CITY OF LODI

2015 Urban Water Management Plan

JUNE 2016

RMC water and environment

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City of Lodi 2015
Urban Water Management Plan
Final

Prepared by:

June 2016

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List of Acronyms and Abbreviations

AB	Assembly Bill
Act	Urban Water Management Planning Act
AF	acre-feet
AFY	acre-feet per year
AWWA	American Water Works Association
BMP	best management practice
CASGEM	California Statewide Groundwater Elevation Monitoring
CWC	California Water Code
City	City of Lodi
DBCP	dibromochloropropane
DMMs	Demand Management Measures
DOF	Department of Finance
DWR	California Department of Water Resources
EBMUD	East Bay Municipal Utilities District
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ESJGWMP	Eastern San Joaquin Groundwater Management Plan
ESJIRWMP	2014 Eastern San Joaquin Integrated Regional Water Management Plan
ETo	reference evapotranspiration
FY	fiscal year
GAC	granular activated carbon
GBA	Eastern San Joaquin County Groundwater Basin Authority
GPCD	gallons per capita per day
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
IRWM	Integrated Regional Water Management
IRWMP	Integrated Regional Water Management Plan
kWh	kilowatt hour
LEC	Lodi Energy Center
MAC	Mokelumne-Amador-Calaveras
MCL	Maximum Contaminant Level
MGD	million gallons per day
mg/L	milligrams per liter
MokeWISE	Mokelumne Watershed Interregional Sustainability Evaluation

MSL	mean sea level
MTBE	methyl-tert-butyl-ether
NCPA	Northern California Power Agency
NPDES	National Pollutant Discharge Elimination System
NSJWCD	North San Joaquin Water Conservation District
PCE	tetrachloroethylene
PWS	Public Water System
RWMP	Recycled Water Master Plan
SB	Senate Bill
SGMA	Sustainable Groundwater Management Act
SJCOG	San Joaquin Council of Governments
SJCFCWCD	San Joaquin County Flood Control and Water Conservation District
STIG	steam injected gas turbine
SWTP	Lodi Surface Water Treatment Plant
TCE	trichloroethylene
TDS	total dissolved solids
UWMP	Urban Water Management Plan
UMRWA	Upper Mokelumne River Watershed Authority
WID	Woodbridge Irrigation District
WSCP	Water Shortage Contingency Plan
WWTP	White Slough Water Pollution Control Facility

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Chapter 1 Introduction and Overview

This City of Lodi (City) 2015 Urban Water Management Plan (UWMP) was prepared in compliance with the Urban Water Management Planning Act, as amended by Assembly Bills 2661, 1869, 11X, and 2067; Senate Bills 1420 and 1036; and the Water Conservation Act of 2009. The City's 2015 UWMP includes all information necessary to meet the requirements of California Water Code (CWC), Division 6, Part 2.6.

1.1 Background and Purpose

The City currently serves 26,357 municipal connections and delivers approximately 14,258 acre-feet (AF) to its customers. In accordance with the CWC, the City is considered an urban water supplier and is required to prepare an UWMP every five years. The City completed a 2010 UWMP and has been preparing an UWMP every five years since 1990. The 2015 UWMP meets the CWC requirements and applicable laws outlined below.

1.2 Urban Water Management Planning and the California Water Code

This section summarizes the CWC sections applicable to UWMPs, changes to the code since 2010 UWMPs, and the Water Conservation Act of 2009.

1.2.1 Urban Water Management Planning Act

The Urban Water Management Planning Act (Act) was created by Assembly Bill 797 (AB 797), which was signed into law by Governor Deukmejian on September 21, 1983. The Act requires that urban water suppliers (i.e., municipal water suppliers providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 AF annually) prepare and adopt UWMPs containing certain specified elements. The Act was amended by Assembly Bill 2661 (AB 2661), which was signed into law by Governor Deukmejian on July 18, 1990. AB 2661 deleted the January 1, 1991 termination date specified in AB 797. AB 2661 also expanded the elements which are to be addressed in UWMPs.

The Act was also amended by Assembly Bill (AB) 1869, which was signed by Governor Wilson on October 13, 1991. AB 1869 requires that urban water suppliers update (not just review) UWMPs every five years to include projections of both potable and recycled water use, identify current reclamation practices, address additional alternative conservation measures, and describe findings, actions, and planning related to a number of water conservation and reclamation measures. The Act was further amended by AB 11X, signed by Governor Wilson on October 13, 1991. AB 11X requires that urban water suppliers prepare a Water Shortage Contingency Plan as an amendment to its UWMP. Water Shortage Contingency Plans must be updated every five years and specify proposed measures for response to short-term and long-term water shortages.

1.2.2 Applicable Changes to the Water Code since 2010 UWMPs

Since the 2010 UWMP, the Act was amended by AB 2067 and Senate Bill (SB) 1420, both signed by Governor Brown on September 19, 2014. AB 2067 requires that each urban water supplier submit its 2015 plan to the California Department of Water Resources (DWR) by July 1, 2016, and also expands the requirements for water demand management measures, including requiring retail water suppliers to discuss each measure implemented over the past 5 years and those planned for the future to help achieve water use targets. SB 1420 requires that plans be submitted electronically, include standardized forms and/or tables specified by DWR, include quantification and reporting on distribution system water loss, and, when available, have water use projections account for estimated water savings from adopted codes, standards, ordinances, or transportation and land use plans.

Another Senate Bill, SB 1036, also signed by Governor Brown on September 19, 2014, stipulates that urban water suppliers should include certain energy-related information (e.g., an estimate of the amount of energy used to extract or divert water supplies).

1.2.3 Water Conservation Act of 2009 (SB X7-7)

On November 10, 2009, the state legislature passed the Water Conservation Bill of 2009 (also referred to as SB X7-7) as a water conservation component to the Delta legislative package. The bill seeks a 20 percent statewide reduction in urban per capita water use in California by December 31, 2020. SB X7-7 required that each retail agency preparing a 2010 UWMP calculate baseline per capita water use as well as an interim (to be met in the 2015 UWMP) and final (for 2020) water use reduction targets. The methodologies used to calculate both the baseline per capita water use and targets were outlined in the 2010 UWMP guidelines, published by DWR in March 2011.

1.3 UWMP and Other Planning Efforts

In addition to the City's UWMP preparation efforts, the City is actively involved in other regional efforts regarding water supply planning and groundwater basin management. The City participated in completion of the Eastern San Joaquin Groundwater Basin Groundwater Management Plan (ESJGWMP) and the 2014 Eastern San Joaquin Integrated Regional Water Management Plan (ESJIRWMP), as described briefly below.

1.3.1 Groundwater Management Plan

Historically, the City has relied entirely on groundwater to meet its water demands. Currently, the City uses groundwater and surface water, with groundwater as the primary source of supply. The City's service area overlies the Eastern San Joaquin Subbasin of the San Joaquin Valley Groundwater Basin. This groundwater basin is not adjudicated and is managed by the ESJGWMP, last updated and adopted in September 2004 by the Eastern San Joaquin County Groundwater Basin Authority (GBA). Formed in 2001, the GBA is a regional collaborative effort to collectively work to improve groundwater levels in Eastern San Joaquin County and to develop local projects that will improve water supply reliability.

The completion of the ESJGWMP is one of the GBA's key accomplishments. The ESJGWMP covers the portions of the Eastern San Joaquin and Cosumnes Subbasins in San Joaquin County, and identifies several objectives for managing the basin with a focus on maintaining or enhancing groundwater levels and groundwater quality, protecting surface water quality and flows, and preventing land subsidence. As a member agency of the GBA, the City actively participates in the GBA activities and is included as part of the solution in meeting the ESJGWMP objectives. For instance, the City entered into a 40-year water purchase agreement with Woodbridge Irrigation District (WID) in 2003 to receive up to 6,000 acre-feet per year (AFY) of Mokelumne River water. In 2014, the City entered into an agreement with the North San Joaquin Water Conservation District (NSJWCD) to receive up to 1,000 AFY. These are examples of local projects and alliances that increase water supply reliability and benefit the groundwater basin by reducing reliance in groundwater.

1.3.2 Integrated Regional Water Management Plan

The GBA is the regional water management group responsible for the development and implementation of the 2014 ESJIRWMP for the Eastern San Joaquin IRWM Region. The ESJIRWMP defines and integrates key water management strategies and establishes a course of actions for the implementation of a comprehensive solution for water supplies in Eastern San Joaquin County. This comprehensive solution, called the Eastern San Joaquin Integrated Conjunctive Use Program, is a prioritized set of projects and actions that conjunctively manage surface water and groundwater supplies in a manner that ensures the social, economic, and environmental sustainability of this community.

As a member agency of the GBA, the City participated in the development and completion of the ESJIRWMP and identified local projects to improve water supply reliability. The transfer of WID's Mokelumne River water to the City in 2003 and the completion of the City's first surface water treatment plant in 2012 (with associated conveyance facilities necessary to deliver this water) are among the key progresses completed by the City through the regional IRWMP process. In addition, the City identified other water recycling and reuse projects as part of the IRWMP process.

1.4 UWMP Organization

This 2015 UWMP is organized in ten chapters listed below. The chapters are organized in the same order as recommended in the 2015 UWMP Guidebook.

Chapter 1 - Introduction and Overview provides an overview of the CWC sections applicable to the UWMPs and discusses the importance and extent of the City's water management planning efforts.

Chapter 2 - Plan Preparation provides information on the City's process for developing the UWMP, including efforts in coordination and outreach with other agencies in the region.

Chapter 3 - System Description describes the City's service area, and climate, the Public Water System(s), and the City's organizational structure and history.

Chapter 4 - System Water Use describes and quantifies the current and projected water uses within the City's service area.

Chapter 5 – SB X7-7 Baselines and Targets describes the methods the City used for calculating the baseline and target water consumption to demonstrate the City has achieved the 2015 interim water use target, and is on track for achieving the 2020 water use target.

Chapter 6 - System Supplies describes and quantifies the current and projected sources of water available to the City. This chapter also includes a description and quantification of potential recycled water uses and supply availability.

Chapter 7 - Water Supply Reliability Assessment describes the reliability of the City's water supply and projects the reliability out 20 years, for normal, single dry years and multiple dry years.

Chapter 8 - Water Shortage Contingency Planning provides the City's staged plan for dealing with water shortages, including a catastrophic supply interruption.

Chapter 9 - Demand Management Measures describes the City's efforts to promote conservation and to reduce demand on its water supply and addresses several demand management measures.

Chapter 10 - Plan Adoption, Submittal, and Implementation describes the steps taken to adopt and submit the UWMP and to make it publicly available. This chapter also includes a discussion of the City's plan to implement the UWMP.

A checklist of specific UWMP requirements was developed and is presented in **Appendix A** to indicate the location where the required element is addressed in the document.

1.5 Grant and Loan Eligibility

Beginning in 2016, retail water suppliers are required to comply with the water conservation requirements in SB X7-7 in order to be eligible for State water grants or loans. Retailer agencies are required to set targets and track progress toward decreasing daily per capita urban water use in their service area. Specifically, this means that agencies must meet their 2015 interim urban water use targets and report compliance in their 2015 UWMP.

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Chapter 2 Plan Preparation

This chapter provides information on the City's process for developing the 2015 UWMP, including efforts in coordination and outreach with other agencies in the region.

2.1 Basis for Preparing a Plan

The City currently serves 26,357 municipal connections and delivers approximately 14,258 AF to its customers (**Table 2-1**). In accordance with the CWC, the City is considered an urban water supplier and is required to prepare an UWMP every five years. The City prepared this 2015 UWMP as an update to its 2010 UWMP to provide the most up-to-date information. This document includes all the requirements of the UWMP and can be read as a stand-alone document. The 2015 UWMP standardized tables are included in the main body of the document, and all of the tables applicable to the City's UWMP are also presented in **Appendix B**.

As demonstrated by its past UWMPs, the City understands that water is a limited resource and that a long-term reliable supply of water is essential to protect the local and state economy. The City also recognizes that, while conservation and efficient use of water is a statewide concern, planning is best done at the local level. The 2015 UWMP, which updates the information in past plans, aids the City in ensuring a reliable supply of water sufficient for all desired uses.

2.1.1 Public Water System

The City is a public water system (PWS) in accordance with the CWC and the California Health and Safety Code. The service area of the City (i.e., city boundaries) is served by one PWS, as reported in **Table 2-1**.

Table 2-1: Public Water Systems (DWR Table 2-1)

Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015
3910004	City of Lodi	26,357	14,258
	TOTAL	26,357	14,258

2.2 2015 Planning and Compliance

The City prepared this 2015 UWMP as an individual retailer to report data solely within its service area (**Table 2-2**). The City coordinates with other water supply agencies in the region regarding water supply reliability and groundwater management activities, described in further detail in Section 2.4.

Table 2-2: Plan Identification (DWR Table 2-2)		
Select Only One	**Type of Plan**	
☑	**Individual UWMP**	
	☐	Water Supplier is also a member of a RUWMP
	☐	Water Supplier is also a member of a Regional Alliance
☐	**Regional Urban Water Management Plan (RUWMP)**	

2.3 Fiscal Year and Units of Measure

The City reports water volumes on a fiscal year (FY) basis consistently throughout the 2015 UWMP (**Table 2-3**). The City's fiscal year starts on July 1 and ends on June 30 of the following year. Therefore, 2015 represents the City's fiscal year from July 1, 2014 to June 30, 2015. Consistent with fiscal year reporting, the City presented the complete 2015 water supply data in **Table 2-1** based on records from July 1, 2014 to June 30, 2015.

In terms of the reporting units, the City reports all water volumes in units of AF consistently throughout the 2015 UWMP (**Table 2-3**).

Table 2-3: Agency Identification (DWR Table 2-3)	
Type of Agency	
☐	Agency is a wholesaler
☑	Agency is a retailer
Fiscal or Calendar Year	
☐	UWMP Tables Are in Calendar Years
☑	UWMP Tables Are in Fiscal Years
If Using Fiscal Years Provide Month and Date that the Fiscal Year Begins (mm/dd)	
07/01	
Units of Measure Used in UWMP	
Unit	AF

2.4 Coordination and Outreach

The City coordinates with other water agencies in the region regarding water supply planning, groundwater management, and the preparation of its UWMP, through its involvement in the GBA, including the ESJGWMP and ESJIRWMP.

2.4.1 Wholesale Coordination

The City is a retailer agency and does not receive water from a wholesaler. Therefore, the City does not coordinate with a wholesaler regarding water supply planning and is not required to complete DWR Table 2-4 of the 2015 UWMP. Therefore, DWR Table 2-4 is not included in the main body of the UWMP.

2.4.2 Coordination with Other Agencies and Community

In addition to the water supply planning efforts in the preparation of the UWMP, the City coordinates with other water agencies in the region for water supply planning and identifying local projects that would improve water supply reliability and benefit groundwater basin. The City's primary source of water is groundwater. In addition to its groundwater supply, the City entered into an agreement with two retail agencies to purchase surface water in order to reduce its reliance on groundwater. On April 16, 2003, the City Council approved a 40-year water sale agreement with WID to purchase up to 6,000 AFY of surface water from the Mokelumne River. Before completion of the Lodi Surface Water Treatment Plant (SWTP) in November 2012, this water was not utilized and 42,000 AF was allotted for future use as long as WID has excess supply. The City also entered into a water purchase agreement with the NSJWCD in October 2014 that took effect beginning October 2015. Under the agreement, the City can received up to 1,000 AF between October 15 and March 30 of each calendar year as long as NSJWCD has supply available. The agreement is in effect for five years with the possibility to renew for a total term not to exceed 40 years. These two surface water supply agreements are further discussed in Chapter 6.

Currently, groundwater is the main source of supply for the City's water distribution system and is extracted using 28 wells drawing from the San Joaquin Valley Groundwater Basin, specifically the Eastern San Joaquin Subbasin. The City is a member of the GBA[1]. Through involvement in the GBA, the City works with a number of water agencies in the surrounding area to develop regional solutions for groundwater management. The City coordinated the preparation of this UWMP with the GBA through notification of the UWMP update in progress and by providing a copy of the draft 2015 UWMP for review. The GBA was sent a notice on December 14, 2015 that the UWMP was being updated, a copy of which is included in **Appendix C**.

By coordinating with neighboring water agencies through the GBA and the ESJIRWMP process, the City ensures that its groundwater supply needs, as outlined in this UWMP, will be incorporated into regional water planning and groundwater management efforts.

2.4.3 Notice to San Joaquin County

San Joaquin County was sent a notification letter that the 2015 UWMP was under preparation, as well as a letter with information about the draft 2015 UWMP and public hearing. The City's notification to the County is reported in Chapter 10 (**Table 10-1**). The notification that an UWMP update was in progress was sent on December 14, 2015, well in advance of the required 60 days prior to the UWMP public hearing, and a copy of the letter is included in **Appendix C**.

[1] Formerly the Northeastern San Joaquin County Groundwater Banking Authority. The GBA was renamed in October 2013 to better reflect its activities and goals.

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Chapter 3 System Description

This chapter provides a general description of the City's water supply system, including a description of the service area, climate, and projected population.

3.1 General Description

The City of Lodi is located in the northern San Joaquin Valley in San Joaquin County and borders the Mokelumne River. The bulk of the City's geographical area extends from the Mokelumne River to the north, from WID's South Main Canal and Lower Sacramento Road to the west, from Harney Lane to the south, and from portions of Highway 99 and the Central California Traction Railroad to the east. The City's White Slough Water Pollution Control Facility (WWTP) lies approximately six miles to the southwest of the City. The SWTP began operation in November 2012 and is located near Lodi Lake on four acres of City-owned property.

The City of Lodi Water Utility is the sole water purveyor for the City. The City's water service area is contiguous with City boundaries and covers approximately 12 square miles. There are a few minor connections outside the City. The service area includes a mix of residential, commercial, and industrial land use, and is characterized by an essentially flat terrain. The City's General Plan, adopted in April 2010, provides a more detail description of the land use in the service area (City of Lodi, 2010). Based on the City's current planning information, the City has two future urban development projects: Vintner's Square and Rose Gate II. Both of these new developments include residential housing units west of Lower Sacramento Road between West Turner Road and West Kettleman Lane (i.e., on the west side of the City's present service area).

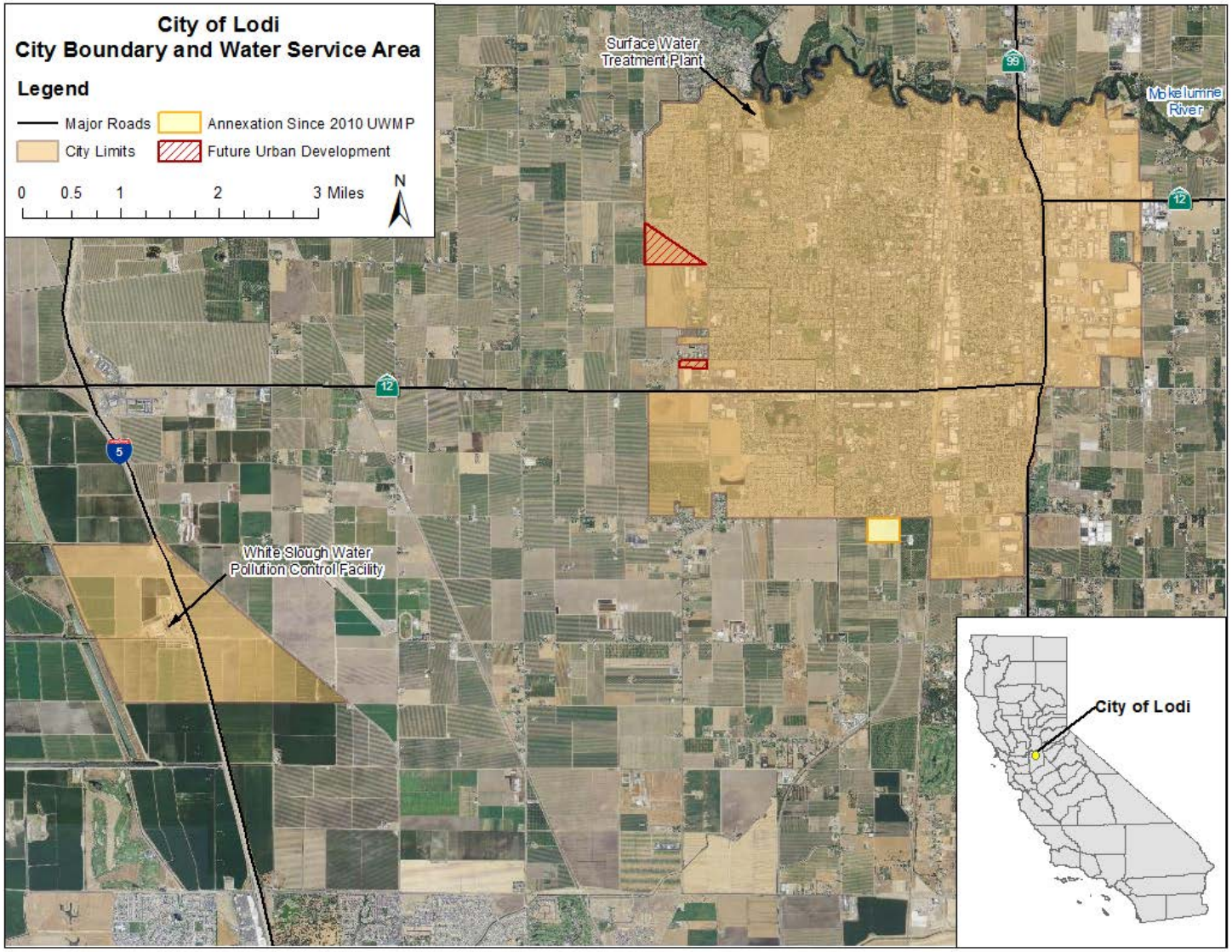
The City provides a small volume of water to Sunnyside Estates, which is located outside of the City boundary but within the General Plan boundary, just north of Harney Lane on the east side of Lower Sacramento Road. The City has been providing a small volume of water to Sunnyside Estates for potable use since 2002 through an agreement between the City and San Joaquin County Department of Public Works. Over the past year, approximately 15 AF of water (5 million gallons) was supplied to Sunnyside Estates. Even though the City sells water to Sunnyside Estates outside of the City service area, the volume of water is small and well below the reporting threshold of 3,000 AFY for the City to be considered a wholesale supplier.

The City Council consists of five members elected at-large by voters in November of even-numbered years. Each year, the Mayor and Mayor Pro Tempore are chosen by the City Council members. The Mayor presides at Council meetings and acts as the ceremonial head of the City. The Mayor Pro Tempore serves as Mayor in the absence of the Mayor.

3.2 Service Area Boundary Map

The City's service area is contiguous with the City boundaries and has undergone small changes since the 2010 UWMP, with one annexation area totaling approximately 32.5 acres. The WWTP and its adjacent City-owned land is also a part of City limits. The City boundaries with the new annexation and the future urban development areas are shown in **Figure 3-1**.

Figure 3-1: City Boundary and Water Service Area



3.3 Service Area Climate

The City typically has cool, humid winters and hot, dry summers. Temperatures average 60°F annually, ranging from average winter morning lows in the upper 30's °F to average summer afternoon highs in the upper 80's °F or low 90's °F. During summer months, temperatures may exceed 100˚F, affecting water demands significantly. Annual rainfall averages approximately 17 inches, with most rainfall occurring between November and April (Western Regional Climate Center, 2015). Relative humidity ranges from about 96 percent in winter months to 38 percent in summer months. The combination of warmer temperatures and low precipitation during the summer results in peak water demands during that period. Reference evapotranspiration (ETo) values, which serve as indicators of how much water is required to maintain healthy agriculture and landscaping, range from 0.94 inches during December to 7.47 inches in July (California Irrigation Management Information System, 2015). Temperature, rainfall, and evapotranspiration averages for the City are presented in **Table 3-1**.

Table 3-1: Monthly Average Climate Data Summary

Month	Standard Monthly Average ETo (inches)	Average Total Rainfall (inches)	Average Temperature (°F)	
			Maximum	Minimum
January	1.1	3.43	53.9	37.4
February	1.77	2.94	60.4	39.8
March	3.37	2.71	65.7	41.8
April	4.81	1.31	72.5	44.5
May	6.36	0.6	79.4	49
June	7.3	0.15	86.6	53.2
July	7.47	0.03	91.5	55.6
August	6.6	0.04	90	54.4
September	4.87	0.26	86.5	52.2
October	3.13	0.93	77.4	46.6
November	1.53	1.93	64.5	40.2
December	0.94	2.92	54.5	36.9

NOTES: Average ETo from California Irrigation Management Information System (CIMIS). Average Total Rainfall and Temperatures from the Western Regional Climate Center.

3.3.1 Climate Change

As recommended in the 2015 UWMP Guidebook, the City evaluated the vulnerabilities to climate change qualitatively as part of this UWMP and completed the IRWM Climate Change Vulnerability Assessment presented in **Appendix D**. A narrative summary of potential climate change impacts on the City's water demand and water supply is included in Section 4.6 and Section 6.10, respectively. **Appendix D** includes a narrative summary of identified vulnerabilities of climate change on other categories, including sea level rise, flooding, ecosystem and habitat vulnerability, and hydropower. A model detail assessment of climate change in the San Joaquin County region has been recently completed as part of the IRWMP.

3.4 Service Area Population and Demographics

Currently, the City's population is 63,719 (Department of Finance, 2015). The City's 2015 assumed annual population growth rate is the same as in the 2010 UWMP or 1.0 percent. This assumption is supported by the following data:

- Annual growth rate for the City between 2010 and 2015 ranged from 0.34 to 0.87 percent with a growth rate of 0.35 percent from 2014 to 2015 (Department of Finance, 2015).
- A San Joaquin Council of Governments' staff report from December 2009 shows population projections every five years through 2035. This report assumes a growth rate of less than 1.0 percent each year, with an average of approximately 0.8 percent (San Joaquin Council of Governments, 2009).
- The Draft 2035 San Joaquin County General Plan assumes an average annual growth rate of 1.1 percent for Lodi for forecasting the City's population from 2010 through 2030 (San Joaquin County, 2014).

The City considers its projection of 1.0 percent growth to be a conservative estimate that is also consistent with the Housing Element of the City's General Plan updated in October 2015 and presently in draft form (City of Lodi, 2015). Population projections from 2015 to 2040 are presented in **Table 3-2**.

Table 3-2: Population - Current and Projected (DWR Table 3-1)

	2015	2020	2025	2030	2035	2040
Population Served	63,719	66,969	70,385	73,976	77,749	81,715

NOTES: Department of Finance population estimate for 2015 population. 2020-2040 projections assume 1.0 percent annual growth rate.

3.4.1 Other Demographics

The City's residential land use is relatively uniform and the 2010 General Plan continues to follow the existing trend, with additional future residential developments and increased population (that is not anticipated large-scale industrial development). Therefore, future water use trends are anticipated to be similar to current trends. Most existing housing units in the City fall under the category of low-density residential with single-family residential at densities of 2 to 8 units per acre. The majority of new residential development will be built within this density range (City of Lodi, 2010). Medium-density residential, with 8 to 20 units per acre, exists to a smaller degree in the eastern neighborhoods. Within new growth areas, medium-density residential is planned between single-family neighborhoods and higher density housing, providing a smooth transition between different land uses. High-density residential (15 to 35 units per acre) is generally dispersed near downtown while industrial activities tend to be clustered on the east side of the City.

Chapter 4 System Water Use

This chapter describes and quantifies the City's current water use and future water use projections through the year 2040 as based on currently available information. Water demand projections provide the basis for sizing and staging future water supply facilities. Water use and production records, combined with projections of population and urban development, provide the basis for estimating future water requirements. This chapter describes the City's potable water demand and also reports on the raw water demand for the year 2015. The following presents a summary of available demographic and water use data and the resulting projections of future water needs for the City.

4.1 Overview of Water Use

Records of historical water production were obtained from the City's Public Works Department. Water production is the volume of water measured at the source (i.e., SWTP outflows and City groundwater wells), and includes all water delivered to residential, city, commercial, industrial, and landscape connections, as well as unaccounted-for water. All of the City's water came from groundwater wells before November 2012 (FY 2013) when the SWTP came online; the SWTP presently provides, on average, a little over 25 percent of the annual water production.

Monthly water demand fluctuates throughout the year, primarily due to seasonal climate changes, and water demands are therefore generally higher in the summer than the winter. Residential use makes up a little over half of water demand within the City (approximately 53 percent in 2015), with commercial accounts close behind at 43 percent in 2015, and the remaining 4 percent distributed among city, industrial, and landscape accounts. In the context of this UWMP, the terms "water use" and "water demand" are used interchangeably.

4.2 Water Uses by Sector

The City's only sources of water supply are from groundwater wells and surface water processed at the SWTP. The change in storage within the system has not changed on an annual basis since the SWTP came online, so the total amount of water produced should be equal to all water delivered to residential (single family and multi-family), commercial, industrial, and public service (i.e., city and landscape) connections, as well as unaccounted-for water.

In 2015, half of the accounts the City delivers water to remain unmetered and consist of residential, city, and commercial customers. The City began a Water Meter Program in 2010 to ensure the metering of all residential accounts by 2019 and will also implement usage-based water bills for all accounts soon after meter installation. Commercial and city accounts are also expected to be completely metered within that same time frame. All industrial and landscape (i.e., all City-owned parks and green areas) accounts are metered. **Table 4-1** summarizes the number of metered and unmetered accounts in the City in 2015.

Table 4-1: City Accounts at the end of FY 2015

Customer Class	Unmetered Accounts	Metered Accounts	Total
Single Family	6,162	11,213	17,375
Multi-family	5,469	498	5,967
Commercial	1,612	1,240	2,852
Industrial	0	18	18
City	7	115	122
Landscape	0	23	23
TOTAL	13,250	13,107	26,357

Overall water use for all these accounts can only be estimated as not all of the City's residential, city, and commercial customers are currently metered. Water usage estimates for unmetered accounts were based on 2015 metered data and overall 2015 water usage measured as production volumes. To estimate the distribution of water use by customer class, currently unmetered city and commercial customers were assumed to use water at the same rate as metered commercial customers. Unmetered single family residential customers are assumed to use 10 percent less water than metered single family customers. This is based on the City's analysis that most of the unmetered single family accounts are older homes with much smaller lot sizes than the newer, metered developments. Since outdoor residential water use accounts for a large portion of residential water demand (estimates of approximately 50 percent or more), houses with smaller lots are expected to use less water than houses with larger lots, even if those larger lot homes are newer with more water efficiency built-in (Pacific Institute, 2003). Multi-family residential customers are assumed to use water at 75 percent of the rate of single family residential customers. These simplifying assumptions for unmetered accounts are consistent with assumptions made in the 2010 UWMP. Estimated unmetered demand and measured (i.e., metered) water use for each customer class is summed together and shown in **Table 4-2**, where city accounts are shown as institutional/governmental.

The City sells a small volume of water to Sunnyside Estates, just outside of the City's service area, but the volume of water (approximately 15 AFY) is well below the wholesaler threshold of 3,000 AFY. Therefore, the City is not considered a wholesaler and is not required to complete the wholesaler standardized tables. The water delivered to Sunnyside Estates is measured at the source (i.e., groundwater wells and SWTP). Deliveries to Sunnyside Estates are not separated out in **Table 4-2** and **Table 4-3** below and are included as part of the residential deliveries. The City does not currently sell water to any other agency, nor, at the present time, does the City foresee any opportunities for sales to other agencies.

Table 4-2 shows actual demands for the City's potable and raw water as can best be determined as described above with regards to unmetered water use. The recycled water used in the vicinity of the WWTP, discussed in detail in Chapter 6, is not included as a water demand since it is not replacing water that would have otherwise been provided by the City. Water loss is described in detail in Section 4.3 and is included in **Table 4-2**. Water loss was calculated as a negative value using the methodology recommended for the 2015 UWMP. The negative value occurred because the water demand total exceeded the water supply total. The City is confident that its water production numbers are accurate, and the methodology for estimating unmetered water use (which includes about half of the accounts supplied by the City) is sound and based on industry-accepted practices and assumptions. The City intends to keep a close watch on total metered water use as all accounts are metered through 2019.

Table 4-2: Demands for Potable and Raw Water – Actual (DWR Table 4-1)			
Use Type	2015 Actual (AF)		
	Additional Description	Level of Treatment When Delivered	Volume
Single Family	Metered and unmetered accounts	Drinking Water	6,201
Multi-Family	Metered and unmetered accounts	Drinking Water	1,504
Commercial	Metered and unmetered accounts	Drinking Water	6,274
Industrial	Metered accounts	Drinking Water	175
Institutional/Governmental	Metered and unmetered accounts	Drinking Water	268
Landscape	Metered accounts	Drinking Water	161
Losses	Calculated using AWWA software		503
		TOTAL	15,086

Future water demand estimates are based on the following assumptions:

1) A constant 1.0 percent annual increase in the number of service connections for each connection type (correlating to a similar annual increase in population);
2) Residential customer metering according to the City's Water Meter Program phasing schedule;
3) All commercial customers metered between 2015 and 2020; and
4) The City is successful in achieving its SB X7-7 targets through implementation of the water use reduction plan discussed in Chapter 5.

Future water demands were projected based on actual water use in 2015, as measured by production rates at the City's groundwater well sites and the SWTP. By 2040, average annual water demands are expected to have increased from current demands by approximately 26 percent, from about 14,500 AFY in 2015 to about 18,300 AFY in 2040. Demand projections by water use sector are presented in **Table 4-3**. Since the City anticipates being completed metered by 2020, all demand projections represent metered water use and use the same average water use per account multipliers calculated from 2015 metered water use.

The projections in **Table 4-3** represent normal (average) conditions, as actual water use varies based on a number of factors. For this reason, it is expected that there will be variations in the City's future water usage from what is predicted in the table below. Losses were projected by assuming the same percent of water loss in all future years.

Table 4-3: Demands for Potable and Raw Water – Projected (DWR Table 4-2)					
Use Type	Projected Water Use (AF)				
	2020	2025	2030	2035	2040
Single Family	6,046	6,355	6,681	7,025	7,384
Multi-Family	1,740	1,829	1,923	2,020	2,124
Commercial	6,596	6,932	7,286	7,656	8,048
Industrial	184	193	203	213	224
Institutional/Governmental	279	290	301	312	323
Landscape	169	178	187	196	206
Losses	518	544	572	601	632
TOTAL	15,532	16,322	17,153	18,023	18,941

Overall, the City expects to continue to grow steadily and see a steady rise in demand. As further discussed in later chapters, the City is committed to ensuring these demands can be met no matter the conditions in the future. These demands, both current and projected, are totaled in **Table 4-4**, along with the current and projected recycled water demands described in detail in Chapter 6. These demands together establish the City's total water demand.

Table 4-4: Total Water Demands (AF) (DWR Table 4-3)						
	2015	2020	2025	2030	2035	2040
Potable and Raw Water *From DWR Tables 4-1 and 4-2*	15,086	15,532	16,322	17,153	18,023	18,941
Recycled Water Demand *From DWR Table 6-4*	4,398	4,398	4,398	4,398	4,398	4,398
TOTAL WATER DEMAND	19,484	19,930	20,720	21,551	22,421	23,339

4.3 Distribution System Water Losses

Water losses, discussed briefly in the section above, were included in **Table 4-2** and projected for inclusion in **Table 4-3**. These losses were calculated using the DWR Water Audit Method, which uses the American Water Works Association (AWWA) Water Audit Software, a Microsoft Excel workbook included in **Appendix E**. As discussed above, the software calculates a negative number for water loss since the 2015 water demand was estimated to be larger than the water supply produced. Overall, the annual water loss is approximately 3.5 percent of total water produced at the SWTP and groundwater wells. This is slightly lower than losses estimated in the 2010 UWMP. The City believes that, as it becomes completed metered, water losses in the distribution system will be easier to track and amend. Since the estimated unmetered consumption in 2015 caused the water demands to be larger than the water production for that year, the water audit does not receive a high score based on AWWA's scoring methodology.

Table 4-5 shows the estimated distribution system water loss for the 12-month period from July 1, 2014 through June 30, 2015 (FY 2015) as determined using the water audit worksheet.

Table 4-5: 12 Month Water Loss Audit Reporting (DWR Table 4-4)	
Reporting Period Start Date	Volume of Water Loss* (AF)
07/2014	503
** Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet.*	
NOTES: The number in the AWWA worksheet is negative, as discussed further in the UWMP text.	

4.4 Estimating Future Water Savings

As shown in **Table 4-6**, passive savings include water savings from codes, standards, ordinances, or transportation and land use plans that affect new and future customers. These future water savings were not directly included in the average conditions water use projections in **Table 4-3**, though they indirectly are applied in assumptions about the City's water metering plans and other conservation measures to ensure SB X7-7 targets are met.

4.5 Water Use for Lower Income Households

The CWC Section 10631.1(a) requires suppliers to estimate projected water use for single-family and multi-family residential housing needed for lower income households, as identified in the Housing Element of the General Plan for the service area of the City (City of Lodi, 2015). This requirement does not require quantification of current water use by lower income households. Lower income refers to a household earning less than 80 percent of the annual median income for the area, as adjusted by household size. The 2015 Housing Element uses a median household income of $48,074, 80 percent of which is $38,459.

The San Joaquin Council of Governments (SJCOG)' Regional Housing Needs Plan for 2014-2023 provides data to estimate that about 39 percent of Lodi households qualify as lower income (SJCOG, 2014). The plan also allocates 1,931 future households to Lodi, about 710 of which are estimated to fall into the lower income bracket. Since the plan does not break down the housing need by housing type (single family vs. multi-family), the projected water demand for lower income housing was conservatively assumed to be the same as for 2015 single family residential metered customers. This estimate is considered conservative because multi-family residential housing uses less water on a per unit basis than single family housing. This demand is therefore already incorporated in overall demand projections in the UWMP, as shown in **Table 4-6**.

