funding future capital improvements. These revenues are accumulated in a capital reserve fund and are used for capital projects in future years. Pay-as-you-go financing can be used to finance 100 percent or only a portion of a given project.

One of the primary advantages of pay-as-you-go financing is that it avoids the transaction costs (e.g., legal fees, underwriters' discounts, etc.) associated with debt financing alternatives, such as revenue bonds. However, there are two common disadvantages associated with this method. First, it is difficult to raise the required capital within the allowable time without charging existing users elevated rates. Second, it may result in inequities in that existing residents would be paying for facilities that would be utilized by, and benefit, future residents.

8.2.1.1 Utility Fees and Benefit Assessment Fees

Utility fees or benefit assessments, sometimes called service fees or user fees, consist of a fee imposed on each property in proportion to the service provided to that property. They are inherently flexible in that the City can select any assessment method that equitably relates the amount charged to the service provided. Benefit assessment fees are usually included as a separate line item on the annual property tax bill sent to each property owner.

Utility fees are usually billed on a monthly or bi-monthly interval. In all other respects, benefit assessments, utility fees and service charges are essentially identical. A utility has the authority to collect a benefit assessment fee, but only after approval by a majority of the voters, affected property owners, or ratepayers.

8.2.1.2 Development Charges/Connection Fees

The system development charges/connection fees/impact fees represent the cost of providing regional conveyance and treatment facilities to serve new recycled water customers. They are one-time fees charged to customers at the time of system connection approval or permit/contract issuance. The charges for individual properties may be based on whatever assessment measures the City desires for equity.

A disadvantage to utilizing impact fees is that the fees cannot be collected until the system constructions permit stage at the earliest. The amount collected each year depends solely on the rate of growth of the recycled water system. Consequently, funds may not be available to construct new facilities at the time it is needed.

8.2.2 Debt Financing

There are several different options for debt financing of recycled water projects, ranging from issuance of short- or long-term bonds.

8.2.2.1 Revenue Bonds

Revenue bonds are historically the principal method of incurring long-term debt. This method of debt obligation requires specific non-tax revenues such as user charges, facility income, and other funds, pledged to guarantee repayment. There is often no legal limitation on the amount of authorized revenue bonds that may be issued, but from a practical standpoint, the size of the issue must be limited to an amount where annual interest and

principal payments are well within the revenues available for debt service on the bonds. Revenue bond covenants generally include coverage provisions, which require that revenue from fees minus operating expenses be greater than debt service costs.

In the case of this project, based on policy decisions made regarding cost of service, any revenue bonds obtained would require proof of financial capacity to repay, using the City revenue sources that do not inequitably burden customers.

8.2.2.2 Certificates of Participation

Certificates of participation provide long-term financing through a lease agreement that does not require voter approval. The legislative body of the issuing agency is required to approve the lease arrangement by a resolution. The lessee (City), is required to make payments typically from revenues derived from the operation of the facilities. The amount financed may include reserves and capitalized interest for the period that facilities will be under construction. One disadvantage with certificates of participation, as compared with revenue bonds, is that interest rates can be slightly higher due to the insecurity associated with the obligation to make lease payments.

8.2.2.3 General Obligation Bonds

General obligation (GO) bonds are municipal securities secured by the issuer's pledge of its full faith, credit, and taxing power. GO bonds are backed by the general taxing authority of local governments and are often repaid using utility revenues when issued in support of a sewer or water enterprise fund. In the event that GO bonds are issued for this project, the City of Ukiah or Mendocino County tax revenue will need to be used to back the bonds.

8.2.2.4 Assessment District Bonds

Financing by this method involves initiating assessment proceedings. Assessment proceedings are documents in "Assessment Acts" and "Bond Acts." An assessment act specifies a procedure for the formation of a district (boundaries), the ordering, and making of an acquisition or improvement, and the levy and confirmation of an assessment secured by liens on land. A bond act provides the procedure for issuance of bonds to represent liens resulting from proceedings taken under an assessment act. Procedural acts include the Municipal Improvements Acts of 1911 and 1913. The commonly used bond acts are the 1911 Act and the Improvement Bond Act of 1915. The procedure most prevalent currently is a combination of the 1913 Improvement Act with the 1915 Bond Act. Charges for debt service can be included as a special assessment on the annual property tax bill. The procedure necessary to establish an assessment district may vary depending on the acts under which it is established and the district size.

8.2.3 Grants and Loans

Several grant and loan programs can be utilized to finance the recommended recycled water project alternative. These grants and loans are further discussed as state and federal

funding sources in the succeeding sections. Table 8.1 provides a summary of the available state and federal funding sources. The grant and loan options presented herein are accurate as of June 2010. Please refer to the contact or website for the most up to date information for each of these grants and loans.

There are numerous factors that should be considered in the pursuance of grant funding. Several factors that should be noted in pursuance of grant funding include:

- Grant applications require demonstration of the ability to construct, operate, and maintain the project without grant funding.
- Grant award or funding authorization is NOT a promise of grant reimbursement:
  - Most grants are reimbursements and not cash up front. This requires that a source of funding be available for the construction of the project.
  - Grant reimbursements are subject to annual budget and appropriations process and thus disbursement of grant funds on schedule is not guaranteed.
  - It may take several years after project completion to receive reimbursements, especially in difficult economic times.
  - Most grants require a minimum cost share by project sponsor.
  - Federal grants typically require investment of additional resources to obtain lobbying support.

Despite the competitive nature of alternate funding, available funding sources should be considered to minimize ratepayer impacts. The following sections summarize available state and federal funding options.

8.2.3.1 State Funding

Several state funding sources are applicable to the recycled water project alternatives. Due to the California state budget crisis, some of these programs may be suspended or not have funding available when the City of Ukiah is ready to move to construction.

8.2.3.1.1 *Water Recycling Funding Program*

One option for financing the Recycled Water Project is the Water Recycling Funding Program administered by the State Water Resources Control Board. The program offers funding for research, feasibility studies, planning, and construction. The program is financed through Propositions 13, 50, and the State Revolving Fund (SRF).

Recycling projects are categorized by their potential benefits to state and local communities, which in turn determine which funding sources are applicable.

Table 8.1 Funding Summary
Recycled Water Feasibility Study
City of Ukiah

Program	Agency	Type	Description
State			
Water Recycling Funding Program	State Water Resources and Control Board	Grant/Loan	Funding is available for projects in the following categories: 1. Category I projects will offset state water supplies and increase water to the Delta. 2. Category II projects will offset state water use, but do not provide benefits to the Delta. 3. Category III projects use recycled water to supplement local water supplies but have no impact on the state water supply or the Delta. 4. Category IV projects will treat and reuse groundwater contaminated by human activity. 5. Category V projects will treat and dispose wastewater to meet waste discharge regulations. 6. Category VI captures miscellaneous projects that do not fall into other categories and have no benefits to state or local water supplies. Category V and VI projects are only eligible for SRF loans. Loans are generally capped at $50 million per agency per year. The Division may, on a case-by-case basis, authorize funding in excess of $50 million per agency per year.
Integrated Regional Water Management Grants Program (Prop 84)	Department of Water Resources	Grants	Grants are available for projects that support IRWM Plans and are related to water supply reliability, groundwater recharge, water quality enhancement etc.
Specialty Crop Block Grant	California Department of Food and Agriculture	Grant	Eligible projects include those that will enhance the competitiveness of California specialty crops. Specialty crops include fruits, vegetables, tree nuts, dried fruits, horticulture, and nursery crops. Awards range from $75,000 to $500,000 per project.
Federal			
Title XVI	U.S. Bureau of Reclamation	Grants	Eligible projects include recycled water feasibility, demonstration, and construction projects. The program provides as much as 25 percent of construction costs with a maximum of $20 million. To meet eligibility requirements a project must have a Bureau of Reclamation approved feasibility study, comply with environmental regulations, and demonstrate the ability to pay the remainder of the construction costs.
USDA Agricultural Water Enhancement Program	U.S. Department of Agriculture (USDA)	Grants	Several grant programs awards to projects or programs that support sustainable agriculture and the conservation of water resources. • The Sustainable Agriculture Research and Education Program (SARE) provide grants of up to $60,000 for projects within a single state that promotes sustainable agriculture through outreach, education, training, and technical support. • The Environmental Quality Incentive Program grant program awards incentive payments, up to $50,000 per year, directly to agricultural producers who conserve soil, water, and air resources on their land. • The Agricultural Water Enhancement Program offers local units of government that work with EQIP participants the option to receive multi-million dollar grants for capital and non-capital projects that improve agricultural water quality or quantity.
Organic Farming Research Foundation	Organic Farming Research Foundation	Grants	Grants are available for research or public outreach projects related to organic farming. Grant awards have averaged approximately $5,000 to $12,000.

- Category I projects will offset state water supplies and increase water to the Delta.
- Category II projects will offset state water use, but do not provide benefits to the Delta.
- Category III projects use recycled water to supplement local water supplies but have no impact on the state water supply or the Delta.
- Category IV projects will treat and reuse groundwater contaminated by human activity.
- Category V projects will treat and dispose wastewater to meet waste discharge regulations.

Category VI captures miscellaneous projects that do not fall into other categories and have no benefits to state or local water supplies.

The recycled water alternatives will likely fall into Category II as it should offset state water use, will use recycled water to supplement local water supplies, but will have no impact on the Delta.

The source of available funding varies with the category in which the project is classified. The maximum award for construction grants for Category I through IV projects is the lesser value of $5 million per project or 25 percent of construction costs.

Category V and VI projects are only eligible for SRF loans. Loans are capped at $50 million per agency per year. The SRF interest rate is set at one-half of the state general obligation bond rate and has historically averaged around 2.5 percent.

The SWRCB provides one application package for both construction grants and SRF recycled water loans. The application package consists of:

- Financial Assistance Application.
- Facilities Plan composed of:
  - Project report.
  - Environmental documents including CEQA documents.
  - Construction Financing Plan.
  - Recycled Water Market Assurances documenting user participation in the project.
  - Authorized Representative Resolution (Legal Authority).

- Water Conservation Plan demonstrating that the applicant has a water conservation program in effect or has signed onto the California Urban Water Conservation Council's Memorandum of Understanding.

The SWRCB will review the application package and assess eligibility. Once the SWRCB receives and reviews the final plans and specs, it will issue project performance standards. Once performance standards are agreed to and the applicant chooses a contractor, the parties sign a funding agreement. The applicant must also have an Urban Water Management Plan filed with the Department of Water Resources to receive funds.

8.2.3.1.2 *Integrated Regional Water Management Implementation Grant Program*

Grants are available for projects that support IRWM Plans and are related to water supply reliability, groundwater recharge, water quality enhancement etc.

In transitioning from Prop 50 funding to Prop 84 funding, the DWR altered several of the standards it uses to evaluate regions including governance requirements, acknowledgement of water conflicts, and potential climate change requirements. To facilitate this change, DWR has allowed regions with standing IRWM plans to also receive funds under Prop 84 to comply with the new standards and to develop new projects. Projects seeking funding through this grant process generally submit a project summary to the respective local IRWM management group to review and assess the merits of a project and its ability to fulfill the intent of the IRWM plan. Once approved through this process, a project may be included in the region's implementation grant application.

8.2.3.1.3 *Specialty Crop Block Grant*

Since the project will supply water to agricultural irrigation, the City has the option of utilizing grant programs targeted at conservation within agricultural lands. At the state level, the California Department of Food and Agriculture awards grants annually to projects that will enhance the competitiveness of California specialty crops. Specialty crops include fruits, vegetables, tree nuts, dried fruits, horticulture, and nursery crops. Awards range from $75,000 to $500,000 per project. Eligible projects include the development of best management practices, conservation practices, special studies and research, education and outreach, and training and technical assistance. Past grant awards have not typically included funding for capital projects. However, the City could utilize Specialty Crop Block Grant Funds for outreach, education, training or the development of recycled water best management practices for its customers.

8.2.3.2 Federal Funding

In addition to local and State grants and loans, there are several highly competitive Federal grant and loan programs that provide financial resources to recycled water projects.

8.2.3.2.1 *Title XVI*

The U.S. Bureau of Reclamation administers funds for recycled water feasibility, demonstration, and construction projects through the Water Reclamation and Reuse Program authorized by the Reclamation Wastewater and Groundwater Study and Facilities Act of 1992 (Title XVI) and its amendments. The program provides as much as 25 percent of construction costs with a maximum of $20 million. To meet eligibility requirements a project must have a feasibility study, comply with environmental regulations, and demonstrate the ability to pay the remainder of the construction costs. Projects are authorized by Congress and recommended in the President's annual budget request by the Bureau of Reclamation. Congress then appropriates funds and the Bureau ranks and prioritizes projects and disburses the money on a competitive grant basis each year. Prioritized projects are those that postpone the development of new water supplies, reduce diversions from natural watercourses, reduce demand on federal water supply facilities, or that have a regional or watershed perspective.

8.2.3.2.2 *USDA Agricultural Water Enhancement Program*

The U.S. Department of Agriculture (USDA) offers several grant programs that give awards to projects or programs that support sustainable agriculture and the conservation of water resources. These programs are detailed below.

- The Sustainable Agriculture Research and Education Program (SARE) is administered by the USDA's Cooperative State Research, Education and Extension Service (CSREES) and universities nationwide to provide support for sustainable agriculture. SARE provides grants of up to $60,000 for projects within a single state that promote sustainable agriculture through outreach, education, training, and technical support. Applications are accepted throughout the year.

- Environmental Quality Incentive Program is grant program offered through the Environmental Quality Incentive Program (EQIP). This program awards incentive payments directly to agricultural producers who conserve soil, water, and air resources on their land. To participate, agricultural producers sign six-year commitments to conserve resources and the USDA provides payments of up to $50,000 per year. Well decommissioning and irrigation water pipelines, storage, and management are eligible uses of funds.

- The Agricultural Water Enhancement Program offers local units of government that work with EQIP participants the option to receive multi-million dollar grants for capital and non-capital projects that improve agricultural water quality or quantity.

8.2.3.2.3 *Organic Farming Research Foundation*

The Organic Farming Research Foundation offers small grants for research or public outreach projects related to organic farming. This grant program cannot provide funding to

offset the capital costs of the recycled water alternative, but funding could be used to garner support for recycled water use within the City service area for any customers utilizing organic farming practices. Past grant awards have averaged approximately $5,000 to $12,000. Applications are accepted in May and November of each year.

8.2.4 Funding Source and Timing Summary

The City proposes to utilize a combination of funding sources to construct the recycled water project. The priority of the funding will be to secure grants where available, pursue low interest loans such as the SRF loans, and then finally obtain debt financing in the form of GO or revenue bonds for the cost of the project not covered by grants and low interest loans. These funding options are summarized in Table 8.2. Typically, the anticipated sources of repayment for any loans consist of water, wastewater, and recycled water revenues.

Table 8.2 Funding Source Summary
Recycled Water Feasibility Study
City of Ukiah

Funding Source	Use	Amount	Timing
SRF Grants and Loans	Design/Construction	Up To $20.2 million(1)	2011
Other Federal and State Grants and Loans	Construction	TBD	2011
Debt	Construction	Cost not recovered by alternate supplies up to $20.2 million	2011

Note:
(1) Although SRF funding and grants have not yet been secured, the City plans to pursue grants and low interest loans for the construction of the recycled water facilities to the maximum extent possible.

8.3 RECYCLED WATER PRICING POLICY

Typically, the cost of recycled water projects is recovered through a combination of methods where costs are shared amongst recycled water customers, potable water customers, and wastewater customers.

Several recycled water cost recovery alternatives were considered relative to capital, O&M, and repair and replacement (R&R) costs. Dependent on the preferred cost recovery strategy, the corresponding pricing alternatives were developed.