Table 4-6: Inclusion in Water Use Projections (DWR Table 4-5)	
Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook)	No
Are Lower Income Residential Demands Included In Projections?	No

4.6 Climate Change Impact on Demand

Changes of hydrology in the Lodi area as a result of climate change could lead to changes in water demand, both in quantities and patterns. The completed ESJIRWM Climate Change Vulnerability Assessment is presented in **Appendix D**. With respect to demand, potential impacts from climate change are summarized below:

- Increased temperature and evapotranspiration will result in increased domestic water use.
- Food processing industries in the City will require additional cooling as surface water temperature increases.
- While the City does not provide water to agriculture, increased evapotranspiration will increase agricultural water demand in the area.

Chapter 5 SB X7-7 Baselines and Targets

The Water Conservation Bill of 2009 requires individual retail water suppliers to set water conservation targets for 2015 and 2020 to support the overall state goal of reducing urban potable per capita water use by 20 percent by 2020. Individual supplier conservation targets must be determined using one of four methods that are based upon a baseline of use that is calculated using the specific guidelines described in DWR's *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use* (DWR, 2011).

In the 2010 UMWP, the City calculated its baselines and targets based on the requirements and methodologies at that time. In the 2015 UWMP, the City reported water use data on a fiscal year basis, as opposed to the calendar year basis used in the 2010 UWMP. Due to the switch to reporting data by fiscal year, the baselines and targets were recalculated in the 2015 UWMP to be consistent with the fiscal year data used throughout the UWMP and to incorporate 2010 Census data, as required by the 2015 Guidebook. In the 2015 UWMP, the City confirms its water use targets, demonstrates compliance with its water use target for the year 2015, and shows that the City is on track to achieve its 2020 target.

5.1 Updating Calculations from 2010 UWMP

In the 2015 UWMP, the City updated the baselines and targets from the 2010 UWMP. The data and methodology used and the updated baselines and targets are described in the following sections.

5.1.1 Update of Target Method

In the 2010 UWMP, the City calculated a 2020 Urban Water Use Target using Method 1, or a 20 percent reduction from the baseline daily per capita water use. In the 2015 UWMP, the City re-evaluated the methods and chose again to use Method 1, as explained further below in Section 5.6.1.

5.1.2 Use of 2010 Census Data

In the 2010 UWMP, the City used the population of 63,549 for the year 2010 based on the Department of Finance's (DOF) projection for 2010 population and a population of 57,011 for the year 2000. Based on actual decennial U.S. Census data, the City's population is reported to be 62,134 for 2010 and 56,999 for 2000. For both 2010 and 2000, the actual Census population numbers are slightly smaller than the DOF projections. As a result of this discrepancy, the City recalculated the baseline population for the 2015 UWMP using the 2000 and 2010 Census data. This resulted in a modified baseline and target in the 2015 UWMP from what was originally proposed in the 2010 UWMP.

5.1.3 SB X7-7 Verification Form

The City showed the data behind the baseline calculations and demonstrated compliance with the recalculated water use target by completing the standardized tables of the SB X7-7 Verification Form. The complete SB X7-7 Verification Form is included in **Appendix F**.

5.2 Baseline Periods

The City used a 10-year baseline period for the 2010 and 2015 UMWPs due to a recycled water delivery of zero in 2008, per DWR's methodology. The 2010 UMWP used calendar years 1997–2006 for the 10-year baseline period to develop the baseline per capita water usage. In the 2015 UWMP, as a result of the changes to the population estimates and the conversion from calendar year to fiscal year reporting, the City re-selected the baseline period and chose FY 1999–FY 2008 for the 10-year baseline period.

For the 5-year baseline period, the City used calendar years 2004–2008 in the 2010 UWMP. Even with different population estimates and the switch to fiscal year, the same years (though now fiscal years, FY

2004–FY 2008) were selected for use in the 2015 UWMP to confirm that the re-calculated 2020 target does not exceed the maximum allowable water use target.

5.3 Service Area Population

The City's water service area is contiguous with the City boundaries as shown in **Figure 3-1**. In other words, the area used for calculating the service areas population is the same as the water service area used in the gross water use calculation. The City's population has undergone a small change since the 2010 UWMP with the addition of one annexation area totaling approximately 32.5 acres.

5.3.1 Population Methodologies

Since the City's water service area is identical to the City boundary, population estimates were taken directly from DOF tables, except for the two Census years of 2000 and 2010. At the time of the 2015 UWMP preparation, DWR was consulted on the methodology for population data (i.e., based on the DOF) and approved the City's use of DOF population data. Three versions of DOF report E-4 (1991 to 2000, 2001 to 2010, and 2011 to 2015) provided the population estimates from 1990 through 2015 and were tied to actual Census benchmarks in 1990, 2000, and 2010. From this dataset, the current population for 2015 is 63,719. **Table 5-1** shows the population for each baseline year and for 2015.

Table 5-1: Baseline and Compliance Year Population

Fiscal Year	Population
1999	55,533
2000	56,999
2001	58,122
2002	59,376
2003	60,311
2004	61,056
2005	61,431
2006	61,411
2007	61,648
2008	61,749
2015	63,719
NOTE: DOF report E-4 population estimates with Census benchmark(s) for 1991-2000, 2001-2010, and 2011-2015.	

Even though the DOF population data were tied to actual Census benchmarks for 2000 and 2010, the 2000 DOF population is slightly different from the Census population (57,011 for the DOF versus 56,999 for the Census). This difference is too small to affect the 2015 and 2020 target calculation; thus, the 2000 population as reported by the Census was used for recalculating the baselines and targets. The 2010 population data from the DOF matches the Census data exactly.

5.4 Gross Water Use

Data to determine the gross water use for each year within the 5- and 10-year baseline periods were provided by the City. The gross water use was calculated using DWR's Methodology 1 and was based on the City's metered groundwater and SWTP production (beginning in FY 2013). The City exports no water and maintains approximately 4.1 million gallons operational storage in the distribution system as of FY 2015 with no significant change in storage in the system on an average annual basis. Furthermore, there are no considerable deliveries for agricultural or process water use; therefore, no deductions for these water uses are necessary. The City does utilize treated recycled water in the land immediately surrounding the WWTP for agricultural irrigation, power generation, and fish pond replenishment. Since those recycled water users were never intended to utilize potable water, they are not offsetting potable demand and are therefore not included in the gross water use. Gross water use is therefore equivalent to the water entering the distribution system.

For recalculating the baseline and target per capita water use, gross water use was reported for each fiscal year in the 10-year baseline, 5-year baseline, and FY 2015. The City has been utilizing surface water purchased from WID since November 2012 when the SWTP began operation. Since both the 5- and 10-year baseline periods end in FY 2008 (i.e., June 30, 2008), surface water deliveries were not included in the gross water use for re-calculating the baseline and targets, and the gross water use for the baseline years is equal to the groundwater production. For FY 2015, the gross water use includes both groundwater and SWTP production.

5.4.1 Gross Water Tables

The City completed the gross water tables in the SB X7-7 Verification Form. These tables are included in **Appendix F** and were submitted to DWR along with the 2015 UWMP. **Table 5-2** summarizes the gross water data in the SB X7-7 Verification Form, both in units of AF and million gallons (MG).

Table 5-2: Baseline and Compliance Year Gross Water Use

Fiscal Year	Gross Water Use (AF)	Gross Water Use (MG)
1999	16,021	5,221
2000	17,034	5,551
2001	16,648	5,425
2002	17,112	5,576
2003	16,155	5,264
2004	17,293	5,635
2005	15,816	5,154
2006	16,624	5,417
2007	17,289	5,634
2008	17,304	5,639
2015	14,258	4,646

5.5 Baseline Daily Per Capita Water Use

A daily per capita water use was determined for each year by dividing the gross water use by the City's population. An overall baseline daily per capita water use, in gallons per capita per day (GPCD), is calculated by taking the average per capita use for all years within the 5- and 10-year ranges. The GPCD

water use values for all baseline years and the average baseline water use in the 5- and 10-year ranges are shown in **Table 5-3**.

Table 5-3: Baseline Daily Per Capita Water Use

Fiscal Year	10-year Baseline Water Use (GPCD)	5-year Baseline Water Use (GPCD)
1999	258	---
2000	267	---
2001	256	---
2002	257	---
2003	239	---
2004	253	253
2005	230	230
2006	242	242
2007	250	250
2008	250	250
AVERAGE	250	245

5.6 2015 and 2020 Water Usage Targets

This section describes the methodology used to recalculate the 2015 and 2020 water use targets in the 2015 UWMP.

5.6.1 Selection and Application of Target Method

The four allowable methods for calculating water use targets are:

- Method 1: 80% baseline daily per capita use (GPCD)
- Method 2: Performance Standards
- Method 3: 95% of the DWR hydrologic region per capita use target
- Method 4: Applying savings by water sector

Identical to the approach taken in the 2010 UMWP, the City chose to use Method 1 for recalculating its water use target in the 2015 UWMP using DOF population estimates tied to U.S. Census benchmarks, data by fiscal year, and a different 10-year baseline period. The 2020 target water use is calculated as 80 percent of the baseline GPCD water use for the 10-year period from 1999–2008. The result of the target analysis is presented in **Table 5-4** as the "Confirmed 2020 Target" of 200 GPCD.

Table 5-4: **Baselines and Targets Summary** (DWR Table 5-1)

Baseline Period	Start Year	End Year	Average Baseline GPCD	2015 Interim Target (GPCD)	Confirmed 2020 Target (GPCD)
10 Year	1999	2008	250	225	200
5 Year	2004	2008	245		

5.6.2 5-Year Baseline – 2020 Target Confirmation

The 5-year baseline (2004–2008) average GPCD was used to verify that the 2020 water use target will reduce the City's water use by a minimum of 5 percent. In other words, the 2020 target must be less than 95 percent of the 5-year average GPCD. This was confirmed automatically in the tables included in **Appendix F** and is shown in **Table 5-4** where the 2020 target (200 GPCD) is less than 95 percent of the 5-year average GPCD (95 percent of 245 is 232 GPCD). Therefore, the City's 2020 target of 200 GPCD remains as shown in **Table 5-4**.

5.6.3 Calculate the 2015 Interim Urban Water Use Target

The 2015 interim target GPCD is simply the midpoint between the 10-year baseline GPCD and the calculated and verified 2020 target. The 2015 target is 225 GPCD, as summarized in **Table 5-4**.

5.6.4 Baselines and Target Summary

The City's interim and final water usage targets are summarized in **Table 5-4** and all SB X7-7 Verification Form tables are included in **Appendix F**.

5.7 2015 Compliance Daily per Capita Water Use

The compliance daily per capita water use is the GPCD calculated using the 2015 service area population and the 2015 gross water use, shown in **Table 5-1** and **Table 5-2**, respectively. In order to comply with the interim target established above, the FY 2015 daily per capita water use must be less than the interim target.

5.7.1 Meeting the 2015 Target

The City's compliance with the 2015 target is presented in **Table 5-5**. The interim target of 225 GPCD is greater than the 2015 actual GPCD (200 GPCD), so the City is in compliance with its 2015 target. This means the City is on track to meet its 2020 target as well and has actually already met the target if daily per capita water consumption continues to stay at the FY2015 level.

Although the City met its interim target and is on track to meeting its 2020 target, the City will still continue its attempts to reduce urban water use through the Demand Management Measures (DMMs) and other plans, as further discussed in Chapter 9. The City recognizes that the 5-year average daily per capita water use from 2011 to 2015 was 251 GPCD (higher than both the interim and final target) and the reduction in gross water use seen in 2015 at 196 GPCD was unique to that single year. The City is confident it will meet the GPCD target by 2020 through its aggressive conservation program, as well as its ongoing metering program and the subsequent implementation of tiered water rates for metered water customers.

5.7.2 2015 Adjustments to 2015 Gross Water Use

Since the City is already meeting its interim target, it chose not to make any adjustments to the compliance-year (2015) GPCD. There were no substantial changes to commercial, industrial, or institutional water use between the baseline period and 2015. The City's distribution area has changed only slightly, as shown in **Figure 3-1**, between the 2010 and 2015 UWMPs. Between the 2005 and 2010 UWMPs (overlapping the ends of both the 5- and 10-year baseline periods), three annexations of about 600 acres were added. Even so, since all of these annexations added undeveloped areas, there is no impact on the 2015 GPCD because all the annexations are accounted for both in the gross annual water use and the 2015 population. Though there are slight differences in annual evapotranspiration and precipitation averages between the baseline period and 2015 (due to the drought beginning in 2012 and continuing through FY 2015), those differences only helped with interim target compliance since the City actively promoted reducing water use due to the drought.

Since there are no adjustments to the 2015 gross water use, the GPCD targets in **Table 5-5** are the final. As seen in **Table 5-5**, the 2015 actual GPCD is less than the 2015 interim target, confirming the City's compliance with its 2015 target.

Table 5-5: 2015 Compliance (DWR Table 5-2)

Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments to 2015 GPCD *From Methodology 8*					2015 GPCD	Did Supplier Achieve Targeted Reduction for 2015?
		Extraordinary Events	Economic Adjustment	Weather Normalization	TOTAL Adjustments	Adjusted 2015 GPCD		
200	225	0	0	0	0	200	200	Yes

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Chapter 6 System Supplies

This chapter describes the current and future water supplies available to the City, including purchased surface water and pumped groundwater.

6.1 Purchased or Imported Water

The City's surface water supplies include Mokelumne River water purchased from WID and NSJWCD, as described below.

6.1.1 Purchased Water from Woodbridge Irrigation District

In May 2003, the City entered into an agreement with WID to purchase 6,000 AFY of surface water from the Mokelumne River (with delivery via WID canal facilities near Woodbridge Dam) for a period of 40 years. An amendment approved in January 2008 extended the agreement to 2047. The agreement has been included in **Appendix G**. Key provisions in the agreement include:

- Provisions allowing the City to "carryover", or bank, water that is not used during the first seven years of the agreement (until October 2010) for use later, as water supplies are available. A maximum of 42,000 AF can be banked. Note that this banked water is not physically stored, rather it is agreed that WID will supply the banked water to the City when excess water is available.
- During dry years when WID's supply is reduced, the City's allotment can be reduced down to 3,000 AFY. The City would add the remaining 3,000 AFY to its banked water described above for use when water is available. Water banked due to reductions in dry years expires if not used within 8 years from the period it is banked.
- Diversion of the water from the Mokelumne River is permitted only from March 1 through October 15. However, an agreement with East Bay Municipal Utilities District (EBMUD) allows for release of up to 1,000 AF between October 15 and the end of February. This facilitates the usage of banked water and allows for year-round operation of the SWTP, except for up to one month beginning February 1 when the plant is offline for WID fish screen and dam maintenance.
- If the City purchases additional water from another wholesaler on the Mokelumne River, WID's conveyance canals can be utilized at a cost of $20 per AF If additional water is available from WID, the City can purchase that at a cost of $100 per AF.

The City did not begin using this water until the completion of the Lodi SWTP in November 2012. The City's banked supply is at its maximum potential allotment of 42,000 AF. As noted above, this banked supply is not stored, but will be made available to the City when WID has excess supply. Since the completion of the SWTP in 2012, the plant has produced approximately 2,800 AF, 4,700 AF, and 4,900 AF for each of the three fiscal years of plant operation (part of 2013 and all of 2014 and 2015).

6.1.2 Purchased Water from North San Joaquin Water Conservation District

In October 2014, the City entered into an agreement with NSJWCD for up to 1,000 AFY of Mokelumne River surface water from October 15th to March 30th, as long as NSJWCD has sufficient water available. This agreement is also included in **Appendix G**. The water is diverted to the SWTP using the same intake as the water purchased from WID. The agreement is for 5 years, with the possibility to renew up to a total term of 40 years. The agreement went into effect in October 2015, after the end of fiscal year 2015, so water purchased from NSJWCD is only applicable in future supply projections.

6.2 Groundwater

The City's primary source of water is groundwater that it pumps using 28 groundwater production wells distributed throughout the water service area (**Figure 6-1**). Since the completion of the SWTP in November 2012, an average of 26 percent of the monthly water supply comes from surface water instead of groundwater and an average of 300 AF less water is pumped from the wells each month.

6.2.1 Basin Description

The City overlies the Eastern San Joaquin Subbasin of the San Joaquin Valley Groundwater Basin. **Figure 6-2** shows the extent of the subbasin within the county with major cities and rivers. The basin description presented herein reflects the conditions of the entire Eastern San Joaquin Subbasin, as the subbasin conditions can potentially affect the local groundwater system underlying the City's service area.

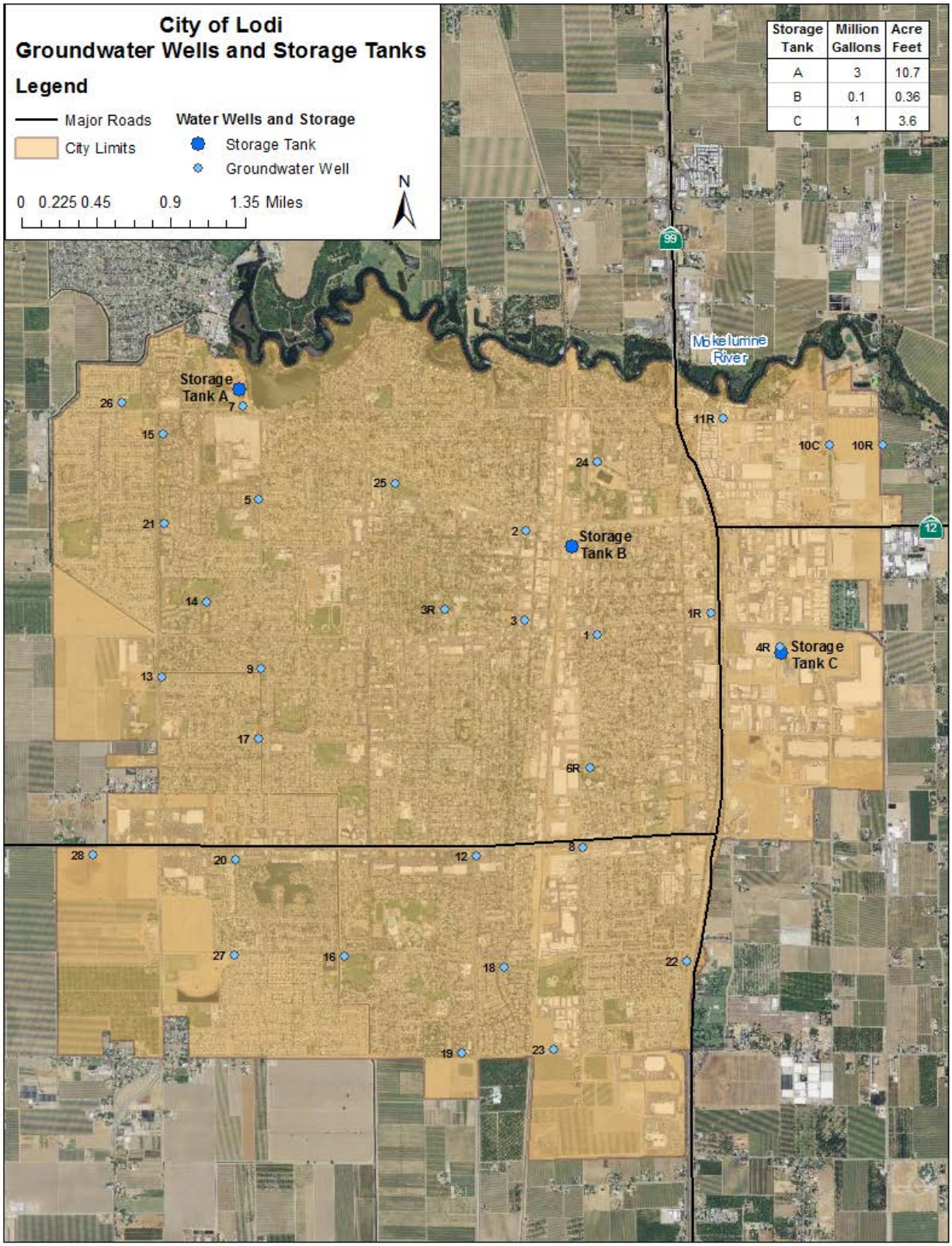
The Eastern San Joaquin Subbasin is not adjudicated and is currently managed under the ESJGWMP presented in **Appendix H**. As this subbasin is largely agricultural, it is experiencing many of the same problems regarding unsustainable use of groundwater as most of the San Joaquin Valley. Similarly, until more recent years, groundwater was the primary source of drinking water in the region.

The San Joaquin Valley Groundwater Basin comprises the southernmost portion of the Great Valley Geomorphic Province of California (DWR, 2003). The Great Valley is a broad structural trough bounded by the tilted block of the Sierra Nevada on the east and the complexly folded and faulted Coast Ranges on the west. The Eastern San Joaquin Subbasin is defined by the areal extent of unconsolidated to semiconsolidated sedimentary deposits that are bounded by the Mokelumne River to the north and northwest; San Joaquin River to the west; Stanislaus River to the south; and consolidated bedrock to the east. Sediments in the San Joaquin Valley consist of interlayered gravel, sand, silt, and clay derived from the adjacent mountains and deposited in alluvial-fax, floodplain, flood-basin, lacustrine, and marsh environments. Hydrogeologic units include both consolidated rocks and unconsolidated deposits. The consolidated rocks include the Victor Formation, the Laguna Formation, and the Mehrten Formation. The consolidated rocks generally yield small quantities of water to wells except for the Mehrten Formation, which is an important aquifer. The unconsolidated deposits include continental deposits, lacustrine and marsh deposits, older alluvium, younger alluvium, and flood-basin deposits. The continental deposits and older alluvium are the main water-yielding units in the unconsolidated deposits. In the Lodi area, the groundwater exists under unconfined and semi-confined conditions with the Mehrten Formation as the most productive fresh water-bearing unit underlying the City.

The Eastern San Joaquin Subbasin was identified as critically overdrafted by DWR in Bulletin 118 in 1980 due to issues related to overpumping of groundwater, degradation of water quality, and seawater intrusion. In 2014, the subbasin was designated as high priority under the California Statewide Groundwater Elevation Monitoring (CASGEM) Program, requiring it to be monitored by an authorized monitoring entity. The San Joaquin County Flood Control and Water Conservation District (SJCFCWCD) has monitored groundwater levels in the basin on a regular basis since 1971 and, since 2010, is responsible for monitoring 112 CASGEM wells distributed throughout the subbasin.

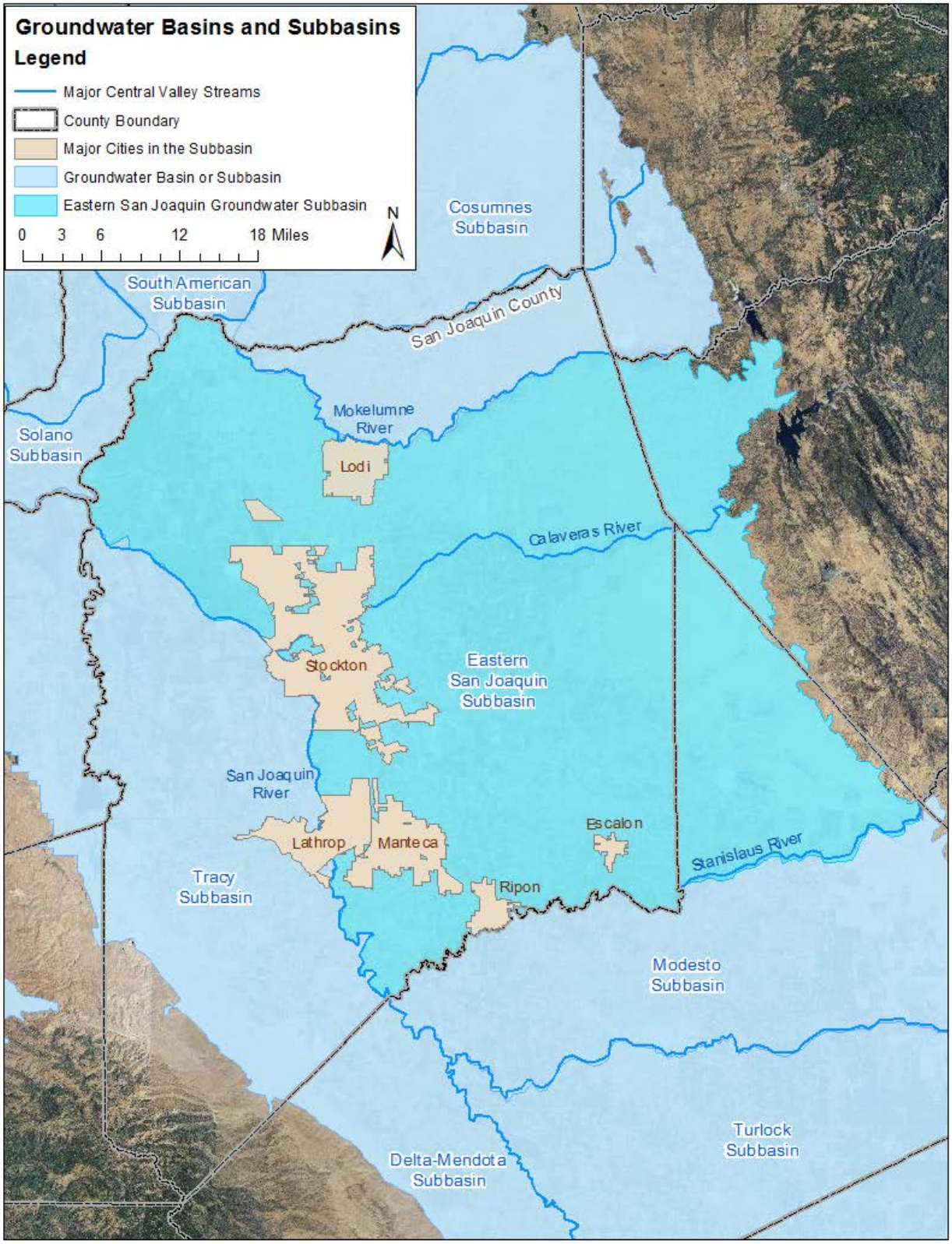
The natural flow of groundwater within the subbasin was significantly altered due to subbasin-wide changes (i.e., surface water diversions and groundwater pumping) in the water used to meet agricultural and urban water demands. Groundwater flow direction is generally toward the south, in agreement with the regional groundwater flow gradient, but may vary from south-southwest to south-southeast with local gradients likely influenced by pumping from municipal supply wells. Pumping tests on municipal wells indicate that they possess a large capture zone, and thus have a large influence upon general groundwater flow direction. In general, the City's municipal supply wells are screened between 100 and 500 feet below the ground surface (Geomatrix, 2006).

Figure 6-1: City of Lodi Well Locations and Storage Facilities



Storage Tank	Million Gallons	Acre Feet
A	3	10.7
B	0.1	0.36
C	1	3.6

Figure 6-2: Groundwater Basins and Subbasins



According to the 2003 update of DWR's Bulletin 118, groundwater levels in the subbasin declined an average of 1.7 feet per year since approximately 1960. There is a significant groundwater depression east of the City of Stockton (Stockton is south of Lodi) due to increased groundwater pumping, which affects both the flow of groundwater and the amount of water in the aquifer. Subbasin-wide estimates of storage in the basin concluded that the withdrawal of groundwater from the basin exceeded the safe yield by over 100,000 AFY under conditions in 1990 (USBR, 1996). In recent years, groundwater level declines have slowed in some areas due to a number of factors, including reduced groundwater pumping, water use efficiency practices, and investments in surface water projects.

Saline intrusion from the west into the subbasin is drawn further into the subbasin due to the changes in groundwater flow and levels discussed above. It is estimated that the rate of eastward migration of the saline front is approximately 150 to 250 feet per year and the saline front is projected to further advance eastward (NSJCGBA, 2004). Areas of elevated chloride exceeding the secondary Maximum Contaminant Level (MCL) of 250 milligrams per liter (mg/L) are present along the western side of the subbasin and along the San Joaquin River (Izbicki, 2006). Near the San Joaquin Delta, chloride concentrations as high as 1,800 mg/L were reported, and high concentrations were present to almost 1,000 feet below land surface. The source of this saline water may be from the San Joaquin Delta, but also may be due to saline deposits, high-salinity aquifers underlying the freshwater, and irrigation return flows.

Groundwater quality in the subbasin as a whole is affected by the poor quality water high in saline leaching from the west, recharge from irrigated fields, and groundwater flow. Primary constituents of concerns impacting the groundwater quality include nitrate, pesticides, boron, and arsenic, in addition to chloride and total dissolved solids (TDS) (NSJCGBA, 2004). The widespread occurrence of nitrate and pesticides in groundwater at elevated concentrations affects rural and public drinking water supplies in the Eastern San Joaquin Valley. Areas with high levels of nitrate exist southeast of Lodi, south of Stockton, and east of Manteca, extending towards the San Joaquin–Stanislaus County line. Potential long-term degradation of water quality with nitrate is of concern due to continued fertilizer use, the predominantly downward movement of groundwater, and limited nitrate attenuation in the aquifer system. Pesticides (primarily dibromochloropropane or DBCP) persist in groundwater at concentrations above the MCL posing a threat to drinking water supplies, even though their use has long been discontinued. Areas of elevated boron occur over a large portion of the subbasin from south of Tracy and extend to the northwest side of the subbasin. Arsenic concentrations exceeding the MCL of 10 micrograms per liter (μg/L) are reported in deeper wells to the west near the margin of the Delta, while concentrations are lower near groundwater recharge areas along the Sierra Nevada foothills (Izbicki, 2008).

Considerable efforts have been made in the past 15 years to offset the municipal demand of groundwater by increasing the use of treated surface water, and partially relieve the groundwater basin overdraft by implementing conjunctive use projects. While significant progress has been made in the region to address the overdraft, the subbasin is faced with considerable challenges to further recover groundwater levels and to protect against prolonged drought.

6.2.2 Groundwater Management

As it is not adjudicated, the subbasin is managed instead by the ESJGWMP, last updated and adopted in September 2004 by the GBA and included in **Appendix H**. The ESJGWMP, which covers the portions of the Eastern San Joaquin and Cosumnes Subbasins in San Joaquin County, identifies several objectives for managing the basin, focusing on maintaining or enhancing groundwater levels and groundwater quality, protecting surface water quality and flows, and preventing land subsidence. The ESJGWMP is intended to lay the groundwork for further refinement of solutions for the basin. The plan identified options for managing the basin with respect to these objectives, and characterized them according to their cost. The plan also describes the Integrated Conjunctive Use Program, which was identified as the key element in fulfilling the purpose of the ESJGWMP.

In June 2014, the GBA updated its ESJIRWMP, included in **Appendix I**. The IRWMP defines and integrates key water management strategies and establishes a course of action for the implementation of a comprehensive solution for water supplies in Eastern San Joaquin County. This comprehensive solution, called the Eastern San Joaquin Integrated Conjunctive Use Program, is a prioritized set of projects and actions that conjunctively manage surface water and groundwater supplies in a manner that ensures the social, economic, and environmental sustainability of this community.

As stated in the basin description, the subbasin received a prioritization ranking of high priority under the CASGEM program in 2014. The SJCFCWCD has taken charge of monitoring groundwater conditions for the 112 CASGEM wells in the subbasin.

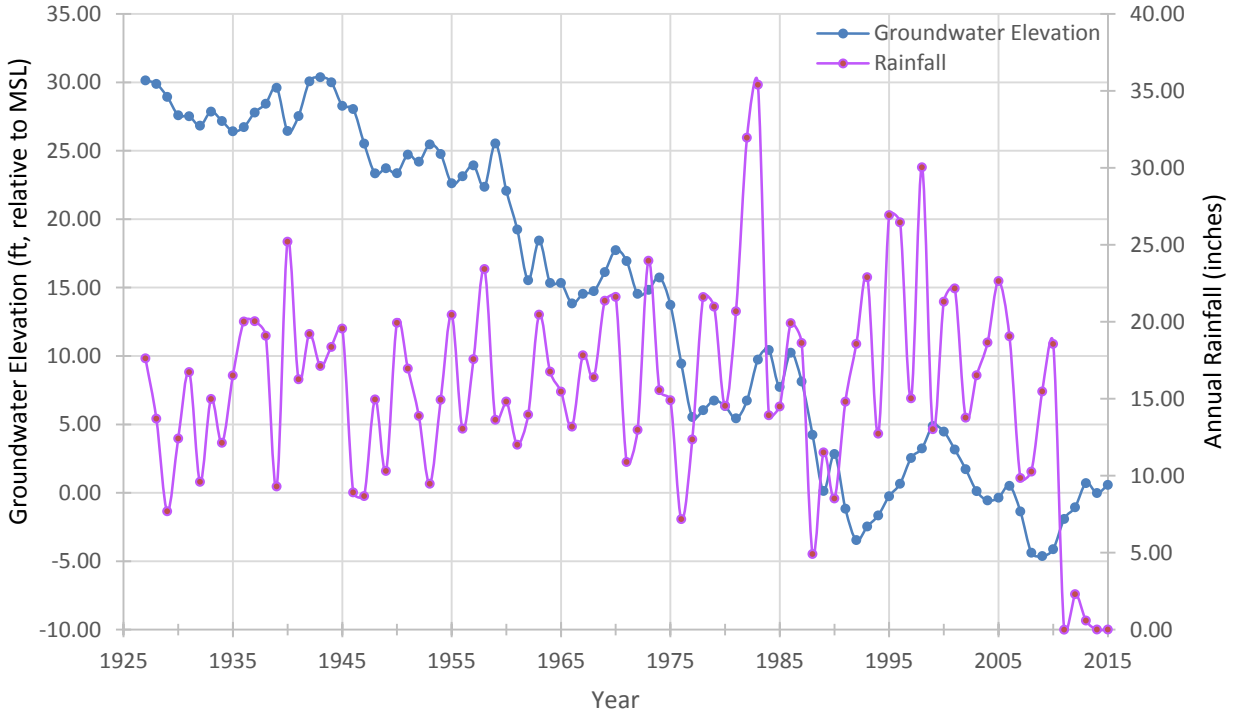
The City is very active in all activities related to the 2014 Sustainable Groundwater Management Act (SGMA). In February 2016, the City filed notification that it intends to serve as a Groundwater Sustainability Agency (GSA) and manage the portion of the Eastern San Joaquin Subbasin that lies within the boundaries of the City. Through participation in the GBA and coordination with other agencies overlying the Subbasin, the City will continue to be an active participant in the development of a Groundwater Sustainability Plan (GSP) for the Subbasin.

6.2.3 Overdraft Conditions

As described in more detail in Section 6.2.1 above, DWR determined (DWR, 2003) that the groundwater subbasin underlying the City (the Eastern San Joaquin Subbasin) is critically overdrafted due to generally decreasing groundwater levels largely caused by agricultural and municipal pumping. Groundwater levels may also fluctuate over time depending on precipitation, aquifer recharge, and pumping demands. Groundwater levels relative to mean sea level (MSL) at a well in the downtown area and the corresponding annual precipitation from 1927 through 2015 are shown in **Figure 6-3**. Overall, the average annual decrease in groundwater levels from 1930 to 2010 was about 0.40 feet per year. Generally, groundwater levels decreased with the increase in population and water production; however, annual rainfall also influences groundwater level. The groundwater level increase from 1981 to 1984 can be partially attributed to the increase in annual rainfall from 1981 to 1983.

From 2010 to 2015, though rainfall was negligible, groundwater levels actually increased slightly (about 0.80 feet per year). This can be attributed to an increased focus on managing groundwater and the completion of the SWTP that enabled the City to get about a third of its water annually from surface water rather than groundwater. Area groundwater levels for the years 1927 to 1961 were obtained from the EBMUD. Groundwater level data from 1962 to the present, as shown in **Figure 6-3** were obtained from the City’s Public Works Department for Well No. 2, one of the oldest production wells in the City.

Figure 6-3: Historical Groundwater Levels (Well No. 2)



Source: City of Lodi Public Works Department; WRCC, 2015

The historical decline of groundwater levels measured at Well No. 2 implies that the sustainable annual groundwater supply available to the City may be something less than what is currently extracted. As a member agency of the GBA, the City is participating in the development of policies and programs (such as the ESJGWMP and ESJIRWMP), including groundwater recharge and conjunctive use programs, intended to help eliminate the Eastern San Joaquin Subbasin overdraft condition.

A safe yield of approximately 15,000 AFY has been estimated for the aquifer serving the City based on water balance calculations performed using data from the San Joaquin County Water Management Plan Phase 1—Planning in September 2001 (both the calculation and water management plan are in **Appendix J**). This safe yield estimate reflects an acreage-based relationship. Therefore, as the City's land area increases, the estimated safe yield of the underlying aquifer will likely increase. For the purposes of this UWMP, 15,000 AFY has been assumed as the amount of groundwater available during all future years. Although rigorous scientific analyses have not been performed, the City projects that some recharge of the groundwater basin will occur as the amount of groundwater pumped decreases (due to the increased reliance on surface water). This result, however, is contingent on the cooperative efforts of all groundwater users within the basin, including other cities, agriculture, and private well owners, to also reduce groundwater extraction. The City does not expect the development of cones of depression, significant changes in the direction or amount of groundwater flow, changes in the movement or levels of contaminants, or changes in groundwater salinity and/or total dissolved solids concentrations.

The City continues its efforts to eliminate long-term overdraft conditions by reducing its reliance on groundwater for drinking water use by continuing to promote water conservation in the City. The City is considering implementing projects in the future that will expand the City's water supply and help improve the basin overdraft condition.

6.2.4 Historical Groundwater Pumping

The 28 wells that currently provide water to the City have a combined capacity of 38,355 gallons per minute or 170.4 AF per day. At this rate, the wells could pump a maximum of over 62,000 AFY. The wells operate automatically on water pressure demand and pump directly into the distribution system. All wells are equipped to provide continuous chlorination, though historically, prior to the SWTP, the water has not required chlorination. Seven wells are equipped with granular activated carbon (GAC) for the removal of dibromochloropropane (DBCP), a legacy pesticide historically used in the area; other wells show trace levels of DBCP but are within State and Federal standards. Well No. 27 and No. 28, the two wells built since the 2010 UWMP, have the ability to implement GAC systems if necessary in the future. Water quality of the groundwater wells is discussed in detail in Chapter 7 (Section **Error! Reference source not found.**) of this UWMP.