8.3.1 Capital Cost Recovery

The capital costs associated with the recycled water system will consist of distribution system components – pump station, storage, and pipelines. No new treatment infrastructure is required as the City wastewater treatment plant has sufficient capacity to produce tertiary treated recycled water.

Implementation of expansive recycled water projects requires large up-front capital. The current project implementation plan proposes to finance the construction of the recommended project through a combination of SRF and other grants and loans, as well as the issuance of debt. There are several alternatives by which the associated debt service can be recovered. These include:

- Land based assessments where all parcels in the City service area are assessed a dollars per acre or dollars per parcel fee.
- Consumption based service charges where water, wastewater and recycled water users are assessed their fair share of the annual debt service of the recycled water project based on their quantity of potable or recycled water used.
- A combination of land based assessments and consumption based service charges where a portion of the debt service is recovered using both methods.
- System connection fees where users connecting to the water, wastewater, and recycled water systems pay a one-time fee for the system capacity utilized.

The construction of the recycled water distribution system reduces reliance on use of increasingly regulated Russian River water, reduces the need for perhaps more costly future water supplies, and facilitates City compliance with its wastewater discharge permit, which requires increased reuse of the tertiary treated effluent. Because the City currently has adequate potable water supplies to meet its water demands, and compliance with the City wastewater permit requirements is needed in the near term, the pricing policy for the capital cost component of the recycled water project consists of recovery through wastewater customers.

8.3.2 Operations and Maintenance Cost Recovery

The O&M costs associated with the recycled water system will consist of treatment and distribution components.

The City's wastewater permit requires tertiary treatment of its wastewater to meet specified effluent limits from October through May each year. During this period, no additional treatment is incurred to produce tertiary quality recycled water. The City is prohibited from discharging treated effluent to the Russian River from May through October and thus discharge secondary treated effluent to recharge ponds. Implementation of the recycled water program will now require tertiary treatment during the summer months for urban and

agricultural reuse, increasing O&M costs at the wastewater treatment facility. In addition to increased treatment cost during the summer, the City will incur recycled water distribution costs year-round.

O&M costs are most typically recovered using user charges. Similar to capital costs, it is possible for the City to recover its O&M costs using land based, consumption based, or combination methods. As the causation of the City's O&M costs are directly correlated to compliance with its wastewater permit and delivery of recycled water to specific recycled water users, the pricing policy proposes to recover the O&M costs on a consumption basis from wastewater and recycled water customers.

At this time, no purchase agreements are in place between the City and the recycled water users. As these agreements are further developed, the O&M pricing strategy will be modified to appropriately allocate and recover fixed and variable costs amongst users.

8.3.3 Repair and Replacement Cost Recovery

Similar to O&M costs, the R&R costs can also be recovered using land based, consumption based, or combination methods. The currently proposed recycled water pricing policy will recover annual R&R costs from its users through a consumption based fee with the assumption that any R&R required is a result of system use.

8.3.4 Costs Allocated to Water Pollution Control

The implementation of the recycled water project reduces reliance on use of increasingly regulated Russian River water, reduces the need for perhaps more costly future water supplies, and facilitates compliance with the wastewater NPDES discharge permit, which is starting to require use of the tertiary treated effluent. The project also extends the use of existing discharge ponds by reducing the need for construction of additional wastewater discharge ponds to meet future discharge needs.

As the primary drivers of this project are related to compliance with the City's wastewater discharge permit, much of the capital and O&M costs of the project are allocated to wastewater pollution control. Similarly, much of the capital repair and replacement cost is allocated to water pollution control as a fully functional and reliable system is required to comply with discharge regulations.

8.3.5 Costs Allocated to Potable Water

Implementation of the recycled water project may facilitate compliance with the 2009 CA Water Conservation Act to reduce 20% urban water use by 2020. Additionally, the project may help reduce the need for and the size of future, perhaps more costly, water supplies.

The recommended alternative will not result in sizable potable water offsets until the final, optional phase of the project is constructed. The City's Urban Water Management Plan projects the baseline water demand in 2035 to equal 5,217 AFY. The preferred recycled

water alternative is projected to offset approximately 400 AFY, or approximately 10 percent of the City's average potable water demands between 1995 to 2008 if the optional phase is implemented (demands have decreased by about 25 percent in 2009 and 2010) . Currently, the City has sufficient water supplies to meet water demand and has already achieved the conservation targets set by the State. Therefore, the City does not intend to recover costs associated with the initial phases of the recycled water project from water ratepayers. THe City does however, plan to evaluate allocation of a portion of the capital costs associated with construction of this portion of the system to water ratepayers or private developers benefitting from potable offsets at the time of construction of Phase 4.

8.3.6 Recycled Water Pricing Summary

The recycled water pricing summary for the various project cost elements is summarized in Table 8.3. The City plans to conduct a cost of service study in the future to appropriately and equitably determine the impacts to water, wastewater, and recycled water rates.

Table 8.3 Pricing Summary for Project Cost Elements
Recycled Water Feasibility Study
City of Ukiah

Cost Description	Allocation	Cost Unit[(1)]
Capital Cost	Wastewater	$ per hcf or af[(1)]
O&M and R&R Cost	Treatment – Recycled Water Distribution - Wastewater	$ per hcf or af[(1)]

Note:
(1) Cost recovery strategy of consumptive based charges was determined to be most appropriate at this stage of the recycled water project. Rates would be set to recover the annual debt service, O&M, and R&R costs from water, wastewater, and recycled water users as appropriate.

8.4 ANNUAL COST PROJECTIONS

8.4.1 Capital Costs

The total project cost for the recommended alternative is estimated to be approximately $24.5 million for construction of all phases of the project (including the optional phase). The estimated costs do not include retrofit costs or costs associated with piping required within the individual users' property lines.

It was assumed for planning purposes that the project would be funded through a 30-year loan. Annual debt service was calculated using a 5 percent interest rate over a 30-year period for each project phase.

The annual cash flow projections for assuming debt financing is presented in Appendix G. It was assumed that the annual payments collected from wastewater and recycled water revenues will be equal to the annual debt service.

8.4.1.1 Sunk Costs

In the last three years, the City has spent approximately $150,000 on this engineering feasibility report, public outreach, CEQA review, and preliminary engineering to promote recycled water use within its service area.

The estimated indebtedness for construction of necessary facilities is $24.5 million. The costs associated with project planning and construction will also be sunk costs upon project completion.

8.4.1.2 Salvage Value

The salvage value of the system at the end of the debt period was calculated assuming an average useful life of 50 years for the system. Engineering, legal, and administrative costs were assumed to have no salvage value. The salvage value of the distribution system is estimated at $112,731.

8.4.2 Operations and Maintenance Costs

The O&M costs associated with the recycled water program will be dependent upon the volume of recycled water production. Potential O&M costs include:

- Recycled water pumping costs.
- Inspections costs.
- Metering and meter reading costs.
- Billing costs.
- System cleaning and maintenance costs.
- Public outreach costs.

Table 8.4 summarizes the estimated annual O&M costs of the system by category after Phase 3 has been implemented.

8.4.3 Repair and Rehabilitation Costs

The City currently replaces its tertiary filter media approximately every five years. The media replacement costs approximately $500,000; the City plans to allocate 50 percent of the media replacement cost to the recycled water system operation, resulting in an estimated annual R&R need of $50,000.

Table 8.4 Operations and Maintenance Cost Summary Recycled Water Feasibility Study City of Ukiah	
Description	**Annual Cost (2010 Dollars)**
Staffing[(1)]	
Inspection Personnel (0.25 FTE)	$25,000
Metering and Meter Reading (0.25 FTE)	$25,000
System Cleaning and Maintenance (0.25 FTE)	$25,000
Billing Support	$5,000
Public Outreach	$5,000
Recycled Water Pumping[(1)]	$100,000
Treatment[(2)]	$12,311
Total	**$197,311**

Note:
(1) Assumes Full Time Equivalent (FTE) = $100,000 per year for salary and benefits.
(2) Varies based on flow; cost shown is estimated for Phase 3. Cash balance analysis incorporates variation in flow. For treatment, energy and chemical usage is dependent on flow, and is estimated using a unit cost of $12.37 per af. For pump station, increased head is required for later phases, and costs are estimated based on $0.10 per kWh and 70% total plant efficiency.

8.4.4 Total Annual Project Expenses

Table 8.5 presents a summary of the estimated project costs for the recommended project and the allocation of costs to water, wastewater, and recycled water customers. Since project implementation helps reduce the capacity of future water supply needs, the City water enterprise may opt to recover the costs allocated to the water system from future water customers. Similarly, the City's wastewater enterprise may opt to allocate costs to both existing and future customers. For the purposes of this study, it is assumed that annual debt service allocated to water and wastewater will be recovered from existing customers. As there are no existing recycled water users, 100 percent of the costs are allocated to future users.

A cash flow forecast was developed over a 30 year period for the recycled water project assuming that the first phase of project will start design in fiscal year (FY) 2015 and complete construction in FY 2016. Each subsequent phase of the project was assumed to be initiated in five-year increments with phase construction requiring two years. A summary of the cash flows for these scenarios is presented in Appendix G. It was assumed that the annual payments collected from property owners would be equal to the annual debt service and operations costs.

Table 8.5 Recommended Project Annual Cost Summary and Allocation Recycled Water Feasibility Study City of Ukiah				
Expense Type	**Total Annual Expense**	**Water Customers[1]**	**Wastewater Customers[1]**	**Recycled Water Customers[2]**
Capital (Debt Service/Loan Repayment)[3]				
Existing	$1,179,000	$0	$1,179,000	$0
Future	$0	$0	$0	$0
Operating Expense				
Distribution O&M	$235,000	$0	$235,000	$0
Treatment O&M	$12,311	$0	$0	$12,311
Capital Replacement				
Annual R&R	$50,000	$0	$50,000	$0
Total Annual Revenue Requirement	**$1,476,311**	**$0**	**$1,464,000**	**$12,311**

Notes:

(1) The City's water and wastewater enterprise may opt to allocate costs to both existing and future customers. For the purposes of this study, it is assumed that annual costs allocated to water and wastewater will be recovered from existing customers.

(2) Only customers who use recycled water are allocated distribution system O&M costs.

(3) The debt service presented is the debt service associated with a 30-year term and 5 percent interest.

8.4.5 Recycled Water Use Projections and Unit Costs

The projected recycled water use for the recommended alternative (based on acreage and land use) is 1,376 acre-feet per year for Phases 1 through 4 and 995 afy for Phases 1 through 3. All projected recycled water use is anticipated to be for irrigation and frost protection.

Preliminary unit costs for each user category were developed using the proposed cost recovery strategy. These costs assume that only Phases 1 through 3 of the project will be constructed. Phase 4 is considered as optional. Table 8.6 presents a summary of the unit costs. These unit costs are preliminary and are not based on a detailed cost of service study. The allocation of costs, unit costs, and rates for water, wastewater and recycled will be developed to recover the cost of construction and operation through the cost of service study. The City plans to pursue a detailed cost of service and assessment study prior to the initiation of a Proposition 218 process and adoption of rates.

Table 8.6 Summary of Unit Costs
Recycled Water Feasibility Study
City of Ukiah

Expense Type	Total Annual Expense	Unit Cost[1]		
		Water[1]	Wastewater[2]	Recycled Water[3]
Capital Costs		0		
Annual Debt Service[4]	$1,179,000	$0.00	$0.81 per hcf ($263.17 per acre-foot)	$0.00
Operating Costs				
Treatment and Distribution O&M	$247,311	$0.00	$0.16 per hcf ($52.46 per acre-foot)	$0.03 per hcf ($12.37 per acre-foot)
Capital Repair and Replacement Costs				
Annual R&R	$50,000	$0.00	$0.15 per hcf ($50.24 per acre-foot)	$0.00

Notes:
(1) Costs associated with Phases 1 through 3 of the recommended project are not expected to be allocated to water ratepayers.
(2) Unit costs based on estimated average annual wastewater flow of 4 mgd or 4,480 AFY.
(3) Unit costs presented are based on use of 995 acre-feet per year for the total annual cost.
(4) Assumes a 30-year term with an interest rate of 5 percent.

8.4.6 Preliminary Recycled Water Price

The cost recovery strategy proposed to recover the cost associated with capital infrastructure and recycled water system operation is through a combination of wastewater and recycled water rates.

As previously discussed, the repayment of the project costs is anticipated to be spread across all project beneficiaries. Table 8.7 summarizes the estimates of project costs per acre and per acre-foot of consumption.

Table 8.7 Price of Recycled Water for Repayment of Capital Costs Recycled Water Feasibility Study City of Ukiah	
Cost Summary	
Project Cost[1]	$18,117,100
Annual O&M Costs	$197,311
Annual R&R Costs	$50,000
Acreage Summary	
Acreage Irrigated	1,030
Acreage Frost Protected	284
Total Acreage	1,030
Consumption Summary	
Projected Annual Consumption	995
Price Summary	
Unit Price of Project Construction[2]	$1,180
Unit Price of Delivered Water[3]	$250
Unit Price of Project over 20 Years[4]	$1,300

Notes:

(1) Project costs include estimating contingencies and estimates for engineering, legal, administrative, and environmental costs. Capital cost shown for Phases 1 through 3.

(2) Price presented is for costs and volume associated with Phases 1 through 3.

(3) Price per acre-foot is applicable to only metered recycled water customers. This price is based on annual use of 995 acre-feet per year and includes both annual O&M and annual R&R costs.

(4) The unit price shown was calculated using the SWRCB present worth analysis methodology. The present worth analysis was conducted on the projected cash flows over a 20-year period using a present worth factor of 4.6%.

8.4.7 Comparison to Water Prices

Based on the City's most current utility rate sheet, the monthly service charge for a 3/4" residential water connection is $26.11. The unit consumption rate is $2.21 per hundred cubic feet (hcf) or approximately $2.96 per 1,000 gallons. Appendix E provides the City's most recent utility rate information.

In comparison, the unit recycled water price (including project construction cost), using total annual cost and the estimated recycled water delivery of 995 acre-feet per year is $2.71 (or about $1.97 per 1,000 gallons). This is about 33% less than the cost of potable. The total cost of the project is expected to be allocated to all project beneficiaries, including wastewater and recycled water customers.

8.4.8 Sensitivity Analysis

It is possible that the actual recycled water consumption is above and below the projected assumed recycled water consumption. A sensitivity analysis was conducted to evaluate the impact of change in consumption on unit recycled water price. Table 8.8 summarizes this sensitivity analysis.

8.4.9 Recommended Project Benefit-Cost Analysis

In order to calculate the quantitative benefit cost of the project cost, a present worth analysis was conducted on the projected cash flows over a 20-year period using a present worth factor of 4.6 percent. The unit cost of the recommended project was estimated using the present value of the project capital and O&M costs as well as recycled water consumption. The estimated unit cost was $1,300 per acre-foot. Detailed calculations are provided in Appendix E.

Qualitative costs of the project include short-term construction impacts such as noise, environmental and aesthetic nuisance. Qualitative benefits of the recommended project include the following:

- The promotion of sustainability through the availability of the new drought proof supply.
- Alternate disposal of treated effluent through irrigation use.
- Facilitation of compliance with future WWTP permit requirements.
- Facilitation of compliance with the 2009 CA Water Conservation Act goal to achieve a 20 percent reduction in urban water consumption by 2020.
- Extension of existing storage ponds useful life and capacity.
- Reduction in Russian River water withdrawals.
- Alternate water supply source for frost protection.
- The maintenance of the viability of agriculture in the region.
- The avoided use of ground and surface water resources in the region.

Table 8.8 Sensitivity Analysis
Recycled Water Feasibility Study
City of Ukiah

	Price @ No Change in Consumption	Price @ 5% Less Consumption	Price @ 10% Less Consumption	Price @ 25% Less Consumption
Annual Recycled Water Consumption	995 AFY	945 AFY	896 AFY	746 AFY
Capital Costs(1)				
Price per Acre-Foot	$1,180	$1,250	$1,320	$1,580
O&M and R&R Costs				
Unit Price	$0.57 per hcf ($250 per acre-foot)	$0.60 per hcf ($260 per acre-foot)	$0.64 per hcf ($280 per acre-foot)	$0.76 per hcf ($330 per acre-foot)

Note:
(1) As capital costs are based on estimated debt service for a 30-year term at 5 percent interest.

APPENDIX A - QUESTIONNAIRE RESPONSES

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

The purpose of this questionnaire is to gather information and understand your department/agency/businesses' interest in using recycled water for irrigation/frost protection.

PLEASE RETURN YOUR COMPLETED QUESTIONNAIRE BY APRIL 30, 2011 TO:
Jarod Thiele, City of Ukiah, Public Works Administration, 300 Seminary Ave, Ukiah, CA 95482 or at jthiele@cityofukiah.com. An electronic or hard copy is fine.

1. Land Owner Name: Beckstoffer Vineyards

2. Property Address: Talmage / Hopland

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Vineyard

4. Existing irrigated acreage: ±700 acres

Assumed 200. 164 acres ID'd through GIS.

Planned additional irrigable acreage: _____acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells	Y	Irr/frost
Stream/surface water	Y	Irr/frost
Potable (City) water		
Other		

6. Existing Water Storage: 1200 acre-feet

Any plans to add more storage: _____ YES _____ NO

If yes, how much storage will be added? _____acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

X Cost of the recycled water

X Cost of the delivery system (e.g., pipelines, pump stations, etc.)

X Water quality

___ Daily timing of deliveries

___ Seasonal timing of deliveries

___ Pressure

___ Other (please list)

all manageable based on Sonoma Experience

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

X YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Richard K. Schaefers

Name of Representative

Richard K. Schaefers

Signature of Representative

6-8-11

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

The purpose of this questionnaire is to gather information and understand your department/agency/businesses' interest in using recycled water for irrigation/frost protection.

PLEASE RETURN YOUR COMPLETED QUESTIONNAIRE BY APRIL 30, 2011 TO: Jarod Thiele, City of Ukiah, Public Works Administration, 300 Seminary Ave, Ukiah, CA 95482 or at jthiele@cityofukiah.com. An electronic or hard copy is fine.

1. Land Owner Name: Michael Boer

2. Property Address: 301 - 901 Boonville Rd

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Grapes

4. Existing irrigated acreage: 20 acres

   Planned additional irrigable acreage: 0 acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells	Y	IRRIGATION
Stream/surface water	N	
Potable (City) water	N	
Other	N	

6. Existing Water Storage: 0 acre-feet

Any plans to add more storage: X YES ____ NO

If yes, how much storage will be added? 25 acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

✓ Cost of the recycled water

___ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

___ Daily timing of deliveries

___ Seasonal timing of deliveries

___ Pressure

___ Other (please list)

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

X YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Michael Ben

Name of Representative

Signature of Representative

6/8/11

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: City of Ukiah Group 1

2. Property Address:
Anton Stadium (506 Park Blvd) / Giorno Field (506 Park Blvd) / Lions Field (506 Park Blvd)- these ball fields all border each other and are 12 acres

Todd Grove Park (600 Live Oak Ave)- 16 acres

Golf Course (599 Park Ave)- 80 acres

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Grass

4. Existing irrigated acreage: 108 acres total

Planned additional irrigable acreage: 0 acres

5. Current irrigation/frost protection water source(s):

2010 Usage
Anton/Giorno/Lions — 12.97 AF (4,226,948 gal)
Todd Grove — 11.96 AFY (3,909,072 gal)
Golf Course — 124 AFY (40,419,676 gal)

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells		
Stream/surface water		
Potable (City) water	yes	grass irrigation
Other		

6. Existing Water Storage: ____0_____acre-feet

Any plans to add more storage: _____ YES __X___ NO

If yes, how much storage will be added? ____0_____acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

___ Cost of the recycled water

_X__ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

___ Daily timing of deliveries

_X__ Seasonal timing of deliveries

___ Pressure

___ Other (please list)

_____

_____

_____

_____

_____

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

_____

_____

1

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

_X____YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Sage Sangiacomo, Assistant City Manager

Name of Representative

Signature of Representative

6/24/11

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: City of Ukiah Group 2_____

2. Property Address: Riverside Park (E. Gobbi St by Russian River) 2010 usage - 0 AF

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Grass

4. Existing irrigated acreage: ____0_____acres

   Planned additional irrigable acreage: _____4_____acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells	yes	Grass irrigation
Stream/surface water	No	
Potable (City) water	No	
Other	No	

2

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

_X_YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Sage Sangiacomo

Name of Representative

Sage Sangiacomo

Signature of Representative

6/24/14

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: City of Ukiah Group 3- Downtown Area

2. Property Address: Alex Thomas Plaza (300 S. School St.), - 8/10 acre – 2010 usage 1.71 AF (559,504 gal)
Hudson-Carpenter Park/Community Garden (431 S. Main St), - 8/10 acre – 3.8 AF (1,239,436 gal)
Ukiah Civic Center (300 Seminary Ave),- 2.5 acres – Rudy Park – .28 AF (92,004/gal)
McGarvey Park (310 S. Dora St)- 1 acre – 256 AF (834,768 gal)

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Grass

4. Existing irrigated acreage: __5.1 total acres

Planned additional irrigable acreage: ____0_____acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells		
Stream/surface water		
Potable (City) water	yes	Grass irrigation
Other		

6. Existing Water Storage: ____0_____acre-feet

Any plans to add more storage: _____ YES ___X__ NO

If yes, how much storage will be added? _____acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

___ Cost of the recycled water

_X__ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

___ Daily timing of deliveries

__X_ Seasonal timing of deliveries

___ Pressure

___ Other (please list)

_____
_____
_____
_____
_____

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

_____
_____
_____
_____

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

__X___YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Sage Sangiacomo

Name of Representative

Sage Sangiacomo

Signature of Representative

6/24/11

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: City of Ukiah Group 4

2. Property Address: Observatory Park (432 Observatory St.) & Community Garden — 2010 Usage 4.89 AF (1,594,736 gal)

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Grass

4. Existing irrigated acreage: 2.5 acres

   Planned additional irrigable acreage: _____ acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells		
Stream/surface water		
Potable (City) water	X	landscape irrigation
Other		

6. Existing Water Storage: 0 acre-feet

Any plans to add more storage: ~~YES~~ NO

If yes, how much storage will be added? 0 acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

___ Cost of the recycled water

X Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

___ Daily timing of deliveries

X Seasonal timing of deliveries

___ Pressure

___ Other (please list)

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

X YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Sage Sangiacomo

Name of Representative

Signature of Representative

6/24/11

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: City of Ukiah Group 5

2. Property Address: Oak Manor Park (500 Oak Manor Dr.) 2010 Usage 9.32 AF (3,037,628 gal)

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Grass

4. Existing irrigated acreage: 4 acres

   Planned additional irrigable acreage: — acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells		
Stream/surface water		
Potable (City) water	X	landscape irrigation
Other		

5

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

X YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Sage Sangiacomo

Name of Representative

Sage Sangiacomo

Signature of Representative

6/24/11

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

6. Existing Water Storage: ~~_____~~ acre-feet

Any plans to add more storage: ~~____YES~~ ____ NO

If yes, how much storage will be added? ~~_____~~ acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

___ Cost of the recycled water

X Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

___ Daily timing of deliveries

X Seasonal timing of deliveries

___ Pressure

___ Other (please list)

_____

_____

_____

_____

_____

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

_____

_____

_____

_____

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: City of Ukiah Group 6

2. Property Address: Cindee Park (707 Cindee Drive) Orchard Park 2010 usage 1.52 AF (495,924 gal)

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Grass

4. Existing irrigated acreage: 2 acres

   Planned additional irrigable acreage: _____ acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells		
Stream/surface water		
Potable (City) water	yes	landscape irrigation
Other		

6

6. Existing Water Storage: 0 acre-feet

Any plans to add more storage: ~ YES ~ NO

If yes, how much storage will be added? ~ acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

___ Cost of the recycled water

X Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

___ Daily timing of deliveries

X Seasonal timing of deliveries

___ Pressure

___ Other (please list)

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

__X__YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Sage Sangiacomo

Name of Representative

Signature of Representative

6/24/11

Date

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CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: City of Ukiah Group 7

2. Property Address: Vinewood Park (1260 Elm St) 2010 usage 10.62 AF (3,463,240 gal)

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Grass

4. Existing irrigated acreage: 4.7 acres

   Planned additional irrigable acreage: _____ acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells		
Stream/surface water		
Potable (City) water	yes	landscape irrigation
Other		

6. Existing Water Storage: 0 acre-feet

Any plans to add more storage: ~~_____~~ YES _____ NO

If yes, how much storage will be added? _____ acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

X Cost of the recycled water

___ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

___ Daily timing of deliveries

X Seasonal timing of deliveries

___ Pressure

___ Other (please list)

_____

_____

_____

_____

_____

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

_____

_____

_____

_____

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

X YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Sage Sangiacomo

Name of Representative

Signature of Representative

6/24/11

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: City of Ukiah Group 8

2. Property Address: Softball Complex (River St Exit of Hwy 101) 2010 Usage 14.54 AF (4,739,326 gal)

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Grass

4. Existing irrigated acreage: 10.3 acres

   Planned additional irrigable acreage: _____ acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells	NO	
Stream/surface water	NO	
Potable (City) water	yes	landscape irrigation
Other	NO	

6. Existing Water Storage: 0 acre-feet

Any plans to add more storage: ___ YES ___ NO

If yes, how much storage will be added? ___ acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

___ Cost of the recycled water

X Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

___ Daily timing of deliveries

X Seasonal timing of deliveries

___ Pressure

___ Other (please list)

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

X YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Sage Sangiacomo

Name of Representative

Signature of Representative

6/24/11

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: Catherine Golden + Gannon Family LLC

2. Property Address: 3301 S. State St. Ukiah

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

agricultural → Whispering Pine Nursery

4. Existing irrigated acreage: 0 acres

   Planned additional irrigable acreage: 0 acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells	Ø	
Stream/surface water	Ø	
Potable (City) water	Ø	Willow County Water District street water
Other	Yes	↓

6. Existing Water Storage: Ø acre-feet

Any plans to add more storage: ____ YES ✓ NO

If yes, how much storage will be added? Ø acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

✓ Cost of the recycled water

✓ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

✓ Water quality

___ Daily timing of deliveries

___ Seasonal timing of deliveries

✓ Pressure

___ Other (please list)

There is serious concern regarding the quality of the recycled water. Mr O'Neil is concerned it could damage his plants

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

Ø

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

____YES ✓ NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Maureen Gannon Riedy
Name of Representative

Maureen Gannon Riedy
Signature of Representative

April 30, 2011
Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

phoned interview 4/30/11
Jim O'Neil. owner/ nursery tenant at 3301 S State.
If recycled water becomes available & can be guaranteed not to harm plants - it might be worth contacting Mr. O'Neil w/ the information + cost factors (707) 462-0422

Maureen Riedy
(415) 453-8890
mgriedy@gmail.com
273 Butterfield Rd.
San Anselmo, Ca
94960

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: DEVIN W. GORDON

2. Property Address: 4550 El Roble Rd Ukiah

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Vineyard

4. Existing irrigated acreage: 32 acres

   Planned additional irrigable acreage: ~~0~~ acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells	YES	Drip Irrigation
Stream/surface water	YES	Frost Protection
Potable (City) water		
Other		

6. Existing Water Storage: ~10 acre-feet

Any plans to add more storage: _____ YES ✓ NO

If yes, how much storage will be added? _____acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

✓ Cost of the recycled water

✓ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

✓ Water quality

___ Daily timing of deliveries

___ Seasonal timing of deliveries

___ Pressure

✓ Other (please list)

What would usage of the treated water mean to my water right, if I displace my water right water with your water what does SCWB do?

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

X YES _____ NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Devin W. Gordon

Name of Representative

Signature of Representative

4/22/2011

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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Jarod Thiele, City of Ukiah, Public Works Administration, 300 Seminary Ave, Ukiah, CA 95482 or at jthiele@cityofukiah.com. An electronic or hard copy is fine.

1. Land Owner Name: Hildreth Farms Inc and Michael L. Hildreth

2. Property Address: Hastings Rd and Talmage Rd. AND 3750 Burke Hill Rd

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Pear Orchards - Vineyards
64ac Pears

4. Existing irrigated acreage: 30ac acres Vineyard

   Planned additional irrigable acreage: 0 acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells		
Stream/surface water	Y	Irrigation AND Frost protection (Pears) FrostProtect + Drip Irrigation (Grapes)
Potable (City) water		
Other	Willow water District	Drip Irrigation

6. Existing Water Storage: 23.6 acre-feet

Any plans to add more storage: _____ YES X NO

If yes, how much storage will be added? _____ acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

✓ Cost of the recycled water

✓ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

✓ Water quality

✓ Daily timing of deliveries

✓ Seasonal timing of deliveries

✓ Pressure

✓ Other (please list)

Has to be exceptable to the fresh fruit and Cannery markets as well as the wineries.

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

orchard @ Hastings Rd

Could use irrigation water at 10 TO 14 day intervals for 24 Hr sets, pressurized to my lines @ 50 psi. Summer irrigation use begins Late April to end of September - Total use 100 TO 125 AC FT./season. (1200 gal/min.) required

Vineyard @ 3750 Burke Hill Rd.

Could use water to recharge and fill Reservoir

Possible use for drip irrigation during summer season

30 TO 40 ac ft/season.

Frost Protection IN the spring. 1500 gal/min out of Reservoir. Hours and total amount depends on the year.

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

✓ YES _____ NO Depending on costs.

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Hildreth Farms Inc

Name of Representative

Michael S. Hildreth

Signature of Representative

4-19-2011

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

The purpose of this questionnaire is to gather information and understand your department/agency/businesses' interest in using recycled water for irrigation/frost protection.

PLEASE RETURN YOUR COMPLETED QUESTIONNAIRE BY APRIL 30, 2011 TO: Jarod Thiele, City of Ukiah, Public Works Administration, 300 Seminary Ave, Ukiah, CA 95482 or at jthiele@cityofukiah.com. An electronic or hard copy is fine.

1. Land Owner Name: William T Johnson

2. Property Address: 801 Babcock Lane Ukiah, CA 95482

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Pears + Grapes
50 30

4. Existing irrigated acreage: 80 acres

   Planned additional irrigable acreage: 80 acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells	Y	Frost + Irrigation
Stream/surface water	Y	Frost + Irrigatin
Potable (City) water		
Other	~~N~~ Y	Russian River Flood control water for Irrigation + Frost

6. Existing Water Storage: Dat @ this Ranch acre-feet

Any plans to add more storage: ? YES _____ NO

If yes, how much storage will be added? ? acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

✓ Cost of the recycled water

✓ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

✓ Daily timing of deliveries

✓ Seasonal timing of deliveries

___ Pressure

___ Other (please list)

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

yes all of these could be possible issues

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

__X__YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Peter Johnson

Name of Representative

Peter Johnson

Signature of Representative

May 8th 2011

Date

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CITY OF UKIAH
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1. Land Owner Name: David Kodall (revised)

2. Property Address: 3495 Taylor Drive.

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Pasture, alfalfa, grapes, hops

4. Existing irrigated acreage: 80 acres

Planned additional irrigable acreage: 32 acres → 2012
80 → 2022?