During the last five years, groundwater switched from being the only source of water to being the majority of supplies after the SWTP came online in November 2012. The groundwater pumped was sufficient to meet the City's needs in the five years since the 2010 UWMP and the City did not encounter any major challenges, apart from the requirements to decrease water use during the current drought, with regards to obtaining groundwater. As already described in the section above, the groundwater level in Well No. 2 actually increased from 2010 to 2015 and there were no increased or new groundwater contamination concerns.

Table 6-1 shows how much groundwater was pumped from 2011 to 2015. **Table 6-2** presents the historical groundwater production since 1998, illustrating that groundwater is no longer the only source of water for the City. In fact, during fiscal year 2015, groundwater only accounted for 66 percent of the total water supplied.

Table 6-1: Groundwater Volume Pumped (AF) (DWR Table 6-1)

☐	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type	Location or Basin Name	2011	2012	2013	2014	2015
Alluvial Basin	Eastern San Joaquin Subbasin	16,669	17,786	17,423	15,314	9,366
	TOTAL	16,669	17,786	17,423	15,314	9,366

Table 6-2: Historical Groundwater Production

Fiscal Year	Groundwater Production (AF)	Percent of Total Water Supply
1998	14,139	100%
1999	16,021	100%
2000	17,034	100%
2001	16,648	100%
2002	17,112	100%
2003	16,155	100%
2004	17,293	100%
2005	15,816	100%

Table 6-2: Historical Groundwater Production		
Fiscal Year	Groundwater Production (AF)	Percent of Total Water Supply
2006	16,624	100%
2007	17,289	100%
2008	17,304	100%
2009	17,163	100%
2010	15,500	100%
2011	16,669	100%
2012	17,786	100%
2013	17,423	86%
2014	15,314	76%
2015	9,366	66%

6.3 Surface Water

The City does not divert any raw surface water directly from the river for municipal use. Though, the City is bordered by the Mokelumne River to the north (seen in **Figure 3-1**), it does not have any water rights to that river. As described in the purchased water section, the City purchases Mokelumne River water from WID and NSJWCD that is diverted from the river near Woodbridge Dam and then pumped to the SWTP. From the treatment plant, the water is distributed to the City using a system of pipelines and three water storage tanks, including the one located at the SWTP.

Besides WID and NSJWCD, other Mokelumne River water right holders include Amador County, Calaveras County, EBMUD, and riparian and pre-1914 appropriative water rights. The City lies within the Lower Cosumnes-Lower Mokelumne watershed and the river itself originates in the neighboring Upper Mokelumne watershed. The Upper Mokelumne River Watershed Authority's (UMRWA) Integrated Regional Water Management Plan update in January 2013 covers from the headwaters of the Mokelumne River to the San Joaquin County line and is included in **Appendix K**. The lower portion of the Mokelumne River is covered by the GBA's IRWMP (**Appendix I**). The Mokelumne Watershed Interregional Sustainability Evaluation (MokeWISE) Program's June 2015 report covers both the upper and lower portions of the Mokelumne River watersheds in a partnership between UMRWA and GBA (**Appendix L**).

6.4 Stormwater

The City does not currently use stormwater to meet local water supply demands. Stormwater is currently collected in a system of catch basins, detention basins, pumps, and pipelines that ultimately runs off into WID's canal, Lodi Lake, or the Mokelumne River. The City's Stormwater Management Program, developed in January 2003 to fulfill its Phase II National Pollutant Discharge Elimination System (NPDES) permit requirements, describes the City's stormwater-related activities (i.e., best management practices or BMPs). The Stormwater Management Program was updated in 2012. In 2015, the City collaborated on the Multi-Agency Post-Construction Stormwater Standards Manual, which provides guidance on managing stormwater in various projects. Both of these programs and plans are included in **Appendix M**.

The City is active in the San Joaquin Valley Stormwater Quality Partnership, which helps with public outreach ideas, aids with permit compliance, and provides an opportunity for communities to work together.

6.5 Wastewater and Recycled Water

The City treats wastewater at its WWTP, located about 6 miles southwest of the City, and distributes a portion of the treated effluent for recycled water use.

6.5.1 Recycled Water Coordination

The City collects, treats, and discharges all municipal wastewater generated within the service area at its WWTP and does not coordinate with any other agencies with regards to collecting and treating Lodi wastewater. The availability of the treated wastewater for beneficial reuse as recycled water is widely known. For example, the MokeWISE Program partnership between the Mokelumne-Amador-Calaveras (MAC) and Eastern San Joaquin IRWM Regions includes a project that would use some of the WWTP's currently-discharged treated wastewater for groundwater recharge (**Appendix L**).

6.5.2 Wastewater Collection, Treatment, and Disposal

The wastewater needs of the entire City (100 percent of both the service area and population) are served by the WWTP, which has a treatment capacity of 8.5 million gallons per day (MGD) or 9,500 AFY. The City has two separate sewer lines, one for municipal wastewater (i.e., from residential and commercial customers) and one for industrial wastewater. Municipal wastewater is either treated to tertiary, UV disinfected standards or secondary, undisinfected levels. The WWTP has adequate capacity to treat all wastewater flows to Title 22 standards for recycled water (California Code of Regulations, Division 4, Chapter 3, Section 60301). The industrial wastewater, the majority of which comes from a fruit canning facility, is blended with treated flows and is stored for agricultural irrigation of neighboring City-owned land. In 2015, a little over 500 AF of industrial wastewater, part of which is return flows from the irrigation of nearby fields, was received by the WWTP. Since this industrial wastewater is untreated, it is not included in recycled water totals in all relevant tables.

Table 6-3 shows the volume of municipal (residential and commercial) plus industrial wastewater collected in the service area during 2015. In 2015, the City collected a little over 5,200 AF of municipal wastewater and a little over 500 AF of industrial wastewater.

The City discharges all wastewater effluent that is not used for recycled water into Dredger Cut, a slough flowing into the Delta, under a NPDES permit (recycled water application to land is under a separate NPDES permit). In 2015, as seen in **Table 6-4**, 1,201 AF of tertiary treated and UV disinfected effluent was discharged into Dredger Cut from November through February. Recycled water, shown in **Table 6-4**, is discussed in detail in the sections below.

Table 6-3: Wastewater Collected Within Service Area in 2015 (DWR Table 6-2)

☐	There is no wastewater collection system. The supplier will not complete the table below.					
Wastewater Collection			**Recipient of Collected Wastewater**			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2015 (AF)	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
City of Lodi	Metered	5,717	City of Lodi	White Slough Water Pollution Control Facility	Yes	No
Total Wastewater Collected from Service Area in 2015:		5,717				

Table 6-4: Wastewater Treatment and Discharge Within Service Area in 2015 (DWR Table 6-3)

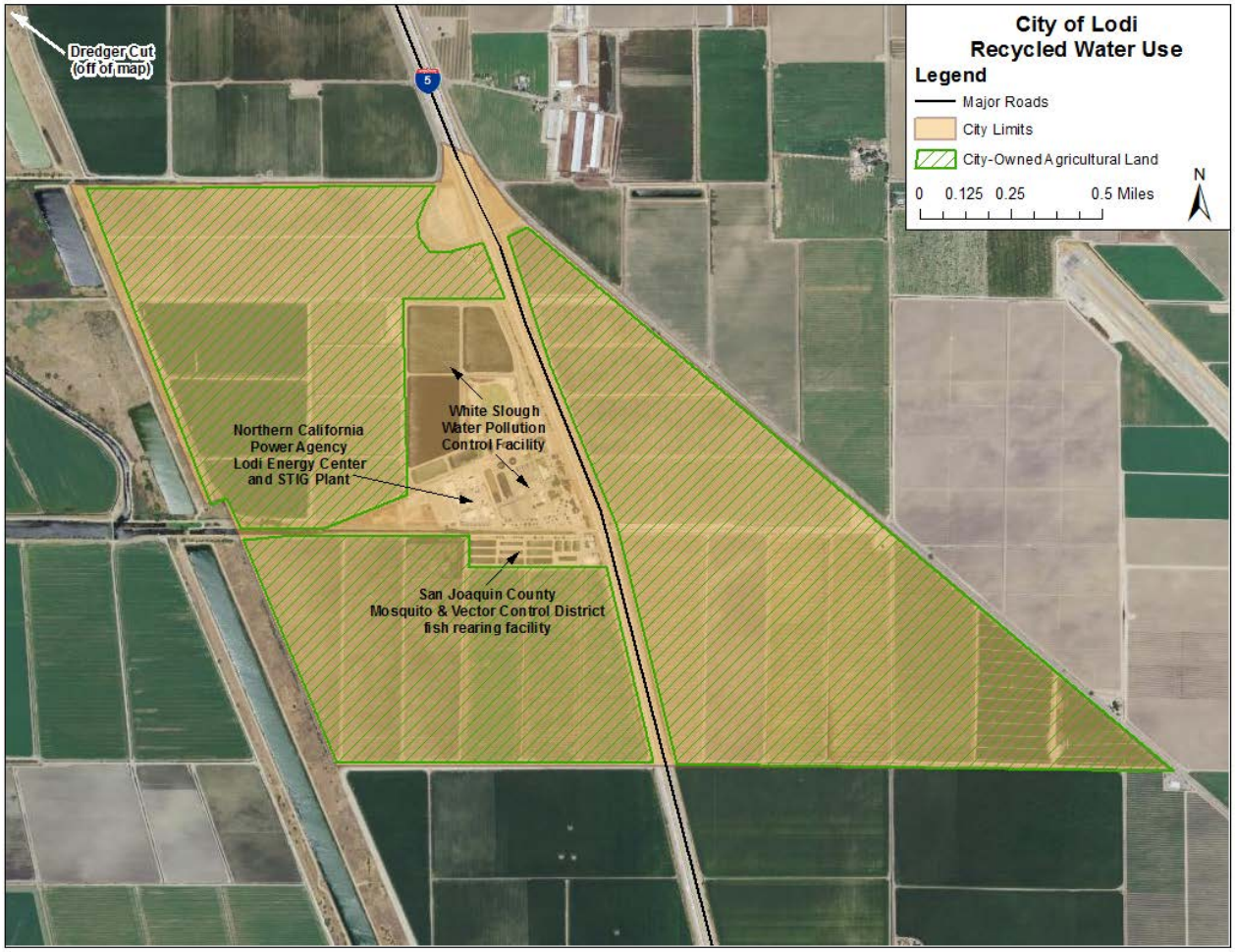
☐	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.									
							2015 Volumes (AF)			
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level	Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
White Slough Water Pollution Control Facility	Dredger Cut	Sacramento-San Joaquin Delta	5B39NP00073	Bay or estuary outfall	No	Tertiary	5,717	1,201	4,398	0
						Total	5,717	1,201	4,398	0

6.5.3 Recycled Water System

The City owns 1,040 acres of land, including and surrounding the WWTP, as shown in **Figure 6-4**. On this land, a portion of the wastewater is currently used as recycled water for agricultural land irrigation, fish pond replenishment, and two power-generating facilities. Though recycled water is provided to different agencies that rent city-owned land, the City is the only agency involved in the collection, treatment, and distribution of the recycled water.

Excluding the power facilities, WWTP, and fish-rearing ponds, there are 790 acres of City-owned land surrounding the WWTP that are irrigated with a mixture of disinfected tertiary treated wastewater, undisinfected secondary treatment wastewater, and the City's industrial process wastewater. The City has been irrigating at least some of this land with recycled water since the 1940s. The land is used to grow crops for dairy cattle, such as corn, wheat, and alfalfa. As these crops are for fodder and not human consumption, the use undisinfected secondary treatment recycled water for irrigation is allowed. In 2015, the City used a total of 3,421 AF for agricultural irrigation, composed of 2,062 AF of undisinfected wastewater effluent, 856 AF of disinfected wastewater effluent, and 503 AF of industrial influent wastewater. The portion of the recycled water from treated municipal wastewater is 2,918 AF. Recycled water is provided throughout the year, though the total supply was significantly reduced during winter months (November through February) to an average volume of 48.5 AF in 2015. The average recycled water flow during the remaining months (March through October) was 403 AF in 2015.

Figure 6-4: Recycled Water Application Area



The power plant, the Lodi Energy Center (LEC), is operated by the Northern California Power Agency (NCPA) and is adjacent to the WWTP to the west on City-owned land. It was completed in August 2012 and utilizes up to 1,800 AFY of recycled water in its cooling towers per the agreement letter included in **Appendix N**. The NCPA also operates the STIG (steam injected gas turbine) plant to the west of the LEC that has been in operation since 1996. Recycled water is used to provide steam for the 49-megawatt natural gas-powered generator at the plant. In 2015, a total of 1,345 AF of UV disinfected, tertiary treated effluent was delivered for use at both the LEC and STIG plant. With approximately 130 AF provided to the STIG plant, the bulk of the recycled water (1,215 AF) is used at the LEC.

The San Joaquin County Mosquito and Vector Control District has mosquito-fish rearing ponds to the south of the WWTP at the White Slough Mosquitofish Rearing Facility, which was constructed in 1995. Current recycled water use includes 135 AF of tertiary treated, UV disinfected wastewater effluent to replenish the mosquito-fish rearing ponds.

The City's Recycled Water Master Plan (RWMP), updated in November 2008 and included in **Appendix O**, describes the City's approach to optimizing the use of recycled water in the service area. The RWMP evaluated existing and potential customers for recycled water, as well as available supplies. Additional uses could be constrained without the availability of additional seasonal storage. All alternatives developed as part of the RWMP therefore include a seasonal storage component. The City is considering future opportunities to expand its recycled water use.

6.5.4 Recycled Water Beneficial Uses

As described in the section above, recycled water is currently used to irrigate 790 acres of City-owned land, for cooling towers at the LEC, to provide steam to the STIG plant, and to replenish mosquito-fish rearing ponds. All current recycled water flows are in accordance with Title 22 of the California Code of Regulations. As described above, since the irrigated crops are not for human consumption and are instead for dairy cattle fodder, it is appropriate to use some undisinfected secondary treatment recycled water (mixed with the industrial wastewater) for land irrigation. Disinfected tertiary treated wastewater is utilized for the other recycled water users described above. The recycled water provided to the NCPA (for the LEC and STIG plant) has an industrial beneficial use, and the water used to replenish the mosquito-fish rearing ponds has a recreational impoundment beneficial use.

In the future, the City currently anticipates that recycled water use will remain the same as in 2015, though these estimates are likely conservative. **Table 6-5** summarizes all the recycled water currently used within the UWMP area (i.e., the City boundaries) and anticipated in the future.

Table 6-5: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area (AF) (DWR Table 6-4)									
☐	Recycled water is not used and is not planned for use within the service area of the supplier. The supplier will not complete the table below.								
Name of Agency Producing (Treating) the Recycled Water:		City of Lodi							
Name of Agency Operating the Recycled Water Distribution System:		City of Lodi							
Supplemental Water Added in 2015		n/a							
Source of 2015 Supplemental Water		n/a							
Beneficial Use Type	General Description of 2015 Uses	Level of Treatment	2015	2020	2025	2030	2035	2040	
Agricultural irrigation	Irrigation of 790 acres of fodder crop	Secondary, Undisinfected	2,918	2,918	2,918	2,918	2,918	2,918	
Industrial use	In cooling tower and providing steam for power plants	Tertiary	1,345	1,345	1,345	1,345	1,345	1,345	
Recreational impoundment	Fish rearing pond replenishment	Tertiary	135	135	135	135	135	135	
		Total:	4,398	4,398	4,398	4,398	4,398	4,398	

Table 6-6 compares the amount of recycled water projected to be used in 2015 according to the 2010 UWMP with the actual amount of recycled water used in 2015. It is difficult to directly compare the 2010 UWMP to this UWMP due to the aforementioned switch from reporting by calendar year to fiscal year. In the 2010 UWMP, it was estimated that the amount of recycled water used in the calendar year 2015 would be 2,842 AF. In FY 2015, 4,398 AF of recycled water was used. The projection for recycled water use by NCPA (industrial use) was almost exactly what occurred in 2015, but the projected recycled water use by both agricultural irrigation and fish pond replenishment were lower than the actual recycled water delivered, potentially due to more land being irrigated. The increase in recycled water use over what was anticipated is considered to be positive for the City in achieving its sustainability goals.

Table 6-6: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual (DWR Table 6-5)

☐	Recycled water was not used in 2010 nor projected for use in 2015. The supplier will not complete the table below.

Use Type	2010 Projection for 2015 (AF)	2015 Actual Use (AF)
Agricultural irrigation	1,465	2,918
Industrial use	1,327	1,345
Recreational impoundment	50	135
Total	2,842	4,398

6.5.5 Actions to Encourage and Optimize Future Recycled Water Use

The City completed a RWMP in November 2008 which evaluated the City's alternatives for encouraging the use of recycled water. Through the evaluation, it was determined that there were no economically feasible projects at this time without additional outside funding. The City will continue to evaluate the potential for grant funding of recycled water projects, and/or seek opportunities to implement portions of larger projects as they becomes economically feasible. The City does not have any current plans to utilize financial incentives for recycled water use. Therefore, DWR Table 6-6 is not applicable and has not been included. As recycled water projects are identified, financial incentives may be one action considered to promote the implementation of the recycled water project, if the project is feasible and cost-effective.

6.6 Desalinated Water Opportunities

At the present time, the City does not foresee any opportunity for the use of desalinated water, which includes ocean water, brackish ocean water, and brackish groundwater, as a long-term water supply. The City is currently not directly affected by brackish water, though the intrusion of sea water into the Delta is raising concerns about an increase in brackish groundwater in the region. Due to groundwater flows discussed in Section 6.2 above, however, the cone of depression near Stockton (south of Lodi) is expected to keep brackish groundwater away from the City during the planning horizon of this UWMP.

6.7 Exchanges or Transfers

The City does not currently have any approved plans to pursue exchange or transfer opportunities, including emergency interties.

6.8 Future Water Projects

Since the completion of the 2010 UWMP, the City built the SWTP to treat Mokelumne River water purchased from the WID and NSJWCD. As discussed earlier, the City entered into an agreement with WID in 2003 to receive up to 6,000 AFY for a period of 40 years. The City entered into another agreement with

NSJWCD to receive up to 1,000 AFY for five years, with the possibility to renew this purchase up to a total of 40 years. With the combined surface water from WID and NSJWCD, the City can potentially receive up to 7,000 AFY of Mokelumne River water. For the City, which solely relied on groundwater historically, this is a significant long-term source of supply that improves the water supply reliability, partially offsets groundwater pumping, and helps eliminate the basin overdraft condition.

In addition to these major accomplishments to secure long-term surface water supplies, the City continues its efforts to increase the reliability of water supplies throughout the year and has ongoing plans to identify the most cost-effective opportunities. These plans are not considered as future projects or programs anticipated to add to the City's water supply within the next 20 years; therefore, these plans are not applicable for completing DWR Table 6-7**.** A narrative description of these plans are provided in place of the table.

The City's current future supply plans include a 1 million gallon (approximately 3.1 AF) storage tank anticipated to be built in 2017, and potentially another storage tank in 2019. Both of these future storage tanks will help to ensure that the City has reliable access to water throughout the year, no matter the hydrologic conditions; neither project increases the agency's overall water supply. These storage tanks push back or potentially eliminate the necessity of building new wells, which were determined to be needed by 2035 to meet demands in the City's Water Master Plan (City of Lodi, 2012).

6.9 Summary of Existing and Planned Sources of Water

The sections above discuss the City's current supply of water, any anticipated water supply changes, and elaborate on any future plans for additional supply projects. **Table 6-7** summarizes the City's current water supply for 2015, including the purchased water, groundwater, and recycled water. As explained above, the agreement with NSJWCD took effect after FY 2015 had ended, so only water purchased from WID is included in this table. The City's 2003 agreement with WID to purchase up to 6,000 AFY of surface water and the SWTP that came online in November 2012 treats this water for distribution. The City has not utilized the full agreement amount of 6,000 AF and treated 4,892 AF of water in 2015.

The City currently uses groundwater as its primary source of supply, pumping almost 9,370 AF from its 28 wells in 2015, as shown in **Table 6-7**. The City currently has the capacity to store approximately 12.6 AF of water (4.1 million gallons) in three different storage tanks - one at the SWTP and two in key areas of the City's distribution system. The locations of the tanks are shown in **Figure 6-1**.

Limited recycled water is used in the vicinity of the WWTP, primarily for the City-owned agricultural fields, and at power-generating facilities owned by NCPA. Approximately 4,398 AF of recycled water was beneficially applied to or used on the City-owned lands surrounding the WWTP in 2015.

Table 6-7: Water Supplies — Actual (DWR Table 6-8)

Water Supply	Additional Detail on Water Supply	2015		
		Actual Volume (AF)	Water Quality	Total Right or Safe Yield (AF)
Purchased or Imported Water	WID from Mokelumne River	4,892	Raw Water	6,000
Groundwater	From 28 municipal wells	9,366	Raw Water	15,000
Recycled Water		4,398	Recycled Water	---
	Total	18,656		21,000

Table 6-8 summarizes the projected future water supplies through 2040, including the purchased water from WID and NSJWCD, groundwater, and recycled water. In the future, the City will continue to pump groundwater and utilize treated surface water per its agreements with WID and NSJWCD. From WID, the agreement allotment of 6,000 AF is assumed, though the supply volume may increase if and when the City decides to use its banked supply. In October 2015, the City's agreement with NSJWCD for up to 1,000 AFY of surface water went into effect; thus, an additional 1,000 AF is assumed to be purchased annually from the NSJWCD. With the agreement with WID still in effect until 2043, the City will have access to a total of 7,000 AF of purchased water each year. The SWTP currently has a capacity of 10 MGD (approximately 11,200 AFY) and is expandable to up to 20 MGD (approximately 22,400 AFY), so the City has the opportunity to expand its surface water use in the future. The potential for an increase in storage capacity in the City's distribution system, with the construction of two additional storage tanks, increases the City's reliability for providing water to its customers.

With a safe yield of 15,000 AFY estimated for the groundwater subbasin underlying the City, the City is able to reasonably project having access to that same amount of groundwater in the future. In reality, the volume groundwater actually extracted will likely be less than this amount due to water conservation and an increasing reliance on surface water.

Table 6-8: Water Supplies — Projected (DWR Table 6-9)

Water Supply	Additional Detail on Water Supply	Projected Water Supply (AF)									
		2020		2025		2030		2035		2040	
		Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield
Purchased or Imported Water	WID from Mokelumne River	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Purchased or Imported Water	NSJWCD from Mokelumne River	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Groundwater	From 28 municipal wells in the Eastern San Joaquin subbasin	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Recycled Water		5,480	---	5,759	---	6,053	---	6,362	---	6,686	---
	Total	27,480	22,000	27,759	22,000	28,053	22,000	28,362	22,000	28,686	22,000

The City expects to continue to beneficially use recycled water in the future and, at this time, has no plans to alter its uses from those discussed in Section 6.5. **Table 6-5** shows that the projected recycled water, broken down by each beneficial use, in the future is anticipated to be the same as what was used in 2015. In **Table 6-8**, though, the total amount of recycled water reasonably available is the total amount of wastewater influent from the municipal sewer line. Municipal wastewater is estimated to increase as the City's population increases.

6.10 Energy Intensity of Water Supply

CWC Section 10631.2 discusses the recommended voluntary reporting of estimates of the amount of energy used in extracting, conveying, treating, distributing, and storing water supplies. These data can be used to calculate the energy intensity associated with water management processes occurring within the water supplier's operational control. Energy intensity, simply, is the amount of energy in kilowatt hour (kWh) divided by the amount of water in AF. **Appendix P** includes the tables used to calculate the energy intensities associated both with the City's potable water and wastewater systems.

The energy intensity for retail potable water deliveries (i.e., the water used to fulfill customer demand) in 2015 is 334.5 kwh/AF. This represents the energy consumed to divert raw water from the Mokelumne River (via Lodi Lake), treat the water at the SWTP, pump water from City groundwater wells and delivery the potable supplies, divided by the volume of water entering the SWTP and the amount of water produced from groundwater wells.

The total energy intensity for wastewater in 2015 is 1,080.2 kwh/AF. The volume of wastewater collected and conveyed is measured as the inflows to the WWTP and represents both industrial and non-industrial (i.e., mainly residential and commercial) wastewater. The volume of wastewater treated does not include the industrial wastewater, since it is directly used for recycled water purposes. The overall wastewater energy intensity also includes the volume of water that is discharged to Dredger Cut. The WWTP measures energy consumption using 4 meters, making separating the energy for each separate process (e.g., collection/conveyance, treatment, and discharge/distribution) impossible. This is also why the recycled water energy intensity was not able to be calculated (that is, the energy used to pump recycled water to the nearby fields cannot be separated out from total WWTP energy). Furthermore, the volume of recycled water collected and treated cannot be separated from the rest of the wastewater flows, and only the volume of recycled water delivered to end uses is known.

6.11 Climate Change Impacts to Supply

The City currently uses groundwater and surface water as the main sources of supply. The completed ESJIRWM Climate Change Vulnerability Assessment is presented in **Appendix D**. The potential climate change impacts on water supply are discussed in this assessment qualitatively and are summarized below:

- Groundwater levels are generally decreasing in the area and fluctuate depending on precipitation, aquifer recharge, and pumping. Changes in local hydrology could affect natural recharge to the local groundwater aquifers and the quantity of groundwater that could be pumped sustainably over the long-term. Decreased inflow from runoff, increased evaporative losses, warmer and shorter winter seasons can alter natural recharge of groundwater.
- While the City is not subject to sea water intrusion directly, salt intrusion from the Delta and resulting water quality impacts are a continuing concern in the Eastern San Joaquin Subbasin.
- Snowmelt comprises a large portion of the Mokelumne River watershed's runoff. Snowmelt is expected to decrease as the climate warms. Changes in streamflow resulting from climate change may impact the timing and availability of the surface water from the river.

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Chapter 7 Water Supply Reliability Assessment

This section describes the overall reliability of the City's water supplies, including constraints on the water supply and a comparison of projected future supplies and demands.

7.1 Constraints on Water Supply

The City's water supply, described in detail in Chapter 6, is made up of both groundwater and surface water (via purchase agreements) with some recycled water supplied in the vicinity of the WWTP. Many of the constraints on water supply draw from the Climate Change Vulnerability Assessment in **Appendix D**.

Although the City's existing facilities are capable of maintaining reliable and high quality sources of water for the service area, catastrophic events, such as earthquakes, major fire emergencies, water outages due to extended losses of power, localized flooding, surface water or groundwater contamination, and acts of sabotage, could impact the City's ability to maintain high water quality. To prepare for such events, the City has prepared an Emergency Response Plan (ERP), which includes federal, state, and local contact directories, an emergency contractor directory, resource inventories, locations for emergency operations centers, response procedures, and the steps necessary to resume normal operations. An excerpt from the plan is included in **Appendix Q**.

Water quality is an important factor in determining supply reliability; if adequate quality cannot be maintained, then the supply may be lost. In general, the City is well-equipped to handle a variety of constituents present in its supply sources that can affect water quality. The City's most recent Annual Water Quality Report, which doubles as its Consumer Confidence Report, was published in April 2016 and is included in **Appendix R**.

7.1.1 Groundwater

As discussed in Chapter 6, water supply from the City's groundwater wells is considered to be very consistent. Historical fluctuations in groundwater levels due to changes in climatic conditions have not significantly impacted well production capacity or the City's capability to fulfill potable water demand. Several chemicals have been identified as potential groundwater contaminants in some of the City's wells. All of the City's wells require continuous chlorination and are complete with chlorination equipment. Additionally, seven of the City's wells are equipped with GAC treatment systems to remove DBCP and provide added insurance against inconsistencies caused by the presence of contaminants in the City's aquifer. The two latest wells built (Well No. 27 and Well No. 28) have the necessary space to implement GAC systems in the future if needed. Finally, the availability of seven emergency generators at various well locations ensures the City's ability to extract groundwater during extended power outages.

As discussed previously, the groundwater subbasin underlying the City is critically overdrafted and groundwater levels are decreasing by approximately 0.40 feet per year (with a slight increase in recent years (from 2010 to 2015) of about 0.80 feet per year). From an extraction standpoint, this magnitude of groundwater level fluctuation is a relatively slow process with regards to available groundwater volume, and the City does not anticipate that overdrafting conditions will significantly impact its ability to extract groundwater in the short term. Even so, in addition to constructing a SWTP in order to augment the groundwater supply with surface water, the City remains committed to eliminating the overdraft condition in the long term and has been an active participant in actions to accomplish this task. As a member of GBA, the City has participated in the development of regional groundwater recharge and conjunctive use programs intended to replenish the Eastern San Joaquin Subbasin and promote sustainability for the future. Copies of the ESJGWMP and ESJIRWMP, both prepared by the GBA, are included in **Appendix H** and

Appendix I¸ respectively. Furthermore, the City is involved in SGMA-related activities to ensure the subbasin's sustainability in the future through the development of a GSP.

As described above, the City has taken steps to ensure the reliability of its groundwater through GAC treatment at several key wells. In addition, the City conducts regular monitoring of well water quality, and all wells are capable of providing as-needed chlorination for disinfection. Specific constituents of concern are discussed in the paragraphs below.

DBCP has been used by area farmers to kill nematodes in vineyards. DBCP was banned in California in 1977, but is still present in trace levels in some groundwater. In 1996, the City settled a lawsuit against DBCP manufacturers, who have already paid the City for a large portion of Lodi's costs related to DBCP treatment. DBCP manufacturers will continue to pay a large portion of the City's DBCP-related costs for the settlement's 40-year life. Seven of City's wells have filters to remove DBCP after Well No. 6R exceeded the MCL and had a GAC system installed in 2013. Thirteen of the City's wells have no detectable DBCP and the remaining wells meet State and Federal standards, but have trace amounts of DBCP. The City rotates which wells are in use so that, over the course of time, water being delivered is a blend from all these wells. In 2014, the City used 26 of its 28 wells to provide drinking water. As a result, DBCP concentrations in the water provided to the people of Lodi are within the level deemed safe by the U.S. Environmental Protection Agency (EPA) and the State of California.

MTBE (methyl-tert-butyl-ether) is a controversial additive to gasoline that can affect the odor and taste of drinking water. MTBE can potentially leak from service stations into the groundwater. Monitoring of City wells has not found any detected traces of MTBE to date and the City has a program to routinely monitor all City wells for MTBE. Wells that are at greater risk (i.e., closer to gasoline stations) are monitored more frequently.

The City, working with regulatory agencies and potentially responsible parties in a cooperative manner, is pursuing a resolution to a groundwater contamination problem in the north and central Lodi area where tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected in samples taken in soils and groundwater in the late 1980s. None of the City's operating wells are currently out of compliance with any drinking water standards. A groundwater model was developed to help the City optimize the number, size, and location of wells to facilitate cleanup, and the City's cleanup efforts are ongoing with the installation of several monitoring and extraction wells since 2010 to treat the central plume and monitor the southern, western, and northern plumes.

The City takes over 20 samples per week from throughout its water distribution system to monitor bacterial water quality. Regulations allow 5 percent of all total coliform samples in a month to be positive. The City met all bacteriological standards in 2014, the latest year data is compiled for. Well water from the City's wells receives low level chlorination as a proactive step to help keep the water system in compliance with strict bacteriological standards.

The City has taken steps to address any potential water quality issues that could impact the reliability of its current and projected groundwater sources.

7.1.2 Surface Water

Water supply from the City's surface water suppliers, WID and NSJWCD, is susceptible to dry year conditions when diversions from the Mokelumne River may be reduced. The river itself, largely fed by snowmelt, is susceptible to climate change which may impact the timing and availability of water supply in the future. Even in the most severe shortage conditions, however, contractually WID may only reduce the City's supply by 50 percent (to 3,000 AFY), though NSJWCD may halt deliveries if sufficient water is lacking.

Beginning in 2012, the City began operating the SWTP to receive and treat water from the Mokelumne River. Water quality in the Mokelumne River is generally very high because it comes from a remote, mostly undeveloped watershed. EBMUD maintains its reservoirs, Camanche Reservoir and Pardee Reservoir, upstream of the City and protects water quality through conservation easements, watershed management, and other measures.

Cryptosporidium, a microbial pathogen found in surface water throughout the country, is present in the Mokelumne River and is capable of causing disease if ingested (i.e., cryptosporidiosis, an abdominal infection). Filtration at the SWTP should remove almost, if not all, of the pathogen, though a slight risk of contamination still remains, especially for the more vulnerable (e.g., immuno-compromised adults, the elderly, and young children) of the population.

7.1.3 Recycled Water

Recycled water supply for the City is considered to be very consistent. Indoor water consumption by the City's customers, which does not significantly fluctuate with climatic conditions like outdoor water use, is the bulk of the City's recycled water raw supply (i.e., indoor water use makes up a large volume of the City's wastewater). As such, the amount of recycled water available to the City is not expected to fluctuate in the future. In addition, as the number of water and sewer connections increase, the City's recycled water supply is anticipated to increase.

The recycled water produced by the City's WWTP is considered safe for its various uses (including irrigation of fodder crops, industrial use, and pond replenishment) by California Department of Public Health.

7.2 Reliability by Type of Year

CWC Section 10631 (c)(1) requires water suppliers to consider supply conditions during an average water year, a single dry water year, and multiple-dry water years. This section identifies the historical water years that meet these conditions for drought planning purposes. The base year for average conditions is the water year in the historical sequence that most closely represents median river runoff levels and patterns. It was determined by comparing total runoff in individual years to the median runoff during the previous 35 years (1980-2014) based on the San Joaquin River Index (DWR, 2015). The average or "normal" water year in this case was determined to be 2003.

The single-dry year is the water year with the lowest annual runoff for a watershed since 1903. In the Mokelumne River watershed (represented by the San Joaquin River), this water year was 1977. The multiple-dry year period is the multiple (3 years or more) period with the lowest average annual runoff since 1903. For the City's basin, this period is the five years from 1987-1991.

Table 7-1 summarizes the base years and actual water supply conditions for the City under the conditions introduced above and discussed in more detail below. Historically, the City's supply has been entirely groundwater, which is not as vulnerable as surface water to seasonal variations in runoff. Beginning in November 2012, a portion of the City's supply comes from surface water. Since this section deals with future reliability in the case of these water year types occurring again, the agreement with NSJWCD (effective October 2015) for 1,000 AFY is included in reliability projections.

The volume available during an average water year is assumed to be 100 percent of all the projected water sources (groundwater, surface water, and recycled water). As described in Chapter 6 and shown in **Table 6-8**, the safe yield of groundwater is 15,000 AFY and the maximum surface water available per the WID and NSJWCD agreements is 7,000 AFY. The amount of recycled water available is expected to increase as

the City's population increases and creates more wastewater. The average amount of recycled water in **Table 6-8** is 6,068 AFY. The total water supply for an average year is estimated to be 28,068 AFY.

In a single-dry year, the groundwater and recycled water supplies are expected to remain at 100 percent, but the surface water supply is reduced to 50 percent or 3,000 AF from WID and 0 percent or 0 AF from NSJWCD. Each year of the multiple-dry year period is assumed to behave the same as a single-dry year (i.e., with reductions only to the surface water allotment). Since only surface water is assumed to be reduced during dry years, the dry years have 86 percent of the average year water supply.

Table 7-1: Basis of Water Year Data (DWR Table 7-1)

Year Type	Base Year	Available Supplies if Year Type Repeats	
		☐ Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____	
		☑ Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available (AF)	**% of Average Supply**
Average Year	2003	28,068	100%
Single-Dry Year	1977	24,068	86%
Multiple-Dry Years 1st Year	1987	24,068	86%
Multiple-Dry Years 2nd Year	1988	24,068	86%
Multiple-Dry Years 3rd Year	1989	24,068	86%
Multiple-Dry Years 4th Year	1990	24,068	86%
Multiple-Dry Years 5th Year	1991	24,068	86%

7.3 Supply and Demand Assessment

CWC Section 10635(1) requires water suppliers to assess their water supply and demand under normal, dry, and multiple-dry year conditions, in five-year increments. Supply and demand for the City was discussed in detail in Chapters 6 and 4, respectively.

During normal water years, no curtailments or other reductions in supply are expected for any of the City's supplies. The projected normal water year supplies and demands from 2020 to 2040 are shown in **Table 7-2** as developed initially for **Table 6-8** and **Table 4-4**, respectively. The supply is larger than the demand in all years, so the City is not expected to have any supply shortfalls during normal water years or any issues with providing a reliable and consistent supply of water.

Table 7-2: Normal Year Supply and Demand Comparison (AF) (DWR Table 7-2)

	2020	2025	2030	2035	2040
Supply totals *(autofill from DWR Table 6-9)*	27,480	27,759	28,053	28,362	28,686
Demand totals *(autofill from DWR Table 4-3)*	19,930	20,720	21,551	22,421	23,339
Difference	7,550	7,039	6,502	5,941	5,347

During single-dry water years, there may be up to a 50 percent curtailment in the City's surface water supply by WID and a 100 percent curtailment in the surface water from NSJWCD. No reductions are assumed for the City's recycled water or groundwater supplies. The projected single-dry water year supplies from 2020 to 2040 are shown in **Table 7-3**.

Table 7-3: Single Dry Year Supply and Demand Comparison (AF) (DWR Table 7-3)

	2020	2025	2030	2035	2040
Supply totals	23,480	23,759	24,053	24,362	24,686
Demand totals	19,930	20,720	21,551	22,421	23,339
Difference	3,550	3,040	2,502	1,940	1,347

Because the City's surface water supply is the only supply that is considered to be susceptible to dry water years, and because 50 percent is the maximum annual curtailment allowed under the City's contract with WID, supplies available during multiple-dry water years are assumed to be no different than supplies available during single-dry water years. The projected multiple-dry water year supplies from 2020 to 2040 are shown in **Table 7-4**.

Table 7-4: Multiple Dry Years Supply and Demand Comparison (AF) (DWR Table 7-4)

		2020	2025	2030	2035	2040
First year	Supply totals	23,480	23,759	24,053	24,362	24,686
	Demand totals	19,930	20,720	21,551	22,421	23,339
	Difference	3,550	3,040	2,502	1,940	1,347
Second year	Supply totals	23,480	23,759	24,053	24,362	24,686
	Demand totals	19,930	20,720	21,551	22,421	23,339
	Difference	3,550	3,040	2,502	1,940	1,347
Third year	Supply totals	23,480	23,759	24,053	24,362	24,686
	Demand totals	19,930	20,720	21,551	22,421	23,339
	Difference	3,550	3,040	2,502	1,940	1,347
Fourth year	Supply totals	23,480	23,759	24,053	24,362	24,686
	Demand totals	19,930	20,720	21,551	22,421	23,339
	Difference	3,550	3,040	2,502	1,940	1,347
Fifth year	Supply totals	23,480	23,759	24,053	24,362	24,686
	Demand totals	19,930	20,720	21,551	22,421	23,339
	Difference	3,550	3,040	2,502	1,940	1,347

To further evaluate the City's supplies, a comparison between supplies and demands excluding the recycled water system was performed. This represents the capacity of the City's existing groundwater and surface water supplies to meet the City's non-recycled water demands (i.e., potable water demands). This evaluation was performed for normal years; during dry years it is anticipated that the City may increase groundwater withdrawals to make up for the reduction in surface water supplies. **Table 7-5** shows that the City has sufficient capacity to meet anticipated demands through 2040. Beyond 2040, an additional source of supply, either recycled water or another source, may be necessary to supplement existing groundwater and surface water supplies to ensure the City can deliver all water demands to its customers.

Table 7-5: Normal Year Supply and Demand Comparison without Recycled Water (AF)

	2020	2025	2030	2035	2040
Supply totals	22,000	22,000	22,000	22,000	22,000
Demand totals	15,532	16,322	17,153	18,023	18,941
Difference	6,468	5,678	4,847	3,977	3,059

7.4 Regional Supply Reliability

The City is committed to ensuring a sustainable and reliable supply of water to meet all future demands. As a result of the relative consistency of the City's water supplies, there are no definite plans at this time to replace or supplement any of the City's supply sources with alternative sources. The City currently does not import water from other regions and there are no plans to start importing water from other regions.

The City is actively implementing a number of DMMs expected to reduce water consumption, especially in residential customers, explained fully in Chapter 9. As residential users make up the largest portion of annual water demand by customer type, many of the DMMs are focused on Lodi residents in order to achieve a larger reduction in water deliveries. Furthermore, as described in Chapter 6, the City is considering possible future projects to utilize more of the recycled water available from the WWTP in order to further improve the City's water supply reliability, improve the basin overdraft condition by offsetting groundwater pumping, and put recycled water into beneficial use.

Chapter 8 Water Shortage Contingency Planning

This section describes the City's plans for addressing water supply shortage or catastrophic interruption. The City's Water Shortage Contingency Plan (WSCP) includes five stages of increasing restrictions in the case a water shortage is declared. This is in addition to the Water Conservation Ordinance (see **Appendix S**), Lodi Municipal Code, Section 13.08, Article III, that is always in effect and was most recently updated and adopted on November 18, 2015.

8.1 Water Conservation Ordinance

All requirements of the City's Water Conservation Ordinance are in effect during normal water conditions. The waste of water is prohibited and defined in the Water Conservation Ordinance as:

- Failure to repair a controllable leak of water or to correct or repair overspray, low head drainage, leaks or excessive watering amounts from irrigation system or landscape watering.
- Watering of lawns, flower beds, landscaping, ornamental plants or gardens on days or times other than those outlined in Section 13.08.240 of the Water Conservation Ordinance as:
    A. Watering Days:
        1. Premises having odd numbered street addresses on Wednesday, Friday, and Sunday.
        2. Premises having even numbered street addresses on Tuesday, Thursday, and Saturday.
        3. No watering will be allowed by any addresses on Monday.
    B. Watering Hours: Any hour except between the hours of 10 a.m. and 6 p.m. is prohibited.
- Washing of sidewalks, driveways, parking areas, tennis courts, patios, streets, or other exterior paved areas or buildings except when required to remove any spillage of substances that may be a danger to public health or safety.
- Washing with water any motor vehicles, trailers, or movable equipment other than with a bucket and rinsing the vehicle or equipment by use of a hose for not more than three minutes.
- Use of a hose without a positive shut off nozzle.
- The excess watering of any area so that water flows into a gutter or any drainage area.
- The unnecessary running of water in any residential, commercial, or industrial establishment onto the floor, pavement, ground, or into any drain or drainage area, with any equipment or in any way.
- Watering of lawns or landscapes during or within 48 hours following a measurable rain.
- Operation of a water fountain or other decorative water feature that does not use re-circulated water.

Enforcement procedures and penalties for water wasting as defined in Section 13.08.250 of Lodi's Water Conservation Ordinance include:

- First Water Waste: Notification of water waste to the person at the premises of water waste by mailing a written notice (i.e., warning) (**Appendix T**) requiring the waste to be corrected, cured, or abated. Additionally, the City will mail a written notice to the person who receives the utility bill for the premises of water waste.
- Second Water Waste: In the event of a second waste of water within 12 months of a first waste, the City will send a written notice assessing a $35 charge to be added to the next utility bill.

- Third Water Waste: In the event of a third waste of water within 12 months of a second waste, the City will send a written notice assessing a $75 charge to be added to the next utility bill.
- Fourth Water Waste: In the event of a fourth waste of water within 12 months of a third waste the City will send a written notice assessing a $200 charge to be added to the next utility bill.
- Fifth Water Waste: In the event of a fifth waste of water within 12 months of a fourth waste, the City will send a written notice assessing a $500 charge to be added to the next utility bill. If the property is not already metered, the City may also require a water meter and/or a water restrictor to be installed at the waster's expense.
- Subsequent Water Waste: In the event of a subsequent waste of water within 12 months of a fifth waste, water service will be disconnected. Prior to reconnection, the City will require payment of all outstanding utility charges, fees, penalties, and surcharges in addition to a reconnection fee.

In addition to the enforcement procedures above, any person who wastes water may also be charged with an infraction as per Sections 13.08.250 and 13.08.280 of the Water Conservation Ordinance.

8.2 Stages of Action

CWC Section 10632(a)(1) requires that the City develop stages of action to be undertaken in response to a water supply shortage, including one stage with up to a 50 percent reduction in water supply. The City must also identify specific water supply conditions which are applicable to each stage.

The City's five-stage rationing plan is described in the section below. During a water supply shortage, the Public Works Director determines and publicly declares which WSCP stage the City is in. The stages are summarized in **Table 8-1**. Due to the ongoing drought that began in 2012, the City declared a Stage I water emergency on May 21, 2014, a Stage II water emergency on February 27, 2015, and a Stage III water emergency on May 1, 2015 that continued to be in effect through the end of the 2015 fiscal year.

Table 8-1: Stages of Water Shortage Contingency Plan (DWR Table 8-1)

Stage	Percent Supply Reduction	Water Supply Condition
I	5%	Potential Shortage
II	10%	Minor Shortage
III	20%	Moderate Shortage
IV	30%	Severe Shortage
V	50%	Critical Shortage

8.3 Prohibitions on End Uses

The narrative below describes the specific rationing measures associated with each stage. The prohibitions, penalties or charges, and consumption reduction methods for each of the five water supply stages are included in this section as described in CWC Section 10632(a)(4,5,6) and are summarized in **Table 8-2**.

Table 8-2: Restrictions and Prohibitions on End Uses (DWR Table 8-2)

Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?
I	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
I	Landscape - Limit landscape irrigation to specific times		Yes
I,III,IV	Landscape - Limit landscape irrigation to specific days		Yes
V	Landscape - Prohibit all landscape irrigation		Yes
II	CII - Lodging establishment must offer opt out of linen service		Yes
II	CII - Restaurants may only serve water upon request		Yes
I,IV	Water Features - Restrict water use for decorative water features, such as fountains		Yes
IV	Other water feature or swimming pool restriction	No potable water may be used to fill or refill swimming pools, artificial lakes, ponds, or streams	Yes
I	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner		Yes
I	Other - Require automatic shut of hoses		Yes
V	Other - Prohibit use of potable water for construction and dust control		Yes
I	Other - Prohibit use of potable water for washing hard surfaces		Yes
V	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water		Yes
IV	Other	Flushing of sewers or fire hydrants only for emergency and essential operations	Yes
V	Other	Large industry must reduce or cease all water use	Yes
NOTES: All Stage I restrictions and prohibitions are from the Water Conservation Ordinance in effect at all times.			

Stage I. Potential Shortage

During Stage I, there is potential for a supply shortage and a 5 percent or greater voluntary reduction is suggested. The concern about a future water shortage is explained to the public and future stages, including mandatory restrictions, are outlined.

All requirements of the City's Water Conservation Ordinance are in effect for Stage I as during normal conditions. Also, as in normal conditions, the State's Model Water Efficient Landscape Ordinance is in effect in the City, per the State's mandate as of January 1, 2010. Lodi's Water Conservation Program consists mainly of outdoor watering restrictions enforced by water conservation patrol staff, public education through local fairs and other events, bill inserts, and newspaper articles, and an in-school education program. During Stage I, public outreach from the Water Conservation Program remains the same.

Enforcement procedures and penalties for water wasting continue as described in the Lodi Water Conservation Ordinance Sections 13.08.250 and 13.08.280.

Stage II. Minor Shortage

During Stage II of a water supply shortage, the shortage is minor and a 10 percent or greater reduction in water usage is required for the City to meet the immediate needs of its customers. Water alert conditions are declared, the water shortage situation is explained to the public, and consumers are asked for a 10 percent or greater mandatory water use reduction. The City also explains other stages and forecasts future actions.

Existing ongoing water conservation measures are continued and emphasized as necessary to alert the public of the nature of the water supply shortage. The City maintains an ongoing public information campaign consisting of distribution of literature, speaking engagements, bill inserts, and conversation messages printed in local newspapers. Educational programs in area schools are ongoing and utilized as necessary.

All requirements of Stage I remain in effect. Additional requirements include:

- Dining establishments are not to serve water unless requested.
- Hotels and motels must offer guests the option of not having towels and linens laundered daily by displaying notices prominently in each guestroom.

Enforcement procedures and penalties for water wasting continue as described in the Lodi Water Conservation Ordinance Sections 13.08.250 and 13.08.280.

Stage III. Moderate Shortage

During Stage III, the water supply shortage is moderate. The City aggressively continues its public information and education programs. Consumers are asked for a 20 percent or greater mandatory water use reduction.

All requirements of Stages I and II remain in effect. Additional requirements include:

- Landscape irrigation restrictions are implemented to limit the allowable frequency of irrigation to a maximum of two days per week and based on the following schedule:
    1. Premises having odd numbered street addresses irrigate only on Wednesday and Sunday.
    2. Premises having even numbered street addresses irrigate only on Tuesday and Saturday.
    3. No watering will be allowed by any addresses on Monday, Thursday, and Friday.

Enforcement procedures and penalties for water wasting continue as described in the Lodi Water Conservation Ordinance Sections 13.08.250 and 13.08.280.

Stage IV. Severe Shortage

During Stage IV of a water supply shortage, the shortage is severe and a 30 percent or greater reduction in water usage is required for the City to meet the immediate needs of its customers. The City aggressively continues its public information and education programs and consumers are asked for a 30 percent or greater mandatory water use reduction.

All requirements of Stages I, II, and III remain in effect. Additional requirements include:

- Landscape irrigation restrictions are implemented to limit the allowable frequency of irrigation to a maximum of one day per week and based on the following schedule:
    1. Premises having odd numbered street addresses irrigate only on Sunday.
    2. Premises having even numbered street addresses irrigate only on Saturday.
- No potable water from the City's system is used to fill or refill new swimming pools, artificial lakes, ponds, or streams until the water crisis is declared over.
- Water use for ornamental ponds and fountains is prohibited.
- Washing of automobiles and equipment must be done on the lawn or at a commercial establishment that uses recycled or reclaimed water.
- Flushing of sewers or fire hydrants is permitted only in cases of emergency and essential operations.

Enforcement procedures and penalties for water wasting continues as described in the Lodi Water Conservation Ordinance Sections 13.08.250 and 13.08.280. Additionally, permanent water meters on existing non-metered services and/or flow restrictors on existing metered services are installed by the City at the customer's expense in the event of a second violation.

Stage V. Critical Shortage

During Stage V of a water supply shortage, the shortage is critical and a 50 percent or greater reduction in water usage is required for the City to meet the immediate needs of its customers. The City aggressively continues its public information and education programs and consumers are asked for a 50 percent or greater mandatory water use reduction.

All requirements of Stages I, II, III, and IV remain in effect. Additional requirements may include:

- Landscape irrigation is not allowed.
- Washing of automobiles and equipment must be done at a commercial establishment that uses recycled or reclaimed water.
- No potable water from the City's system can be used for construction purposes, such as dust control, compaction, or trench jetting.
- Large industrial users, for example canneries and other food manufacturers, are required to reduce or cease all water use.

Enforcement procedures and penalties for water wasting continue as described in the Lodi Water Conservation Ordinance Sections 13.08.250 and 13.08.280 and for Stage IV.

8.4 Penalties, Charges, and Other Enforcement of Prohibitions

A narrative description of the City's methods for enforcing the water use prohibitions in **Table 8-2** is included in the sections above. A breakdown of the actions taken and/or fines assessed in the event of water waste per CWC Section 10632(a)(6) is included in Section 8.1. Stage IV of the WSCP adds an additional enforcement mechanism where water meters and/or flow restrictors can be installed at the customer's expense in the event of a second waste of water.

8.5 Consumption Reduction Methods

Consumption reduction methods are actions taken by the City in order to help reduce water consumption in the service area. These methods, briefly described in the narrative description above relative to each stage of the WSCP, include ongoing public outreach and conservation activities described more completely as part of the discussion of DMMs in Chapter 9. Broadly, the City's Water Conservation Program uses several forms of public education and patrolling water conservation officers to encourage water conservation all the time. In the event of a water shortage, some of these activities may be further emphasized, though few specific actions are highlighted in the WSCP or in **Table 8-3**.

Table 8-3: Stages of Water Shortage Contingency Plan - Consumption Reduction Methods (DWR Table 8-3)

Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference
II,III,IV,V	Other	Mandatory water use reductions
IV	Decrease Line Flushing	Flushing of sewers or fire hydrants only for emergency and essential operations

8.6 Determining Water Shortage Reductions

Section 10632(a)(9) of the CWC requires that the urban WSCP includes a mechanism for determining actual reductions in water use. For metered accounts, reductions in water use for each user can be determined based on meter readings. For unmetered accounts and the service area as a whole, reductions in water use must be determined by measuring water production at the City's well sites and treatment plant. As described previously, the City is in the midst of a Water Meter Program, and by 2019 will have meters installed at all service connections.

In the event of a water shortage, the City will monitor its production meters more frequently for changes in the volumes of water produced at the City's wells and SWTP, as well as at the WWTP. The City will also monitor water delivered to individual metered service connections for changes in delivered water.

The City can track its water use reduction through the state's DRINC portal, operated by the State Water Resources Control Board, which logs the monthly reporting by urban water suppliers made mandatory by drought emergency regulations. The website tracks water use reduction by comparing each supplier's monthly total potable water production with the same month's total production in 2013. As of June 2015 (the last month in the 2015 fiscal year), the City reduced residential water use by 29.4 percent compared with the same month in 2013.

8.7 Revenue and Expenditure Impacts

Section 10632(a)(7) of the CWC requires an analysis of the impacts of the actions taken for conservation and water restriction on the revenues and expenditures of the water supplier, along with measures to overcomes these impacts.

Before the implementation of the Water Meter Program (as reported in the 2005 UWMP), over 90 percent of the City's water was supplied to non-metered customers who were charged a flat rate. During this time, with its revenue was largely disconnected with how much water was used, the impact of decreasing supply or consumer use would have been minimal.

In 2010, the City of Lodi initiated a Water Meter Program to install meters on all residential accounts. Any residential properties constructed after 1992 were already equipped with water meters and, as part of the program, those property owners were transitioned from flat rate billing to a usage (volumetric)-based water bill in January 2012. The remaining residences will have water meters installed in phases through 2018. During the Water Meter Program, two different billing structures will be in place: flat rates for unmetered customers based on the number of bedrooms and usage-based rates for metered customers. Ultimately, all customers will receive a monthly usage-based water bill that consists of a fixed service charge based on the water meter size and a tiered usage-based charge to help encourage water conservation.

As the metering program progresses and more and more properties receive usage-based water bills, the City's revenue will be more closely tied to water use and therefore more likely to be impacted by the water conservation measures in the WSCP. With the implementation of the WSCP, expenditures may increase due to an increase in the water consumption reduction methods described earlier and revenue from water bills may decrease due to the reduction in water use encouraged in the WSCP's stages. Due to this potential for expenditures to outpace revenue during a water shortage, the City utilizes a rate model that is adjusted annually to ensure an ongoing revenue stream that will adequately support operation of the utility. The fixed service charge for metered customers will help buffer the economic impacts of a reduction in use due to water shortage restrictions. For a catastrophic shortage, the City would use financial reserves to support the operation of the utility in the short term. For a long term shortage, such as a multi-year drought, the City would make rate adjustments or institute drought pricing as needed.

During the current drought, the City has not considered drought pricing and plans to continue utilizing its annually-adjusted rates through the duration of the metering program. In Resolution 2014-240, adopted in December 2014, the City Council adopted pre-approved water rate increases of either 3 percent or the percentage change in the Engineering News Record Twenty Cities Annual Average Index in order to better stabilize revenue impacts through January 2019.

8.8 Water Shortage Contingency Resolution

Section 10632(a)(8) of the CWC requires the inclusion of a draft water shortage contingency resolution or ordinance. In the event of a water shortage emergency, the following is a draft water shortage contingency resolution to be passed by the Lodi City Council. The following draft ordinance gives the City Council's support to the Public Works Director in taking emergency actions as currently authorized in Lodi Municipal Code, Chapter 13.08, Article III, Section 13.08.290, "Emergency Water Conservation—Purpose".

DRAFT

City of Lodi

Resolution No._____

WHEREAS, Lodi Municipal Code, Chapter 13.08, Article III, Section 13.08.290, Emergency Water Conservation allows the Public Works Director to determine the degree of emergency and determine what additional restrictions of water use or other appropriate actions must be taken to protect the water system and the citizens of Lodi; and

WHEREAS, the City of Lodi is experiencing water shortages, therefore;

BE IT RESOLVED by the City Council of the City of Lodi that full support is given to the Public Works Director to make the appropriate recommendations which may include increased restrictions on watering days and hours, restrictions on washing vehicles, etc., restrictions on large water users, restrictions on flushing of water lines, restrictions on the filling of swimming pools, and increases in the current penalties for not complying with water conservation restrictions for the duration of the emergency, and urge full support and cooperation from the citizens of Lodi.

[Affix Official Seal Here]

Signature:_____

Name:_____

Title:_____

Clerk of City of Lodi

8.9 Catastrophic Supply Interruption

CWC Section 10632(a)(3) requires actions to be undertaken by the water supplier to prepare for and implement during a catastrophic interruption of water supplies. A catastrophic event that constitutes a proclamation of a water shortage is any event, either natural or manmade, that causes a severe shortage of water, synonymous with or with greater severity than the Stage III or Stage IV WSCP shortage conditions. The City has developed an ERP, not updated since the 2010 UWMP, which includes appropriate personnel listings, resource inventories, locations for emergency operations centers, response procedures, and the steps necessary to resume normal operations. Because the City's ERP contains sensitive information, only a portion of the document has been included in **Appendix Q**.

The City maintains a sound preventative maintenance program for its distribution system. Auxiliary generators are available and improvements to water facilities are made to minimize loss of these facilities during an earthquake or any disaster causing an electric power outage. Part of the metering program includes surveying and replacing water mainlines, which both limits distribution system loss and better ensures the water system's reliability in the event of a catastrophic supply interruption.

Since the 2010 UWMP, additional action items have been pursued in preparing for and responding to a catastrophic water supply interruption. These include increasing existing water storage through the construction of the SWTP and future plans to add additional storage tanks. Furthermore, the City obtained additional water through its agreement with the NSJWCD, beginning October 2015, for up to 1,000 acre-feet of water for a maximum of 40 years.

8.10 Minimum Supply for the Next Three Years

CWC Section 10632(a)(2) requires an estimate of the minimum annual water supply availability during each of the next three water years (October 1 of the previous year to September 30 of 2016, 2017, and 2018) based on the driest three-year historical sequence for the agency's water supply previously determined in Chapter 7.

The City of Lodi's water supply has historically been 100 percent groundwater. Beginning in November 2012, a portion of the City's supply is surface water from the Mokelumne River through an agreement with WID for 6,000 AFY, which can be curtailed up to 50 percent (to 3,000 AFY) in the case of a shortage. Another agreement with NSJWCD took effect in October 2015 and is for 1,000 AFY of surface water, though this can be completely curtailed in dry years (i.e., 0 AFY). The reliability of the groundwater supply over a 3-year drought is assumed to be 100 percent. Even though regional groundwater levels have been dropping, no short-term groundwater supply problems are anticipated in the next three years, even if they remain dry. Recycled water for the next three years is based on the volume of wastewater treated, which is directly tied to the population. Assuming a population increase of 1 percent each year, the wastewater and therefore recycled water supply will slightly increase. **Table 8-4** shows the minimum water supply available for the next three water years assuming three years of dry conditions.

Table 8-4: Minimum Supply Next Three Years (DWR Table 8-4)

	2016	2017	2018
Available Water Supply	23,266	23,318	23,372

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Chapter 9 Demand Management Measures

This chapter presents a detailed analysis of the demand management measures contained in the UWMP Act, as well as the City's existing efforts to further develop its water conservation program. A DMM, also known as a best management practice (BMP), is a program designed to maximize the efficient use of water and minimize water waste, thus helping the City to meet its urban water use target. This section includes a description of each DMM identified in the UWMP Guidebook, including effectiveness, implementation schedule, and future plans or methods for improvement.

9.1 Law

CWC Section 10631(f)(1) requires that urban retail water suppliers provide a description of the supplier's water demand management measures that includes the following:

(A) A narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years and describes the measures planned to help achieve the supplier's water use targets.

(B) A narrative description of the following water demand management measures:

- (i) Water waste prevention ordinances
- (ii) Metering
- (iii) Conservation pricing
- (iv) Public education and outreach
- (v) Programs to assess and manage distribution system loss
- (vi) Water conservation program coordination and staffing support
- (vii) Other demand management measures that would have a significant impact on daily per capita water use, including innovative measures, if implemented.

9.2 Overview

Water conservation in Lodi is supported by the City Council and Lodi's citizens. The City's current water conservation program consists mainly of outdoor watering restrictions enforced by water conservation patrol staff, public education, and an in-school education program.

Since 1977, the City has had a continuously enforced ordinance for water conservation that has developed into one of the most comprehensive on-going programs in the San Joaquin Valley. A copy of the City's current Water Conservation Ordinance is included in **Appendix S**. From 1977 through 1988, a single water conservation officer patrolled during the months of May through October. Since 1989, three to four water conservation officers have patrolled from May through October to intensify and enhance the program.

The City is committed to water conservation and has several additional policies and on-going programs to promote and encourage water conservation. In addition, the City has recently implemented several drought-specific programs to promote more intensive water conservation during the ongoing drought that began in 2012. Detailed descriptions of the City's current water conservation policies and programs as they relate to the six DMMs follow.

9.3 Demand Management Measures

Each DMM is discussed in detail below, including implementation over the past five years, the effectiveness of the DMM, and planned implementation to help achieve water use targets.

The DMMs describe the City's plan to achieve the water use reductions necessary to meet the per capita water use targets, consistent with the Water Conservation Bill of 2009. The urban water use targets and how they were calculated are described in Chapter 5. The City's interim 2015 target is 225 GPCD and the 2020 target is 200 GPCD. The City's actual water usage in 2015 was 196 GPCD; therefore, the City is currently meeting the interim target and is on track meeting the 2020 target, especially with the plans set forth by the DMMs.

9.3.1 Water Waste Prevention Ordinances

The City's ongoing Water Conservation Ordinance (Lodi Municipal Code, Chapter 13.08, Article III), first implemented in 1977 with the most recent update going into effect on December 18, 2015 (copy included in **Appendix S**), defines water waste prohibitions for the City's customers. The Ordinance provides several definitions of the "waste of water," outlines watering days and hours, describes the City's enforcement procedures, and discusses the violations and infractions process. The City also has a WSCP, discussed in full in Chapter 8, where Stage I includes a voluntary reduction in water use, along with the permanent restrictions of the Water Conservation Ordinance, and additional stages implement mandatory measures that only take effect in the event of a more serious water supply shortage.

The effectiveness of the Water Conservation Ordinance can be determined by the number of citations and violations that are reported annually. Violations are typically reported by the water conservation patrol officers that patrol the City (currently there are two officers, with one more position actively advertised for hiring), though they may also come from Lodi residents reporting on one another. During 2015, the City received 1,349 phone calls from Lodi residents, and conservation staff acted upon 2,394 accounts, distributing verbal warnings (208 total), written warnings (2,186 total), and citations with fines (occurs with a third water waste within a year of the second). From November 2014 through the remainder of the FY 2015, 11 citations with fines were assessed. The monitoring activities of the Water Conservation Ordinance are also useful for targeted outreach; for example, if an area is determined to have excessive violations, the City can implement a targeted public outreach program informing the public about the Water Conservation Ordinance.

Table 9-1 shows the number of citations/violations recorded in different categories of water waste for each of the past five fiscal years. The Water Conservation Ordinance has been very much in effect over the past five years and the number of violations decreased from 2011 to 2014, potentially due to the Ordinance's effectiveness. However, in 2015, the number of violations increased almost to the amount seen in 2011. This is likely due to the ongoing drought that began in 2012, and it prompted the City to declare a Stage II water emergency on February 27, 2015 and a Stage III water emergency on May 1, 2015. Each of these stages increased the focus on or added new water use restrictions and the City increased its efforts to curb water waste by issuing more warnings and citations to residents caught wasting water. As described in Chapter 8, Stage II requires at least 10 percent mandatory reduction in water use and on-going public outreach, along with requirements for dining establishments not serving water unless requested and hotels/motels offering the option to not launder towels and linens. During Stage III, the mandatory reduction increases to at least 20 percent with landscape irrigation days reduced to 2 days a week.

There are no set methods to quantify the savings of this DMM, but the City believes that this program is necessary to curtail flagrant water waste situations and is financially successful. Daily per capita water usage, as outlined in Chapter 5, increased from 2011 to 2014 and then dropped in 2015 to 196 GPCD, which is below the interim SB X7-7 target of 225 GPCD for 2015. Although it is difficult to extract the savings associated with individual DMMs from less per capita water use, it is reasonable to assume that a portion is attributable to the City's Water Conservation Ordinance.

Table 9-1: Water Waste Violations					
Category	2011	2012	2013	2014	2015
Controllable leak	162	65	59	43	211
Watering on an unassigned day	1,127	954	623	288	1,174
Watering during the wrong time	444	352	187	82	198
Washing down paved areas	67	34	24	15	118
Washing vehicle	0	0	5	12	0
Hose without positive shut off nozzle	122	109	65	175	40
Flooding gutter	1,090	705	378	46	1,200
Other	91	86	18	0	157
Total	3,103	2,305	1,359	661	3,098

The daily per capita water use (in GPCD) from 2011 to 2015 was inversely related to the number of water waste violations (i.e., more violations, lower GPCD). Therefore, in 2014, when not many violations were reported, the GPCD was higher. However, in 2015, when there was a citywide focus on reducing water waste and as the number of violations increased, the GPCD subsequently decreased. From this information, it is reasonable to rely upon the Water Conservation Ordinance and an increased presence of patrolling to continue to make sure the City achieves its 2020 water use target.

In the future, the Water Conservation Ordinance will continue to set a baseline level for conservation in the City due to enforceable restrictions on water wasting activities. With the deputy water conservation officer position currently open for hiring, the City is well positioned to curb water waste through the Water Conservation Ordinance's base water use restrictions and increased patrolling with the addition of another officer. This DMM is currently advertised through the Public Works' website, flyers, and the information sheets informing users of their water waste violations. **Appendix T** includes a water conservation information sheet that outlines the requirements of the Ordinance, describes water wasting rates and enforcements, and provides water saving tips to the public.

The City will continue to monitor the effectiveness of this DMM. Coordination with other DMMs, such as public education and outreach and water conservation program, could increase effectiveness.

9.3.2 Metering

The City's primary means for achieving and sustaining the urban use targets is through its Water Meter Program. Over the next several years, the City will install water meters on all unmetered water service connections. As part of this Program, usage-based water rates will be implemented, as described in the Conservation Pricing DMM.

Assembly Bill 2572 (AB 2572) became law in 2004 and requires that all urban water suppliers install water meters on all residential, commercial, and industrial services constructed prior to 1992. Also according to AB 2572, the City must:

- Install water meters by January 1, 2025 on all municipal and industrial water service connections constructed before 1992; and,

- Charge each customer that has a metered service connection based on the volume of deliveries as measured by the water meter.

Installing water meters and billing for actual water use provides a strong incentive for customers to use less water and equalizes service costs for each customer to their actual use (high water users pay a more equitable share of the system costs). Water metering can reduce exterior landscape water use and can also achieve a modest reduction in interior water use.

The City currently meters and bills for actual water used for many of its customers. A few commercial and city customers are currently unmetered. The City is currently implementing a program for installing water meters (approximately 700) for unmetered commercial customers (i.e., non-residential), estimated to be complete by 2018.

The City is in the process of implementing an eight phase residential metering program with conversion to usage (volumetric)-based water rates occurring at least several months after the meter is installed. Approximately 3,000 single family customers with existing meters were converted to usage-based rates in 2011, and each year during the meter retrofit program, additional customers will be converted to usage-based water rates. It is estimated that all single family residential customers will be transitioned to usage-based water rates by January 2020. Prior to converting any customer to usage-based rates, the City will provide the customer with actual water usage data and information regarding how the customer's bill may be affected with the change in billing. Residential meter installation/billing began in 2011 and metering is expected to be fully implemented by 2019. **Table 9-2** shows the City's progress made in the metering program since implementation began in 2011. The estimated schedule through the end of the program (approximately 2020) is included. By the end of Phase 5 in 2015, 9,513 meters have been installed.

The best way to evaluate the effectiveness of metering is a periodic review of customer water use. Various studies have estimated water savings as a result of metering and commodity pricing. Past studies have indicated between 10 to 40 percent reduction, with 15 percent as the most typical (Richards et al, 2009). A 10 percent to 20 percent reduction in residential use could potentially result in savings for the City of approximately 350 to 680 AFY, based on current unmetered usage (3,418 AF for single family and multi-family customers in 2015). The City is currently meeting its interim water usage target. If these savings from metering are at least partially achieved, it will aid the City in meeting its final water usage target. Furthermore, though savings from metering commercial accounts is not as well documented as it is specific to how commercial accounts use water, the City might anticipate at least a slight lessening in per account commercial water use.

Combining customer education and outreach with this DMM is likely to improve its overall effectiveness. The City intends to increase outreach efforts around the metering program and water conservation in general during implementation. The City's outreach efforts are described more thoroughly in the Public Education and Outreach DMM.

Table 9-2: Water Meter Program Implementation

Category	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Phase of Water Meter Program	1	2	3	4	5	6	7	8	---	---	---
Number of Unmetered Residential Accounts	19,523	19,504	15,535	13,450	11,631	8,723	5,815	2,907	0	0	---
Number of Meters Installed	3,698[a]	2,111	1,465	1,334	905	938[b]	1,379[b]	794[b]	0	0	12,624
Number of Accounts with Commodity Rates	2,874	3,100	5,551	9,449	12,353	15,337	18,321	21,305	24,289	24,532	---
Water Savings (AFY)[c]	144	11	123	195	145	149	149	149	149	12	1,227

NOTES:
a. Not including 2,874 meters installed before 2011 (not as part of the program)
b. Expected to occur during Phase 6, Phase 7, and Phase 8 between April and November 2016, 2017, and 2018, respectively
c. Assumes 10 percent reduction in use for metered customers or savings of 0.05 AFY per metered account receiving commodity rates

9.3.3 Conservation Pricing

The City is currently implementing its Water Meter Program. Water meters for residential customers will be installed though 2018 with implementation of usage-based billing for all customers occurring by the end of 2020. The City is also working on meter installation for currently unmetered commercial customers and should be completed by 2019. See the Metering DMM for more information regarding the City's meter implementation schedule.

Conservation pricing is often cited as a means to have market mechanisms provide incentives for conservation. Water consumption, however, has a relatively inelastic demand relative to price, meaning as unit prices go up, unit demand does not correspond in a 1:1 linear fashion due to a variety of factors. Only a portion of water use for a residence can be considered discretionary, generally a portion of landscaping use, excess showering periods, and other similar household activities. Most water use is simply a basic function of existence and therefore cannot be drastically reduced. At the point discretionary use has been wrung out of the system due to the marginal costs of water, another rate tier is unlikely to reap much conservation savings.

Implementing water bills based directly on the amount of water used (i.e., volumetrically-based), a form of conservation pricing, is expected to help reduce residential water demand in the City, thereby helping the City meet its 2020 water use target. Evaluation of the City's water use before and after implementation of the program will provide information on the effectiveness of the City's rate structure. Water savings due to conservation pricing already implemented are difficult to determine since the City is still in the process of implementing its Water Meter Program. Estimates of water savings from the residential metering program are provided under the Metering DMM.

Since the majority of the City's non-residential customers are metered and charged the same as in-city multi-family residential customers (seen in **Table 9-3**), the single-block commodity rate (i.e., one price for each unit volumetric water use) for water encourages water conservation since more water use means a higher water bill. The City's wastewater billing policies for these customers (non-residential and multi-family residential) also reflect water use, which provides an additional incentive for conservation.

In July 2010, the City Council approved new usage-based water rates implemented starting in January 2011. The new usage-based water rate structure for single family residential customers includes a fixed service charge based on the size of the water meter and a three-tier usage rate structure intended to help encourage water conservation (rate structure shown in **Table 9-3**). Customers are switched from flat rates to tiered rates after the installation of water meters on their properties. Customers begin receiving volumetric wastewater bills after receiving comparative bills, which may also promote further conservation.

Table 9-3: Residential Metered Rates (Effective January 2015)

Type of Service Connection	Meter Size	Monthly Service Charge	Usage Charge (per 100 ft^3)		
			Tier 1 (0-10)	Tier 2 (11-50)	Tier 3 (>50)
Single Family	up to 3/4" meter	$22.58	$0.96	$1.32	$1.68
	1" meter	$35.91			
	1 1/2" meter	$68.95			
	2" meter	$108.77			

Table 9-3: Residential Metered Rates (Effective January 2015)

Type of Service Connection	Meter Size	Monthly Service Charge	Usage Charge (per 100 ft^3)		
			Tier 1 (0-10)	Tier 2 (11-50)	Tier 3 (>50)
Multi-Family and Non-Residential	up to 3/4" meter	$22.58	$1.08		
	1" meter	$35.91			
	1 1/2" meter	$68.95			
	2" meter	$93.26			
	3" meter	$160.61			
	4" meter	$252.33			
	6" meter	$476.15			
	8" meter	$740.68			
	10" meter	$1,045.83			

Though the Water Meter Program didn't begin installing new meters until 2011, 2,874 residential customers already had meters in place before that and began receiving volumetrically-based water bills in January 2011. Additional customers are converted during each new phase of the program. The Metering DMM above discusses the number of meters installed during each phase of the metering program. As discussed above, by the end of calendar year 2015, 9,513 residential meters had been installed. This does not necessarily mean this same number of water accounts are receiving volumetrically-based water bills, partially due to the time lag in implementing volumetrically-based water bills after meter installation and also that multiple meters may apply to only one water account. Before an account is switched to a usage-based water bill, the customer receives a comparative bill for a year showing actual water usage data and information regarding how the customer's bill may be affected with the change in billing.

It is difficult to measure water consumption savings since the beginning of the Water Meter Program and the subsequent rise in usage-based water bills due to the uncertainty in the estimation of unmetered water usage. Also, is also difficult to separate any savings due to metering and usage-based water bills from savings due to the ongoing drought and the water reduction requirements mandated by the state.

The City is currently not considering drought pricing (i.e., surcharges effective during times of drought that may increase the fixed charge, volumetric charge, volumetric tier cutoffs, etc.), but may as the drought continues and the Water Meter Program is closer to completion.

9.3.4 Public Education and Outreach

The City has an ongoing public information program that was first implemented in 1977. Representatives from the City's Water Conservation Program general participate in local fairs and meetings, including the Lodi Grape Festival and Harvest Fair, San Joaquin County Master Gardener conferences, the Literacy Fair, the summertime weekly Lodi Downtown Farmers Market, and other special events. Staff converse with fair visitors about Lodi's Water Conservation Program and answer questions concerning water issues. The City

also hands out information sheets and flyers, conservation kits, and holds contests for prizes such as low-flow showerheads. The City participates in about six of these events a year and hands out an average of 14 water conservation brochures during each event. Additionally, watering day and other Water Conservation Ordinance reminders have been periodically included on utility bills and on Lodi's cable television station during summer months. Newspaper articles and advertisements are also published throughout the year in Lodi's and Stockton's newspapers reminding Lodi residents of water conservation regulations, offering conservation tips, and relaying the successes of the program. Refrigerator magnets with the watering day and hour schedules are given out by City staff and at the local fairs. The City's website has sustainable water use guides that include water saving tips for both indoor and outdoor use, a native plant guide, examples of sustainable landscaping, and an interactive plant selection tool. A demonstration garden, installed in the spring of 2014, is a river-friendly example of sustainable landscaping that highlights less waste and runoff and a healthy alternative to pesticides. **Appendix U** includes examples of some public outreach information, including flyers and website screenshots.

Since 1986, Lodi schools have had a Water Educational Program aimed at grades K though 6 to cultivate water awareness and the formation of good water habits. Originally with four pilot schools in 1986, the program has expanded to visit over 60 unique schools, centers, or groups and reaches an average of over 3,000 students a year.

In addition, as part of the City's Water Meter Program, the City provides customers with comparative water meter bills prior to implementing usage-based billing. This information allows customers to compare their water bill under the flat billing rate with what their water bill would have been if they had been charged based on the City's usage based billing. The City has also created a website for the Program, with a link on the City's home page, and designated a Water Meter Program Administrator to respond to customer questions. This additional public outreach is intended to make the metering program more effective. A study conducted in Davis, California found an average reduction in water use of 18 percent due to the addition of meters with "associated publicity." The study also found a higher percent savings for high use customers (Maddaus, 2001). Therefore, the public outreach associated with the Water Meter Program likely helped the City achieve its interim water use target.