Phone call 07/26/11:
2012:
28 acres alphalfa
12 acres grapes
12 acres pasture
11 acres of storage
2022:
40 acres total

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells	N	
Stream/surface water	Y	irrigation + frost protection
Potable (City) water	N	
Other		

6. Existing Water Storage: (0) acre-feet

Any plans to add more storage: X YES ____ NO

If yes, how much storage will be added? 11 acre-feet minimum
40 AF max - depending upon system design & grant funding.

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

X Cost of the recycled water

X Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

X Daily timing of deliveries

X Seasonal timing of deliveries

___ Pressure

___ Other (please list)

- Organic use
- Regional WQCB requirements.

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

- storage volume needed, ability to seasonally recharge ponds, ability to recharge during severe frost events.

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

X YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

David Kobal

Name of Representative

Signature of Representative

6/7/11

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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Jarod Thiele, City of Ukiah, Public Works Administration, 300 Seminary Ave, Ukiah, CA 95482 or at jthiele@cityofukiah.com. An electronic or hard copy is fine.

1. Land Owner Name: David Koball and Amy Smith

2. Property Address: 3493 + 3495 Taylor Drive

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Pasture, Alfalfa, Vineyard

4. Existing irrigated acreage: 30 acres

   Planned additional irrigable acreage: 30 acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells	N	
Stream/surface water	Y	Irrigation + frost protection
Potable (City) water	N	
Other	N	

6. Existing Water Storage: Ø acre-feet

Any plans to add more storage: X YES ____ NO

If yes, how much storage will be added? 15 acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

X Cost of the recycled water

X Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

X Daily timing of deliveries

X Seasonal timing of deliveries

___ Pressure

X Other (please list)

- Compatibility with organic production
- regional water quality guidelines needing to control runoff

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

X YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

David Koball Pres. K2 Farming LLC

Name of Representative

Signature of Representative

4/15/11

Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH

RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: LELAND LA MALFA

2. Property Address: 251 Stipp Ln

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

VINES

4. Existing irrigated acreage: 8 acres

   Planned additional irrigable acreage: 4 acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells		
Stream/surface water		
Potable (City) water		
Other		

Information for questions 5 through 9 are the same as those included in the La Malfa, R. questionnaire. This form was completed by Richard La Malfa on behalf of Leland La Malfa.

6. Existing Water Storage: _____acre-feet

Any plans to add more storage: _____ YES _____ NO

If yes, how much storage will be added? _____acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

___ Cost of the recycled water

___ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

___ Daily timing of deliveries

___ Seasonal timing of deliveries

___ Pressure

___ Other (please list)

_____
_____
_____
_____
_____

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

_____
_____
_____
_____

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

_____YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

_____

Name of Representative

_____ _____

Signature of Representative Date

Thank you for your help and participation in this very important City of Ukiah project. We welcome your participation throughout the planning process. Please see the accompanying letter on how you can stay involved.

CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: RICHARD LAMALFA

2. Property Address: 3600 LEland LANE / 4607 El Roble RD

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

VINE / ORCHARD
40 AC PEARS 9 AC

4. Existing irrigated acreage: ~~360~~ acres

   Planned additional irrigable acreage: 15 acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells	Y	IRRIGATION & FROST
Stream/surface water	Y	" "
Potable (City) water	N	
Other	N	

6. Existing Water Storage: 15 acre-feet

Any plans to add more storage: _____ YES _X_ NO

If yes, how much storage will be added? _____acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

_X_ Cost of the recycled water

_X_ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

_X_ Water quality

_X_ Daily timing of deliveries

_X_ Seasonal timing of deliveries

_X_ Pressure

___ Other (please list)

_____

_____

_____

_____

_____

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

_____

_____

_____

_____

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

X YES _____NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

_____

Name of Representative

Richard LeMoyne

Signature of Representative

6/8/11

Date

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CITY OF UKIAH

RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: MILOVINA VINEYARDS

2. Property Address: 3551 TAYLOR RD

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

VINES

4. Existing irrigated acreage: 40 acres

   Planned additional irrigable acreage: 13 acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells		
Stream/surface water	Y	FROST, IRRIGATION
Potable (City) water		
Other		

6. Existing Water Storage: ___0___acre-feet

Any plans to add more storage: ___✓___ YES _____ NO

If yes, how much storage will be added? ___10___acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

___✓___ Cost of the recycled water

___✓___ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___✓___ Water quality

___✓___ Daily timing of deliveries

___✓___ Seasonal timing of deliveries

___✓___ Pressure

___ Other (please list)

_____

_____

_____

_____

_____

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

_____

_____

_____

_____

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

✓ YES _____ NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

John Mcvinn

Name of Representative

John Mcvinn

Signature of Representative

5-11-11

Date

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CITY OF UKIAH
RECYCLED WATER USE QUESTIONNAIRE

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1. Land Owner Name: Norgard Properties, Inc.

2. Property Address: South of 381 Norgard Lane

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

Vineyard

4. Existing irrigated acreage: 8 acres

   Planned additional irrigable acreage: _____ acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells		
Stream/surface water	Y	irrigation, frost, cooling
Potable (City) water	Y	irrigation, frost, cooling
Other		

6. Existing Water Storage: _____acre-feet

Any plans to add more storage: _____ YES ___✓___ NO

If yes, how much storage will be added? _____acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

___ Cost of the recycled water

___ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

___ Water quality

___ Daily timing of deliveries

___ Seasonal timing of deliveries

___ Pressure

___ Other (please list)

_____

_____

_____

_____

_____

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

_____

_____

_____

_____

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

✓ YES _____ NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Timothy Norgard

Name of Representative

Timothy L. Norgard

Signature of Representative

5/10/11

Date

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CITY OF UKIAH
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1. Land Owner Name: UKIAH UNIFIED School DIST

2. Property Address: _____

3. Type of land to be irrigated (grass/landscaping, pasture, vines, orchard, etc):

TURF

4. Existing irrigated acreage: 38.8 acres

   Planned additional irrigable acreage: Ø acres

5. Current irrigation/frost protection water source(s):

Water Source:	Used? (Y/N)	Description of Use (e.g. irrigation, frost protection):
Groundwater wells	N	
Stream/surface water	N	
Potable (City) water	Y	
Other		38.8 ACRES OF IRRIGATED TURF WITHIN TOWN BOUNDARIES

6. Existing Water Storage: N/A acre-feet

Any plans to add more storage: _____ YES _____ NO

If yes, how much storage will be added? _____acre-feet

7. Do you have any concerns or issues with using recycled water? Please check all that apply and explain:

✓ Cost of the recycled water

✓ Cost of the delivery system (e.g., pipelines, pump stations, etc.)

✓ Water quality

✓ Daily timing of deliveries

✓ Seasonal timing of deliveries

✓ Pressure

___ Other (please list)

_____
_____
_____
_____
_____

8. Please list other water usage considerations you feel would be important to your possible use of recycled water (e.g., time of year, days of week, hours of day, pressure considerations, volumes, duration of irrigation, etc):

_____
_____
_____
_____

9. Are you interested in using recycled water for irrigation and/or frost protection purposes?

✓ YES _____ NO

In checking yes, I understand I am expressing interest in potentially using recycled water for irrigation and/or frost protection purposes provided the recycled water available is of comparable quality and reasonable cost to the water currently used for irrigation and/or frost protection.

Tom Birse

Name of Representative

Tom Birse

Signature of Representative

5/24/11

Date

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APPENDIX B – POTENTIAL RECYCLED WATER CUSTOMERS

Appendix B - Potential Recycled Water Customers
Recycled Water Master Plan
City of Ukiah

Site or Farmer Name	Parcel APN	Owner (per Parcel GIS Layer from County Assessor's Office)	Site Address	City	Parcel Acreage based on GIS (from Aerial Photograph)	Irrigated Acreage based on GIS (from Aerial Photograph)	Irrigated Acreage from Parcel GIS Layer	Crop or Site Type	Storage	Existing Storage (af)	Planned Future Storage (af)	Irrigated Vineyard Acreage	Irrigated Orchard Acreage	Irrigated Pasture Acreage	Irrigated Row Crop Acreage
	17903002	Thomas Alexander R III & Mary			8.4	7.9	7.4	Orchard	Yes	50	0	0.0	7.9	0.0	0.0
Norgard	18009003	Norgard Properties Inc	1301 Hastings Frontage Rd	TA	6.3	5.1	4.9	Orchard	No	0	0	0.0	5.1	0.0	0.0
	17904001	Thomas Alexander R III & Mary			5.8	4.0	3.7	Orchard	No	0	0	0.0	4.0	0.0	0.0
	17903001	Thomas Alexander R III & Mary	802 E Perkins St	UK	28.1	27.4	37.4	Orchard	Yes	0	0	0.0	27.4	0.0	0.0
	17912001	Ukiah City Of			1.4	0.7	0.8	Orchard	No	0	0	0.0	0.7	0.0	0.0
	17912004	Thomas Alexander R III & Mary			28.0	15.8	16.7	Orchard	No	0	0	0.0	15.8	0.0	0.0
	17902001	Thomas Alexander R III & Mary	224 Vichy Hill Rd	UK	53.6	44.1	28.5	Orchard	No	0	0	0.0	44.1	0.0	0.0
	17914104	Thomas John H			4.4	0.5	0.2	Orchard	No	0	0	0.0	0.5	0.0	0.0
	17903003	Thomas Alexander R III & Mary			1.3	1.1	0.0	Orchard	No	0	0	0.0	1.1	0.0	0.0
	17903005	Thomas Alexander R III & Mary			1.2	0.4	0.0	Orchard	Yes	0	0	0.0	0.4	0.0	0.0
	18413039	Zaina Vineyards LLC	204 Stipp Ln	UK	22.0	20.0	21.2	Vineyard	No	0	0	20.0	0.0	0.0	0.0
Norgard	18011003	Norgard Properties Inc	1900 Hastings Rd	UK	31.9	27.1	25.6	Orchard	No	0	0	0.0	27.1	0.0	0.0
Nova Partners Ltd	18420001	Nova Partners Ltd	4001 Cox Schrader Rd	UK	70.0	59.2	60.5	Vineyard	No	0	0	59.2	0.0	0.0	0.0
Nova Partners Ltd	18422003	Nova Partners Ltd	4301 Cox Schrader Rd	UK	22.6	17.8	20.0	Vineyard	No	0	0	17.8	0.0	0.0	0.0
Nova Partners Ltd	18424002	Nova Partners Ltd			53.1	30.9	26.8	Vineyard	No	0	0	30.9	0.0	0.0	0.0
Koball	18416001	Thomas Alexander R III & Mary	3493 Taylor Dr	UK	46.9	40.5	39.0	Orchard	Yes	0	0	0.0	40.5	0.0	0.0
	18412002	Kummert Jack H & Elizabeth J			3.3	3.0	0.0	Vineyard	No	0	0	3.0	0.0	0.0	0.0
	18601017	Mccarn Jerry D	4520 Burke Hill Dr	UK	1.1	0.3	0.2	Vineyard	No	0	0	0.3	0.0	0.0	0.0
	18412003	Kummert Jack H & Elizabeth J	250 Gobalet Ln	UK	1.9	0.4	0.3	Vineyard	No	0	0	0.4	0.0	0.0	0.0
Boer	18505004	Boer Michael P & Nadine E			3.9	2.7	2.1	Vineyard	Yes	0	0	2.7	0.0	0.0	0.0
Boer	18506015	Boer Michael P & Nadine E			9.5	7.9	8.0	Vineyard/Other Row/Orchard	Yes	0	0	7.1	0.8	0.0	1.5
Beckstoffer	18606002	Beckstoffer Vineyard XI Inc	4801 El Roble Rd	UK	9.7	9.0	12.9	Vineyard	Yes	0	0	9.0	0.0	0.0	0.0
Boer	18505001	Kirby Robert W & M Louise Ttee	501 Boonville Rd	UK	1.2	0.1	0.0	Vineyard	Yes	0	0	0.1	0.0	0.0	0.0
Koball	18419001	Thomas Alexander R III & Mary			35.3	28.4	31.2	Orchard	Yes	0	0	0.0	28.4	0.0	0.0
Nova Partners Ltd	18422002	Nova Partners Ltd			32.4	23.7	22.0	Vineyard	No	0	0	23.7	0.0	0.0	0.0
	18524003	Gerhart Katherine E	4100 Burke Hill Dr	UK	20.7	2.0	1.5	Vineyard	No	0	0	2.0	0.0	0.0	0.0
Gordon	18423004	Schrader G K & Eleanor			0.3	0.1	0.1	Vineyard	Yes	0	0	0.1	0.0	0.0	0.0
Beckstoffer	18611003	Beckstoffer Vineyard XI Inc			22.2	14.6	9.5	Vineyard	Yes	0	0	14.6	0.0	0.0	0.0
Gordon	18423006	Gordon Devin W	4550 El Roble Rd	UK	16.5	13.9	15.1	Vineyard	Yes	0	0	13.9	0.0	0.0	0.0
Vau	18602002	Vau Charles & Kerri	4501 El Roble Rd	UK	8.9	6.3	5.4	Vineyard	No	0	0	6.3	0.0	0.0	0.0
Beckstoffer	18604001	Beckstoffer Vineyard XI Inc	4801 S Hwy 101	UK	45.3	41.0	45.3	Vineyard	Yes	0	0	41.0	0.0	0.0	0.0
	18525006	Mccarn Jerry D	4520 Burke Hill Dr	UK	5.9	0.3	0.2	Vineyard	No	0	0	0.3	0.0	0.0	0.0
Beckstoffer	18606005	Beckstoffer Vineyard XI Inc	4701 El Roble Rd	UK	19.0	13.7	14.4	Vineyard	Yes	0	0	13.7	0.0	0.0	0.0
Gordon	18423007	Gordon Devin W			13.9	11.4	12.8	Vineyard	Yes	0	0	11.4	0.0	0.0	0.0
Nova Partners Ltd	18424004	Willow County Water District			4.2	0.4	0.3	Vineyard	No	0	0	0.4	0.0	0.0	0.0
LaMalfa	18603001	Lamalfa Joseph A & Lena Ttees	4607 El Roble Rd	UK	50.7	46.3	51.3	Vineyard	Yes	15	0	46.3	0.0	0.0	0.0
	18608004	Larramendy William L & Jeannet	5040 Burke Hill Dr	UK	4.8	0.3	0.3	Vineyard	No	0	0	0.3	0.0	0.0	0.0
Gordon	18423001	Cox Jack L	4552 El Roble Rd	UK	1.1	0.4	0.5	Vineyard	Yes	10	0	0.4	0.0	0.0	0.0
	18602001	Vau Charles & Kerri			1.0	0.8	1.0	Vineyard	No	0	0	0.8	0.0	0.0	0.0
	18601016	Pettrone Catherine A 1/2	4540 Burke Hill Dr	UK	5.1	2.1	2.1	Vineyard	No	0	0	2.1	0.0	0.0	0.0
Beckstoffer	18602004	Beckstoffer Vineyard XI Inc	4701 El Roble Rd	UK	9.9	9.3	10.8	Vineyard	Yes	60	0	9.3	0.0	0.0	0.0
Beckstoffer	18605002	Beckstoffer Vineyard XI Inc	4701 El Roble Rd	UK	46.7	38.3	44.4	Vineyard/PTL	Yes	0	0	21.5	0.0	16.9	0.0
	18607033	Gordon Devin W	4752 Burke Hill Dr	UK	11.8	6.3	4.8	Vineyard	No	0	0	6.3	0.0	0.0	0.0
Beckstoffer	18606001	Beckstoffer Vineyard XI Inc	4901 El Roble Rd	UK	6.7	5.1	0.0	Vineyard	Yes	0	0	5.1	0.0	0.0	0.0
	18608005	Larramendy William L & Jeannet	5050 Burke Hill Dr	UK	26.5	17.8	15.4	Vineyard	No	0	0	17.8	0.0	0.0	0.0
	18421005	Jahnke Suzanne	4101 Cox Schrader Rd	UK	3.6	2.4	2.4	Vineyard	No	0	0	2.4	0.0	0.0	0.0
	17020011	Sawyer Charles A & Nancy J Tte			15.3	9.5	6.0	Vineyard	No	0	0	9.5	0.0	0.0	0.0
	17911002	Golden Catherine T	1050 E Gobbi St	UK	33.3	28.2	25.4	Vineyard	No	0	0	28.2	0.0	0.0	0.0
	17904004	Thomas Alexander R III & Mary	1000 Vichy Springs Rd	UK	55.9	49.3	66.2	Orchard	Yes	0	0	0.0	49.3	0.0	0.0
	17910001	Thomas John Hall	1001 Vichy Springs Rd	UK	74.2	61.3	64.3	Orchard/Vineyard	No	0	0	2.5	58.8	0.0	0.0
	17911001	Nunez Humberto	1000 E Gobbi St	UK	28.3	25.5	27.1	Vineyard	No	0	0	25.5	0.0	0.0	0.0
Nova Partners Ltd	18421004	Nova Partners Ltd	4101 Cox Schrader Rd	UK	0.2	0.1	0.1	Vineyard	No	0	0	0.1	0.0	0.0	0.0
	18003005	Mountanos Mark P Ttee	701 E Gobbi St	UK	8.4	5.1	0.0	Vineyard	Yes	0	0	5.1	0.0	0.0	0.0
	18003001	Mountanos Mark P Ttee	701 E Gobbi St	UK	26.9	24.1	25.3	Vineyard	Yes	0	0	24.1	0.0	0.0	0.0
Norgard	18010003	Norgard Properties Inc	1801 Hastings Rd	UK	24.8	21.6	22.6	Orchard	No	0	0	0.0	21.6	0.0	0.0
Boer	18505003	Boer Michael P & Nadine E	401 Boonville Rd	UK	4.5	3.7	0.0	Vineyard	Yes	0	0	3.7	0.0	0.0	0.0
Hildreth	18504004	Hildreth Michael L & Susan K T	3800 Burke Hill Dr	UK	15.5	13.7	13.6	Vineyard	Yes	0	0	13.7	0.0	0.0	0.0
	18002001	Shultz Paul	801 E Gobbi St	UK	10.0	6.1	6.3	Vineyard	No	0	0	6.1	0.0	0.0	0.0
Hildreth	18505009	Hildreth Michael L & Susan K T	4020 Burke Hill Dr	UK	14.0	11.8	10.7	Vineyard	Yes	0	0	11.8	0.0	0.0	0.0
	18421003	Nova Partners Ltd	4101 Cox Schrader Rd	UK	36.7	28.8	27.4	Vineyard	No	0	0	28.8	0.0	0.0	0.0
	18510047	Hatch Bruce G & Judy A	4016 Fracchia Rd	UK	10.9	9.0	9.1	Vineyard	No	0	0	9.0	0.0	0.0	0.0
Hildreth	18009004	Hildreth Farms Incorporated	1401 Hastings Frontage Rd	UK	41.1	36.8	36.0	Vineyard	No	0	0	36.8	0.0	0.0	0.0
	18524002	Gerhart Katherine E	4100 Burke Hill Dr	UK	29.1	21.7	22.8	Vineyard	No	0	0	21.7	0.0	0.0	0.0
	18002002	Johnson William T 1/4	801 Babcock Ln	UK	56.0	49.5	47.3	Orchard/Vineyard	No	0	0	19.8	29.7	0.0	0.0
	18005001	Norgard Properties Inc	951 Babcock Ln	UK	15.0	14.7	14.5	Orchard/PTL	No	0	0	0.0	8.8	5.9	0.0
	18005002	Hildreth Janis A Ttee	1001 Babcock Ln	UK	31.9	29.2	27.1	Orchard/Vineyard	No	0	0	13.4	15.8	0.0	0.0
	18005004	Norgard Properties Inc	1101 Babcock Ln	UK	20.3	13.4	12.6	Orchard	No	0	0	0.0	13.4	0.0	0.0
	18006005	Norgard Properties Inc			9.6	5.5	5.6	Orchard	No	0	0	0.0	5.5	0.0	0.0
Hildreth	18006007	Hildreth Michael L & Susan K	725 Talmage Rd	UK	26.8	24.1	25.2	Orchard	No	0	0	0.0	24.1	0.0	0.0
City	18409006	Mattern Richard H & Donna M	217 Norgard Ln	UK	14.1	13.8	13.7	Vineyard	No	0	0	13.8	0.0	0.0	0.0