Evaluating the effectiveness of these public education and outreach programs on consumer water use and behavior is difficult. The effectiveness of these programs is currently evaluated by the amount of information presented to the community. The City tracks the number of brochures distributed, special events attended, number of students/schools receiving tours or presentations, and other activities pursued to promote water conservation. The City also tracks customer response and any commentary regarding the information provided. The City believes that its public outreach efforts are beneficial and necessary to implement other DMMs effectively. **Table 9-4** summarizes the public education and outreach programs for the past five years.

Table 9-4: Public Education and Outreach Implementation

Category	2011	2012	2013	2014	2015
Number of students receiving presentations via Water Educational Program	4,912	2,407	5,071	1,504	1,574
Unique visitors to sustainable water website[a]	3,385[b]	13,881	10,325	7,597	6,899
Bill Inserts/ Newsletters/ Brochures	20,000+	20,000+	20,000+	20,000+	20,000+
Demonstration Gardens	1	1	1	1	1
Special Events/ Media Events	5	5	5	7	7

NOTES:
a. Sustainable water use website: lodi.watersavingplants.com
b. Data only for January 2011 through June 2011

Public information and education is an effective tool in promoting water conservation. The City will continue to improve its public information program by augmenting and updating the water conservation information on the City's website. Filling the currently-vacant Water Conservation Coordinator position will also enhance public outreach efforts by facilitating communication to promote program activities.

9.3.5 Programs to Assess and Manage Distribution System Loss

In 2001, the City implemented a capital improvement program to replace water lines, with an ultimate goal of replacing one percent of the system annually. First evaluated were locations with problems due to the water main size (typically 2- and 3-inch diameter mains). Next targeted were mains in backyards due to the difficulty of obtaining access for maintenance and repair. Finally, the City examined the frequency of call outs and interviews maintenance crews to determine which mains are most problematic.

The Water Meter Program that began in 2011 included water main evaluation and replacement of mains (including relocation) that did not comply with the City's 6-inch minimum diameter criteria and were located in backyards or alley easements. Water main replacement was matched to residential water meter installation to minimize the frequency of disruptions to neighborhoods and streets.

The best way to evaluate the effectiveness of this program is to compare water production data at the City's wells with water consumption from the City's customers. Without comprehensive residential water meters in place to compare water supply and demand data, it is very difficult to evaluate the effectiveness of the pipeline replacement program. The City is in the process of implementing the residential metering program. For more information on the City's metering implementation plans, see the Metering DMM.

Because the effectiveness of this DMM implementation cannot be determined without all residential meters in place, savings have to be estimated. In the first five phases of the Water Meter Program, 91,510 feet of water main has been replaced and has likely already yielded water savings. With over 55,000 linear feet scheduled for replacement in the remaining phases of the program (to occur from 2016 to 2018), additional water savings will be realized with a little more than one-third of the total water main length left to replace. Assuming a one percent reduction in water demand due to water main replacement, savings in 2015 could be approximately 146 AFY.

The City's water pipeline replacement program is currently on-going as part of the Water Meter Program that began in 2011. Through 2015, 91,510 feet or 16.4 miles of water main pipeline has been replaced out of the total planned 148,580 feet. **Table 9-5** shows the past and projected progress of replacing water mains, including estimated water savings. To improve the effectiveness of this DMM, the City should develop a regular leak detection program to focus work areas for the future. As discussed in Chapter 4, the City's distribution system losses are currently estimated to be approximately 3.5 percent of the water production from the City's groundwater wells and SWTP. The City anticipates maintaining this low level of system loss through completion of its metering program (making system losses simpler to estimate) and water main replacement project.

Table 9-5: Water Main Replacement

Category	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Phase of Water Meter Program	1	2	3	4	5	6	7	8	---	---	---
Length of Main Replaced (feet)	4,220	26,350	20,310	24,000	16,630	27,090[a]	11,750[a]	18,230[a]	0	0	148,580
Water Savings[b] (AFY)	149	148	147	147	146	147	148	148	149	150	1,480

NOTES:
a. Expected to occur during Phase 6, Phase 7, and Phase 8 between April and November 2016, 2017, and 2018, respectively
b. Assumes a 1 percent reduction in annual demand based on water main replacement, based on 2010 UWMP

9.3.6 Water Conservation Program Coordination and Staffing Support

The City's Water Conservation Program was started in 1989 to coordinate the conservation activities which are beneficial to the community and important to the long-term success of the program. The City's Water Conservation Coordinator position is currently unfilled, though several employees work part-time to perform many of the same duties. At present, the program has three part-time positions, though currently only two are filled and the City is actively trying to hire another Deputy Water Conservation Officer to replace one that left in August 2015. The officers patrol the City in shifts to look for violations to the Water Conservation Ordinance (e.g. water leaks, over watering, or violation of watering days/hours), help to coordinate events that educate the public about conserving water, distribute water conservation information, process water conservation rebates, and perform residential water audits. The program receives funding from the City's water fund and spent an average of just under $28,000 in the last four fiscal years (2012–2015). Expenditures in the past two years (2014 and 2015) averaged over $38,000 due to the increased importance of water conservation during the ongoing drought.

The effectiveness of this DMM could be improved through greater coordination with other DMM activities such as school education and public outreach. This program is incredibly important to the success of the Water Conservation Ordinance, since the Water Conservation Program staff are in charge of patrolling, following up on citizen telephone calls reporting water waste, and issuing warnings or fines. As explained above in the Waste Water Prevention Ordinance DMM, the Water Conservation Ordinance is an important piece in the City achieving its 2020 SB X7-7 target daily per capita water use. The Water Conservation Program supports the Ordinance and, through public outreach and educational events and information, works to encourage all Lodi residents to reduce water use, thereby ensuring the 2020 water use target will be met.

9.3.7 Other Demand Management Measures

The City currently offers a variety of rebates through its Water Conservation Rebate Program, which was implemented in 2001 to promote the retrofitting of residential plumbing fixtures. Presently, on-going rebates are available for ultra-low flow toilets, low-flow shower heads, rain barrels, high-efficiency clothes washers, automatic sprinkler timers, hose bib manual timers, and insulated hot water blankets through an application and reimbursement system (with reimbursements generally up to 50 percent off the cost). The current rebate application is included in **Appendix U**.

The effectiveness of this program is based upon the number of rebates issued for water conservation devices (currently tracked by the City) and the percentage of customers that install the equipment after purchasing the devices. As the City becomes fully metered, the effectiveness of this DMM may be evaluated by comparing metered water use for customers before and after installation of water saving devices. Reduced wastewater treatment and disposal is another benefit of this program due to the water use reduction potential of water-saving showerheads and toilets. **Table 9-6** below summarizes the rebate programs implemented for the past five years and provides estimates for the City's water savings as a result of the rebate program. In FY 2011, no rebates were distributed; thus data for FY 2011 are not included in **Table 9-6**.

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Table 9-6: Water Conservation Rebate Program

Category	Rebate Offer	2012			2013			2014			2015		
		Number Rebated	Amount Rebated	Estimated Savings (AFY)	Number Rebated	Amount Rebated	Estimated Savings (AFY)	Number Rebated	Amount Rebated	Estimated Savings (AFY)	Number Rebated	Amount Rebated	Estimated Savings (AFY)
Ultra-low Flow Toilet – 1.6 gpf or less	$44	111	$4,940.00	3.5	86	$3,784.00	2.7	58	$2,552.00	1.9	18	$797.00	0.6
EPA WaterSense Certified Toilet – 1.28 gpf	50% off up to $100	0	$0	0	0	$0	0	77	$6,139.43	2.9	128	$10,936.33	4.8
Pressure Assisted PF/2 Ultra-low Flow Toilet	50% off up to $100	0	$0	0	2	$160.75	0.06	1	$66.03	0.03	0	$0	0
Low Flow Shower Head– 2.5 gpm or less	50% off up to $25	1	$50.00	0.07	8	$271.71	0.5	12	$406.18	0.8	10	$324.79	0.7
EPA WaterSense Certified Showerhead – 2.0 gpm or less	50% off up to $100	0	$0	0	0	$0	0	0	$0	0	6	$137.29	0.5
Replacement Automatic Sprinkler Timer	50% off up to $100	0	$0	0	0	$0	0	0	$0	0	6	$213.71	0.02
Hose Bib Manual Timer (for outside hose)	50% off up to $50	1	$10.75	0.004	0	$0	0	5	$70.71	0.02	2	$32.88	0.01
	Total	113	$5,001	3.6	96	$4,216	3.3	153	$9,234	5.6	170	$12,442	6.5

NOTES: gpf = gallons per flush, gpm = gallons per minute

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The City's Building Code requires that all new residential construction and major remodels or renovations of existing homes install low flow plumbing fixtures and fittings, including low flow toilets and showerheads. The City could realize more water savings if existing homes with high-water-using fixtures and fittings (likely older homes) were targeted with promotional material for the rebate program. To increase the number of retrofits for existing homes, the City should pursue any opportunities for grants. The City could use also use grants to facilitate the establishment of a direct-installation program.

9.4 Implementation over the Past Five Years

The nature and extent of DMM implementation over the past five years was already addressed in the individual sections describing each DMM above.

9.5 Planned Implementation to Achieve Water Use Targets

Any future implementation plans were already discussed in the individual sections describing each DMM above.

9.6 California Urban Water Conservation Council Membership

The City is not a member of the California Urban Water Conservation Council (CUWCC).

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Chapter 10 Plan Adoption, Submittal, and Implementation

This 2015 UWMP serves as an update to the City's 2010 UWMP. The City's UWMP was first developed in 1990 and addressed water supply and demand for the City. Plan updates have occurred every five years since then. With each update, additional elements have been added, in addition to updating previous plan estimates of water supply and demand. These new elements have included recycled water use, water conservation programs, a water shortage contingency plan, energy intensity, and water loss reporting.

The City will implement this UWMP in accordance with the requirements established in the Urban Water Management Planning Act of 1983, as amended, and the Water Conservation Act of 2009.

10.1 Inclusion of All 2015 Data

For this 2015 UWMP, the City of Lodi switched to reporting data by fiscal year rather than by calendar year. The City's fiscal year goes from July 1st of the previous year to June 30th of the next, so the City's 2015 fiscal year was July 1, 2014 to June 30, 2015. 2015 fiscal year data is reported in this UWMP.

10.2 Notice of Public Hearing

The City encouraged public participation in the development of the 2015 UWMP and provided opportunities for public review and comment. In April 2016, the City posted an announcement of the 2015 UWMP update on its website. The City also included a statement on utility bills during the month of February 2016, notifying customers of the update and providing contact information for more details.

The City placed a copy of the draft UWMP on its website along with a notice stating that the UWMP was being updated and that a public review period through May 25, 2016 would be provided to address comments and concerns from members of the community. A similar notice was printed in the Lodi News-Sentinel, a local newspaper. Copies of these notices are included in **Appendix V**. The notice, as well as the draft 2015 UWMP, was made available for public inspection on the City's website and at the City Clerk's office. On June 1, 2016, the City conducted a public hearing to receive comments from the public regarding the UWMP. This hearing provided an opportunity for the City's customers/residents and employees to learn about the water supply situation and the plans for providing a reliable, safe, high-quality water supply for the future. Information regarding the public hearing and the public review period is included in **Appendix V**. This UWMP was finalized after the public review period and adoption by the City Council and was placed on the City's website.

10.2.1 Notice to Cities and Counties

San Joaquin County was sent both a notification letter that the 2015 UWMP was under preparation and a notice of the public hearing. The GBA, of which the City of Lodi is a member, was also notified at the same times as the County. The notification letters to both the County and the GBA are included in **Appendix C**.

Table 10-1: Notification to Cities and Counties (DWR Table 10-1)

City Name	60 Day Notice	Notice of Public Hearing
City of Lodi	☐	☑
County Name	**60 Day Notice**	**Notice of Public Hearing**
San Joaquin County	☑	☑

10.2.2 Notice to the Public

As described above, the public was notified of the public hearing and review period for the draft 2015 UWMP through the City of Lodi's website, utility bills, and a local newspaper (the Lodi News-Sentinel). Copies of these notifications are included in **Appendix V**.

10.3 Public Hearing and Adoption

After the notification and public review period described above, a public hearing took place on June 1, 2016, the same day as the City Council meeting to adopt the 2015 UWMP. Included in **Appendix V** is a copy of the City Council's agenda showing the public hearing.

10.3.1 Adoption

The UWMP was formally adopted by the City Council on June 1, 2016 after modifications based on the public review period (where no comments were received) and hearing. The adoption resolution (Resolution 2016-90) is included in **Appendix W**.

10.4 Plan Submittal

The City prepared the 2015 UWMP update during the fall of 2015 and the winter and spring of 2016 in order to adopt and submit the final 2015 UWMP before July 1, 2016.

10.4.1 Submitting a UWMP to DWR

The City's adopted 2015 UWMP was submitted to the California Department of Water Resources (DWR) using its online submittal tool within 30 days of the City Council's adoption of the plan as required by CWC Section 10644(a)(1).

10.4.2 Electronic Data Submittal

The final UWMP (including all text and data tables) was submitted electronically using DWR's online submittal tool.

10.4.3 Submitting a UWMP to the California State Library

Per CWC Section 10644(a)(1), a copy of the 2015 UWMP was sent to the California State Library within 30 days of adoption by the City Council.

10.4.4 Submitting a UWMP to Cities and Counties

Per CWC Section 10644(a)(1) and Section 10635(b), copies of the 2015 UWMP were sent to San Joaquin County within 30 days of adoption by the City Council. A copy was also sent to the GBA, the California Department of Public Health, and the Lodi Public Library.

10.5 Public Availability

Per CWC Section 10645 and within 30 days of filing a copy of the 2015 UWMP with DWR, the City will make the adopted UWMP available for public review during normal business hours at the Lodi Public Library and on the website for the City's Public Works department.

10.6 Amending an Adopted UWMP

If the City of Lodi makes any modifications or amendments to the adopted UWMP, it will go through the process of notification, public hearing, adoption, and submittal as described above for the amended plan.

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Appendix A - UWMP Checklist

Checklist Arranged by Water Code Section

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10608.20(b)	Retail suppliers shall adopt a 2020 water use target using one of four methods.	Baselines and Targets	Section 5.7 and App E	**Section 5.6 and Appendix F**
10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	Chapter 5 and App E	**Chapter 5 and Appendix F**
10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5 year baseline. This does not apply if the suppliers base GPCD is at or below 100.	Baselines and Targets	Section 5.7.2	**Section 5.6 and Appendix F**
10608.24(a)	Retail suppliers shall meet their interim target by December 31, 2015.	Baselines and Targets	Section 5.8 and App E	**Section 5.7 and Appendix F**
10608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.8.2	**N/A**
10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets.	Plan Adoption, Submittal, and Implementation	Section 10.3	**Sections 10.2 and 10.3**
10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted water use reductions.	Baselines and Targets	Section 5.1	**N/A**
10608.40	Retail suppliers shall report on their progress in meeting their water use targets. The data shall be reported using a standardized form.	Baselines and Targets	Section 5.8 and App E	**Section 5.7 and Appendix F**
10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.1	**Section 1.2**
10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.5.2	**Section 2.4**
10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.4	**Section 7.4**
10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.	Plan Adoption, Submittal, and Implementation	Section 10.2.1	**Sections 2.4 and 10.2**

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10621(d)	Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.	Plan Adoption, Submittal, and Implementation	Sections 10.3.1 and 10.4	**Section 10.4**
10631(a)	Describe the water supplier service area.	System Description	Section 3.1	**Section 3.1**
10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.3	**Section 3.3**
10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Sections 3.4 and 5.4	**Section 3.4**
10631(a)	Provide population projections for 2020, 2025, 2030, and 2035.	System Description	Section 3.4	**Section 3.4**
10631(a)	Describe other demographic factors affecting the supplier's water management planning.	System Description	Section 3.4	**Section 3.4**
10631(b)	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, 2030, and 2035.	System Supplies	Chapter 6	**Section 6.9**
10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2	**Section 6.2**
10631(b)(1)	Indicate whether a groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.2	**Section 6.2**
10631(b)(2)	Describe the groundwater basin.	System Supplies	Section 6.2.1	**Sextion 6.2**
10631(b)(2)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Section 6.2.2	**N/A**
10631(b)(2)	For unadjudicated basins, indicate whether or not the department has identified the basin as overdrafted, or projected to become overdrafted. Describe efforts by the supplier to eliminate the long-term overdraft condition.	System Supplies	Section 6.2.3	**Section 6.2**
10631(b)(3)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	System Supplies	Section 6.2.4	**Section 6.2**
10631(b)(4)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Sections 6.2 and 6.9	**Sections 6.2 and 6.9**
10631(c)(1)	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage.	Water Supply Reliability Assessment	Section 7.1	**Section 7.1**
10631(c)(1)	Provide data for an average water year, a single dry water year, and multiple dry water years	Water Supply Reliability Assessment	Section 7.2	**Section 7.2**

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10631(c)(2)	For any water source that may not be available at a consistent level of use, describe plans to supplement or replace that source.	Water Supply Reliability Assessment	Section 7.1	**N/A**
10631(d)	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	System Supplies	Section 6.7	**Section 6.7**
10631(e)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.2	**Section 4.2**
10631(e)(3)(A)	Report the distribution system water loss for the most recent 12-month period available.	System Water Use	Section 4.3	**Section 4.3**
10631(f)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Sections 9.2 and 9.3	**Sections 9.3 and 9.4**
10631(f)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Demand Management Measures	Sections 9.1 and 9.3	**N/A**
10631(g)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years.	System Supplies	Section 6.8	**Section 6.8**
10631(h)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.6	**Section 6.6**
10631(i)	CUWCC members may submit their 2013-2014 CUWCC BMP annual reports in lieu of, or in addition to, describing the DMM implementation in their UWMPs. This option is only allowable if the supplier has been found to be in full compliance with the CUWCC MOU.	Demand Management Measures	Section 9.5	**N/A**
10631(j)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) – if any - with water use projections from that source.	System Supplies	Section 2.5.1	**N/A**
10631(j)	Wholesale suppliers will include documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.	System Supplies	Section 2.5.1	**N/A**
10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.5	**Section 4.5**
10632(a) and 10632(a)(1)	Provide an urban water shortage contingency analysis that specifies stages of action and an outline of specific water supply conditions at each stage.	Water Shortage Contingency Planning	Section 8.1	**Chapter 8**
10632(a)(2)	Provide an estimate of the minimum water supply available during each of the next three water	Water Shortage Contingency Planning	Section 8.9	**Section 8.10**

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
	years based on the driest three-year historic sequence for the agency.			
10632(a)(3)	Identify actions to be undertaken by the urban water supplier in case of a catastrophic interruption of water supplies.	Water Shortage Contingency Planning	Section 8.8	**Section 8.9**
10632(a)(4)	Identify mandatory prohibitions against specific water use practices during water shortages.	Water Shortage Contingency Planning	Section 8.2	**Section 8.3**
10632(a)(5)	Specify consumption reduction methods in the most restrictive stages.	Water Shortage Contingency Planning	Section 8.4	**Section 8.5**
10632(a)(6)	Indicated penalties or charges for excessive use, where applicable.	Water Shortage Contingency Planning	Section 8.3	**Section 8.4**
10632(a)(7)	Provide an analysis of the impacts of each of the actions and conditions in the water shortage contingency analysis on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts.	Water Shortage Contingency Planning	Section 8.6	**Section 8.7**
10632(a)(8)	Provide a draft water shortage contingency resolution or ordinance.	Water Shortage Contingency Planning	Section 8.7	**Section 8.8**
10632(a)(9)	Indicate a mechanism for determining actual reductions in water use pursuant to the water shortage contingency analysis.	Water Shortage Contingency Planning	Section 8.5	**Section 8.6**
10633	For wastewater and recycled water, coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.1	**Section 6.5**
10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area. Include quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	System Supplies (Recycled Water)	Section 6.5.2	**Section 6.5**
10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.5.2.2	**Section 6.5**
10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.3 and 6.5.4	**Section 6.5**
10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.5.4	**Section 6.5**
10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.5.4	**Section 6.5**

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.5.5	**Section 6.5**
10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.5	**Section 6.5**
10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	Section 7.1	**Section 7.1**
10635(a)	Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	Section 7.3	**Section 7.3**
10635(b)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 60 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	**Section 10.4**
10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	Plan Preparation	Section 2.5.2	**Sections 2.4 and 10.2**
10642	Provide supporting documentation that the urban water supplier made the plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan.	Plan Adoption, Submittal, and Implementation	Sections 10.2.2, 10.3, and 10.5	**Sections 10.2, 10.3, and 10.5**
10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Sections 10.2.1	**Section 10.2**
10642	Provide supporting documentation that the plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Section 10.3.1	**Section 10.3**
10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4.3	**Section 10.4**
10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	**Section 10.4**
10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Sections 10.4.1 and 10.4.2	**Section 10.4**
10645	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5	**Section 10.5**

Appendix B - UWMP Standardized DWR Tables

Table 2-1: Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015
3910004	City of Lodi	26,357	14,258
	TOTAL	26,357	14,258

Table 2-2: Plan Identification		
Select Only One	**Type of Plan**	
☑	**Individual UWMP**	
	☐	Water Supplier is also a member of a RUWMP
	☐	Water Supplier is also a member of a Regional Alliance
☐	**Regional Urban Water Management Plan**	

Table 2-3: Agency Identification	
Type of Agency	
☐	Agency is a wholesaler
☑	Agency is a retailer
Fiscal or Calendar Year	
☐	UWMP Tables Are in Calendar Years
☑	UWMP Tables Are in Fiscal Years
If Using Fiscal Years Provide Month and Date that	
07/01	
Units of Measure Used in UWMP	
Unit	AF

Table 2-4: Water Supplier Information Exchange
The retail supplier has informed the following wholesale supplier(s) of
Wholesale Water Supplier Name
n/a

Table 3-1: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040
	63,719	66,969	70,385	73,976	77,749	81,715
NOTES: Department of Finance population estimate for 2015 population. 2020-2040 projections assume 1.0 percent annual growth rate.						

Table 4-1: Demands for Potable and Raw Water - Actual			
Use Type	2015 Actual		
	Additional Description	Level of Treatment When Delivered	Volume
Single Family	Metered and unmetered accounts	Drinking Water	6,201
Multi-Family	Metered and unmetered accounts	Drinking Water	1,504
Commercial	Metered and unmetered accounts	Drinking Water	6,274
Industrial	Metered accounts	Drinking Water	175
Institutional/Governmental	Metered and unmetered accounts	Drinking Water	268
Landscape	Metered accounts	Drinking Water	161
Losses	Calculated using AWWA software		503
		TOTAL	15,086

Table 4-2: Demands for Potable and Raw Water - Projected					
Use Type	Projected Water Use				
	2020	2025	2030	2035	2040
Single Family	6,046	6,355	6,681	7,025	7,384
Multi-Family	1,740	1,829	1,923	2,020	2,124
Commercial	6,596	6,932	7,286	7,656	8,048
Industrial	184	193	203	213	224
Institutional/Governmental	279	290	301	312	323
Landscape	169	178	187	196	206
Losses	518	544	572	601	632
TOTAL	15,532	16,322	17,153	18,023	18,941

Table 4-3: Total Water Demands						
	2015	2020	2025	2030	2035	2040
Potable and Raw Water *From DWR Tables 4-1 and 4-2*	15,086	15,532	16,322	17,153	18,023	18,941
Recycled Water Demand *From DWR Table 6-4*	4,398	4,398	4,398	4,398	4,398	4,398
TOTAL WATER DEMAND	19,484	19,930	20,720	21,551	22,421	23,339

Table 4-4: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date	Volume of Water Loss*
07/2014	503
** Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet.*	
NOTES: The number in the AWWA worksheet is negative, as discussed further in the UWMP text.	

Table 4-5: Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook)	No
Are Lower Income Residential Demands Included In Projections?	No

Table 5-1 Baselines and Targets Summary					
Baseline Period	Start Year	End Year	Average Baseline GPCD	2015 Interim Target (GPCD)	Confirmed 2020 Target (GPCD)
10 Year	1999	2008	250	225	200
5 Year	2004	2008	245		

Table 5-2: 2015 Compliance								
Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments to 2015 GPCD					2015 GPCD	Did Supplier Achieve Targeted Reduction for 2015?
		Extraordinary Events	Economic Adjustment	Weather Normalization	TOTAL Adjustments	Adjusted 2015 GPCD		
200	225	0	0	0	0	200	200	Yes

Table 6-1: Groundwater Volume Pumped						
☐	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type	Location or Basin Name	2011	2012	2013	2014	2015
Alluvial Basin	Eastern San Joaquin Subbasin	16,669	17,786	17,423	15,314	9,366
	TOTAL	16,669	17,786	17,423	15,314	9,366

Table 6-2: Wastewater Collected Within Service Area in 2015						
☐	There is no wastewater collection system. The supplier will not complete the table below.					
Wastewater Collection			**Recipient of Collected Wastewater**			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2015	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
City of Lodi	Metered	5,717	City of Lodi	White Slough Water Pollution Control Facility	Yes	No
Total Wastewater Collected from Service Area in 2015:		5,717				

Table 6-3: Wastewater Treatment and Discharge Within Service Area in 2015										
☐	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.									
							2015 Volumes			
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level	Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
White Slough Water Pollution Control Facility	Dredger Cut	Sacramento-San Joaquin Delta	5B39NP00073	Bay or estuary outfall	No	Tertiary	5,717	1,201	4,398	0
						Total	5,717	1,201	4,398	0

Table 6-4: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area								
☐	Recycled water is not used and is not planned for use within the service area of the supplier.							
Name of Agency Producing (Treating) the	City of Lodi							
Name of Agency Operating the Recycled Water	City of Lodi							
Supplemental Water Added in 2015	n/a							
Source of 2015 Supplemental Water	n/a							
Beneficial Use Type	General Description of 2015 Uses	Level of Treatment	2015	2020	2025	2030	2035	2040
Agricultural irrigation	Irrigation of 790 acres of fodder crop	Secondary, Undisinfected	2,918	2,918	2,918	2,918	2,918	2,918
Industrial use	In cooling tower and providing steam for power plants	Tertiary	1,345	1,345	1,345	1,345	1,345	1,345
Recreational impoundment	Fish rearing pond replenishment	Tertiary	135	135	135	135	135	135
		Total:	4,398	4,398	4,398	4,398	4,398	4,398

Table 6-5: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual		
☐	Recycled water was not used in 2010 nor projected for use in 2015. The supplier will not complete the table below.	
Use Type	**2010 Projection for 2015**	**2015 Actual Use**
Agricultural irrigation	1,465	2,918
Industrial use	1,327	1,345
Recreational impoundment	50	135
Total	2,842	4,398

Table 6-6: Methods to Expand Future Recycled Water Use			
☑	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.		
Section 6.5.5	Provide page location of narrative in UWMP		
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
n/a	n/a	n/a	n/a
		Total	0

Table 6-7: Expected Future Water Supply Projects or Programs					
☑	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.				
☐	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.				
Section 6.8	Provide page location of narrative in the UWMP				
Name of Future Projects or Programs	Joint Project with other agencies?	Description (if needed)	Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Agency
n/a	n/a	n/a	n/a	n/a	n/a

Table 6-8: Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	2015		
		Actual Volume	Water Quality	Total Right or Safe Yield
Purchased or Imported Water	WID from Mokelumne River	4,892	Raw Water	6,000
Groundwater	From 28 municipal wells	9,366	Raw Water	15,000
Recycled Water		4,398	Recycled Water	---
	Total	18,656		21,000

Table 6-9: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	**Projected Water Supply**									
		2020		**2025**		**2030**		**2035**		**2040**	
		Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield
Purchased or Imported Water	WID from Mokelumne River	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Purchased or Imported Water	NSJWCD from Mokelumne River	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Groundwater	From 28 municipal wells in the Eastern San Joaquin subbasin	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Recycled Water		5,480	---	5,759	---	6,053	---	6,362	---	6,686	---
	Total	27,480	22,000	27,759	22,000	28,053	22,000	28,362	22,000	28,686	22,000

Table 7-1: Basis of Water Year Data				
Year Type	**Base Year**	**Available Supplies if Year Type Repeats**		
		☐	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____	
		☑	Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available		**% of Average Supply**
Average Year	2003	28,068		100%
Single-Dry Year	1977	24,068		86%
Multiple-Dry Years 1st Year	1987	24,068		86%
Multiple-Dry Years 2nd Year	1988	24,068		86%
Multiple-Dry Years 3rd Year	1989	24,068		86%
Multiple-Dry Years 4th Year	1990	24,068		86%
Multiple-Dry Years 5th Year	1991	24,068		86%

Table 7-2: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040
Supply totals *(autofill from DWR Table 6-9)*	27,480	27,759	28,053	28,362	28,686
Demand totals *(autofill from DWR Table 4-3)*	19,930	20,720	21,551	22,421	23,339
Difference	7,550	7,039	6,502	5,941	5,347

Table 7-3: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040
Supply totals	23,480	23,759	24,053	24,362	24,686
Demand totals	19,930	20,720	21,551	22,421	23,339
Difference	3,550	3,040	2,502	1,940	1,347

Table 7-4: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040
First year	Supply totals	23,480	23,759	24,053	24,362	24,686
	Demand totals	19,930	20,720	21,551	22,421	23,339
	Difference	3,550	3,040	2,502	1,940	1,347
Second year	Supply totals	23,480	23,759	24,053	24,362	24,686
	Demand totals	19,930	20,720	21,551	22,421	23,339
	Difference	3,550	3,040	2,502	1,940	1,347
Third year	Supply totals	23,480	23,759	24,053	24,362	24,686
	Demand totals	19,930	20,720	21,551	22,421	23,339
	Difference	3,550	3,040	2,502	1,940	1,347
Fourth year	Supply totals	23,480	23,759	24,053	24,362	24,686
	Demand totals	19,930	20,720	21,551	22,421	23,339
	Difference	3,550	3,040	2,502	1,940	1,347
Fifth year	Supply totals	23,480	23,759	24,053	24,362	24,686
	Demand totals	19,930	20,720	21,551	22,421	23,339
	Difference	3,550	3,040	2,502	1,940	1,347

Table 8-1: Stages of Water Shortage Contingency Plan		
Stage	Percent Supply Reduction	Water Supply Condition
I	5%	Potential Shortage
II	10%	Minor Shortage
III	20%	Moderate Shortage
IV	30%	Severe Shortage
V	50%	Critical Shortage

Table 8-2: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?
I	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
I	Landscape - Limit landscape irrigation to specific times		Yes
I,III,IV	Landscape - Limit landscape irrigation to specific days		Yes
V	Landscape - Prohibit all landscape irrigation		Yes
II	CII - Lodging establishment must offer opt out of linen service		Yes
II	CII - Restaurants may only serve water upon request		Yes
I,IV	Water Features - Restrict water use for decorative water features, such as fountains		Yes
IV	Other water feature or swimming pool restriction	No potable water may be used to fill or refill swimming pools, artificial lakes, ponds, or streams	Yes
I	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner		Yes
I	Other - Require automatic shut of hoses		Yes
V	Other - Prohibit use of potable water for construction and dust control		Yes
I	Other - Prohibit use of potable water for washing hard surfaces		Yes
V	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water		Yes
IV	Other	Flushing of sewers or fire hydrants only for emergency and essential operations	Yes
V	Other	Large industry must reduce or cease all water use	Yes
NOTES: All Stage I restrictions and prohibitions are from the Water Conservation Ordinance in effect at all times.			

Table 8-3: Stages of Water Shortage Contingency Plan - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference
II,III,IV,V	Other	Mandatory water use reductions
IV	Decrease Line Flushing	Flushing of sewers or fire hydrants only for emergency and essential operations

Table 8-4: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	23,266	23,318	23,372

Table 10-1: Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
City of Lodi	☐	☑
County Name	60 Day Notice	Notice of Public Hearing
San Joaquin County	☑	☑

Appendix C - Notification Letters

CITY COUNCIL
MARK CHANDLER, Mayor
DOUG KUEHNE,
Mayor Pro Tempore
BOB JOHNSON
JOANNE MOUNCE
ALAN NAKANISHI

CITY OF LODI

SURFACE WATER TREATMENT FACILITY
2001 WEST TURNER ROAD
LODI, CALIFORNIA 95242
(209) 333-6878
EMAIL: pwdept@lodi.gov
www.lodi.gov

STEPHEN SCHWABAUER
City Manager
JENNIFER M. FERRAIOLO
City Clerk
JANICE D. MAGDICH
City Attorney
CHARLES E. SWIMLEY, JR.
Interim Public Works
Director

December 14, 2015

Kerry Sullivan
Director
San Joaquin County Community Development Department
1810 E. Hazelton Ave.
Stockton, CA 95205

Subject: 2015 Urban Water Management Plan Update

Dear Ms. Sullivan,

Existing State law requires each urban water supplier to prepare and adopt an urban water management plan at least once every 5 years. The City of Lodi (City) is currently preparing an update to its 2010 Urban Water Management Plan (UWMP) in compliance with the 2015 UWMP Guidebook. A copy of the 2010 UWMP is available at the City's website: http://www.lodi.gov/public_works/water.html.

The UWMP documents the City's plans to ensure adequate water supplies meet existing and future demands for water under a range of water supply conditions, including water shortages. Furthermore, the 2015 plan records the City's progress in meeting its 2020 water use target under Senate Bill SB X7-7.

In conformance with California Water Code Section 10621(b), the City is notifying the County within which the City provides water supplies that the UWMP is being reviewed and updated. We anticipate having a draft plan available for public review in April 2016. The final plan will be submitted to the California Department of Water Resources by July 1, 2016.

Please contact me at 209-333-6800 ext. 2091 if you have any questions about the City's Urban Water Management Plan update.

Sincerely,

Kathryn E. Garcia, P.E.
Compliance Engineer

KG/SM/trb

cc: Charles Swimley, Interim Public Works Director
Lance Roberts, Utilities Superintendent

CITY COUNCIL
MARK CHANDLER, Mayor
DOUG KUEHNE,
Mayor Pro Tempore
BOB JOHNSON
JOANNE MOUNCE
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CITY OF LODI

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Interim Public Works
Director

December 14, 2015

Brandon W. Nakagawa, P.E.
Water Resources Coordinator
Eastern San Joaquin County Groundwater Basin Authority
1810 E. Hazelton Avenue
P. O. Box 1810
Stockton, CA 95201

Subject: Urban Water Management Plan Update

Dear Mr. Nakagawa,

Existing State law requires each urban water supplier to prepare and adopt an urban water management plan at least once every 5 years. The City of Lodi (City) is currently preparing an update to its 2010 Urban Water Management Plan (UWMP) in compliance with the 2015 UWMP Guidebook. A copy of the 2010 UWMP is available at the City's website: http://www.lodi.gov/public_works/water.html.

The UWMP documents the City's plans to ensure adequate water supplies meet existing and future demands for water under a range of water supply conditions, including water shortages. Furthermore, the 2015 plan records the City's progress in meeting its 2020 water use target under Senate Bill SB X7-7.

California Water Code Section 10620(d)(2) requires urban water suppliers to coordinate preparation of UWMPs with appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable. The City is a member of the Eastern San Joaquin County Groundwater Basin Authority (GBA), and consistent with the water code requirements, is notifying the GBA that our UWMP is being reviewed and updated. We anticipate having a draft plan available for public review in April 2016. The final plan will be submitted to the California Department of Water Resources by July 1, 2016.

Please contact me at 209-333-6800 ext. 2091 if you have any questions about the City's Urban Water Management Plan update.

Sincerely,

Kathryn E. Garcia, P.E.
Compliance Engineer

KG/SM/trb

cc: Charles Swimley, Interim Public Works Director
Lance Roberts, Utilities Superintendent

CITY COUNCIL
MARK CHANDLER, Mayor
DOUG KUEHNE,
Mayor Pro Tempore
BOB JOHNSON
JOANNE MOUNCE
ALAN NAKANISHI

CITY OF LODI

SURFACE WATER TREATMENT FACILITY
2001 WEST TURNER ROAD
LODI, CALIFORNIA 95242
(209) 333-6878
EMAIL: pwdept@lodi.gov
www.lodi.gov

STEPHEN SCHWABAUER
City Manager
JENNIFER M. FERRAIOLO
City Clerk
JANICE D. MAGDICH
City Attorney
CHARLES E. SWIMLEY, JR.
Interim Public Works
Director

April 11, 2016

Kerry Sullivan
Director
San Joaquin County Community Development Department
1810 E. Hazelton Ave.
Stockton, CA 95205

Subject: Urban Water Management Plan Update

Dear Ms. Sullivan,

This letter is being provided to you as a follow up to the letter sent to you on December 14, 2015 informing you that the City of Lodi (City) is preparing a 2015 Urban Water Management Plan (UWMP). Notice is hereby given that the City has scheduled a public meeting on June 1, 2016 to receive comments on the Draft 2015 UWMP. The meeting will be held at the Carnegie Forum, 305 West Pine Street, Lodi.

All interested parties are invited to attend the public meeting and present their views. If you are unable to attend the public hearing, you may also submit to the City written comments regarding the subject of the meeting. Please send written comments to Kathryn Garcia at kgarcia@lodi.gov or Public Works Department, 2001 West Turner Road, Lodi, 95242 by May 25, 2016. Written statements may also be filed with the City Clerk, City Hall, 221 West Pine Street, 2nd Floor, Lodi, 95240, at any time prior to the public review period end date.

The Draft 2015 UWMP is available online at: www.lodi.gov/public_works/pdf/2015%20UWMP%20Public%20Draft.pdf. A hard copy is also available for review at the City Clerk's office, located at 221 West Pine Street, Lodi, CA.

Please contact me at 209-333-6800 ext. 2091 if you have any questions about the City's 2015 UWMP update.

Sincerely,

Kathryn E. Garcia, P.E.
Compliance Engineer

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Interim Public Works
Director

April 11, 2016

Brandon W. Nakagawa, P.E.
Water Resources Coordinator
Eastern San Joaquin County Groundwater Basin Authority
1810 E. Hazelton Avenue
P. O. Box 1810
Stockton, CA 95201

Subject: Urban Water Management Plan Update

Dear Mr. Nakagawa,

This letter is being provided to you as a follow up to the letter sent to you on December 14, 2015 informing you that the City of Lodi (City) is preparing a 2015 Urban Water Management Plan (UWMP). Notice is hereby given that the City has scheduled a public meeting on June 1, 2016 to receive comments on the Draft 2015 UWMP. The meeting will be held at the Carnegie Forum, 305 West Pine Street, Lodi.

All interested parties are invited to attend the public meeting and present their views. If you are unable to attend the public hearing, you may also submit to the City written comments regarding the subject of the meeting. Please send written comments to Kathryn Garcia at kgarcia@lodi.gov or Public Works Department, 2001 West Turner Road, Lodi, 95242 by May 25, 2016. Written statements may also be filed with the City Clerk, City Hall, 221 West Pine Street, 2nd Floor, Lodi, 95240, at any time prior to the public review period end date.

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Please contact me at 209-333-6800 ext. 2091 if you have any questions about the City's 2015 UWMP update.

Sincerely,

Kathryn E. Garcia, P.E.
Compliance Engineer

Appendix D - Climate Change Vulnerability Assessment

The Climate Change Vulnerability Assessment is taken from the Climate Change Handbook for Regional Water Planning, USEPA and DWR, 2011. The vulnerability assessment highlights those water-related resources that are important to a region and are sensitive to climate change.

I. Water Demand

☐ *Are there major industries that require cooling/process water in your planning region?*

- As average temperatures increase, cooling water needs may also increase.
- Identify major industrial water users in your region and assess their current and projected needs for cooling and process water.

Vulnerability: Among the water sectors in the City, residential water demand is the highest and industrial water use constitutes less than one tenth of the total water demand. According to the 2015 water use data, industrial water use is 175 AFY out of total water use of 15,086 AFY and is projected to be 224 AFY by 2040. The major industrial water users identified in the 2010 General Plan include wine, food, tourism, agriculture, plastics, manufacturing and general services. In the City's service area, future development projects primarily include residential development. While the industrial use is smaller and not anticipated to increase significantly in the future, as surface water temperatures increase, food processing industries in the City will require additional cooling requirements.

☐ *Does water use vary by more than 50% seasonally in parts of your region?*

- Seasonal water use, which is primarily outdoor water use, is expected to increase as average temperatures increase and droughts become more frequent.
- Where water use records are available, look at total monthly water uses averaged over the last five years (if available). If maximum and minimum monthly water uses vary by more than 25%, then the answer to this question is "yes"
- Where no water use records exist, is crop irrigation responsible for a significant (say >50%) percentage of water demand in parts of your region?

Vulnerability: Based on the analysis of the FY 2011-2015 delivery data averaged over the last five years for each month, the maximum and minimum monthly water use in the City varied by more than 25 percent. Seasonal changes in the temperature in the San Joaquin region are anticipated to increase with climate change, as described in the 2014 Eastern San Joaquin IRWM. Increased temperature and evapotranspiration projections with climate change will result in increased domestic water use. All three climate change modeling scenarios project an increase in the maximum temperature in all seasons (4-8 percent), resulting in an annual increase of 4-6 percent. Similarly, the climate change scenarios project increased evapotranspiration (3-5 percent) except during winter months.

☐ *Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?*

- Fruit and nut crops are climate-sensitive and may require additional water as the climate warms.

Vulnerability: Yes. Currently, the biggest crops in the City's service area are wine, alfalfa, oats/corn, some walnuts/cherries, according to 2014 land use map for the county. While the City does not supply water for agricultural use directly, increased evapotranspiration with climate change will increase agricultural water demand in the area. In addition, changes in heat patterns will affect grapes grown in the area. While reduction in frost free days with climate change can enhance the quality of growth in fruits, exposure to continued high

temperature in the summers is detrimental to the quality of grapes grown for wine production.

☐ *Do groundwater supplies in your region lack resiliency after drought events?*

- Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts and may become more dependent on groundwater pumping.

Vulnerability: Yes. Groundwater levels in the area are generally decreasing and fluctuate depending on precipitation, aquifer recharge, and pumping. Groundwater experienced declines during the extended 1986-1992 drought. Although the rainfall during the most recent drought was negligible, groundwater levels increased slightly, which is attributed to the use of surface water instead of groundwater pumping to meet a portion of demand.

☐ *Are water use curtailment measures effective in your region?*

- Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts.

Vulnerability: Yes. In addition to the statewide required reduction in water use per the SB X7-7 requirements, the City declared a Stage III water emergency with requirements and restrictions that limit the water use during the ongoing drought that began in 2012.

☐ *Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?*

- Changes in snowmelt patterns in the future may make it difficult to balance water demands. Vulnerabilities for ecosystems and municipal/agricultural water needs may be exacerbated by instream flow requirements that are:
    1. not quantified,
    2. not accurate for ecosystem needs under multiple environmental conditions including droughts, and
    3. not met by regional water managers.

Vulnerability: No. Although the City is bordered by the Mokelumne River to the north, the City purchases a small portion of water from the river from Woodbridge Irrigation District (WID) and North San Joaquin Water Conservation District (NSJWCD). The City's major water source is groundwater. As described in the 2014 Eastern San Joaquin IRWM, vulnerabilities to the aquatic life have been identified in the San Joaquin region due to lower stream flows in the spring and summer and changes anticipated in water quality due to low flow and increased water temperatures.

II. Water Supply

☐ *Does a portion of the water supply in your region come from snowmelt?*

- Snowmelt is expected to decrease as the climate warms. Water systems supplied by snowmelt are therefore potentially vulnerable to climate change.
- Where watershed planning documents are available, refer to these in identifying parts of your region that rely on surface water for supplies; if your region contains surface water supplies originating in watersheds where snowpack accumulates, the answer to this question is "Yes."
- Where planning documents are not available, identify major rivers in your region with large users.

Identify whether the river's headwaters are fed by snowpack.

Vulnerability: The City indirectly receives water from the Mokelumne River via agreements with WID and NSJWCD. Snowmelt comprises a large portion of the Mokelumne River watershed's runoff. As discussed in the 2014 Eastern San Joaquin IRWM, changes in streamflow resulting from climate change may impact the timing and availability of this water supply. Water supply shortages from reduced annual precipitation are anticipated in the region. With shift in the precipitation and runoff patterns, dry seasons are anticipated to be extremely dry.

- ☐ *Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?*

  - Some imported or transferred water supplies are sources from climate-sensitive watersheds, such as water imported from the Delta and the Colorado River.

Vulnerability: No. The City's water sources come from the local groundwater basin and the Mokelumne River based on the agreements with the WID and NSJWCD.

- ☐ *Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?*

  - Coastal aquifers are susceptible to salt intrusion as sea levels rise, and many have already observed salt intrusion due to over-extraction, such as the West Coast Basin in southern California.

Vulnerability: Although the Eastern San Joaquin Subbasin underlying the City is not a coastal aquifer and sea water intrusion is not a local issue for the City, sea water intrusion from the Delta and resulting water quality impacts are a continuing concern in the subbasin. As a result of the groundwater depression near the City of Stockton, groundwater flow now converges on the depression with relatively steep gradients eastward from the Delta toward the cone of depression. The connection of the Delta to the Pacific Ocean makes changes in sea level an important variable in the water resources planning in the San Joaquin IRWM region as w whole. As described in the 2014 Eastern San Joaquin IRWM, sea level rise will induce intrusion of saline water into the Delta, endangering agriculture in the reclaimed regions that lie to west and north west of the IRWM region. As part of the ongoing monitoring in the region, groundwater is sampled annually from approximately 18 municipal and domestic supply wells located along the saline front to monitor and assess the saline intrusion.

- ☐ *Would your region have difficulty in storing carryover supply surpluses from year to year?*

  - Droughts are expected to become more severe in the future. Systems that can store more water may be more resilient to droughts.

Vulnerability: This is not expected to be a local issue within the City service area. To increase the system reliability, the City plans to build an additional storage tank with a 1 million gallon capacity in the next two years and another one potentially in 2019.

- ☐ *Has your region faced a drought in the past during which it failed to meet local water demands?*

  - Droughts are expected to become more severe in the future. Systems that have already come close to their supply thresholds may be especially vulnerable to droughts in the future.

Vulnerability: No. While the recent drought in California affected the water supply reliability significantly, the City was able to meet the local water demand.

☐ *Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?*

- As invasive species are expected to become more prevalent with climate change, existing invasive species issues may indicate an ecological vulnerability to climate change.

Vulnerability: No. This is not identified as a significant issue for the City with respect to climate change impact.

III. Water Quality

☐ *Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?*

- Some areas are expected to become more vulnerable to wildfires over time. To identify whether this is the case for parts of your region, the California Public Interest Energy Research (PIER) Program has posted wildfire susceptibility projections as a Google Earth application at: *http://cal-adapt.org/fire/*. These projections are only the results of a single study and are not intended for analysis, but can aid in qualitatively answering this question. Read the application's disclaimers carefully to be aware of its limitations.

Vulnerability: No. The City is not located in areas of increased risk with wildfire susceptibility. However, increase wildfires are expected within the San Joaquin region due to drier weather.

☐ *Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?*

- Warming temperatures will result in lower dissolved oxygen levels in water bodies, which are exacerbated by algal blooms and in turn enhance eutrophication. Changes in streamflows may alter pollutant concentrations in water bodies.

Vulnerability: This is anticipated to affect the surface water bodies within the San Joaquin region. The City does not draw water directly from the Mokelumne River but receives the river water based on the agreements with the WID and NSJWCD. Increased surface water temperatures will reduce the dissolved oxygen content in the water decreasing the water quality.

☐ *Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?*

- In the future, low flow conditions are expected to be more extreme and last longer. This may result in higher pollutant concentrations where loadings increase or remain constant.

Vulnerability: This is anticipated to affect the surface water bodies within the San Joaquin region, including the Mokelumne River, which the City indirectly receives water from. Lower water flows will lead to higher concentrations.

☐ *Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?*

- In the future, low flows are expected decrease, and to last longer. This may result in higher

pollutant concentrations where loadings increase or remain constant.

- ☐ *Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?*

  - While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to increased erosion, which will increase turbidity in surface waters. Areas that already observe water quality responses to rainstorm intensity may be especially vulnerable.

IV. Sea Level Rise

The City is not directly subject to sea level rise; thus, this is not a local concern and not discussed further in this vulnerability assessment.

- ☐ *Has coastal erosion already been observed in your region?*

  - Coastal erosion is expected to occur over the next century as sea levels rise.

- ☐ *Are there coastal structures, such as levees or breakwaters, in your region?*

  - Coastal structures designed for a specific mean sea level may be impacted by sea level rise.

- ☐ *Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation) at less than six feet above mean sea level in your region?*

  - Coastal flooding will become more common, and will impact a greater extent of property, as sea levels rise. Critical infrastructure in the coastal floodplain may be at risk.
  - Digital elevation maps should be compared with locations of coastal infrastructure.

- ☐ *Are there climate-sensitive low-lying coastal habitats in your region?*

  - Low-lying coastal habitats that are particularly vulnerable to climate change include estuaries and coastal wetlands that rely on a delicate balance of freshwater and salt water.

Are there areas in your region that currently flood during extreme high tides or storm surges?

Areas that are already experiencing flooding during storm surges and very high tides, are more likely to experience increased flooding as sea levels rise.

- ☐ *Is there land subsidence in the coastal areas of your region?*

  - Land subsidence may compound the impacts of sea level rise.

- ☐ *Do tidal gauges along the coastal parts of your region show an increase over the past several decades?*

  - Local sea level rise may be higher or lower than state, national, or continental projections.
  - Planners can find information on local tidal gauges at *http://tidesandcurrents.noaa.gov/sltrends/sltrends_states.shtml?region=ca*

V. Flooding

☐ *Does critical infrastructure in your region lie within the 200-year floodplain? DWR's best available floodplain maps are available at:* *http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/best_available_maps/*

- While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to higher peak flows and more severe floods.
- Refer to FEMA floodplain maps and any recent FEMA, US Army Corps of Engineers, or DWR studies that might help identify specific local vulnerabilities for your region. Other follow-up questions that might help answer this question:

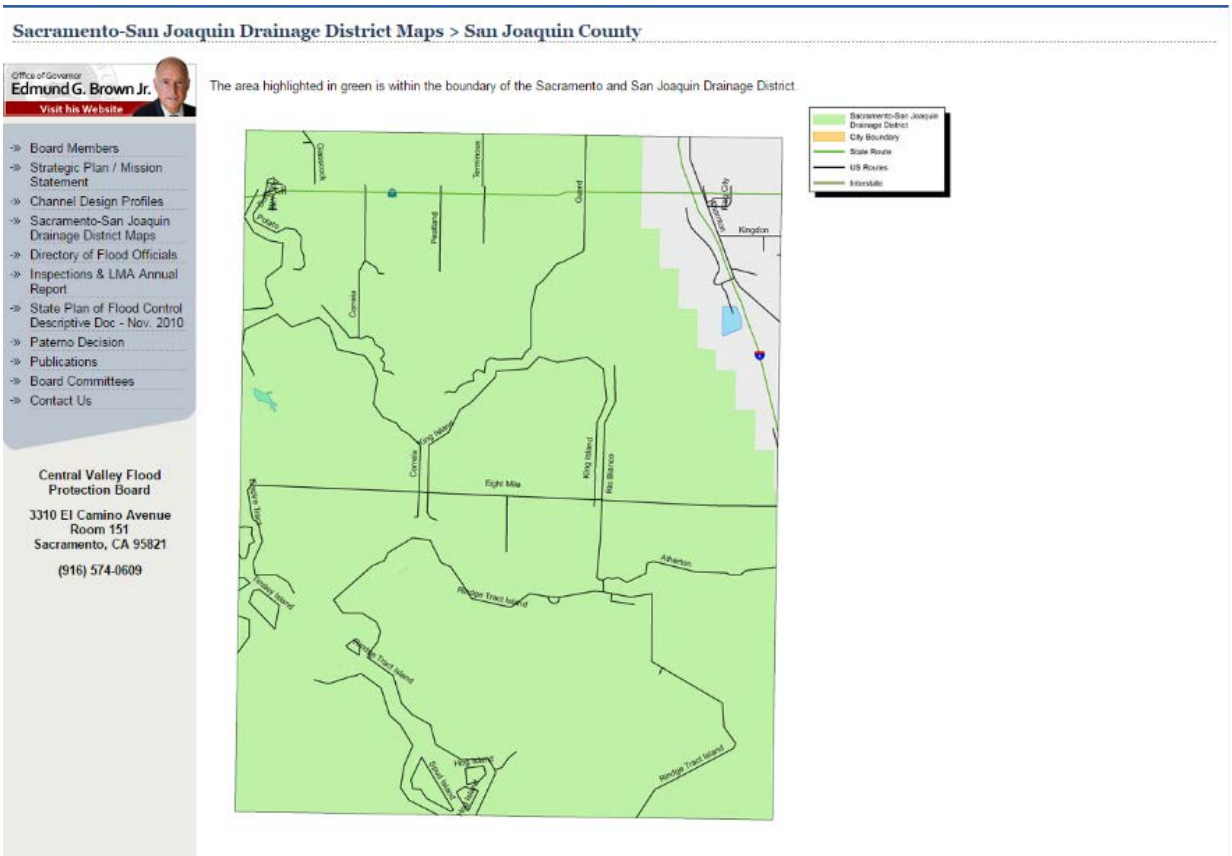
    1. **What public safety issues could be affected by increased flooding events or intensity**? For example, evacuation routes, emergency personnel access, hospitals, water treatment and **wastewater treatment plants**, power generation plants and fire stations should be considered.
    2. Could key regional or economic functions be impacted from more frequent and/or intense flooding?

Vulnerability: According to the BAM 200 year composite floodplain map, areas affected would include primarily local levees on the Mokelumne River. Only a small portion of the City's SWTP is identified within the floodplain. As described in the 2014 Eastern San Joaquin IRWM, Increases in seasonal precipitation during the winter and fall would cause flooding in the respective seasons in the San Joaquin region. Local surface flows could change as a result of more frequent and intense storm events, leading to more areas susceptible to flooding, and increased risk of direct flood damage in the region.

☐ *Does part of your region lie within the Sacramento-San Joaquin Drainage District?*

-The SSJDD contains lands that are susceptible to overflows from the Sacramento and San Joaquin Rivers, and are a key focus of the Central Valley Flood Protection Plan. (*http://www.water.ca.gov/cvfmp/program.cfm*).

- No.



☐ *Does aging critical flood protection infrastructure exist in your region?*

- Levees and other flood protection facilities across the state of California are aging and in need of repair. Due to their overall lowered resiliency, these facilities may be particularly vulnerable to climate change impacts.
- DWR is evaluating more than 300 miles of levees in the San Joaquin and Sacramento Rivers Valleys and the Delta (*http://www.water.ca.gov/levees/*).

Vulnerability: No. There is no information on the City in the link provided.

☐ *Have flood control facilities (such as impoundment structures) been insufficient in the past?*

- Reservoirs and other facilities with impoundment capacity may be insufficient for severe storms in the future. Facilities that have been insufficient in the past may be particularly vulnerable.

Vulnerability: No.

☐ *Are wildfires a concern in parts of your region?*

- Wildfires alter the landscape and soil conditions, increasing the risk of flooding within the burn and downstream areas. Some areas are expected to become more vulnerable to wildfires over time. To identify whether this is the case for parts of your region, the California Public Interest Energy Research Program (PIER) has posted wildfire susceptibility projections as a Google Earth

application at: http://cal-adapt.org/fire/. These projections are the results of only a single study and are not intended for analysis, but can aid in qualitatively answering this question. Read the application's disclaimers carefully to be aware of its limitations.

Vulnerability: No. However, increase in wildfires are expected due to drier weather within the San Joaquin region.

VI. Ecosystem and Habitat Vulnerability

The potential impact of climate change on ecosystem and habitat vulnerability is not a local issue within the City service area; thus, this category is not discussed further below. However, as noted in the 2014 Eastern San Joaquin IRWM, lower flows in the summers would cause the freshwater-saltwater interface to move inwards in the Delta, and potentially up to the western Delta causing the freshwater-saltwater habitat to migrate eastward.

☐ *Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?*

- Erosion is expected to increase with climate change, and sedimentation is expected to shift. Habitats sensitive to these events may be particularly vulnerable to climate change.

☐ *Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?*

- Seasonal high and low flows, especially those originating from snowmelt, are already shifting in many locations.

☐ *Do climate-sensitive fauna or flora populations live in your region?*

- Some specific species are more sensitive to climate variations than others.

☐ *Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?*

- Species that are already threatened or endangered may have a lowered capacity to adapt to climate change.

☐ *Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?*

- Economic values associated with natural habitat can influence prioritization.

☐ *Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?*

- Constrained water quality and quantity requirements may be difficult to meet in the future.

☐ *Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?*

- Storm surges are expected to result in greater damage in the future due to sea level rise. This makes fragile coastal ecosystems vulnerable.

- ☐ *Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change (http://www.itsgettinghotoutthere.org/)?*

  - These ecosystems are particularly vulnerable to climate change.

- ☐ *Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?*

  - These ecosystems are particularly vulnerable to climate change.

VII. Hydropower

The potential impact of climate change on hydropower generation is not a local issue within the City service area. Hydropower generation is anticipated to be moderately impacted in the upstream watersheds.

- ☐ *Is hydropower a source of electricity in your region?*

  - As seasonal river flows shift, hydropower is expected to become less reliable in the future.

Vulnerability: No.

- ☐ *Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?*

  - Energy needs are expected to increase in many locations as the climate warms.
    This increase in electricity demand may compound decreases in hydropower production, increasing its priority for a region.

Vulnerability: No. Energy needs in the City are not anticipated increase significantly.

Appendix E - Water Audit Worksheet

AWWA Free Water Audit Software v5.0

American Water Works Association Copyright © 2014, All Rights Reserved.

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person:	Kathryn Garcia	
Email Address:	kgarcia@lodi.gov	
Telephone | Ext.:	209-333-6800	Ext. 2091
Name of City / Utility:	City of Lodi	
City/Town/Municipality:	Lodi	
State / Province:	California (CA)	
Country:	United States	
Year:	2015	Financial Year
Start Date:	07/2014	Enter MM/YYYY numeric format
End Date:	06/2015	Enter MM/YYYY numeric format
Audit Preparation Date:	12/30/2015	
Volume Reporting Units:	Acre-feet	
PWSID / Other ID:	391004	

The following guidance will help you complete the Audit

All audit data are entered on the ***Reporting Worksheet***

- Value can be entered by user
- Value calculated based on input data
- These cells contain recommended default values

Use of Option (Radio) Buttons: Pcnt: 0.25% Value:

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions
The current sheet. Enter contact information and basic audit details (year, units etc)

Reporting Worksheet
Enter the required data on this worksheet to calculate the water balance and data grading

Comments
Enter comments to explain how values were calculated or to document data sources

Performance Indicators
Review the performance indicators to evaluate the results of the audit

Water Balance
The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard
A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix
Presents the possible grading options for each input component of the audit

Service Connection Diagram
Diagrams depicting possible customer service connection line configurations

Definitions
Use this sheet to understand the terms used in the audit process

Loss Control Planning
Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits
Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements
Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0

American Water Works Association.
Copyright © 2014, All Rights Reserved.

? Click to access definition
+ Click to add a comment

Water Audit Report for: City of Lodi (391004)
Reporting Year: 2015 | 7/2014 - 6/2015

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

Master Meter and Supply Error Adjustments

WATER SUPPLIED

<---------- Enter grading in column 'E' and 'J' ---------->

							Pcnt:		Value:	
Volume from own sources:	+ ?	7	9,366.000	acre-ft/yr	+ ?		0.00%			acre-ft/yr
Water imported:	+ ?	7	4,892.000	acre-ft/yr	+ ?					acre-ft/yr
Water exported:	+ ?	n/a	0.000	acre-ft/yr	+ ?					acre-ft/yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 14,258.000 acre-ft/yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

Billed metered:	+ ?	4	7,604.000	acre-ft/yr			
Billed unmetered:	+ ?	4	6,979.000	acre-ft/yr			
Unbilled metered:	+ ?	n/a	0.000	acre-ft/yr	Pcnt:	Value:	
Unbilled unmetered:	+ ?	4	178.225	acre-ft/yr	1.25%		acre-ft/yr

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION: ? 14,761.225 acre-ft/yr

Check input values; WATER SUPPLIED should be greater than AUTHORIZED CONSUMPTION

WATER LOSSES (Water Supplied - Authorized Consumption)

-503.225 acre-ft/yr

Apparent Losses

					Pcnt:	Value:	
Unauthorized consumption:	+ ?		35.645	acre-ft/yr	0.25%		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	+ ?	6	194.974	acre-ft/yr	2.50%		acre-ft/yr
Systematic data handling errors:	+ ?	5	19.010	acre-ft/yr	0.25%		acre-ft/yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? 249.629 acre-ft/yr

Check input values; APPARENT LOSSES should be less than WATER LOSSES

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: ? -752.854 acre-ft/yr

WATER LOSSES: -503.225 acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: ? -325.000 acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	+ ?	5	239.5	miles
Number of active AND inactive service connections:	+ ?	5	19,200	
Service connection density:	?		80	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: + ? (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 9 53.0 psi

COST DATA

Total annual cost of operating water system:	+ ?	7	$13,756,510	$/Year
Customer retail unit cost (applied to Apparent Losses):	+ ?	7	$0.94	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	+ ?	7	$46.45	$/acre-ft

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 62 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Billed metered
3: Billed unmetered

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

WAS v5.0

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Water Audit Report for: City of Lodi (391004)
Reporting Year: 2015 | 7/2014 - 6/2015

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 62 out of 100 ***

System Attributes:

	Apparent Losses:	249.629	acre-ft/yr
+	Real Losses:	(752.854)	acre-ft/yr
=	Water Losses:	(503.225)	acre-ft/yr
?	Unavoidable Annual Real Losses (UARL):	247.90	acre-ft/yr
	Annual cost of Apparent Losses:	$102,214	
	Annual cost of Real Losses:	-$34,970	Valued at Variable Production Cost

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	-2.3%	
	Non-revenue water as percent by cost of operating system:	0.5%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	11.61	gallons/connection/day
	Real Losses per service connection per day:	-35.01	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	-0.66	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	-752.85	acre-feet/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	-3.04	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

AWWA Free Water Audit Software:
User Comments

WAS v5.0

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Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:	

Audit Item	Comment
Volume from own sources:	Production from groundwater wells
Vol. from own sources: Master meter error adjustment:	n/a
Water imported:	Production from surface water treatment plant (which recieves purchased water from the Mokelumne River via agreements with local districts)
Water imported: master meter error adjustment:	n/a
Water exported:	None
Water exported: master meter error adjustment:	n/a
Billed metered:	Derived form billing records for FY 2015
Billed unmetered:	Estimated using same or slightly reduced (for residential connections) per account water use as seen in metered customers
Unbilled metered:	n/a
Unbilled unmetered:	Left at default percent of water production
Unauthorized consumption:	
Customer metering inaccuracies:	
Systematic data handling errors:	
Length of mains:	
Number of active AND inactive service connections:	
Average length of customer service line:	
Average operating pressure:	
Total annual cost of operating water system:	
Customer retail unit cost (applied to Apparent Losses):	
Variable production cost (applied to Real Losses):	

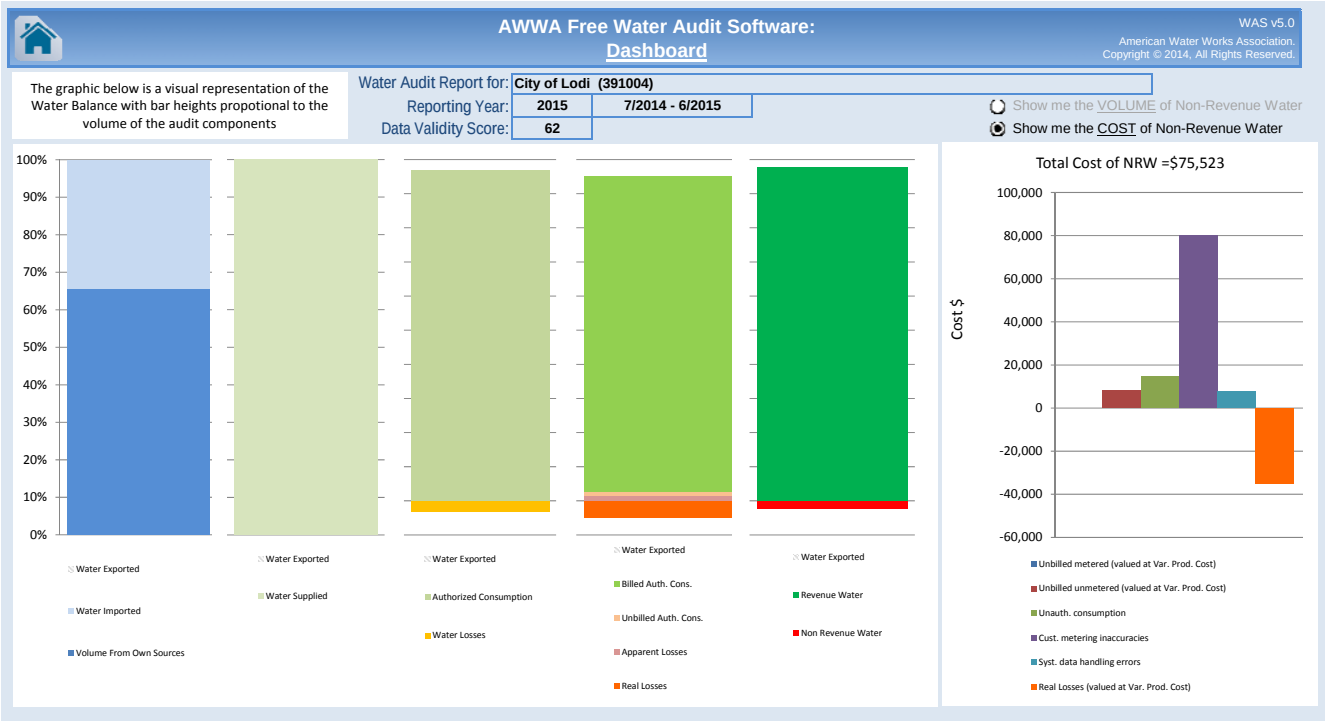
AWWA Free Water Audit Software: Water Balance

WAS v5.0

American Water Works Association.

Water Audit Report for:	City of Lodi (391004)
Reporting Year:	2015 — 7/2014 - 6/2015
Data Validity Score:	62

Own Sources (Adjusted for known errors) 9,366.000	System Input 14,258.000	Water Exported 0.000	Billed Water Exported			Revenue Water 0.000
		Water Supplied 14,258.000	Authorized Consumption 14,761.225	Billed Authorized Consumption 14,583.000	Billed Metered Consumption (water exported is removed) 7,604.000	Revenue Water 14,583.000
					Billed Unmetered Consumption 6,979.000	
				Unbilled Authorized Consumption 178.225	Unbilled Metered Consumption 0.000	Non-Revenue Water (NRW) -325.000
					Unbilled Unmetered Consumption 178.225	
			Water Losses -503.225	Apparent Losses 249.629	Unauthorized Consumption 35.645	
					Customer Metering Inaccuracies 194.974	
					Systematic Data Handling Errors 19.010	
Water Imported 4,892.000				Real Losses -752.854	Leakage on Transmission and/or Distribution Mains Not broken down	
					Leakage and Overflows at Utility's Storage Tanks Not broken down	
					Leakage on Service Connections Not broken down	


AWWA Free Water Audit Software:
Dashboard
WAS v5.0
American Water Works Association.
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The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components
Water Audit Report for: City of Lodi (391004)
Reporting Year: 2015 7/2014 - 6/2015
Data Validity Score: 62
Show me the VOLUME of Non-Revenue Water
Show me the COST of Non-Revenue Water
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Water Exported
Water Imported
Volume From Own Sources
Water Exported
Water Supplied
Water Exported
Authorized Consumption
Water Losses
Water Exported
Billed Auth. Cons.
Unbilled Auth. Cons.
Apparent Losses
Real Losses
Water Exported
Revenue Water
Non Revenue Water
Total Cost of NRW =$75,523
Cost $
100,000
80,000
60,000
40,000
20,000
0
-20,000
-40,000
-60,000
Unbilled metered (valued at Var. Prod. Cost)
Unbilled unmetered (valued at Var. Prod. Cost)
Unauth. consumption
Cust. metering inaccuracies
Syst. data handling errors
Real Losses (valued at Var. Prod. Cost)

AWWA Free Water Audit Software: Grading Matrix

WAS 5.0

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The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from own Sources" component:		to qualify for 2: Organize and launch efforts to collect data for determining volume from own sources	to qualify for 4: Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		to qualify for 8: Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system: tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	to qualify for 4: Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		to qualify for 6: Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		to qualify for 8: Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component: *(Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.)*		to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	To qualify for 4: Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Exporter. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of meters are found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component: *(Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.)*		to qualify for 2: Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	To qualify for 4: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate, remaining accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records exist, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducting by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		to qualify for 8: Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		to maintain 10: Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		to qualify for 2: Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	to qualify for 4: Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		to qualify for 6: Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:		to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		to maintain 10: Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: water used in periodic testing of unmetered fire connections), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		to qualify for 5: Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings).	to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, unmetered consumption is usually a relatively small quatity component, and other larger-quantity components should take priority.	to qualify for 6 or greater: Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES											

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:		Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:		to qualify for 5: Use accepted default of 0.25% of volume of water supplied. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 9: Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:		to qualify for 2: Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy and procedures for activation of new billing accounts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:		to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	to qualify for 4: Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		to qualify for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		to maintain 10: Continue with standardization and random field validation to improve the completeness and accuracy of the system.
Number of active AND inactive service connections:		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well-managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	**Note: The number of Service Connections does not include fire hydrant leads/lines connecting the hydrant to the water main**	to qualify for 2: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
	Note: if customer water meters are located	Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met for a grading of 10:

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line:	meters are located outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curb stops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curb stops.	Policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curb stop is the property of the water utility; and the piping from the curb stop to the customer building is owned by the customer. Curb stop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Conditions between 2 and 4	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records of limited accuracy.	Conditions between 4 and 6	Clear written policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curb stops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Working asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet . b). Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		to qualify for 2: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	to qualify for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		to qualify for 6: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		to qualify for 8: Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		to qualify for 10: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breech pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.
Improvements to attain higher data grading for "Average Operating Pressure" component:		to qualify for 2: Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	to qualify for 4: Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		to qualify for 6: Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		to qualify for 8: Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		to qualify for 10: Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		to maintain 10: Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:		Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:		to qualify for 2: Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		to qualify for 8: Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:		to qualify for 2: Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	to qualify for 4: Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	Launch effort to fully meter the customer-population and charge rates based upon water volumes	to qualify for 8: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to qualify for 10: Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to maintain 10: Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis. or: 2) Water supply is entirely purchased as bulk water imported, and the unit purchase cost - including all applicable marginal supply costs - serves as the variable production cost. If all applicable marginal supply costs are not included in this figure, a grade of 10 should not be selected.
Improvements to attain higher data grading for "Variable Production Cost" component:		to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		to qualify for 8: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgable third-party at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively

AWWA Free Water Audit Software:
Determining Water Loss Standing

WAS v5.0

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Water Audit Report for: City of Lodi (391004)
Reporting Year: 2015 7/2014 - 6/2015
Data Validity Score: 62

Water Loss Control Planning Guide

Functional Focus Area	Water Audit Data Validity Level / Score				
	Level I (0-25)	**Level II** (26-50)	**Level III** (51-70)	**Level IV** (71-90)	**Level V** (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI
(without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		

Appendix F - SB X7-7 Verification Form

WUEdata Entry Exceptions
The data from the tables below will not be entered into WUEdata tables (the tabs for these tables' worksheets are colored **purple**). These tables will be submitted as separate uploads, in Excel, to WUEdata.
Process Water Deduction SB X7-7 tables 4-C, 4-C.1, 4-C.2, 4-C.3, 4-C.4 and 4-D A supplier that will use the process water deduction will complete the appropriate tables in Excel, submit them as a separate upload to the WUE data tool, and include them in its UWMP.
Target Method 2 SB X7-7 tables 7-B, 7-C, and 7-D A supplier that selects Target Method 2 will contact DWR (gwen.huff@water.ca.gov) for SB X7-7 tables 7-B, 7-C, and 7-D.
Target Method 4 These tables are only available online at http://www.dwr.water.ca.gov/wateruseefficiency/sb7/committees/urban/u4/ptm4.cfm A supplier that selects Target Method 4 will save the tables from the website listed above, complete the tables, submit as a separate upload to WUE data, and include them with its UWMP.

SB X7-7 Table 0: Units of Measure Used in UWMP*
Acre Feet
**The unit of measure must be consistent with Table 2-3*

SB X7-7 Table-1: Baseline Period Ranges			
Baseline	**Parameter**	**Value**	**Units**
10- to 15-year baseline period	2008 total water deliveries	17,304	Acre Feet
	2008 total volume of delivered recycled water	0	Acre Feet
	2008 recycled water as a percent of total deliveries	0.00%	Percent
	Number of years in baseline period[1, 2]	10	Years
	Year beginning baseline period range	1999	
	Year ending baseline period range[3]	2008	
5-year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2004	
	Year ending baseline period range[4]	2008	

[1] If the 2008 recycled water percent is less than 10 percent, then the first baseline period is a continuous 10-year period. If the amount of recycled water delivered in 2008 is 10 percent or greater, the first baseline period is a continuous 10- to 15-year period.

[2] The Water Code requires that the baseline period is between 10 and 15 years. However, DWR recognizes that some water suppliers may not have the minimum 10 years of baseline data.

[3] The ending year must be between December 31, 2004 and December 31, 2010.

[4] The ending year must be between December 31, 2007 and December 31, 2010.

SB X7-7 Table 2: Method for Population Estimates	
Method Used to Determine Population (may check more than one)	
☑	**1. Department of Finance** (DOF) DOF Table E-8 (1990 - 2000) and (2000-2010) and DOF Table E-5 (2011 - 2015) when available
☐	**2. Persons-per-Connection Method**
☐	**3. DWR Population Tool**
☐	**4. Other** DWR recommends pre-review
NOTES: DOF estimate for 2000 is off by 12 people from U.S. Census. Used U.S. Census population for 2000 and 2010 per discussion with DWR.	

SB X7-7 Table 3: Service Area		
Year		**Population**
10 Year Baseline Population		
Year 1	1999	55,533
Year 2	2000	56,999
Year 3	2001	58,122
Year 4	2002	59,376
Year 5	2003	60,311
Year 6	2004	61,056
Year 7	2005	61,431
Year 8	2006	61,411
Year 9	2007	61,648
Year 10	2008	61,749
5 Year Baseline Population		
Year 1	2004	61,056
Year 2	2005	61,431
Year 3	2006	61,411
Year 4	2007	61,648
Year 5	2008	61,749
2015 Compliance Year Population		
2015		63,719
NOTES: DOF estimates for all years except 2000 and 2010, which use U.S. Census population.		