Site or Farmer Name	Parcel APN	Owner (per Parcel GIS Layer from County Assessor's Office)	Site Address	City	Parcel Acreage based on GIS (from Aerial Photograph)	Irrigated Acreage based on GIS (from Aerial Photograph)	Irrigated Acreage from Parcel GIS Layer	Crop or Site Type	Storage	Existing Storage (af)	Planned Future Storage (af)	Irrigated Vineyard Acreage	Irrigated Orchard Acreage	Irrigated Pasture Acreage	Irrigated Row Crop Acreage
Norgard	18410004	Norgard Properties Inc			12.6	9.7	8.1	PTL	No	0	0	0.0	0.0	9.7	0.0
	18411022	Mattern Richard H & Donna M	2801 S State St	UK	2.0	1.1	1.2	Vineyard	No	0	0	1.1	0.0	0.0	0.0
	17020010	Sawyer Charles A & Nancy J Tte			32.2	29.2	29.3	Vineyard	Yes	8	0	29.2	0.0	0.0	0.0
	17021005	Sawyer Charles A & Nancy J Tte			41.7	28.9	25.3	Vineyard	No	0	0	28.9	0.0	0.0	0.0
Norgard	18012006	Norgard Properties Inc			9.1	6.0	5.7	Orchard	No	0	0	0.0	6.0	0.0	0.0
Norgard	18012005	Norgard Properties Inc		UK	1.9	1.0	0.7	Vineyard	No	0	0	1.0	0.0	0.0	0.0
Norgard	18408025	Norgard Properties Inc			3.2	2.0	1.8	Vineyard/Orchard	No	0	0	1.5	0.5	0.0	0.0
	18601018	Alessi Richard L & Patricia Q	4650 Burke Hill Dr	UK	12.6	7.4	7.9	Vineyard	No	0	0	7.4	0.0	0.0	0.0
Koball	18415001	Thomas Alexander R III & Mary	3495 Taylor Dr	UK	43.9	35.2	34.4	Orchard	Yes	0	25.5	0.0	35.2	0.0	0.0
	18412001	Ukiah Land LLC	3000 S State St	UK	26.6	12.0	13.1	Vineyard	No	0	0	12.0	0.0	0.0	0.0
	18411019	Ukiah Land LLC	3000 S State St	UK	18.3	17.4	17.2	Vineyard	No	0	0	17.4	0.0	0.0	0.0
	18414014	Zaina Vineyards LLC	3150 S State St	UK	17.4	16.0	18.1	Vineyard	No	0	0	16.0	0.0	0.0	0.0
	18414002				2.0	1.2	0.0	Vineyard	No	0	0	1.2	0.0	0.0	0.0
Norgard	18408027	Norgard Properties Inc	341 Norgard Ln	UK	3.7	0.6	0.0	Vineyard	No	0	0	0.6	0.0	0.0	0.0
Norgard	18408028	Norgard Properties Inc			4.7	3.2	2.7	PTL/VineyardC/Orchard	No	0	0	1.4	0.2	1.5	0.0
Norgard	18409001	Norgard Properties Inc			3.7	3.5	3.8	Vineyard/Orchard/PTL/	No	0	0	2.0	0.9	0.6	0.0
Norgard	18409007	Norgard Properties Inc			14.5	10.8	10.4	PTL/Orchard	No	0	0	0.0	3.0	7.8	0.0
	18407015	Mattern Richard H & Donna M	2601 S State St	UK	11.7	9.9	9.4	Vineyard	No	0	0	9.9	0.0	0.0	0.0
Gannon	18414010	Riedy Mary Maureen Ttee 1/4	3201 Taylor Dr	UK	9.9	9.2	0.0	Orchard	No	0	0	0.0	9.2	0.0	0.0
	18414003	Stambaugh Pierina	3160 S State St	UK	0.3	0.3	0.3	Vineyard	No	0	0	0.3	0.0	0.0	0.0
	18414004	Zaina Vineyards LLC	3200 S State St	UK	1.7	0.9	0.9	Vineyard	No	0	0	0.9	0.0	0.0	0.0
	18413041	Stolich Sandra M	3381 Zaina Ln	UK	3.5	2.4	0.2	Vineyard	No	0	0	2.4	0.0	0.0	0.0
	18413017	Mcchesney Richard & Sandra	3311 Zaina Ln	UK	2.8	0.5	0.5	Vineyard	No	0	0	0.5	0.0	0.0	0.0
	18414016	Zaina Vineyards LLC	3150 S State St	UK	0.3	0.3	0.0	Vineyard	No	0	0	0.3	0.0	0.0	0.0
	18414015	Zaina Vineyards LLC	3150 S State St	UK	0.8	0.8	0.0	Vineyard	No	0	0	0.8	0.0	0.0	0.0
	18502007	Lamalfa Joseph A & Lena Ttees	251 Stipp Ln	UK	17.0	10.2	9.3	Vineyard/Orchard	No	0	0	7.2	3.1	0.0	0.0
Milovina	18417010	Milovina James D & Lyle P	3525 Taylor Dr	UK	12.9	10.5	11.1	Vineyard	Yes	0	10	10.5	0.0	0.0	0.0
Boer	18502005	Boer Michael P & Nadine E	253 Boonville Rd	UK	5.9	4.8	0.0	Vineyard	Yes	0	0	4.8	0.0	0.0	0.0
	18502004	Boer Adrian E & Susan J	301 Boonville Rd	UK	1.9	0.6	0.5	Orchard	No	0	0	0.0	0.6	0.0	0.0
Milovina	18418001	Milovina James D & Lyle P	3525 S Hwy 101	UK	46.6	44.0	42.9	Vineyard	Yes	0	0	44.0	0.0	0.0	0.0
	18502003	Boer Michael P & Nadine E	351 Boonville Rd	UK	2.4	1.5	1.4	Orchard	Yes	0	25	0.0	1.5	0.0	0.0
LaMalfa	18504002	Lamalfa Joseph A & Lena Ttees	3600 Leland Ln	UK	17.1	13.8	0.0	Orchard	No	0	0	0.0	13.8	0.0	0.0
Boer	18505005	Boer Michael P & Nadine E			27.0	24.1	26.3	Vineyard	Yes	0	0	24.1	0.0	0.0	0.0
	18510044	Hildreth Michael L & Susan K T	3750 Burke Hill Dr	UK	10.8	4.9	4.6	Vineyard	Yes	23.6	0	4.9	0.0	0.0	0.0
Boer	18506005	Boer Michael P & Nadine E			2.1	0.7	1.0	Vineyard/Other Row	Yes	0	0	0.7	0.0	0.0	0.2
Boer	18508001	Boer Michael P & Nadine E			12.7	8.7	11.7	Other Row/Orchard	Yes	0	0	4.7	4.0	0.0	4.7
Boer	18508004	Boer Michael P & Nadine E			2.3	1.7	2.8	Other Row	Yes	0	0	1.7	0.0	0.0	1.7
Boer	18507210	Boer Michael P & Nadine E			4.2	1.2	1.2	Other Row	Yes	0	0	1.2	0.0	0.0	1.2
	18508008	Boer Michael P & Nadine E			1.0	0.2	0.3	Orchard	No	0	0	0.0	0.2	0.0	0.0
	18508009	Lazaro John Lee & Marcia Morga	1071 Boonville Rd	UK	6.8	1.9	1.7	Vineyard	No	0	0	1.9	0.0	0.0	0.0
	18510048	Hatch Bruce G & Judy A	304 Bisby Ave	UK	8.5	3.3	4.9	Vineyard	No	0	0	3.3	0.0	0.0	0.0
	18522001	Gerhart Katherine			4.0	1.4	1.3	Vineyard	No	0	0	1.4	0.0	0.0	0.0
	18413040	Larose Mark E & Teresa M	3331 Zaina Ln	UK	0.6	0.2	0.2	Vineyard	No	0	0	0.2	0.0	0.0	0.0
12th District Fair Grounds	00136038	Pan Pacific Retail Properties	1275 Ford Rd		1.5	0.7	0.6	Agriculture							
City Park/Community Garden	00228127	City of Ukiah			3.0	2.2	0.0	Park							
City Park/Community Garden	00228126	City of Ukiah			0.8	0.4	0.0	Park							
City Park/Community Garden	00228115	City of Ukiah			0.2	0.2	0.0	Park							
City Park/Community Garden	00228119	Johnson Thomas F	220 Cleveland Ln		0.5	0.2	0.0	Park							
City Park/Community Garden	00228118	Johnson Thomas F			0.2	0.2	0.0	Park							
City Softball Field/irrigation	17901009	City of Ukiah			19.3	11.5	12.4	Park							
12th District Fair Grounds	00201001	Twelfth District Agricultural			7.3	3.2	3.5	Agriculture							
UUSD/Ukiah High School	00102074	Ukiah Unified School District			50.0	34.6	0.0	School							
UUSD/special ed/preschool	00143004	Mendocino County Board of Educ	518 Low Gap Rd	UK	0.1	<0.1	0.0	School							
UUSD/special ed/preschool	00143019	Nordvick Virginia H	512 Low Gap Rd	UK	0.1	0.1	0.0	School							
UUSD/District Office	00204023	Zimmerman Rodney Lee & Marylou	925 N State St	UK	0.8	0.2	0.0	School							
UUSD/District Office	00204026	Zimmerman Rodney Lee & Marylou			0.2	0.1	0.0	School							
UUSD/District Office	00204027	Ung Lim /	915 N State St	UK	0.3	0.0	0.0	School							
City Park/irrigation/fountain	00207210	City of Ukiah	251 Low Gap Rd	UK	0.4	0.3	0.0	Park							
12th District Fair Grounds	00136036	Twelfth District Agricultural			26.3	14.7	0.0	Agriculture							
UUSD/Frank Zeek School	00102066	Ukiah Union Elementary School			5.5	3.5	3.1	School							
City Park/Vinewood Park	00145001	City of Ukiah			4.7	4.4	4.5	Park							
Russian River Cemetery	00143002	Russian River Cemetery Distric			0.4	0.2	0.0	Other							
UUSD/Ukiah High School	00102060	Ukiah Unified School District			8.7	3.2	3.2	School							
Russian River Cemetery	00102050	Russian River Cemetery Distric			26.6	22.0	0.0	Other							
Russian River Cemetery	00102049	Russian River Cemetery Distric			5.0	4.4	0.0	Other							
UUSD/Ukiah High School	00102061	Ukiah Unified School District			5.3	1.8	2.1	School							
UUSD/Ukiah Adult School	00143026	Ukiah Union Elementary School			4.2	0.9	0.8	School							
12th District Fair Grounds	00136039	Erickson Henry O Ttee 1/2	1211 N State St		10.8	7.7	7.3	Agriculture							
12th District Fair Grounds	00136002	Twelfth District Agricultural			13.3	10.4	11.0	Agriculture							
City Golf Course	00102078	City of Ukiah			37.5	37.5	41.6	Golf Course							
City Golf Course	00103001	City of Ukiah			96.3	24.4	11.7	Golf Course							
City Golf Course	00109001	City of Ukiah			13.0	11.6	8.9	Golf Course							
City Park/Todd Grove Park	00109002	City of Ukiah			7.2	5.7	5.9	Park							