SB X7-7 Table 4: Annual Gross Water Use *								
Baseline Year *Fm SB X7-7 Table 3*		**Volume Into Distribution System** *This column will remain blank until SB X7-7 Table 4-A is completed.*	**Deductions**					**Annual Gross Water Use**
			Exported Water	**Change in Dist. System Storage** (+/-)	**Indirect Recycled Water** *This column will remain blank until SB X7-7 Table 4-B is completed.*	**Water Delivered for Agricultural Use**	**Process Water** *This column will remain blank until SB X7-7 Table 4-D is completed.*	
10 Year Baseline - Gross Water Use								
Year 1	1999	16,021	-	-	-	-	-	16,021
Year 2	2000	17,034	-	-	-	-	-	17,034
Year 3	2001	16,648	-	-	-	-	-	16,648
Year 4	2002	17,112	-	-	-	-	-	17,112
Year 5	2003	16,155	-	-	-	-	-	16,155
Year 6	2004	17,293	-	-	-	-	-	17,293
Year 7	2005	15,816	-	-	-	-	-	15,816
Year 8	2006	16,624	-	-	-	-	-	16,624
Year 9	2007	17,289	-	-	-	-	-	17,289
Year 10	2008	17,304	-	-	-	-	-	17,304
10 year baseline average gross water use								**16,730**
5 Year Baseline - Gross Water Use								
Year 1	2004	17,293	-	-	-	-	-	17,293
Year 2	2005	15,816	-	-	-	-	-	15,816
Year 3	2006	16,624	-	-	-	-	-	16,624
Year 4	2007	17,289	-	-	-	-	-	17,289
Year 5	2008	17,304	-	-	-	-	-	17,304
5 year baseline average gross water use								**16,865**
2015 Compliance Year - Gross Water Use								
2015		14,258	-	-	-	-	9	**14,249**

* NOTE that the units of measure must remain consistent throughout the UWMP, as reported in Table 2-3

SB X7-7 Table 4-A: Volume Entering the Distribution System(s)				
Name of Source	Groundwater			
This water source is:				
☑	The supplier's own water source			
☐	A purchased or imported source			
Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment* *Optional (+/-)*	Corrected Volume Entering Distribution System
10 Year Baseline - Water into Distribution System				
Year 1	1999	16,021	-	16,021
Year 2	2000	17,034	-	17,034
Year 3	2001	16,648	-	16,648
Year 4	2002	17,112	-	17,112
Year 5	2003	16,155	-	16,155
Year 6	2004	17293	-	17,293
Year 7	2005	15816	-	15,816
Year 8	2006	16624	-	16,624
Year 9	2007	17289	-	17,289
Year 10	2008	17304	-	17,304
5 Year Baseline - Water into Distribution System				
Year 1	2004	17,293	-	17,293
Year 2	2005	15,816	-	15,816
Year 3	2006	16,624	-	16,624
Year 4	2007	17,289	-	17,289
Year 5	2008	17,304	-	17,304
2015 Compliance Year - Water into Distribution System				
2015		9,366	-	9,366
** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*				

SB X7-7 Table 4-A: Volume Entering the Distribution System(s)				
Name of Source	Mokelumne River			
This water source is:				
☐	The supplier's own water source			
☑	A purchased or imported source			
Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment* *Optional (+/-)*	Corrected Volume Entering Distribution System
10 Year Baseline - Water into Distribution System				
Year 1	1999	0	-	0
Year 2	2000	0	-	0
Year 3	2001	0	-	0
Year 4	2002	0	-	0
Year 5	2003	0	-	0
Year 6	2004	0	-	0
Year 7	2005	0	-	0
Year 8	2006	0	-	0
Year 9	2007	0	-	0
Year 10	2008	0	-	0
5 Year Baseline - Water into Distribution System				
Year 1	2004	0	-	0
Year 2	2005	0	-	0
Year 3	2006	0	-	0
Year 4	2007	0	-	0
Year 5	2008	0	-	0
2015 Compliance Year - Water into Distribution System				
2015		4,892	-	4,892
** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*				

No deduction for indirect recycled water

SB X7-7 Table 4-B: Indirect Recycled Water Use Deduction *(For use only by agencies that are deducting indirect recycled water)*

Baseline Year *Fm SB X7-7 Table 3*		Surface Reservoir Augmentation					Groundwater Recharge			**Total Deductible Volume of Indirect Recycled Water Entering the Distribution System**
		Volume Discharged from Reservoir for Distribution System Delivery	Percent Recycled Water	Recycled Water Delivered to Treatment Plant	Transmission/ Treatment Loss	Recycled Volume Entering Distribution System from Surface Reservoir Augmentation	Recycled Water Pumped by Utility*	Transmission/ Treatment Losses	Recycled Volume Entering Distribution System from Groundwater Recharge	
10 Year Baseline - Indirect Recycled Water Use										
Year 1	1999	0	0.00%	-	0	-	0	0	-	-
Year 2	2000	0	0.00%	-	0	-	0	0	-	-
Year 3	2001	0	0.00%	-	0	-	0	0	-	-
Year 4	2002	0	0.00%	-	0	-	0	0	-	-
Year 5	2003	0	0.00%	-	0	-	0	0	-	-
Year 6	2004	0	0.00%	-	0	-	0	0	-	-
Year 7	2005	0	0.00%	-	0	-	0	0	-	-
Year 8	2006	0	0.00%	-	0	-	0	0	-	-
Year 9	2007	0	0.00%	-	0	-	0	0	-	-
Year 10	2008	0	0.00%	-	0	-	0	0	-	-
5 Year Baseline - Indirect Recycled Water Use										
Year 1	2004	0	0.00%	-	0	-	0	0	-	-
Year 2	2005	0	0.00%	-	0	-	0	0	-	-
Year 3	2006	0	0.00%	-	0	-	0	0	-	-
Year 4	2007	0	0.00%	-	0	-	0	0	-	-
Year 5	2008	0	0.00%	-	0	-	0	0	-	-
2015 Compliance - Indirect Recycled Water Use										
2015		0	0.00%	-	0	-	0	0	-	-

**Suppliers will provide supplemental sheets to document the calculation for their input into "Recycled Water Pumped by Utility". The volume reported in this cell must be less than total groundwater pumped - See Methodology 1, Step 8, section 2.c.*

No deduction for process water

SB X7-7 Table 4-C: Process Water Deduction Eligibility *(For use only by agencies that are deducting process water)*	
☐	**Criteria 1**- Industrial water use is equal to or greater than 12% of gross water use. Complete SB X7-7 Table 4-C.1
☐	**Criteria 2** - Industrial water use is equal to or greater than 15 GPCD. Complete SB X7-7 Table 4-C.2
☐	**Criteria 3** - Non-industrial use is equal to or less than 120 GPCD. Complete SB X7-7 Table 4-C.3
☐	**Criteria 4** - Disadvantaged Community. Complete SB x7-7 Table 4-C.4

No deduction for process water

SB X7-7 Table 4-C.1: Process Water Deduction Eligibility					
Criteria 1 Industrial water use is equal to or greater than 12% of gross water use					
Baseline Year *Fm SB X7-7 Table 3*		Gross Water Use Without Process Water Deduction	Industrial Water Use	Percent Industrial Water	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility					
Year 1	1999	16,021		0%	NO
Year 2	2000	17,034		0%	NO
Year 3	2001	16,648		0%	NO
Year 4	2002	17,112		0%	NO
Year 5	2003	16,155		0%	NO
Year 6	2004	17,293		0%	NO
Year 7	2005	15,816		0%	NO
Year 8	2006	16,624		0%	NO
Year 9	2007	17,289		0%	NO
Year 10	2008	17,304		0%	NO
5 Year Baseline - Process Water Deduction Eligibility					
Year 1	2004	17,293		0%	NO
Year 2	2005	15,816		0%	NO
Year 3	2006	16,624		0%	NO
Year 4	2007	17,289		0%	NO
Year 5	2008	17,304		0%	NO
2015 Compliance Year - Process Water Deduction Eligiblity					
2015		14,258		0%	NO

No deduction for process water

SB X7-7 Table 4-C.2: Process Water Deduction Eligibility					
Criteria 2 Industrial water use is equal to or greater than 15 GPCD					
Baseline Year *Fm SB X7-7 Table 3*		Industrial Water Use	Population	Industrial GPCD	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility					
Year 1	1999		55,533		NO
Year 2	2000		56,999		NO
Year 3	2001		58,122		NO
Year 4	2002		59,376		NO
Year 5	2003		60,311		NO
Year 6	2004		61,056		NO
Year 7	2005		61,431		NO
Year 8	2006		61,411		NO
Year 9	2007		61,648		NO
Year 10	2008		61,749		NO
5 Year Baseline - Process Water Deduction Eligibility					
Year 1	2004		61,056		NO
Year 2	2005		61,431		NO
Year 3	2006		61,411		NO
Year 4	2007		61,648		NO
Year 5	2008		61,749		NO
2015 Compliance Year - Process Water Deduction Eligibility					
2015			63,719		NO

No deduction for process water

SB X7-7 Table 4-C.3: Process Water Deduction Eligibility							
Criteria 3 Non-industrial use is equal to or less than 120 GPCD							
Baseline Year *Fm SB X7-7 Table 3*		Gross Water Use Without Process Water Deduction *Fm SB X7-7 Table 4*	Industrial Water Use	Non-industrial Water Use	Population *Fm SB X7-7 Table 3*	Non-Industrial GPCD	**Eligible for Exclusion Y/N**
10 to 15 Year Baseline - Process Water Deduction Eligibility							
Year 1	1999	16,021		16,021	55,533		NO
Year 2	2000	17,034		17,034	56,999		NO
Year 3	2001	16,648		16,648	58,122		NO
Year 4	2002	17,112		17,112	59,376		NO
Year 5	2003	16,155		16,155	60,311		NO
Year 6	2004	17,293		17,293	61,056		NO
Year 7	2005	15,816		15,816	61,431		NO
Year 8	2006	16,624		16,624	61,411		NO
Year 9	2007	17,289		17,289	61,648		NO
Year 10	2008	17,304		17,304	61,749		NO
5 Year Baseline - Process Water Deduction Eligibility							
Year 1	2004	17,293		17,293	61,056		NO
Year 2	2005	15,816		15,816	61,431		NO
Year 3	2006	16,624		16,624	61,411		NO
Year 4	2007	17,289		17,289	61,648		NO
Year 5	2008	17,304		17,304	61,749		NO
2015 Compliance Year - Process Water Deduction Eligiblity							
2015		14,258		14,258	63,719		NO

No deduction for process water

SB X7-7 Table 4-C.4: Process Water Deduction Eligibility				
Criteria 4				
California Median Household Income		Service Area Median Household Income	Percentage of Statewide Average	**Eligible for Exclusion? Y/N**
2015 Compliance Year - Process Water Deduction Eligibility				
2010	$53,046		0%	YES
A "Disadvantaged Community" is a community with a median household income less than 80 percent of the statewide average.				
NOTES:				

No deduction for process water

SB X7-7 Table 4-D: Process Water Deduction - Volume						
Complete a separate table for each industrial customer with a process water exclusion						
Name of Industrial Customer		*Industrial Customer 1*				
Baseline Year *Fm SB X7-7 Table 3*		Industrial Customer's Total Water Use	Total Volume Supplied by Water Agency	% of Water Supplied by Water Agency	Customer's Total Process Water Use	Volume of Process Water Eligible for Exclusion for this Customer
10 to 15 Year Baseline - Process Water Deduction						
Year 1	1999					-
Year 2	2000					-
Year 3	2001					-
Year 4	2002					-
Year 5	2003					-
Year 6	2004					-
Year 7	2005					-
Year 8	2006					-
Year 9	2007					-
Year 10	2008					-
5 Year Baseline - Process Water Deduction						
Year 1	2004					-
Year 2	2005					-
Year 3	2006					-
Year 4	2007					-
Year 5	2008					-
2015 Compliance Year - Process Water Deduction						
2015						-
NOTES:						

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Annual Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use (GPCD)
10 Year Baseline GPCD				
Year 1	1999	55,533	16,021	258
Year 2	2000	56,999	17,034	267
Year 3	2001	58,122	16,648	256
Year 4	2002	59,376	17,112	257
Year 5	2003	60,311	16,155	239
Year 6	2004	61,056	17,293	253
Year 7	2005	61,431	15,816	230
Year 8	2006	61,411	16,624	242
Year 9	2007	61,648	17,289	250
Year 10	2008	61,749	17,304	250
10 Year Average Baseline GPCD				**250**
5 Year Baseline GPCD				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use
Year 1	2004	61,056	17,293	253
Year 2	2005	61,431	15,816	230
Year 3	2006	61,411	16,624	242
Year 4	2007	61,648	17,289	250
Year 5	2008	61,749	17,304	250
5 Year Average Baseline GPCD				**245**
2015 Compliance Year GPCD				
2015		63,719	14,249	200

SB X7-7 Table 6: Gallons per Capita per Day *Summary From Table SB X7-7 Table 5*	
10 Year Baseline GPCD	250
5 Year Baseline GPCD	245
2015 Compliance Year GPCD	200

SB X7-7 Table 7: 2020 Target Method *Select Only One*		
Target Method		Supporting Documentation
☑	Method 1	SB X7-7 Table 7A
☐	Method 2	SB X7-7 Tables 7B, 7C, and 7D *Contact DWR for these tables*
☐	Method 3	SB X7-7 Table 7-E
☐	Method 4	Method 4 Calculator

SB X7-7 Table 7-A: Target Method 1	
10 Year Baseline GPCD	**2020 Target GPCD**
250	**200**

Did not use Target Method 2

SB X7-7 Table 7-B: Target Method 2 Target Landscape Water Use
Tables for Target Method 2 (SB X7-7 Tables 7-B, 7-C, and 7-D) are not included in the SB X7-7 Verification Form, but are still required for water suppliers using Target Method 2. These water suppliers should contact Gwen Huff at (916) 651-9672 or gwen.huff@water.ca.gov

Did not use Target Method 2

SB X7-7 Table 7-C: Target Method 2
Tables for Target Method 2 (SB X7-7 Tables 7-B, 7-C, and 7-D) are not included in the SB X7-7 Verification Form, but are still required for water suppliers using Target Method 2. These water suppliers should contact Gwen Huff at (916) 651-9672 or gwen.huff@water.ca.gov

Did not use Target Method 2

SB X7-7 Table 7-D: Target Method 2 Summary
Tables for Target Method 2 (SB X7-7 Tables 7-B, 7-C, and 7-D) are not included in the SB X7-7 Verification Form, but are still required for water suppliers using Target Method 2. These water suppliers should contact Gwen Huff at (916) 651-9672 or gwen.huff@water.ca.gov

Did not use Target Method 3

SB X7-7 Table 7-E: Target Method 3				
Agency May Select More Than One as Applicable	Percentage of Service Area in This Hydrological Region	Hydrologic Region	"2020 Plan" Regional Targets	Method 3 Regional Targets (95%)
☐		North Coast	137	130
☐		North Lahontan	173	164
☐		Sacramento River	176	167
☐		San Francisco Bay	131	124
☐		San Joaquin River	174	165
☐		Central Coast	123	117
☐		Tulare Lake	188	179
☐		South Lahontan	170	162
☐		South Coast	149	142
☐		Colorado River	211	200
Target *(If more than one region is selected, this value is calculated.)*				**0**

NOTES:

SB X7-7 Table 7-F: Confirm Minimum Reduction for 2020 Target			
5 Year Baseline GPCD *From SB X7-7 Table 5*	Maximum 2020 Target[1]	Calculated 2020 Target[2]	**Confirmed 2020 Target**
245	233	200	**200**

[1] Maximum 2020 Target is 95% of the 5 Year Baseline GPCD *[2] 2020 Target is calculated based on the selected Target Method, see SB X7-7 Table 7 and corresponding tables for agency's calculated target.*

SB X7-7 Table 8: 2015 Interim Target GPCD		
Confirmed 2020 Target *Fm SB X7-7 Table 7-F*	10 year Baseline GPCD *Fm SB X7-7 Table 5*	**2015 Interim Target GPCD**
200	250	**225**

SB X7-7 Table 9: 2015 Compliance								
Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments *(in GPCD)* Enter "0" if Adjustment Not Used			TOTAL Adjustments	Adjusted 2015 GPCD	2015 GPCD *(Adjusted if applicable)*	**Did Supplier Achieve Targeted Reduction for 2015?**
		Extraordinary Events	Weather Normalization	Economic Adjustment				
200	225	*0*	*0*	*0*	0	200	200	**YES**

Appendix G - Agreements with WID and NSJWCD

AGREEMENT FOR PURCHASE OF WATER FROM THE WOODBRIDGE IRRIGATION DISTRICT BY THE CITY OF LODI

This Agreement is made and entered into between Woodbridge Irrigation District and the City of Lodi, adjoining entities located within the County of San Joaquin, State of California, this 13th day of May, 2003.

Background Recitals.

a. The City of Lodi obtains its municipal water supply from wells located within the City, extracting the water from the underground aquifer, which is replenished in part by flows of the Mokelumne River. Lodi desires to acquire a supplemental surface water supply to avoid being wholly dependent upon the wells and the possible impacts of eventual overdraft of the groundwater supply.

b. Woodbridge Irrigation District (District or WID) is an irrigation district that is organized and existing under Division 11 of the California Water Code (Sections 20,500 et seq). The District is located immediately west of the City of Lodi and immediately north of the City of Stockton. The District diverts water from the Mokelumne River at Woodbridge Dam, located in the NE 1/4 of the SE 1/4 of Section 34, Township 4 N, Range 6 E, MDBM, for irrigation of a net area of 19,370.3 acres within a gross area of 40,441.77 acres and located within Townships 2 N, 3 N, 4 N and 5 N, Ranges 5 E, 6 E and 7 E, MDBM.

c. The District diverts its water supply from the Mokelumne River under pre-1914 appropriative rights for the diversion of water up to 300 cubic feet per second (cfs). The District's pre-1914 rights are overlapped by the District License No. 5945 for the appropriation of 300 cfs per annum from February 1 to October 31 for irrigation use, supplemented by License No. 8214 for the diversion of an additional 114.4 cfs from May 1 to August 31 of each year and from November 1 of each year to January 31 of the succeeding year. The combined rights under the two Licenses together with the District's pre-1914 rights are limited to a maximum diversion of 414.4 cfs.

d. The District, following the East Bay Municipal Utility District's (EBMUD) building of the Pardee and Camanche Reservoirs on the Upper Mokelumne River, entered into Agreements with EBMUD in 1938 after Pardee's completion and again in 1965 after the completion of Camanche, which acknowledged the priority of some of the District rights to the EBMUD rights, and under which agreements EBMUD releases a Regulated Base Supply of water each year from Camanche Reservoir for diversion by the District at Woodbridge Dam for irrigation use.

e. The District's demand for water from the Mokelumne River under its water rights has begun to diminish by reason of the District's water conservation programs, including the conversion of field furrow and flood irrigation methods of application to water applied by drip irrigation and micro-sprinklers, which reduce the amount of applied water for crops. There has also been a reduction in the delivery of irrigation water by reason of the number of irrigated acres being reduced as a result of urbanization of District lands.

f. By reason of the anticipated reductions in water usage within the District, the District has determined that it will have surplus water in certain amounts available under its water entitlements from the Mokelumne River, and the water that would be delivered to the City by this Agreement is surplus to the current needs of the landowners and water users within the District as required by Section 22259 of the Water Code. The District's South Main Canal traverses the westerly portion of the City of Lodi, and the District could deliver water diverted from the Mokelumne River under its water rights to Lodi at a mutually agreeable location along the District Canal System.

g. The water is diverted by the District at Woodbridge Dam, with diversions being facilitated during the irrigation season by the installation of flashboards in the Dam. The flashboards are removed after the end of the irrigation season for Dam maintenance and Dam safety. When the flashboards are in place, water backs up into Lodi Lake and the City's Lodi Park Lake. The Lake is used for fishing, boating and recreational purposes by inhabitants of the City, and its presence during the summer months is an enhancement to the City's Lodi Park Lake. During the periods that the flashboards are not in the Dam, the Lake level is lowered and its utility for fishing, recreation and boating is reduced.

h. Because of its age, it is necessary for the District to replace the existing Woodbridge Diversion Dam in order to provide greater security and protection against dam failure. In doing so, and in reliance on this Agreement, the District intends, subject to any requirements of the Division of Safety of Dams, that the replacement dam structure will be designed and constructed so that water can be impounded behind the dam year round. The estimated cost for replacement of the Dam and appurtenances is approximately $20,000,000.

i. The City of Lodi desires to contract with the District for the purchase of water from the District for use within the City service area, for which the City will pay on the basis and pursuant to the conditions hereinafter set forth.

NOW, THERFORE, WOODBRIDGE IRRIGATION DISTRICT (DISTRICT) AND THE CITY OF LODI (CITY) AGREE AS FOLLOWS:

May 2003
Jan 1, 2004

1. Water to be Made Available to City, and Payment. Beginning in the calendar year which first follows the entry of a final judgment confirming the validity of this Agreement pursuant to Chapter 9 (commencing with Section 860) of Title 10 of Part 2 of the Code of Civil Procedure, and continuing through the term of this Agreement, the District shall make available to the City out of its Regulated Base Supply under its Agreement with EBMUD, 6,000 acre feet per annum under the terms and conditions herein set forth. In consideration thereof, the City will pay the District annually the sum of ONE MILLION TWO HUNDRED THOUSAND DOLLARS ($1,200,000.) Payments thereon of $300,000 quarterly are due and payable in advance beginning on the first day of each calendar quarter, commencing on the first day of the calendar year which follows said entry of a final judgment confirming the validity of this Agreement. Said payments shall be made irrespective of whether the City takes the water made available to it under this Agreement and irrespective of whether the District has water available for delivery to the City, provided that the District shall make its best efforts to provide to the City the amounts of water provided for in this Agreement.

October 2003 ?

Prior to the commencement of the first full calendar year following the entry of said final judgment, i.e., in the year in which the entry of the final judgment occurs, the City shall make quarterly payments to the District of $300,000 on the first day of each calendar quarter in that year which follows the entry of the final judgment by more than thirty days, in consideration for which one-fourth of 6,000 acre feet of water shall be made available to the City in the that initial year for each calendar quarter for which such payment is made. Any of such water which is not taken by City in that initial year shall be included as a part of the 18,000 acre feet of carryover water which the City may take at a later date as provided for in paragraph 6.a. hereof.

2 Construction of New Dam by Woodbridge. The District has secured the required permits from the Federal and State agencies and the necessary environmental clearances for the construction of a new Woodbridge Dam to replace the existing Dam together with appurtenant facilities, and the District will proceed with construction as soon as is feasible utilizing the revenues to be paid under this Agreement to finance a portion of the costs of the project.

3. Point of Delivery and Time of Delivery. The District agrees to deliver the water to the City at a point or points on the District's Canal at a mutually agreeable location or locations, to be determined at a later date. The water will be delivered during the period from March 1 through October 15. The City shall construct at its sole cost and expense the facilities needed to measure and take delivery of water from the District Canal, and the design, construction and operation thereof shall be approved by the District. The City will be responsible for all costs of operation, repair, maintenance and replacement of such facilities. The measurement facilities shall be recalibrated annually at the City's

expense as requested by the District and the District shall have a continuing right to test the accuracy of such facilities.

a. The City shall provide the District, by January 1 of each year, an estimate of the maximum amount of water anticipated to be needed by the City during each month of that year from March 1 through October 15, which scheduling will be subject to the District's approval. The District will supply such water on said approved monthly schedule pursuant to and as limited by the terms, conditions and limitations of this Agreement; provided that the City shall to the extent that its operations will permit, schedule the taking of as much of its entitlement to water from the District that year prior to July 1 as is feasible, but in any event not less than 3,000 acre feet.

b. At such times as it is possible for the District to deliver water during the remaining months of the year, or to deliver water in excess of 6,000 acre feet during the period from March 1 through October 15, then by mutual agreement of the parties, delivery of such water to the City may be made by the District. The City shall pay the District $100 per acre foot for any such additional water delivered to the City.

c. The water furnished by the District under this Agreement shall be used or furnished by the City only for domestic, municipal, industrial, irrigation and other beneficial uses.

d. The District further agrees that it will, during the term of this Agreement at the City's request, divert from the Mokelumne River at the District's Woodbridge Dam and wheel and convey through the District's canal system to the City's delivery point(s), any non-District water acquired by or available to the City, subject to the District having available capacity for that purpose and subject to the City paying a per-acre-foot charge in an amount which the District determines to be its costs for such service. The District's cost for such service in year 2003 would be $20 per acre-foot.

e. Commencing on January 1 of the seventh year following the year in which execution of this Agreement occurs, the amounts payable to the District under paragraph 1, and the amounts payable to the District under subparagraphs 2.b. and 2.d., shall be increased by two percent per year above the amounts payable during the preceding calendar year. In the event that the annual change in the Consumer Price Index (CPI-W, unadjusted U.S. average) published in December of each year by the United States Bureau of Labor Statistics, commencing in December in the year preceding such seventh year, has increased more than two (2) percent above the December Index of the prior year, the increases in the amounts payable in the ensuing year shall be in the percentage of that increase; provided that any such annual increase shall not exceed five percent (5%).

f. The payments by the City to the District under this Agreement shall be deemed to include the payment during the term of the Agreement of all District groundwater recharge fees on parcels within the City of Lodi which are also located within the boundary of the District.

4. Term of Agreement. (a) This Agreement shall be effective from the date of execution hereof, and shall remain in effect for a term of forty (40) years from said date.

(b) Upon receipt by the District of written notice and request for renewal from the City at least two years in advance of the termination of the Agreement, the District agrees to negotiate with the City for a renewal of this Agreement for an additional forty (40) year term, on terms and conditions that are reasonable and equitable and which are satisfactory to the District.

(c) The District agrees that it will not enter into any agreement during the initial term of this Agreement to provide water to others outside of the District except upon terms which provide that such supply shall be subordinate to the City's rights to be furnished water under this Agreement (except as the City may otherwise specifically agree to). The parties may contract for the delivery of additional amounts of water that may become available upon terms mutually agreeable to the parties. The City shall have a first right of refusal to purchase any water which the District agrees during the initial term of this Agreement to provide to any other purchaser, upon the same terms and conditions provided in such other proposed sale of water.

5. City Payments to be Made from City's Water System Revenues. The City shall make payments under this Agreement solely from the Revenues of, and as an operating expense of, the Lodi Municipal Water System. The City hereby pledges the Revenues to the payments required hereunder. Nothing herein shall be construed as prohibiting the City from using any other funds and revenues for purposes of satisfying any provisions of this Agreement. So long as the City is in compliance with all of its obligations hereunder, such pledge shall not prevent its application of Revenues to other operating expenses of the Lodi Municipal Water System or, subject to the payment of such operating expenses, to other lawful purposes, or impair the rights of any recipient of Revenues lawfully so applied.

"Revenues" means "all gross income and revenue received or receivable by the City from the ownership and operation of the Lodi Municipal Water System, which gross income and revenue shall be calculated in accordance with generally accepted accounting principles, including all rates, fees, and charges received by the City for water service and connection and hook-up fees and all other income and revenue howsoever derived by the City from the ownership and operation of or arising from the Lodi Municipal Water System, but excluding in all cases any proceeds or taxes and any refundable deposits made to establish credit,

federal or state grants, or advances or contributions in aid of construction".

"Lodi Municipal Water System" means "the municipal water system of the City existing on the effective date of this Agreement and all additions, betterments, extensions and improvements thereto hereafter acquired or constructed".

6. City Cooperation in District's Funding of Reconstruction of Woodbridge Dam. The City agrees to cooperate with District in connection with any financing undertaken by District in connection with the reconstruction of the Woodbridge Diversion Dam and to provide to District such certificates, statements and information as District shall reasonably require in connection with such financing, including, without limitation, information relating to the Lodi Municipal Water System and the Revenues, and to provide such information as may be reasonably required in connection with the continuing disclosure undertaking to be entered into by the City pursuant to Rule 15c2-12(b)(5) of the Securities Exchange Commission in connection with the District financing.

7. No Permanent Water Right, and Dry Year Curtailments. The District has determined that the water to be made available annually for delivery to the District pursuant to this Agreement will be surplus to the needs of the District during the term of this Agreement. The parties further agree that no permanent right to the water supplied by the District shall accrue to the City except pursuant to and as limited by the terms of this Agreement.

a. The District agrees that it will deliver up to 6,000 acre feet per annum to the City under this Agreement except to the extent that the District's Regulated Base Supply of 60,000 acre feet under its Agreements with East Bay Municipal Utility District is reduced in dry years by thirty-five (35) percent. In the event of such a reduction, the District may reduce the amount of water to be provided under this Agreement by up to fifty percent (50%). District shall on or about May 1 of each year make a preliminary estimate of whether the City's deliveries may be curtailed that year, and will provide a final estimate of any curtailment on or about July 1. In such event, the City shall only be obligated to take 50% of its estimated delivery before July 1 in that year. There shall be no reduction in the amount of the City's annual payment to the District in such years under paragraph 1.

b. Except for noncompliance with the foregoing provisions of this paragraph, the City shall have no claim for damages or breach arising from the unavailability of surplus water from the District for any cause or condition.

8. Carryover of Entitlements. Unused water may not be carried over by the City

from year to year except that the right to receive water may be "banked," as follows:

a. If during the first three years in which the water is available to the City under this Agreement, the City does not take the water or takes less than the amounts which are available, then the City may carry over and have credit for the water not taken, not to exceed a total of 18,000 acre feet, for later delivery during the initial 40-year term of this Agreement, at such times as the District has extra water available as determined solely by the District. There will be no additional charge for the delivery of such banked water.

b. If after said initial three years delivery of water to the City is curtailed under paragraph 7.a. by reason of a dry year condition or by District's maintenance or other District activities, then the City may carry over and have credit for the amount of such curtailment for later delivery at such time(s) as the District has extra water available as determined by the District. Any City credits for curtailed segments of carryover water shall expire at the end of eight (8) years from the end of the period in which the curtailment for that segment of curtailed water occurred. Such credits for the delivery of curtailed carryover water within said eight-year period may extend beyond the termination of this Agreement. There will be no additional charge for the delivery of such banked water.

c. Except as provided in subparagraph a, no credits shall accrue for water that is available to but is unused by the City.

9. Water Quality, Temporary Interruptions, and Responsibility for the Water Beyond Point of Delivery.

a. The water being supplied to the City is raw water diverted from the Mokelumne River, and the character or quality of the water furnished hereunder may vary from time to time. District does not guarantee in any respect the character or quality of the water furnished pursuant to this Agreement, provided that the District shall not apply or use any chemicals within the Canal section used to deliver water to the City that the City determines to be deleterious to the quality of the water for the uses made by the City of such water.

b. It is agreed that there may be, in addition to shortages of water, temporary discontinuance or reduction of water to be furnished for the City as herein provided, for purposes of investigation, inspection, maintenance, repair or replacement as may be necessary of any of the facilities used by the District for furnishing water to the City. The District agrees to provide the City notice of such temporary discontinuance or reduction of water as soon as such information is available to the District.

c. The City shall hold the District harmless from and defend the District from all claims or expenses on account of damage or claim of damage of any nature whatsoever from which there is legal responsibility, including property damage, personal injury or death, arising out of or connected with the delivery, control, carriage, handling, use, or disposal or distribution of water furnished hereunder beyond the point of delivery of water into the City's system from the District's Canal.

10. Right of Termination for Unacceptable Conditions in Validation Judgment. In the event that the court in the validation action enters a judgment validating the Agreement but upon conditions or restrictions which impose upon either party costs, requirements, obligations, or limitations in their performance of the agreement or upon their operations or property interests which in that party's judgment are unacceptable or otherwise not in the best interests of that party, that party shall have the right to terminate this Agreement, and in that event neither party shall have any further liability or obligation to the other party hereunder.

11. Arrearage in Payments. No water shall be furnished to the City during any period in which the City may be in arrears in payment of charges accruing hereunder after the determination on the amount thereof as above provided. Interest on arrearage in payment shall be charged at a rate of 1-1/2% per month and compounded monthly, commencing 45 days after the due date of the payment.

12. Assignment. The provisions of this contract shall apply to and bind the successors and assigns of the respective parties hereto; but no assignment or transfer of this contract or any part thereof or interest therein by the City shall be valid unless and until approved in writing by the District; and no assignment of the obligation to provide or deliver the water shall be assignable by the District without the consent of the City.

13. Fees and Costs. Any fees, costs or expenses, including attorney fees, administrative costs, and consultant fees, incurred by the District to effect the sale of water to the City, together with CEQA and any other regulatory approval, shall be paid by District and City on a 50/50 basis. The City shall not be required to contribute to any fees or costs incurred by District relating to other issues or disputes that may arise in any of said proceedings not directly relating to City's use of District water. District shall provide to City invoices and accountings of said fees and expenses on a regular basis.

14. City Use of District Rights of Way. The District agrees to cooperate with City and to agree to the City's use of any District right of way along the District's Main Canal needed by the City for the conveyance or distribution of water it obtains from the District.

15. CEQA. The parties agree that the District will be Lead Agency for purposes of

compliance with any requirements of the California Environmental Quality Act pertaining to the execution of this Agreement by each party.

16. Entire Agreement. This Agreement contains the full and entire Agreement of the parties and there are no other conditions, either explicit or implied, nor any warranties or promises other than those contained within the written terms of this Agreement.

17. Time of the Essence. Time is of the essence in the performance of this Agreement.

18. Nonwaiver. The failure of either party to enforce or abide by a term or condition of this Agreement shall not constitute a waiver of that term or condition unless a written Agreement is prepared specifically providing for the waiver or forgiveness of that term and such Agreement is executed by each party hereto.

19. Date of Execution. The date of execution of this Agreement is the date of execution by the party last signing the Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this instrument on the 13th day of May, 2003.

WOODBRIDGE IRRIGATION DISTRICT

By _____

Attest: _____

CITY OF LODI, A MUNICIPAL CORPORATION

By _____
Susan Hitchcock, Mayor

Attest: _____
Susan J. Blackston, City Clerk

APPROVED AS TO FORM: _____
Randall A. Hays, City Attorney

4/16/03

FIRST AMENDMENT TO AGREEMENT FOR PURCHASE OF WATER FROM WOODBRIDGE IRRIGATION DISTRICT BY CITY OF LODI

This First Amendment to the May 13, 2003 Agreement for Purchase of Water from the Woodbridge Irrigation District by the City of Lodi is entered into by the parties this 17th day of JANUARY, 2008.

WHEREAS, the parties entered into an Agreement for Purchase of Water from the Woodbridge Irrigation District by the City of Lodi on May 13, 2003 ("2003 Agreement") providing that Woodbridge Irrigation District (District) would provide 6,000 acre feet of water per year to the City of Lodi (City), subject to dry year curtailments and the City's ability to take the water, under the terms set forth in the 2003 Agreement, for a period of forty (40) years (until May 13, 2043); and

WHEREAS, Section 8.a of the 2003 Agreement allowed the City to bank up to 18,000 acre feet of unused water during the initial three years under the 2003 Agreement, to allow the City time to develop its plans for utilization of such water; and

WHEREAS, the City has taken more time than anticipated to study alternative methods of using the water provided by the District, including groundwater recharge or by direct use after treatment, and consistent with the District's recommendation, the City has determined that its preferred alternative is to construct treatment works and deliver the treated water to the City's customers, but the City has not yet finalized its plans for utilizing the 6,000 acre-feet of water per year made available under the 2003 Agreement; and

WHEREAS, City expects to commence using the water purchased under the 2003 Agreement within the next four years, and the City has requested that the term of the 2003 Agreement for the purchase of the water from the District be extended for approximately four years, to October 15, 2047, and that it also be allowed until October 15, 2047 to bank any unused water under the Agreement for later usage; and

WHEREAS, the District is also currently negotiating an agreement with the City of Stockton for the sale of surplus water of the District to Stockton, and it is necessary to make some changes to the District's 2003 Agreement with Lodi so that the contract rights to the two Cities will not be in conflict with each other;

NOW, THEREFORE, THE CITY OF LODI AND THE WOODBRIDGE IRRIGATION DISTRICT AGREE AS FOLLOWS:

1. The final sentence of Section 1 of the 2003 Agreement is amended to read as follows:

   Any of such water which is not taken by the City in that initial year shall be included as a part of the 18,000 acre feet of carryover water which the City may

take at a later date as provided for in paragraph ~~6.a.~~ 8 hereof.

2. The first sentence of Section 3 is amended to read as follows:

The District agrees to deliver the water to the City at the location of the District's new fish screen at the Main Canal Intake Headworks at 18750 North Lower Sacramento Road, Woodbridge, and also at any ~~a~~ mutually agreeable location or locations on the District's Canal that may ~~to~~ be determined at a later date.

3. Subsection b of Section 3 is amended to read as follows:

b. At such times as it is possible for the District to deliver water during the remaining months of the year, or to deliver water in excess of 6,000 acre feet during the period from March 1 through October 15, then by mutual agreement of the parties, delivery of such water to the City may be made by the District. The City shall pay the District $100 per acre foot for any such additional water delivered to the City. The determination of whether any such water is available for delivery shall be made solely by the District. In the event that both the City of Lodi and the City of Stockton request any such available water during the same period(s) that the water can be delivered, the water shall be apportioned between them if necessary in the manner and times that they shall agree upon. In the event they do not agree, such water shall be apportioned between them by the District in the ratio of 50/50, or one-half to each; provided that, if such apportionment would result in either party losing any deficiency curtailment water banked to the credit of that party because of non-use within the required eight-year period under Section 8.b., that party shall have a first right to such portion of the available water that will avoid such loss.

4. Sections 4(a) and 4(b) of the 2003 Agreement ("Term of Agreement") are amended to read as follows:

4.(a) This Agreement shall be effective from the date of execution hereof, and shall remain in effect ~~for a term of forty (40) years from said date~~ until October 15, 2047, unless extended. Payment by the City for the water made available by the District during the four-year extension under this Amendment, i.e., until October 15, 2047, will continue to be on the same terms as provided in Section 1 of the 2003 Agreement, to wit, the basic payment of $1,200,000 per year as escalated annually commencing on January 1, 2010, as provided in Section 3.e of the 2003 Agreement.

4.(b) Upon receipt by the District of a written notice and request for renewal from the City at least two years in advance of the termination of the Agreement, the District agrees to ~~negotiate with the City for a renewal of~~ renew this Agreement for an additional forty (40) year term, on terms and conditions that are reasonable and equitable, ~~and which are satisfactory to the District.,~~ provided that the price for the water upon renewal will be at the then fair market value of the

water, but not less than the price being paid by Lodi under the 2003 Agreement (said new price to also be adjusted thereafter in accordance with the CPI formula in the existing Agreement).

5. A new Section 4.1 is added to the 2003 Agreement as follows:

4.1. Right to Purchase Additional Water. The City shall have the further right during the initial term of this Agreement to buy up to an additional 6,000 acre-feet of water from the District based upon the annexation of additional lands within the District to the City of Lodi after the completion and commencement of operation of the City's new Water Treatment Plant, and which as a result of such annexation will be taken out of agricultural production, as follows. For each acre of land so annexed after such date which is now zoned agricultural and which has been irrigated with District water:

- and for which a tentative subdivision map is approved for such acreage for use other than agriculture,
- and which is to be served a water supply by the City of Lodi's utility water system,

the City will be entitled to purchase an additional 3.0 acre-feet of water per such acre from the District, on the same terms and subject to the same conditions herein applicable to the 6,000 acre-feet under this Agreement.