Site or Farmer Name	Parcel APN	Owner (per Parcel GIS Layer from County Assessor's Office)	Site Address	City	Parcel Acreage based on GIS (from Aerial Photograph)	Irrigated Acreage based on GIS (from Aerial Photograph)	Irrigated Acreage from Parcel GIS Layer	Crop or Site Type	Storage	Existing Storage (af)	Planned Future Storage (af)	Irrigated Vineyard Acreage	Irrigated Orchard Acreage	Irrigated Pasture Acreage	Irrigated Row Crop Acreage
City Park/Todd Grove Park	00114101	City of Ukiah			2.3	1.5	1.8	Park							
City Parks/Anton Stadium	00113029	City of Ukiah			2.5	2.0	1.7	Park							
City Park/Giorno Park	00113052	Williams James E Trust	1217 Standley Ave	UK	1.2	1.2	0.0	Park							
City Parks/Anton Stadium	00113028	City of Ukiah			6.1	2.8	2.3	Park							
City Parks/Anton Stadium	00116005	City of Ukiah			1.9	1.6	1.8	Park							
City Parks/Anton Stadium	00117101	City of Ukiah			1.1	1.0	0.9	Park							
City Parking Lots/irrigation	00221803	City of Ukiah			0.1	0.0	0.0	Other							
City Parking Lots/irrigation	00221802	City of Ukiah			0.1	0.0	0.0	Other							
City Parking Lots/irrigation	00221807	City of Ukiah			0.1	0.0	0.0	Other							
City Parking Lots/irrigation	00221808	City of Ukiah			0.1	0.0	0.0	Other							
City Parking Lots/irrigation	00221806	City of Ukiah			0.2	0.0	0.0	Other							
City Parking Lots/irrigation	00221805	City of Ukiah			0.2	0.1	0.0	Other							
City Parking Lots/irrigation	00221804	City of Ukiah			0.2	0.0	0.0	Other							
City Park/Depot Park	00219315	Quan Jing G 1/2	400 E Perkins St	UK	0.8	0.8	0.0	Park							
City Park/Depot Park	00219353	Valentic John P & Patricia A			0.4	0.1	0.0	Park							
City Park/Depot Park	00219354	Keszler Gary R & J Marlene	135 Hospital Dr	UK	0.3	<0.1	0.0	Park							
City Park/Depot Park	00219355	Cho Peter Young & Sharon Misun	320 E Perkins St	UK	0.4	0.1	0.0	Park							
City Park/Depot Park	00219314	Quan Jing	326 E Perkins St	UK	0.2	0.2	0.0	Park							
City Park/Gardner Park	00221703	Rosen Norman & Karen Ttees 1/2	280 N Oak St	UK	0.2	0.1	0.0	Park							
City Park/irrigation planter	00222501	County of Mendocino			0.9	0.4	0.0	Park							
City Parks/irrigation planter	00222303	Abell Masonic Temple Associati	102 S School St	UK	0.2	0.0	0.0	Park							
City Parks/irrigation planter	00222306	Sanchez Francis J & Margie K	110 S School St	UK	0.1	0.0	0.0	Park							
City Parks/irrigation planter	00222307	Poma David 1/3	198 S School St	UK	0.1	0.0	0.0	Park							
UUSD/Oak Manor School	17906108	Ukiah Union Elementary School	400 Oak Manor Dr	UK	8.0	4.2	4.2	School							
UUSD/Oak Manor School	17906107	Ukiah Union Elementary School	400 Oak Manor Dr	UK	3.6	3.3	3.6	School							
City Parks/Alex Thomas Plaza	00226509	Ukiah Redevelopment Agency	300 S State St	UK	0.6	0.3	0.0	Park							
City Parking Lots/irrigation	00226203	Preston Hugh L	207 We Stephenson St	UK	0.1	<0.1	0.0	Other							
City Parking Lots/irrigation	00226208	City of Ukiah			0.2	0.1	0.0	Other							
City Parking Lots/irrigation	00226207	Carter David A /	308 S School St	UK	0.1	0.0	0.0	Other							
City Parking Lots/irrigation	00226204	City of Ukiah	351 S Oak St	UK	0.1	0.0	0.0	Other							
City Parking Lots/irrigation	00226205	City of Ukiah			0.4	0.2	0.0	Other							
City Parks/McGarvey Park	00225201	City of Ukiah			0.9	0.8	0.0	Park							
City Park/Purdy Park	00225503	City of Ukiah			6.5	2.2	2.2	Park							
UUSD/South Valley High School	00225502	City of Ukiah			0.9	0.4	0.4	School							
City Park/Oak Manor Park	17905009	City of Ukiah			2.3	1.3	0.0	Park							
City Park/Oak Manor Park	17905008	City of Ukiah			2.2	2.1	2.3	Park							
UUSD/Yokayo Gym	00131403	Ukiah Union Elementary School			8.8	4.0	0.0	School							
City Park/Cindee Park	00318136	City of Ukiah	855 Cindee Dr	UK	0.9	0.6	0.0	Park							
City Park/Observatory Park	00306203	City of Ukiah	407 Luce Ave	UK	0.7	0.7	0.0	Park							
City Park/Community Garden Observatory	00306205	City of Ukiah	432 Observatory Ave	UK	1.9	1.8	0.0	Park							

APPENDIX C – COST ESTIMATES FOR PROJECT ALTERNATIVES

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PROJECT SUMMARY

		Estimate Class:	**Class 5**
Project:	**Recycled Water Master Plan**	**PIC:**	**LC**
Job #:	**8660A00**	**PM:**	**TAC**
Location:	**Ukiah, CA**	**Date:**	**February 1, 2011**
Zip Code:	**95482**	**By:**	**BB**
Alternative:	**Scenario 1 Parcels with Storage**	**Reviewed:**	

NO.		DESCRIPTION	SIZE/LENGTH	UNIT	TOTAL
1		Distribution System Pipelines			
		Pipelines along Unpaved Agricultural Easements			
		8-inches in Diameter	12,400	ft	$1,349,120
		12-inches in Diameter	11,800	ft	$1,925,760
		16-inches in Diameter	700	ft	$152,320
		Pipelines along Paved Streets			
		8-inches in Diameter	4,300	ft	$584,800
		12-inches in Diameter	1,400	ft	$285,600
		Subtotal			$4,297,600
2		Pump Station	150	hp	$1,110,000
3		Storage Pond	650,000	gal	$65,000
			Subtotal		$5,472,600
		Construction Contingency	20.0%		$1,095,000
		Estimating Contingency	20.0%		$1,314,000
		TOTAL ESTIMATED CONSTRUCTION COST W/ CONTINGENCY			**$7,881,600**
		Engineering and Design	21.0%		
		Administrative	5.0%		
		Legal	5.0%		
		Subtotal Markups	31.0%		$2,444,000
		TOTAL ESTIMATED PROJECT COST			**$10,325,600**

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PROJECT SUMMARY

		Estimate Class:	**Class 5**
Project:	**Recycled Water Master Plan**	**PIC:**	**LC**
Job #:	**8660A00**	**PM:**	**TAC**
Location:	**Ukiah, CA**	**Date:**	**February 1, 2011**
Zip Code:	**95482**	**By:**	**BB**
Alternative:	**Scenario 1B Maximize Irrigation**	**Reviewed:**	

NO.		DESCRIPTION	SIZE/LENGTH	UNIT	TOTAL
1		Distribution System Pipelines			
		Pipelines along Unpaved Agricultural Easements			
		8-inches in Diameter	14,300	ft	$1,555,840
		12-inches in Diameter	11,800	ft	$1,925,760
		16-inches in Diameter	700	ft	$152,320
		Pipelines along Paved Streets			
		8-inches in Diameter	10,400	ft	$1,414,400
		12-inches in Diameter	1,400	ft	$285,600
		Subtotal			$5,333,920
2		Pump Station	150	hp	$1,110,000
3		Storage Pond	650,000	gal	$65,000
			Subtotal		$6,508,920
		Construction Contingency	20.0%		$1,302,000
		Estimating Contingency	20.0%		$1,562,500
		TOTAL ESTIMATED CONSTRUCTION COST W/ CONTINGENCY			**$9,373,420**
		Engineering and Design	21.0%		
		Administrative	5.0%		
		Legal	5.0%		
		Subtotal Markups	31.0%		$2,906,000
		TOTAL ESTIMATED PROJECT COST			**$12,279,420**

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PROJECT SUMMARY

		Estimate Class:	**Class 5**
Project:	**Recycled Water Master Plan**	**PIC:**	**LC**
Job #:	**8660A00**	**PM:**	**TAC**
Location:	**Ukiah, CA**	**Date:**	**February 1, 2011**
Zip Code:	**95482**	**By:**	**BB**
Alternative:	**Scenario 2 Grower Storage**	**Reviewed:**	

NO.		DESCRIPTION	SIZE/LENGTH	UNIT	TOTAL
1		Distribution System Pipelines			
		Pipelines along Unpaved Agricultural Easements			
		8-inches in Diameter	4,100	ft	$446,080
		12-inches in Diameter	11,800	ft	$1,925,760
		16-inches in Diameter	400	ft	$87,040
		Pipelines along Paved Streets			
		12-inches in Diameter	4,300	ft	$877,200
		Subtotal			$3,336,080
2		Pump Station	75	hp	$735,000
3		Storage Pond	1.6	MG	$160,000
			Subtotal		$4,231,080
		Construction Contingency	20.0%		$846,500
		Estimating Contingency	20.0%		$1,016,000
		TOTAL ESTIMATED CONSTRUCTION COST W/ CONTINGENCY			**$6,093,580**
		Engineering and Design	21.0%		
		Administrative	5.0%		
		Legal	5.0%		
		Subtotal Markups	31.0%		$1,890,000
		TOTAL ESTIMATED PROJECT COST			**$7,983,580**

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PROJECT SUMMARY

		Estimate Class:	**Class 5**
Project:	**Recycled Water Master Plan**	**PIC:**	**LC**
Job #:	**8660A00**	**PM:**	**TAC**
Location:	**Ukiah, CA**	**Date:**	**February 1, 2011**
Zip Code:	**95482**	**By:**	**BB**
Alternative:	**Scenario 3 Centralized Storage**	**Reviewed:**	

NO.		DESCRIPTION	SIZE/LENGTH	UNIT	TOTAL
1		Distribution System Pipelines			
		Pipelines along Unpaved Agricultural Easements			
		8-inches in Diameter	1,800	ft	$195,840
		12-inches in Diameter	1,500	ft	$244,800
		16-inches in Diameter	0	ft	$0
		20-inches in Diameter	2,200	ft	$598,400
		24-inches in Diameter	2,300	ft	$750,720
		36-inches in Diameter	2,600	ft	$1,272,960
		42-inches in Diameter	2,100	ft	$1,199,520
		48-inches in Diameter	4,000	ft	$2,611,200
		Pipelines along Paved Streets			
		8-inches in Diameter	600	ft	$244,800
		12-inches in Diameter	0	ft	$306,000
		16-inches in Diameter	0	ft	$0
		20-inches in Diameter	500	ft	$748,000
		24-inches in Diameter	4,800	ft	$938,400
		36-inches in Diameter	4,700	ft	$1,591,200
		42-inches in Diameter	2,900	ft	$1,499,400
		48-inches in Diameter	1,500	ft	$3,264,000
		Subtotal			$15,465,240
2		Pump Station	1,400	hp	$8,960,000
3		Storage Pond	200.0	af	$6,517,012
			Subtotal		$30,942,252
		Construction Contingency	20.0%		$6,188,500
		Estimating Contingency	20.0%		$7,426,500
		TOTAL ESTIMATED CONSTRUCTION COST W/ CONTINGENCY			**$44,557,252**
		Engineering and Design	21.0%		
		Administrative	5.0%		
		Legal	5.0%		
		Subtotal Markups	31.0%		$13,813,000
		TOTAL ESTIMATED PROJECT COST			**$58,370,252**

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PROJECT SUMMARY

		Estimate Class:	**Class 5**
Project:	**Recycled Water Master Plan**	**PIC:**	**LC**
Job #:	**8660A00**	**PM:**	**TAC**
Location:	**Ukiah, CA**	**Date:**	**February 1, 2011**
Zip Code:	**95482**	**By:**	**BB**
Alternative:	**Scenario 3B Centralized Storage Maximizing Irriga**	**Reviewed:**	

NO.		DESCRIPTION	SIZE/LENGTH	UNIT	TOTAL
1		Distribution System Pipelines			
		Pipelines along Unpaved Agricultural Easements			
		8-inches in Diameter	4,400	ft	$478,720
		12-inches in Diameter	12,200	ft	$1,991,040
		16-inches in Diameter	0	ft	$0
		20-inches in Diameter	2,200	ft	$598,400
		24-inches in Diameter	2,300	ft	$750,720
		36-inches in Diameter	2,600	ft	$1,272,960
		42-inches in Diameter	2,100	ft	$1,199,520
		48-inches in Diameter	4,000	ft	$2,611,200
		Pipelines along Paved Streets			
		8-inches in Diameter	0	ft	$598,400
		12-inches in Diameter	0	ft	$2,488,800
		16-inches in Diameter	0	ft	$0
		20-inches in Diameter	500	ft	$748,000
		24-inches in Diameter	4,800	ft	$938,400
		36-inches in Diameter	4,700	ft	$1,591,200
		42-inches in Diameter	2,900	ft	$1,499,400
		48-inches in Diameter	1,500	ft	$3,264,000
		Subtotal			$20,030,760
2		Pump Station	1,400	hp	$8,960,000
3		Storage Pond	200.0	af	$6,517,012
			Subtotal		$35,507,772
		Construction Contingency	20.0%		$7,102,000
		Estimating Contingency	20.0%		$8,522,000
		TOTAL ESTIMATED CONSTRUCTION COST W/ CONTINGENCY			**$51,131,772**
		Engineering and Design	21.0%		
		Administrative	5.0%		
		Legal	5.0%		
		Subtotal Markups	31.0%		$15,851,000
		TOTAL ESTIMATED PROJECT COST			**$66,982,772**

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PROJECT SUMMARY

		Estimate Class:	**Class 5**
Project:	**Recycled Water Master Plan**	**PIC:**	**LC**
Job #:	**8660A00**	**PM:**	**TAC**
Location:	**Ukiah, CA**	**Date:**	**February 1, 2011**
Zip Code:	**95482**	**By:**	**BB**
Alternative:	**Scenario 4 Urban Use**	**Reviewed:**	

NO.		DESCRIPTION	SIZE/LENGTH	UNIT	TOTAL
1		Distribution System Pipelines			
		Pipelines along Unpaved Agricultural Easements			
		12-inches in Diameter	6,000	ft	$979,200
		16-inches in Diameter	14,500	ft	$3,155,200
		Pipelines along Paved Streets			
		8-inches in Diameter	10,900	ft	$1,482,400
		12-inches in Diameter	8,600	ft	$1,754,400
		16-inches in Diameter	9,600	ft	$2,611,200
		Jack and Bore Construction	250	ft	$300,000
		Subtotal			$10,282,400
2		Pump Station	400	hp	$2,960,000
3		Storage Pond	1.6	MG	$160,000
			Subtotal		$13,402,400
		Construction Contingency	20.0%		$2,680,500
		Estimating Contingency	20.0%		$3,217,000
		TOTAL ESTIMATED CONSTRUCTION COST W/ CONTINGENCY			**$19,299,900**
		Engineering and Design	21.0%		
		Administrative	5.0%		
		Legal	5.0%		
		Subtotal Markups	31.0%		$5,983,000
		TOTAL ESTIMATED PROJECT COST			**$25,282,900**

APPENDIX - D – PHASED COST ESTIMATE FOR RECOMMENDED ALTERNATIVE

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PROJECT SUMMARY

		Estimate Class:	**Class 5**
Project:	**Recycled Water Master Plan**	**PIC:**	**LC**
Job #:	**8660A00**	**PM:**	**TAC**
Location:	**Ukiah, CA**	**Date:**	**February 1, 2011**
Zip Code:	**95482**	**By:**	**BB**
Alternative:	**Scenario 4 Urban Use**	**Reviewed:**	

NO.		DESCRIPTION	SIZE/LENGTH	UNIT	TOTAL
1		Distribution System Pipelines			
		Pipelines along Unpaved Agricultural Easements			
		12-inches in Diameter	5,600	ft	$913,920
		16-inches in Diameter	1,300	ft	$282,880
		Subtotal			$1,196,800
2		Pump Station	200	hp	$1,280,000
3		Storage Pond	1.6	MG	$160,000
			Subtotal		$2,636,800
		Construction Contingency	20.0%		$527,500
		Estimating Contingency	20.0%		$633,000
		TOTAL ESTIMATED CONSTRUCTION COST W/ CONTINGENCY			**$3,797,300**
		Engineering and Design	21.0%		
		Administrative	5.0%		
		Legal	5.0%		
		Subtotal Markups	31.0%		$1,178,000
		TOTAL ESTIMATED PROJECT COST			**$4,975,300**

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PROJECT SUMMARY

		Estimate Class:	**Class 5**
Project:	**Recycled Water Master Plan**	**PIC:**	**LC**
Job #:	**8660A00**	**PM:**	**TAC**
Location:	**Ukiah, CA**	**Date:**	**February 1, 2011**
Zip Code:	**95482**	**By:**	**BB**
Alternative:	**Scenario 4 Urban Use**	**Reviewed:**	

NO.		DESCRIPTION	SIZE/LENGTH	UNIT	TOTAL
1		Distribution System Pipelines			
		Pipelines along Unpaved Agricultural Easements			
		16-inches in Diameter	4,200	ft	$913,920
		Pipelines along Paved Streets			
		16-inches in Diameter	5,600	ft	$1,523,200
		Subtotal			$2,437,120
2		Pump Station	200	hp	$1,280,000
			Subtotal		$3,717,120
		Construction Contingency	20.0%		$743,500
		Estimating Contingency	20.0%		$892,500
		TOTAL ESTIMATED CONSTRUCTION COST W/ CONTINGENCY			**$5,353,120**
		Engineering and Design	21.0%		
		Administrative	5.0%		
		Legal	5.0%		
		Subtotal Markups	31.0%		$1,660,000
		TOTAL ESTIMATED PROJECT COST			**$7,013,120**

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PROJECT SUMMARY

		Estimate Class:	**Class 5**
Project:	**Recycled Water Master Plan**	**PIC:**	**LC**
Job #:	**8660A00**	**PM:**	**TAC**
Location:	**Ukiah, CA**	**Date:**	**February 1, 2011**
Zip Code:	**95482**	**By:**	**BB**
Alternative:	**Scenario 4 Urban Use**	**Reviewed:**	

NO.		DESCRIPTION	SIZE/LENGTH	UNIT	TOTAL
1		Distribution System Pipelines			
		Pipelines along Unpaved Agricultural Easements			
		12-inches in Diameter	400	ft	$65,280
		16-inches in Diameter	9,000	ft	$1,958,400
		Pipelines along Paved Streets			
		8-inches in Diameter	1,000	ft	$136,000
		16-inches in Diameter	4,000	ft	$1,088,000
		Subtotal			$3,247,680
			Subtotal		$3,247,680
		Construction Contingency	20.0%		$650,000
		Estimating Contingency	20.0%		$780,000
		TOTAL ESTIMATED CONSTRUCTION COST W/ CONTINGENCY			**$4,677,680**
		Engineering and Design	21.0%		
		Administrative	5.0%		
		Legal	5.0%		
		Subtotal Markups	31.0%		$1,451,000
		TOTAL ESTIMATED PROJECT COST			**$6,128,680**

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PROJECT SUMMARY

		Estimate Class:	**Class 5**
Project:	**Recycled Water Master Plan**	**PIC:**	**LC**
Job #:	**8660A00**	**PM:**	**TAC**
Location:	**Ukiah, CA**	**Date:**	**February 1, 2011**
Zip Code:	**95482**	**By:**	**BB**
Alternative:	**Scenario 4 Urban Use**	**Reviewed:**	

NO.		DESCRIPTION	SIZE/LENGTH	UNIT	TOTAL
1		Distribution System Pipelines			
		Pipelines along Paved Streets			
		8-inches in Diameter	9,900	ft	$1,346,400
		12-inches in Diameter	8,600	ft	$1,754,400
		Jack and Bore Construction	250	ft	$300,000
		Subtotal			$3,400,800
			Subtotal		$3,400,800
		Construction Contingency	20.0%		$680,500
		Estimating Contingency	20.0%		$816,500
		TOTAL ESTIMATED CONSTRUCTION COST W/ CONTINGENCY			**$4,897,800**
		Engineering and Design	21.0%		
		Administrative	5.0%		
		Legal	5.0%		
		Subtotal Markups	31.0%		$1,519,000
		TOTAL ESTIMATED PROJECT COST			**$6,416,800**

APPENDIX E – FINANCIAL MODEL

City of Ukiah
Recycled Water
Feasibility Study
Assumptions

	User Input
Total Annual O&M (Phases 1 through 3), w/ R&R	247,311
Recycled Water Used (Phases 1 to 3) (AFY)	995
Frost Protection (AFY)	142
Irrigation (AFY)	854
Potable Water Offset (Phases 1 to 3) (AFY)	22
Capital Cost Escalation	0%
O&M Cost Escalation	0%
Interest Rate	0%
Include Annual Rate Increase?	(●) Yes ( ) No
Annual Service Charge Rate Increase	2.5%
Recycled Water Rate ($/AF)	$12.37

Loan/Debt Assumptions

SRF Loan (Check Box if Yes)	☐ Yes
Debt Term	30
Interest Rate	5.0%
Annual Debt Service	
Phase 1	324,000
Phase 2	456,000
Phase 3	399,000
Phase 4 (Optional)	417,000
Payments Over Duration of Debt	$47,880,000

Capital Costs	Cost	Start Year
Phase 1	4,975,300	2015
Phase 2	7,013,120	2020
Phase 3	6,128,680	2025
Phase 4 (Optional)	6,416,800	2030

O&M Costs (1)	Treatment	Distribution
Unit Cost	$12.37	
Phase 1	4,995	$47,500
Phase 2	2,661	$22,500
Phase 3	4,655	$30,000
Phase 4 (Optional)	4,708	$50,000
Recycled Water Operations (Phases 1 to 3)	12,311	100,000
Inspection Personnel (0.25 FTE)	25,000	
Metering and Meter Reading (0.25 FTE)	25,000	
System Cleaning and Maintenance (0.25 FTE)	25,000	
Billing Support	5,000	
Public Outreach	5,000	
		85,000
Repair and Replacement (2)	50,000	

Percentage Variable (Phases 1 to 3) 45.4%

Notes:
(1) Assumes Full Time Equivalent (FTE) = $100,000 per year for salary and benefits.
(2) A repair and replacement reserve of $50,000 per year is estimated per year over the duration of the project.

City of Ukiah
Recycled Water
Feasibility Study
Cash Flow Forecast

Total Annual O&M (Phases 1 throug 247,311

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
	1	2	3	4	5	6	7	8	9	10	11	12	13
BEGINNING FUND BALANCE	$0	$0	$0	$0	$2,487,650	$0	$0	$0	$0	$3,506,560	$0	$0	$0
SOURCES OF FUNDS													
Wastewater Revenues (1)	-	-	-	-	324,000	505,702	505,558	505,409	505,257	961,101	1,117,611	1,117,360	1,117,102
Recycled Water Revenues	-	-	-	-	-	5,793	5,937	6,086	6,238	6,394	10,045	10,296	10,554
Loan Proceeds	-	-	-	4,975,300	-	-	-	-	7,013,120	-	-	-	-
Interest Income	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL SOURCES	$0	$0	$0	$4,975,300	$324,000	$511,495	$511,495	$511,495	$7,524,615	$967,495	$1,127,656	$1,127,656	$1,127,656
USES OF FUNDS													
O&M and R&R	$0	$0	$0	$0	$0	$187,495	$187,495	$187,495	$187,495	$187,495	$347,656	$347,656	$347,656
Debt Service	-	-	-	-	324,000	324,000	324,000	324,000	324,000	780,000	780,000	780,000	780,000
CIP Program	-	-	-	2,487,650	2,487,650	-	-	-	3,506,560	3,506,560	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL USES	$0	$0	$0	$2,487,650	$2,811,650	$511,495	$511,495	$511,495	$4,018,055	$4,474,055	$1,127,656	$1,127,656	$1,127,656
ENDING FUND BALANCE	$0	$0	$0	$2,487,650	$0	$0	$0	$0	$3,506,560	$0	$0	$0	$0

Notes:
(1) This cash flow analysis assumes that the annual amount collected for repayment of project costs will equal the annual debt service payment requirement.

Volume of Recycled Water Use	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Phase 1	0	0	0	0	0	404	404	404	404	404	404	404	404
Phase 2	0	0	0	0	0	0	0	0	0	0	215	215	215
Phase 3	0	0	0	0	0	0	0	0	0	0	0	0	0
Phase 4	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum of Phases 1 - 3	0	0	0	0	0	404	404	404	404	404	619	619	619

Project Phase Construction Cost	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Phase 1	$0	$0	$0	$2,487,650	$2,487,650	$0	$0	$0	$0	$0	$0	$0	$0
Phase 2	$0	$0	$0	$0	$0	$0	$0	$0	$3,506,560	$3,506,560	$0	$0	$0
Phase 3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Phase 4	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Sum of Phases 1 - 3	0	0	0	2,487,650	2,487,650	0	0	0	3,506,560	3,506,560	0	0	0

Loan Issuance	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Phase 1	$0	$0	$0	$4,975,300	$0	$0	$0	$0	$0	$0	$0	$0	$0

City of Ukiah
Recycled Water
Feasibility Study
Cash Flow Forecast

Total Annual O&M (Phases 1 throug 247,311

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Phase 2	$0	$0	$0	$0	$0	$0	$0	$0	$7,013,120	$0	$0	$0	$0
Phase 3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Phase 4	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Project Phase D/S	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**
Phase 1	$0	$0	$0	$0	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000
Phase 2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$456,000	$456,000	$456,000	$456,000
Phase 3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Phase 4	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

O&M Costs	**FY 2012**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**
Phase 1	$0	$0	$0	$0	$0	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495
Phase 2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$160,161	$160,161	$160,161
Phase 3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Phase 4	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Sum of Phases 1 - 3	0	0	0	0	0	187,495	187,495	187,495	187,495	187,495	347,656	347,656	347,656

City of Ukiah
Recycled Water
Feasibility Study
Cash Flow Forecast

Total Annual O&M (Phases 1 throug

	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037
	14	15	16	17	18	19	20	21	22	23	24	25	26
BEGINNING FUND BALANCE	$0	$3,064,340	$0	$0	$0	$0	$3,208,400	$0	$0	$0	$0	$0	$0
SOURCES OF FUNDS													
Wastewater Revenues (1)	1,116,838	1,515,568	1,678,035	1,677,579	1,677,110	1,676,630	2,093,138	2,274,434	2,273,720	2,272,987	2,272,237	2,271,467	2,270,678
Recycled Water Revenues	10,817	11,088	18,275	18,732	19,200	19,680	20,172	28,584	29,299	30,031	30,782	31,552	32,340
Loan Proceeds	6,128,680	-	-	-	-	6,416,800	-	-	-	-	-	-	-
Interest Income	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL SOURCES	$7,256,336	1,526,656	$1,696,311	$1,696,311	$1,696,311	$8,113,111	$2,113,311	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019
USES OF FUNDS													
O&M and R&R	$347,656	$347,656	$517,311	$517,311	$517,311	$517,311	$517,311	$707,019	$707,019	$707,019	$707,019	$707,019	$707,019
Debt Service	780,000	1,179,000	1,179,000	1,179,000	1,179,000	1,179,000	1,596,000	1,596,000	1,596,000	1,596,000	1,596,000	1,596,000	1,596,000
CIP Program	3,064,340	3,064,340	-	-	-	3,208,400	3,208,400	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL USES	$4,191,996	$4,590,996	$1,696,311	$1,696,311	$1,696,311	$4,904,711	$5,321,711	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019
ENDING FUND BALANCE	$3,064,340	$0	$0	$0	$0	$3,208,400	$0	$0	$0	$0	$0	$0	$0

Notes:
(1) This cash flow analysis assumes

Volume of Recycled Water Use	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**FY 2030**	**FY 2031**	**FY 2032**	**FY 2033**	**FY 2034**	**FY 2035**	**FY 2036**	**FY 2037**
Phase 1	404	404	404	404	404	404	404	404	404	404	404	404	404
Phase 2	215	215	215	215	215	215	215	215	215	215	215	215	215
Phase 3	0	0	376	376	376	376	376	376	376	376	376	376	376
Phase 4	0	0	0	0	0	0	0	381	381	381	381	381	381
Sum of Phases 1 - 3	619	619	995	995	995	995	995	995	995	995	995	995	995

Project Phase Construction Cost	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**FY 2030**	**FY 2031**	**FY 2032**	**FY 2033**	**FY 2034**	**FY 2035**	**FY 2036**	**FY 2037**
Phase 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Phase 2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Phase 3	$3,064,340	$3,064,340	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Phase 4	$0	$0	$0	$0	$0	$3,208,400	$3,208,400	$0	$0	$0	$0	$0	$0
Sum of Phases 1 - 3	3,064,340	3,064,340	0	0	0	0	0	0	0	0	0	0	0

Loan Issuance	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**FY 2030**	**FY 2031**	**FY 2032**	**FY 2033**	**FY 2034**	**FY 2035**	**FY 2036**	**FY 2037**
Phase 1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

City of Ukiah
Recycled Water
Feasibility Study
Cash Flow Forecast

Total Annual O&M (Phases 1 throug

	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037
Phase 2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Phase 3	$6,128,680	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Phase 4	$0	$0	$0	$0	$0	$6,416,800	$0	$0	$0	$0	$0	$0	$0

Project Phase D/S	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**FY 2030**	**FY 2031**	**FY 2032**	**FY 2033**	**FY 2034**	**FY 2035**	**FY 2036**	**FY 2037**
Phase 1	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000
Phase 2	$456,000	$456,000	$456,000	$456,000	$456,000	$456,000	$456,000	$456,000	$456,000	$456,000	$456,000	$456,000	$456,000
Phase 3	$0	$399,000	$399,000	$399,000	$399,000	$399,000	$399,000	$399,000	$399,000	$399,000	$399,000	$399,000	$399,000
Phase 4	$0	$0	$0	$0	$0	$0	$417,000	$417,000	$417,000	$417,000	$417,000	$417,000	$417,000

O&M Costs	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**FY 2030**	**FY 2031**	**FY 2032**	**FY 2033**	**FY 2034**	**FY 2035**	**FY 2036**	**FY 2037**
Phase 1	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495
Phase 2	$160,161	$160,161	$160,161	$160,161	$160,161	$160,161	$160,161	$160,161	$160,161	$160,161	$160,161	$160,161	$160,161
Phase 3	$0	$0	$169,655	$169,655	$169,655	$169,655	$169,655	$169,655	$169,655	$169,655	$169,655	$169,655	$169,655
Phase 4	$0	$0	$0	$0	$0	$0	$0	$189,708	$189,708	$189,708	$189,708	$189,708	$189,708
Sum of Phases 1 - 3	347,656	347,656	517,311	517,311	517,311	517,311	517,311	517,311	517,311	517,311	517,311	517,311	517,311

City of Ukiah
Recycled Water
Feasibility Study
Cash Flow Forecast

Total Annual O&M (Phases 1 throug

	FY 2038	FY 2039	FY 2040	FY 2041	FY 2042	FY 2043	FY 2044	FY 2045
	27	28	29	30	31	32	33	34
BEGINNING FUND BALANCE	$0	$0	$0	$0	$0	$0	$0	$0
SOURCES OF FUNDS								
Wastewater Revenues (1)	2,269,870	2,269,041	2,268,192	2,267,321	2,266,428	2,265,514	2,264,576	2,263,615
Recycled Water Revenues	33,149	33,978	34,827	35,698	36,590	37,505	38,443	39,404
Loan Proceeds	-	-	-	-	-	-	-	-
Interest Income	-	-	-	-	-	-	-	-
TOTAL SOURCES	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019
USES OF FUNDS								
O&M and R&R	$707,019	$707,019	$707,019	$707,019	$707,019	$707,019	$707,019	$707,019
Debt Service	1,596,000	1,596,000	1,596,000	1,596,000	1,596,000	1,596,000	1,596,000	1,596,000
CIP Program	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-
TOTAL USES	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019	$2,303,019
ENDING FUND BALANCE	$0	$0	$0	$0	$0	$0	$0	$0

Notes:
(1) This cash flow analysis assumes

Volume of Recycled Water Use	**FY 2038**	**FY 2039**	**FY 2040**	**FY 2041**	**FY 2042**	**FY 2043**	**FY 2044**	**FY 2045**
Phase 1	404	404	404	404	404	404	404	404
Phase 2	215	215	215	215	215	215	215	215
Phase 3	376	376	376	376	376	376	376	376
Phase 4	381	381	381	381	381	381	381	381
Sum of Phases 1 - 3	995	995	995	995	995	995	995	995

Project Phase Construction Cost	**FY 2038**	**FY 2039**	**FY 2040**	**FY 2041**	**FY 2042**	**FY 2043**	**FY 2044**	**FY 2045**
Phase 1	$0	$0	$0	$0	$0	$0	$0	$0
Phase 2	$0	$0	$0	$0	$0	$0	$0	$0
Phase 3	$0	$0	$0	$0	$0	$0	$0	$0
Phase 4	$0	$0	$0	$0	$0	$0	$0	$0
Sum of Phases 1 - 3	0	0	0	0	0	0	0	0

Loan Issuance	**FY 2038**	**FY 2039**	**FY 2040**	**FY 2041**	**FY 2042**	**FY 2043**	**FY 2044**	**FY 2045**
Phase 1	$0	$0	$0	$0	$0	$0	$0	$0

City of Ukiah
Recycled Water
Feasibility Study
Cash Flow Forecast

Total Annual O&M (Phases 1 throug

	FY 2038	FY 2039	FY 2040	FY 2041	FY 2042	FY 2043	FY 2044	FY 2045
Phase 2	$0	$0	$0	$0	$0	$0	$0	$0
Phase 3	$0	$0	$0	$0	$0	$0	$0	$0
Phase 4	$0	$0	$0	$0	$0	$0	$0	$0

Project Phase D/S	**FY 2038**	**FY 2039**	**FY 2040**	**FY 2041**	**FY 2042**	**FY 2043**	**FY 2044**	**FY 2045**
Phase 1	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000	$324,000
Phase 2	$456,000	$456,000	$456,000	$456,000	$456,000	$456,000	$456,000	$456,000
Phase 3	$399,000	$399,000	$399,000	$399,000	$399,000	$399,000	$399,000	$399,000
Phase 4	$417,000	$417,000	$417,000	$417,000	$417,000	$417,000	$417,000	$417,000

O&M Costs	**FY 2038**	**FY 2039**	**FY 2040**	**FY 2041**	**FY 2042**	**FY 2043**	**FY 2044**	**FY 2045**
Phase 1	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495	$187,495
Phase 2	$160,161	$160,161	$160,161	$160,161	$160,161	$160,161	$160,161	$160,161
Phase 3	$169,655	$169,655	$169,655	$169,655	$169,655	$169,655	$169,655	$169,655
Phase 4	$189,708	$189,708	$189,708	$189,708	$189,708	$189,708	$189,708	$189,708
Sum of Phases 1 - 3	517,311	517,311	517,311	517,311	517,311	517,311	517,311	517,311

City of Ukiah
Recycled Water
Feasibility Study
Recycled Water Price

Total Annual D/S (Phases 1 through 3)	$1,179,000
Total Annual O&M (Phases 1 through 3), w/ R&R	$247,311
Annual Recycled Water Consumption	995
Total Price per Acre-Foot	$1,430
Total Price per hcf	$3.28

Allocation to Potable Water

Potable Water Offset	22
Total Potable Water Demand in 2035	5,217
Percentage of Water Portfolio	0.43%
Total Annual D/S	$1,179,000
Annual D/S Cost Allocated to Water	$0
Annual O&M and R&R Allocated to Water	$0
Unit Cost to Water per Acre-Foot	$0.00
Total Price per hcf	$0.00

Allocation to Wastewater

Total Annual D/S	$1,179,000
Less: Allocation to Recycled Water	$0
Less: Allocation to Potable Water	$0
Annual D/S Allocated to Wastewater	$1,179,000
Annual O&M and R&R Allocated to Wastewater	$235,000
Total Annual Cost Allocated to Wastewater	$1,414,000
Average Wastewater Flow Treated (AFY)	4,480
Unit Cost to Wastewater per Acre-Foot	$315.63
Total Price per hcf	$0.72

Allocation to Recycled Water

Total Annual D/S Allocated to Recycled Water	$0
Total Annual O&M and R&R Allocated to Recycled Water	$12,311
Total Cost Allocated to Recycled Water	$12,311
Annual Recycled Water Use (AF)	995
Unit Cost to Water per Acre-Foot	$12.37
Total Price per hcf	$0.03

For Comparison:

Full Pumping and Treatment Cost to RW ($/AF)	$112.85
Total Price per hcf	$0.26
Full O&M (w/o R&R) to RW ($/AF)	$198.26
Total Price per hcf	$0.46

Year 247,311	Reclaimed Water Sales, AF	Design & Construc-tion Cost $ /a/	O&M Costs, $		Salvage Value, $ /c/	Present Worth Factor at 4.6%	Present Worth of Costs, $					Recycled Water Sales AF
			Fixed /b/	Variable /b/			Design & Construc-tion Cost	O & M Costs		Salvage Value	Total	
								Fixed	Variable			
2012	-	-	-	-		1.00000	0	0	0		0	0
2013	-	-	-	-		0.95602	0	0	0		0	0
2014	-	-	-	-		0.91398	0	0	0		0	0
2015	-	2,487,650	-	-		0.87379	2,173,673	0	0		2,173,673	0
2016	-	2,487,650	-	-		0.83536	2,078,081	0	0		2,078,081	0
2017	404	-	102,348	85,147		0.79862	0	81,738	68,000		149,738	404
2018	404	-	102,348	85,147		0.76350	0	78,143	65,010		143,153	404
2019	404	-	102,348	85,147		0.72992	0	74,707	62,151		136,857	404
2020	404	3,506,560	102,348	85,147		0.69782	2,446,965	71,421	59,417		2,577,804	404
2021	404	3,506,560	102,348	85,147		0.66714	2,339,355	68,280	56,804		2,464,440	404
2022	619	-	189,776	157,880		0.63780	0	121,039	100,696		221,734	619
2023	619	-	189,776	157,880		0.60975	0	115,716	96,267		211,983	619
2024	619	-	189,776	157,880		0.58293	0	110,627	92,034		202,661	619
2025	619	3,064,340	189,776	157,880		0.55730	1,707,753	105,762	87,986		1,901,501	619
2026	619	3,064,340	189,776	157,880		0.53279	1,632,651	101,111	84,117		1,817,879	619
2027	995	-	282,386	234,925		0.50936	0	143,836	119,661		263,497	995
2028	995	-	282,386	234,925		0.48696	0	137,510	114,399		251,909	995
2029	995	-	282,386	234,925		0.46554	0	131,463	109,368		240,831	995
2030	995	-	282,386	234,925		0.44507	0	125,682	104,558		230,240	995
2031	995	-	282,386	234,925		0.42550	0	120,155	99,960		220,115	995
2032	995	-	282,386	234,925		0.40679	0	114,871	95,564		210,435	995
2033	995	-	282,386	234,925	289,874	0.38890	0	109,819	91,362	112,731	88,450	995
Total		18,117,100					12,378,479	1,811,877	1,507,356	112,731	15,584,981	12,080

Unit Cost ($/AF) = (Total present worth of costs)/(Total present worth of sales)= $1,300 per acre-foot

/a/ All costs adjusted to 2012 dollars

/b/ Assumed that fixed costs equals all costs except for the cost of water treatment and distribution.

/c/ Useful lives: Average useful life of 50 years assumed for the infrastructure. No salvage value for engineering, legal & administration costs which are assumed to equal 25% of the presented cost.

CURRENT AND PROPOSED WATER RATES (TABLE 1)

USE	Current	Proposed August 1, 2010	Proposed July 1, 2011	Proposed July 1, 2012	Proposed July 1, 2013	Proposed July 1, 2014
Consumption Rate ($/unit; 1 unit is 748 gallons						
Single Family Residential	$1.29	$1.92	$2.21	$2.41	$2.65	$2.73
All other customers	1.29	$1.92	$2.21	$2.41	$2.65	$2.73
Minimum base charge by: Meter Size/Class Description						
3/4" Meter	$15.24	$22.71	$26.11	$28.46	$31.31	$32.25
1" Meter	25.90	38.59	44.38	48.37	53.21	54.81
1 1/2" Meter	50.28	74.92	86.15	93.91	103.3	106.4
2" Meter	80.75	120.32	138.37	150.82	165.90	170.88
3" Meter	152.36	227.02	261.07	284.57	313.02	322.41
4" Meter	254.45	379.13	436.00	475.24	522.76	538.45
6" Meter	507.37	755.98	869.38	947.62	1,042.38	1,073.66
Fire Service 2" & Under	16.15	24.06	27.67	30.16	33.18	34.18
Fire Service 3" Meter	30.47	45.40	52.21	56.91	62.60	64.48
Fire Service 4" Meter	50.89	75.83	87.20	95.05	104.55	107.69
Fire Service 6" & Up	101.47	151.19	173.87	189.52	208.47	214.72

How Do I Calculate My New Water Rate

Basis of Proposed Rates: The proposed rates were designed to fairly and equitable recover the cost of providing water service from across all customer groups. The cost of providing service will be recovered through a fixed fee, called the **monthly service charge** and through a **consumption fee** that will apply to the amount of water you consume. The **monthly service charge** is determined by the meter size. The **monthly service charges** will increase across meter sizes as established by industry and regulatory standards.

Estimating your New Water Bill

The fixed fee (called a monthly service charge) and the consumption fee, that will apply to the amount of water you consume, may be estimated as follows:

Step 1: Find your monthly service charge—Your water meter size will determine your **Monthly Service Charge.** The Proposed Rate Table, located above, shows the proposed **Monthly Service Charge** for each meter size.

Step 2: Determine your level of consumption—You can find this information in your most recent water bill on the bottom right hand corner under water usage. The proposed consumption rates are listed at the top of the Proposed Rate Table located above.

Step 3: Estimate your new water bill—To calculate how much your new water bill will be, add your **monthly service charge** to your **consumption charge** (which is the number of units of water you consume multiplied by the per unit consumption fee).

The sample calculation on the right is for a single family home with a 3/4" meter and 11 units of consumption. Your monthly water bill will vary, depending on the number of units recorded on your meter each month.

Estimating your New Water Bill:

Sample calculation using rates effective August 1, 2010

Step 1: Monthly Service Charge
From the proposed water rate table above, determine the monthly service charge
3/4" meter = $22.71/month

Step 2: Consumption Charge
Assuming this family uses 11 units of water each month
11 units @ $1.92 per unit = $21.12/month

Step 3: Estimate you new bill

Monthly service charge:	$22.71
Consumption charge:	$21.12
Projected new bill:	$43.83

Sample calculation based on a single family home using 11 units of water per month.

Proposition 218 Notification
NOTICE TO PROPERTY OWNERS OF PUBLIC HEARING
ON PROPOSED WATER SERVICE RATE ADJUSTMENT
(Please share this information with tenants)

Hearing Date & Time: July 21, 2010 at 6:00PM or as soon thereafter as possible
Hearing Location: City of Ukiah, Council Chambers
300 Seminary Avenue, Ukiah, CA 95482

The hearing will cover the proposed 2010, 2011, 2012, 2013, and 2014 rate adjustment for water service. This notice has been sent to all customers who currently receive this service provided by the City of Ukiah. If adopted, the proposed rate adjustment will become effective for bills issued on or after August 1, 2010 and for bills issued on or after July 1, 2011, 2012, 2013, and 2014.

This Notice of Public Hearing provides information regarding the proposed rate adjustment to the City's water service customers pursuant to the requirements of California Constitution Article XIII D Section 6 (commonly referred to as Proposition 218). The proposed rate adjustment will be presented to the City Council for adoption on July 21, 2010, at 6:00 p.m. in the Council Chambers. This notice also provides information on how rates are calculated, the reasons for the required rate adjustment, how customers can receive more information on the effect of the proposed rate adjustment on their water bill and how to file a protest against the proposed rate adjustment.

Annually the City prepares an analysis of the revenues and expenditures for the Water enterprise to ensure sufficient revenues are collected to effectively provide for the short and long-term water service needs of the community. Revenues received from water charges are restricted solely for these purposes.

HOW WATER RATES ARE CALCULATED:

Multi-Year Rate Setting Strategy—The in-depth analysis that is conducted include a minimum five-year look ahead at operating and capital program costs in order to adequately prepare the funds for upcoming expenses and avoid significant unexpected increases in rates. To achieve planned service goals, incremental rate increases over a number of years are the preferred method for ensuring rate stability. Table 1 of this notice shows the proposed rates. The proposed rates are consistent with the approach taken five years ago when the current rate schedule was adopted.

Rates Based on Customer Usage Choices - Under the City's water rate structure, bills are based on customer usage choices and resulting demand on the water system. The City has a two component water rate—a minimum base charge and a service charge based on the volume of water used.

WHAT ACTION HAS BEEN TAKEN TO CONTROL COSTS:

Keeping costs down is one of our main concerns, especially during these difficult economic times. The City has used layoffs, furloughs and salary reductions to reduce expenditures in all operations. Water operations are an independent business. Expenditures and revenues must balance. The City, including the employees in the Water Department, have worked to minimize costs, budgeting and examining the amount of each expense from scratch with no assumed increases.

Some costs, such as for the electrical power needed to run treatment plant and pumps have increased. However, quantities for disinfectant and process chemicals have decreased. These cost control measures must be delicately balanced against the ever increasing requirements from the State of California. Though at times the new requirements seem onerous, they are all ultimately intended to protect the water quality in our Valley.

Concerns, Please Contact Us For More Information:

If you have questions or comments about the proposed water rate adjustment or wish to protest, you may:
Address The Council: Attend the Public Hearing on July 21, 2010
Telephone: (707) 463-6217
Write: 300 Seminary Avenue, Ukiah, CA 95482
Protests against the proposal must be submitted in writing, identify the property by street address or Mendocino County Assessor's Parcel Number, the owner(s) of the property, and include the signature(s) of the property owner(s). The term "owner" includes tenants who are responsible for paying the monthly water bill. If written protests against the proposed increases in the fee for water service are filed at or prior to the hearing by a majority of the affected property owners, the City Council will not approve the increases.