6. Section 7.a. of the 2003 Agreement is amended to read as follows:

a. The District agrees that it will deliver up to 6,000 acre feet per annum to the City under this Agreement except to the extent that the District's Regulated Base Supply of 60,000 acre feet under its Agreements with East Bay Municipal Utility District is reduced in dry years by thirty-five (35) percent. In the event of such a reduction, the District may reduce the amount of water to be provided under this Agreement by up to fifty percent (50%). District shall on or about May 1 of each year make a preliminary estimate of whether the City's deliveries may be curtailed that year, and will provide a final estimate of any curtailment on or about July 1. In such event, the City shall only be obligated to take ~~50%~~ 35% of its estimated delivery before July 1 in that year. There shall be no reduction in the amount of the City's annual payment to the District in such years under paragraph 1.

7. A new Section 7.1 is added to the 2003 Agreement, as follows:

Section 7.1. Lodi acknowledges that District is negotiating with the City of Stockton to sell a base supply of ~~approximately~~ 6,500 of water to the City of Stockton, at a price per acre-foot which is approximately the same price as provided in the District's May 13, 2003 Agreement with Lodi. The delivery of the 6,500 acre-feet of water to Stockton shall be subordinate to Lodi's right to receive its 6,000 acre-feet of water, provided that:

a. Lodi waives and will not exercise, under the last sentence of paragraph 4(c) of the 2003 Agreement. its right of first refusal to purchase the 6,500 acre-feet of water being sold to Stockton; that

b. The delivery of the 6,500 acre-feet of water to Stockton, and Stockton's right to purchase additional water based upon the future annexation of agricultural lands within the District to Stockton, shall take precedence over Lodi's rights to purchase additional water under paragraph 3.b; and

c. Lodi's right to receive banked water under paragraph 8 of the 2003 Agreement will be on a parity with the right of Stockton to receive banked water under Stockton's agreement with Woodbridge, i.e., in the event both Cities want to withdraw more banked water than is available that year, such water will be allocated one-half to each unless they agree on another allocation, as provided in the new subsection c added to paragraph 8.

8. Section 8 is amended as follows:

8. .Carryover of Entitlements. Unused water may not be carried over by the City from year to year except that the right to receive water may be "banked" as follows:

a. If during the ~~first three years in which the water is available to the City under this Agreement~~ period from May 13, 2003 to October 15, 2010, the City does not take the water which is available to the City under this Agreement or takes less than the amounts which are available, then the City may carry over and have credit for such water not taken during that period, not to exceed a total of ~~18,000 acre-feet,~~ 6,000 acre feet per year or a total of 42,000 acre feet, for later delivery during the ~~40-year~~ remaining term of this Agreement, i.e., until October 15, 2047, at such times as the City requests delivery of the water and the District has extra water available as determined solely by the District. There will be no additional charge for the delivery of such banked water.

b. If after ~~said intitial three years,~~ October 15, 2010 , delivery of water to the City is curtailed under paragraph 7.a. by reason of a dry year condition or by District's maintenance or other District activities, then the City may carry over and have credit for the amount of such curtailment for later delivery at such time(s) as the City requests delivery of the water and the District has extra water available as determined solely by the District. Any City credits for curtailed segments of carryover water shall expire at the end of eight (8) years from the end of the period in which the curtailment for that segment of curtailed water occurred. Such credits for delivery of curtailed carryover water within said eight-year period may extend beyond the termination of this Agreement on October 15, 2047. There will be no additional charge for delivery of such banked water.

c. The determination of whether any such banked water or curtailment water is available for delivery shall be made solely by the District. In the event that both

the City and the City of Stockton request such water during the same period(s) that water is available for delivery, the water shall be apportioned between them if necessary in the manner and times that they shall agree upon. In the event they do not agree, such water shall be apportioned between them by the District in the ratio of 50/50 or one-half to Lodi and one-half to Stockton.; provided that, if such apportionment would result in either party losing any deficiency curtailment water banked to the credit of that party because of non-use within the required eight-year period under Section 8.b., that party shall have a first right to such portion of the available water that will avoid such loss.

~~c.~~ d. Except as provided in subparagraph a, no credits shall accrue for water that is available to but is unused by the city.,

9. Section 14 of the 2003 Agreement is amended to read as follows:

14. City Use of District Rights of Way. The District agrees to cooperate with City and to agree to the City's use of any District right of way along the District's Main Canal needed by the City for the conveyance or distribution of water it obtains from the District, provided that such use does not interfere with District's use of its right of way and that District's right of way permits such use by City. The District agrees that City may continue any such use of the right of way established during the term of this Agreement after the term of this Agreement expires.

10. Section 14.a. is added to the 2003 Agreement as follows:

14.a. District Installation of Quality Control Structures on City's Storm Water Discharge Locations. Under the City's October 20, 1993 Storm Drainage Discharge Agreement with the District, City has the right to discharge into District canals, waters collected by the City's storm drainage system (excluding industrial waste and sewage effluent), under the terms and conditions set forth in said Agreement. District shall be entitled at its option to construct or install from time to time at convenient locations on the City's property at or near any of the City's stormwater discharge points into the District's canal system, and to operate and maintain, at the District's cost, filtration/sedimentation structures or other water quality control or improvement devices at said point(s), subject to the City's prior approval of the plans and specifications for such installations, which approval shall not be unreasonably withheld. Nothing herein shall alter City's obligations under said Agreement with respect to the quality of the storm waters and storm drainage into the District's Canals, and all provisions thereof shall continue in full force and effect.

~~10.~~11. All terms and provisions of the 2003 Agreement remain in full force and effect, except as they are expressly amended or modified by this First Amendment to Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this instrument on the 17th day of JANUARY, 2008.

WOODBRIDGE IRRIGATION DISTRICT

Attest:

By _____

_____

CITY OF LODI, A MUNICIPAL CORPORATION

Attest:

_____
Randi Johl, City Clerk

By _____
Joanne Mounce, Mayor

APPROVED AS TO FORM:

_____
Stephen Schwabauer, City Attorney

866109.1

RESOLUTION NO. 2014-184

A RESOLUTION OF THE LODI CITY COUNCIL
APPROVING A WATER PURCHASE AGREEMENT
WITH THE NORTH SAN JOAQUIN WATER
CONSERVATION DISTRICT

==========

NOW, THEREFORE, BE IT RESOLVED that the Lodi City Council does hereby approve the Water Purchase Agreement with the North San Joaquin Water Conservation District, as shown on Exhibit A attached hereto; and

BE IT FURTHER RESOLVED that the City Council does hereby authorize the City Manager to execute the agreement.

Dated: October 1, 2014

==========

I hereby certify that Resolution No. 2014-184 was passed and adopted by the City Council of the City of Lodi in a regular meeting held October 1, 2014, by the following vote:

AYES: COUNCIL MEMBERS – Hansen, Johnson, Mounce, and Nakanishi

NOES: COUNCIL MEMBERS – None

ABSENT: COUNCIL MEMBERS – Mayor Katzakian

ABSTAIN: COUNCIL MEMBERS – None

Jennifer M. Robison

JENNIFER M. ROBISON
City Clerk

Exhibit A

NORTH SAN JOAQUIN WATER CONSERVATION DISTRICT

RESOLUTION NO. 2014-09

APPROVING AGREEMENT FOR PURCHASE OF WATER FROM THE NORTH SAN JOAQUIN WATER CONSERVATION DISTRICT BY THE CITY OF LODI

WHEREAS, the North San Joaquin Water Conservation District ("District") holds appropriative water right Permit 10477 to appropriate water from the Mokelumne River;

WHEREAS, part of the authorized place of use under Permit 10477 includes the City of Lodi and one of the authorized purposes of use under Permit 10477 is domestic and industrial use; and

WHEREAS, the City of Lodi has the ability to take delivery of water from the District's Permit 10477 from the Woodbridge Irrigation District intake near Lodi Lake for use in the City's water treatment plant; and

WHEREAS, the City and District both support the use of surface water by the City of Lodi, in lieu of groundwater, to help reduce overall demand for groundwater in the City and District and aid in the recovery of groundwater levels, and

WHEREAS, the District currently is not using all of the water available under Permit 10477 and desires to encourage the use of more water under Permit 10477 within its District boundaries, and

WHEREAS, the transfer of water from Permit 10477 from the District to the City will be cost neutral to the City, which will save an equivalent amount on reduced groundwater pumping, and will be financially beneficial to the District to fund additional infrastructure to utilize the other water available under Permit 10477; and

WHEREAS, the District's Board of Directors has reviewed the proposed agreement with the City at the Board's regular meeting held on September 29, 2014, and approves of its terms, and

WHEREAS, the proposed transfer is contingent on obtaining the necessary change approvals from the State Water Resources Control Board for delivery of water through the Woodbridge Irrigation District intake; and

WHEREAS, the District completed California Environmental Quality Act review of the potential transfer of water to the City of Lodi in its Initial Study and Mitigated Negative Declaration certified on March 10, 2014, and filed the Notice of Determination with the State Clearinghouse on March 11, 2014, State Clearinghouse Number 2014022009.

NOW, THEREFORE, BE IT HEREBY RESOLVED by the Board of Directors of the North San Joaquin Water Conservation District as follows:

1. The Board hereby approves the form of the AGREEMENT FOR PURCHASE OF WATER FROM THE NORTH SAN JOAQUIN WATER CONSERVATION DISTRICT BY THE CITY OF LODI attached hereto as Exhibit A.

2. The Board has determined that entering into this agreement with City of Lodi is in the best interests of the District.

3. The President of the Board is hereby authorized to sign and deliver, after consultation with the District's General Counsel, the agreement in the form presented to this meeting, with such non-substantive changes, insertions and deletions as may be recommended by the General Counsel; the President's signing of the agreement being conclusive evidence of such approval.

4. The President and any other officers, employees and agents of the District shall be, and each of them hereby is, authorized to give or take all approvals, consents, directions, instructions, notices, orders, requests, indemnifications and other actions permitted or required by any of the documents authorized by this Resolution, and to take any such action that such authorized representative, with the advice of District's General Counsel, may deem necessary or desirable to further the purposes of this Resolution.

5. All actions heretofore taken by the officers, employees and agents of the District in connection with the matters authorized by this Resolution are hereby ratified, approved and confirmed.

6. This Resolution shall take effect from and after its adoption.

Moved by Director Flinn, seconded by Director Scanlon, that the foregoing resolution be adopted.

Upon roll call the following vote was had:

Ayes:	4	Directors:
Noes:	0	Directors:
Absent:	1	Directors:
Abstain:	0	Directors:

The President declared the resolution adopted.

I, Thomas Flinn, Secretary of the Board of Directors of the NORTH SAN JOAQUIN WATER CONSERVATION DISTRICT, do hereby CERTIFY that the foregoing is a full, true and correct copy of a resolution duly adopted at an adjourned regular meeting of said Board of Directors held the 29th day of September 2014.

EXHIBIT A

AGREEMENT FOR PURCHASE OF WATER FROM THE NORTH SAN JOAQUIN WATER CONSERVATION DISTRICT BY THE CITY OF LODI

This Agreement is made and entered into between North San Joaquin Water Conservation District and the City of Lodi, a municipal corporation, entities located within the County of San Joaquin, State of California, this ___ day of _____2014.

Background Recitals

a. The City of Lodi (City) obtains its municipal water supply largely from wells located within the City, extracting the water from the underground aquifer, which is replenished in part by flows of the Mokelumne River. Lodi desires to acquire a supplemental surface water supply to reduce its dependence upon the wells and the possible impacts of eventual overdraft of the groundwater supply.

b. North San Joaquin Water Conservation District (District) is a water conservation district that is organized and exists under the Water Conservation Law of 1931. The District's jurisdiction covers the eastern half of the City of Lodi.

c. The District has an appropriative right to divert water from the Mokelumne River under Permit 10477, as amended on December 11, 1992. Permit 10477 allows the District to directly divert water up to 80 cubic feet per second (cfs) from December 1 to July 1 of the succeeding year, and store up to 20,000 acre-feet of water per year to be collected from December 1 to July 1 of the succeeding year. The permit restricts direct diversion to no more than 40 cfs at any one pumping facility. The District's water is stored in Camanche Reservoir pursuant to an agreement between the District and East Bay Municipal Utility District (EBMUD).

d. The District can request that EBMUD release the District's water from Camanche Reservoir such that the released water would flow down river to Lodi Lake where it could be diverted by the City for delivery to the City's surface water treatment plant via the existing Woodbridge Irrigation District (WID) diversion facilities (Point of Delivery).

e. In order to maximize the use of surface water, and reduce the use of groundwater in the City, the City and the District desire to contract for the City's purchase of Mokelumne River water from the District pursuant to the terms and conditions set forth in this Agreement.

NOW, THEREFORE, NORTH SAN JOAQUIN WATER CONSERVATION DISTRICT AND THE CITY OF LODI AGREE AS FOLLOWS:

1. Water to be Made Available to the City. Beginning October 15, 2015, and continuing through the term of this Agreement, the District shall sell to the City up to 1,000 acre-feet of water per Transfer Period under the terms and conditions herein set forth. For

purposes of this Agreement, the term "Transfer Period" means the time period between October 15th and March 30th of each calendar year The District's obligation to sell up to 1,000 acre-feet of water per Transfer Period to the City is conditioned on the following:

a. There are 20,000 acre-feet of water available to the District pursuant to Permit 10477 as determined by May 1st preceding the beginning of the Transfer Period. For example, water availability for the Transfer Period beginning October 15, 2015 shall be determined as of May 1, 2015.

b. EBMUD has agreed to facilitate the delivery of water from Permit 10477 to City during the Transfer Period on the schedule requested by the City. City acknowledges that (1) District's Permit 10477 provides for direct diversion and diversion to storage only between December 1 and July 1 and (2) diversion from storage between November 5th and March 30th will require the agreement of EBMUD.

c. The City and WID have an agreement to allow WID to deliver the purchased water from the Point of Delivery to the City.

d. City has paid District for the water pursuant to Paragraph 2.

e. The State Water Resources Control Board has approved the use of the WID diversion facility as an authorized point of diversion for Permit 10477.

2. Payment. City will pay District ONE HUNDRED DOLLARS ($100) per acre-foot of water made available pursuant to this Agreement, less any charges levied on City by WID to convey said water from the Point of Delivery to City. Payments for water estimated to be needed under Paragraph 3.a. are due and payable in advance on each September 15th preceding the requested release period. If District is unable to cause water to be released from Camanche Reservoir for City pursuant to this Agreement after City has made payment, City's payment shall remain as a credit toward future purchases pursuant to this Agreement.

3. Scheduling, Release, Diversion and Use.

a. Availability Determination. The District shall notify the City of water availability under Permit 10477 on or about May 1st of each calendar year during the term of this Agreement.

b. Scheduling Request. The City shall notify the District, no later than July 1st of each calendar year during the term of this Agreement, of the amount of water requested to be purchased by City during the upcoming October 15th – March 30th Transfer Period along with a schedule of requested releases. The schedule

shall be subject to District approval. The City shall schedule water such that requested flow rates are constant for each month of requested release.

c. Release and Diversion. Upon receipt of the schedule from the City, the District will request that EBMUD release from Camanche Reservoir the water requested by the City pursuant to the submitted schedule. The water is expected to flow down river to Lodi Lake where it can be diverted by the City at the Point of Delivery pursuant to an agreement between the City and WID for use of WID's facilities. The District shall have no obligations with respect to the facilities used for the diversion of water from the river by WID or the City.

d. Additional Water. If it is possible for the District to sell additional water to the City during the April 1st through October 15th period following the Transfer Period, or to release water in excess of 1,000 acre feet during the October 15th through March 30th Transfer Period, then by mutual written agreement of the parties, the District may sell additional water to the City. The City shall pay the District $100 per acre-foot of any such additional water released for the City less any charges levied on City by WID to convey said water from the Point of Delivery to City. The determination of whether any such water is available for release shall be made solely be District.

e. Use. The water furnished by the District under this Agreement shall be used by the City only for municipal, industrial, and irrigation uses within the place of use of Permit 10477.

4. Term of Agreement.

a. This Agreement shall be effective from the date of execution hereof, and shall remain in effect for a term of five (5) years from said date.

b. Upon receipt by the District of written notice and request for renewal from the City one year in advance of the termination of this Agreement, the District agrees to renew this Agreement for an additional five (5) year term, on terms and conditions that are reasonable and equitable, and which are mutually satisfactory to the District and the City. This Agreement is subject to up to seven (7) such renewals, for a total term not to exceed forty years.

c. If the parties agree to renew this Agreement pursuant to Paragraph 3.b., the amounts payable to the District under Paragraph 2, shall be increased by two percent per year above the amounts payable during the preceding calendar year. In the event the annual change in the Consumer Price Index (CPI-W, unadjusted U.S. average) published in December of each year by the United States Bureau of Labor Statistics, commencing in December in the year preceding such fifth year, has increased more

than two (2) percent above the December Index of the prior year, the increases in the amounts payable in the next calendar year shall be in the percentage of that increase, provided that any such annual increase shall not exceed five percent (5%).

5. City Payments to be Made from City's Water System Revenues. The City shall make payments under this Agreement solely from the Revenues (as defined below) of, and as an operating expense of, the Lodi Municipal Water System (as defined below). The City hereby pledges the Revenues to the payments required hereunder. Nothing herein shall be construed as prohibiting the City from using any other funds and revenues for purposes of satisfying any provisions of this Agreement. So long as the City is in compliance with all its obligations hereunder, such pledge shall not prevent its application of Revenues to other operating expenses of the Lodi Municipal Water System or, subject to the payment of such operating expenses, to other lawful purposes, or impair the rights of any recipient of Revenues lawfully so applied.

   "Revenues" means "all gross income and revenue received or receivable by the City from the ownership and operation of the Lodi Municipal Water System, the gross income and revenue of which shall be calculated in accordance with generally accepted accounting principles, including all rates, fees, and charges received by the City for water service and connection and hook-up fees and all other income and revenue howsoever derived by the City from the ownership and operation of or arising from the Lodi Municipal Water System, but excluding in all cases any proceeds or taxes and any refundable deposits made to establish credit, federal or state grants, or advances or contribution in aid of construction."

   "Lodi Municipal Water System" means "the municipal water system of the City existing on the effective date of this Agreement and all additions, betterments, extensions, and improvements thereto hereafter acquired or constructed."

6. No Permanent Water Right, and Water Availability. The parties agree that no permanent right to the water supplied by the District shall accrue to the City except pursuant to and as limited by the terms of this Agreement. The City shall have no claim for damages or breach arising from the unavailability of water from the District for any cause or condition.

7. Banking. The City may "bank" any water that it has paid for that either: a) The City has not been able to take delivery of for any reason; or b) the District has not been able to deliver. The City shall have the right to take delivery of any banked water in any Transfer Period that it is available during the term of this Agreement or any extension thereof and continuing through the tenth year after the expiration of this Agreement or any extension thereof, provided that:

a. Delivery of banked water occurs in years in which the District has water available under Permit 10477 (City understands that District does not have a carry-over storage right in Camanche Reservoir that enables it to store water from year to year);

b. Delivery of banked water is on a constant release schedule acceptable to EBMUD and WID for operational purposes;

c. The City may not take delivery of banked water such that total deliveries to the City would exceed 1,000 acre-feet of water under Permit 10477 between December 1st and November 30th of a given calendar year, unless the District determines that it does not have other demands for the water available from Permit 10477.

7. Water Quality, Temporary Interruptions, and Responsibility for the Water Beyond Point of Release.

a. The water being supplied to the City is raw water released from the Mokelumne River, and the character or quality of the water furnished hereunder may vary from time to time. The District does not guarantee in any respect the character or quality of the water furnished pursuant to this Agreement.

b. It is agreed there may be, in addition to shortages of water, temporary discontinuance or reduction of water to be furnished for the City as herein provided, for purposes of investigation, inspection, maintenance, repair, or replacement as may be necessary of any of the facilities used by the District for furnishing water to the City. The District agrees to provide the City notice of such temporary discontinuance of reduction of water as soon as such information is available to the District.

c. The City shall hold the District harmless from and defend the District from all claims or expenses on account of damages or claim of damage of any nature whatsoever that arise from or relate to the City's actions in performing this Agreement, including property damage, personal injury, or death, arising out of or connected with the release, delivery, control, carriage, handling, use, disposal, or distribution of water furnished hereunder at or after the Point of Delivery. The District shall hold the City harmless from and defend the City from all claims or expenses on account of damages or claim of damage of any nature whatsoever that arise from or relate to the District's actions in performing this Agreement, including property damage, personal injury, or death, arising out of or connected with the release, delivery, control, carriage, handling, use, disposal, or distribution of water furnished hereunder to the Point of Delivery.

8. Arrearage in Payments. No water shall be furnished to the City during any period in which the City may be in arrears in payment of charges accruing hereunder after the determination on the amount thereof as above provided. Interest on arrearage in payment shall be charged at a rate of one and a half (1.5) percent per month and compounded monthly, commencing 45 days after the due date of the payment.

9. Assignment. The provisions of this Agreement shall apply to and bind the successors and assigns of the respective parties hereto; but no assignments or transfer of this Agreement or any part thereof or interest therein by the City shall be valid unless and until approved in writing by the District; and no assignment of the obligation to provide or deliver the water shall be assignable by the District without the written consent of the City.

10. California Environmental Quality Act and Other Applicable Laws and Regulations. The parties understand and agree that this Agreement is subject to compliance with the California Environmental Quality Act (CEQA) and all other applicable laws and regulations. The parties further agree the District prepared and certified an Initial Study and Mitigated Negative Declaration on March 10, 2014 which covers this Agreement.

11. Entire Agreement. This Agreement contains the full and entire Agreement of the parties and there are no other conditions, either explicit or implicit, nor any warranties or promises other than those contained within the written terms of this Agreement.

12. Time of the Essence. Time is of the essence in the performance of this Agreement.

13. Nonwaiver. The failure of either party to enforce or abide by a term or condition of this Agreement shall not constitute a waiver of that term or condition unless a written Agreement is prepared specifically providing for the waiver or forgiveness of that term and such Agreement is executed by each party hereto.

[agreement continued on next page]

14. Date of Execution. The date of execution of this Agreement is the date of execution by the party last signing the Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the _____ day of _____ 2014.

NORTH SAN JOAQUIN WATER CONSERVATION DISTRICT

Dated: Sept 29, 2014

By _____

Joe Valente, Board President

Attest:

_____

Thomas Flinn, Board Secretary

APPROVED AS TO FORM:

_____

Roger Masuda, General Counsel

CITY OF LODI, a municipal corporation

Dated: _____, 2014

By _____

Stephen Schwabauer, City Manager

Attest:

_____

APPROVED AS TO FORM:

_____

Janice D. Magdich, City Attorney

Appendix H - Eastern San Joaquin Groundwater Basin Groundwater Management Plan

Report available for download at http://www.gbawater.org/Studies-Projects/Groundwater-Management-Plan

Appendix I - Eastern San Joaquin Integrated Regional Water Management Plan

Report available for download at http://www.gbawater.org/IRWMP/2014-IRWMP-Update

Appendix J - Safe Yield and San Joaquin County Water Management Plan Phase 1

San Joaquin County Water Management Plan available for download at
http://www.morewater.org/maps_documents.html

Treadwell&Rollo

13 January 2006
Project 3923.17

Mr. Charles Swimley
Department of Public Works
City of Lodi
221 West Pine Street
Lodi, California 95240

Subject: Evaluation of Safe Yield
City of Lodi

Dear Mr. Swimley:

As part of our ongoing work, Treadwell & Rollo, Inc. evaluated the potential safe yield of the aquifers used by the City of Lodi (Figure 1). Safe yield is defined as that amount of groundwater that the City of Lodi may extract without a further decline in groundwater elevations. The estimate of safe yield will be used in the City's urban water management plan, which is currently being revised.

CONCEPTUAL MODEL

The City of Lodi lies in the San Joaquin County groundwater basin (Basin) adjacent to the Mokelumne River (Figure 1). Recharge to the Basin occurs from surface water recharge, stream recharge principally from the Mokelumne River, and lateral groundwater flow. Prior to development in the county, groundwater flowed from east to west as shown on Figure 1 (USGS, 1989, *Regional Aquifer-System Analysis – Groundwater Flow in the Central Valley, California,* Professional Paper 1401D). Groundwater has been pumped from the Basin throughout the 1900s for agriculture and municipal/commercial uses. The pumping has resulted in a wide decrease of the groundwater elevations; the deepest portion of these decreases occurs south and east of the Lodi (Figure 1).

Camp Dresser McKee prepared a groundwater-surface water model as part of the *San Joaquin Water Management Plan* dated October 2001. As part of the model, CDM estimated the amount of water that enters and leaves the Basin. The difference between the inflow and outflow is overdraft or mined aquifer storage. The amount of overdraft for the Basin was estimated to be 107,228 acre-feet per year (ac-ft/yr) as shown in the table below. The annual balance of water in and out of the Basin for current conditions was estimated to be the following:

Treadwell & Rollo, Inc. *Environmental & Geotechnical Consultants*
555 Montgomery Street, Suite 1300, San Francisco, CA 94111
Telephone (415) 955-9040 Facsimile (415) 955-9041

	In *ac-ft/yr*	Out *ac-ft/yr*	Balance *ac-ft/yr*	Notes
Surface	608,400		608,400	Net recharge from rainfall and other
Streams	198,170	-108,898	89,272	Stream recharge and discharge
Groundwater Flow	98,000	-35,300	62,700	Subsurface groundwater flow
Pumping		-867,600	-867,600	Lodi's pumping 17,000 ac-ft/yr
TOTALS	904,570	-1,011,798		
			-107,228	Mined aquifer storage

References: Table 3-3, Simplified Groundwater Balance for Current Conditions, CDM October 2001, *San Joaquin County Water Management Plan – Phase 1 Planning, Analysis and Strategy*, v. 2; City of Lodi, 2005 pumping records. (Saline intrusion from Stockton area lateral inflow was estimated to be 42,000 ac-ft/yr but was not included in overdraft calculations due to its local effect.)

APPROACH AND CALCULATIONS

Based on discussions with the City, Treadwell & Rollo used two approaches to estimate Lodi's potential portion of the overdraft and safe yield in the Basin. One approach was based on the proportion of mined aquifer storage relative to total inflow into the Basin. The other approach was based on the difference between pre-development and current water elevations.

In the first approach, Treadwell & Rollo estimated that the safe yield will be Lodi's current usage minus its portion of the Basin overdraft. This assumes that Lodi's overdraft is the same as the average overdraft for the Basin. To estimate the portion of Basin overdraft, Treadwell & Rollo calculated the volume of mined aquifer storage divided by the net inflow (or water available to replenish the Basin). This ratio is the following:

= Mined aquifer storage/(net recharge from rainfall and other + net stream recharge + net subsurface groundwater flow)

Using the estimates in the table above, this overdraft portion would be the following:

= 107,228 / (608,400 + 89,272 + 62,700) or 14%

Since Lodi uses 17,000 ac-ft/yr, then Lodi's portion would 14% of 17,000 or 2,400 ac-ft/yr. So, Lodi's safe yield amount would be 17,000 – 2,400 or 14,600 ac-ft/yr.

In the second approach, Treadwell & Rollo again estimated that the safe yield would be Lodi's current use minus Lodi's portion of Basin overdraft. Lodi's portion of the overdraft was estimated to be the volume defined by the difference between predevelopment and current water elevations within the City limits (V_{Lodi}), divided by the volume between pre-development and current water elevations for the entire Basin (V_{Total}).

In this approach, the pre-development water elevations represent base-line conditions, and current water elevations represent overdraft. The difference between the two surfaces represents the volume of overdraft or mined aquifer storage. This approach is portrayed conceptually in Figure 2, where the four cross sections are displayed in a block diagram. The vertical dimensions of the block diagram are shown on Figure 2, where the average height of the overdraft block for the Basin is 55 feet, and the average height of the overdraft block for the City is 40 feet.

The area of the City of Lodi is 6,466 acres or approximately 10.1 square miles according to City records. So using these dimensions, $V_{Lodi} = 1.1 \times 10^{10}$ ft^3. The area of the Basin is approximately 20 miles (105,600 feet) wide and 33 miles (174,240 feet) long. So $V_{Total} = 1 \times 10^{12}$ ft^3, and $V_{Lodi} / V_{Total} =$ 1.1%. Lodi's portion of overdraft is then, 107,228 x 0.011 = 1,200 ac-ft/ yr, and Lodi's safe yield would be 17,000 – 1,200 = 15,800 ac-ft/yr.

DISCUSSION

Based on these two approaches, the City of Lodi safe yield could range from approximately 14,600 to 15,800 ac-ft/yr. These results are sensitive to calculation assumptions such as the area of the City of Lodi or estimates of mined aquifer storage and should be considered preliminary in recognition of these limitations.

The concept of safe yield is subject to considerable interpretation. This is based on the challenge of accounting for the significant water uses such as streams, springs, wetlands, and groundwater-dependent ecosystems and providing estimates of the actual amounts needed for each use.

Treadwell & Rollo appreciates the opportunity to provide continued services to the City of Lodi. If you have questions regarding this safe yield estimate, please call either of us.

Sincerely,
TREADWELL & ROLLO, INC.

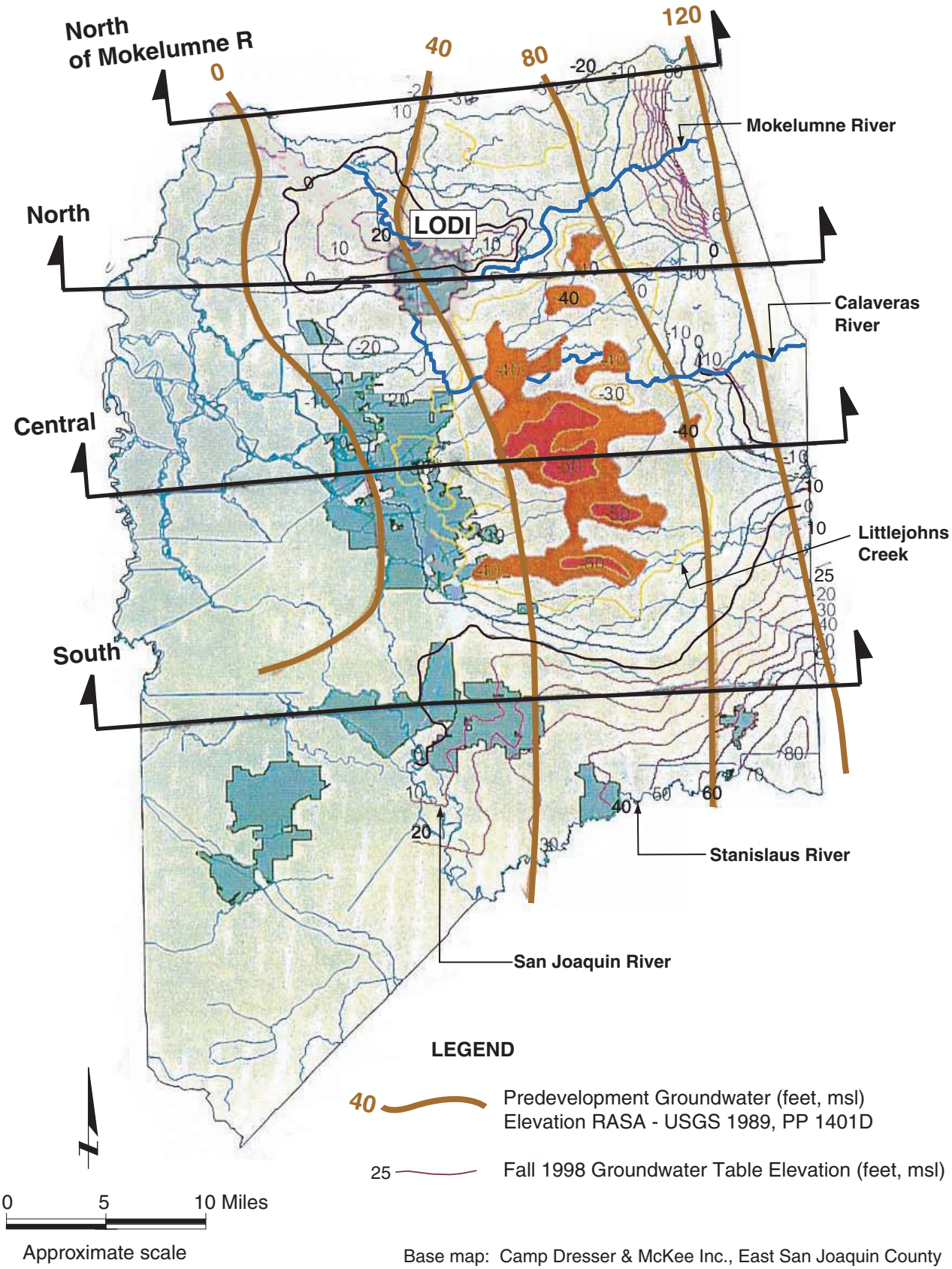
Philip G. Smith, CPGS
Vice President

Patrick B. Hubbard, PG
Senior Associate Geologist

39231702.PBH

Attachments: Figure 1 – Groundwater Contours and Cross Sections
Figure 2 – Cross Sections and Conceptual Block Diagram

FIGURES



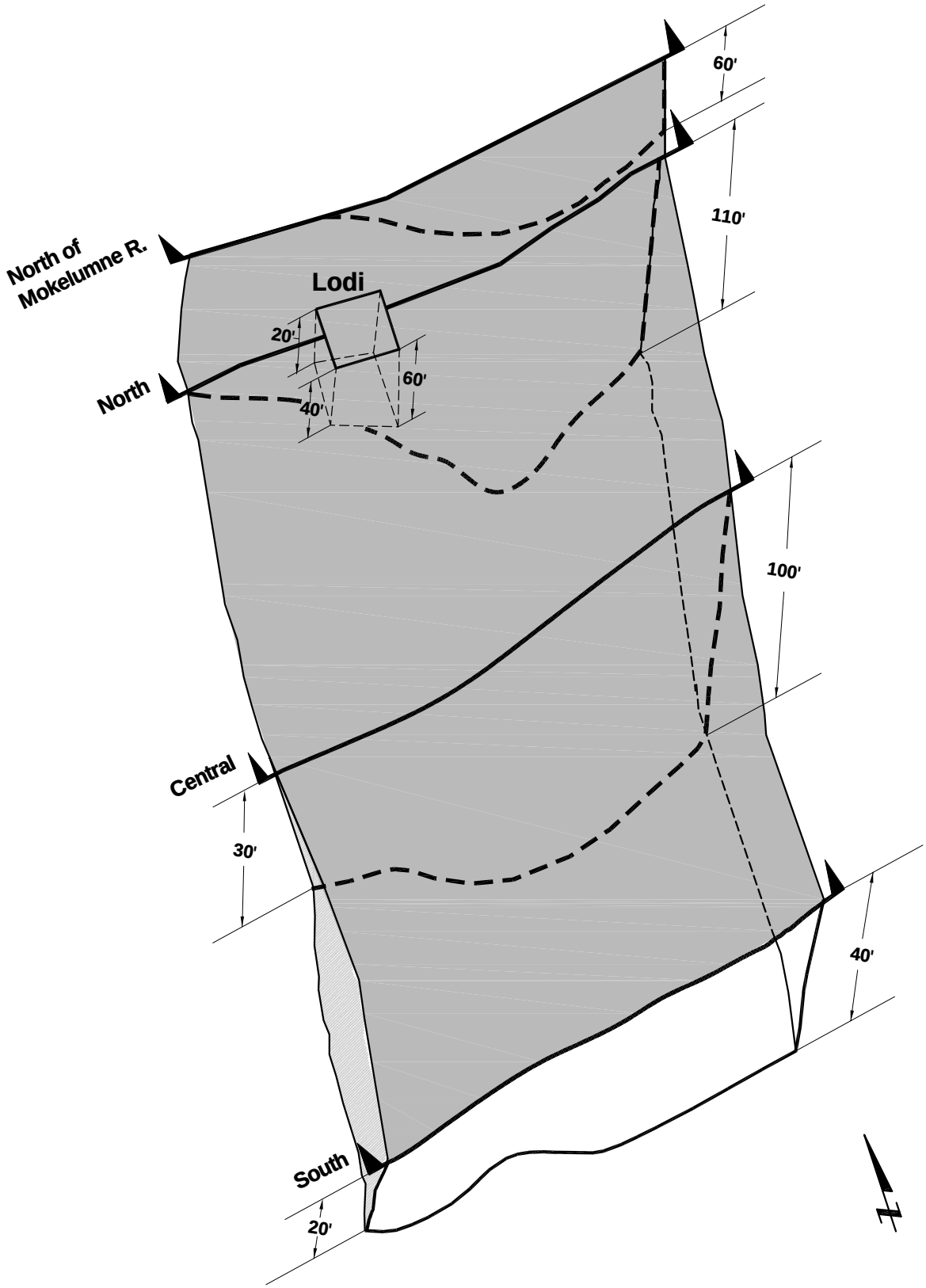
Base map: Camp Dresser & McKee Inc., East San Joaquin County Groundwater Depression and Extent of Saline Intrusion, undated.

LODI SAFE YIELD ESTIMATE
Lodi, California

GROUNDWATER CONTOURS AND CROSS SECTIONS

Treadwell&Rollo

Date 01/19/06	Project No. 3923.17	Figure 1



References: USGS, 1989, PP 1401D; CDM, 2001

LODI SAFE YIELD ESTIMATE
Lodi, California

CROSS SECTIONS AND CONCEPTUAL BLOCK DIAGRAM

Treadwell&Rollo

Date 01/04/06	Project No. 3923.17	Figure 2

3923.17 Cross Section.dwg

Appendix K - Mokelumne-Amador-Calaveras Integrated Regional Water Management Plan

Report available for download at http://www.umrwa.org/irwm.html

Appendix L - Mokelumne Watershed Interregional Sustainability Evaluation Program Report

Report available for download at http://www.mokewise.org/documents

Appendix M - Stormwater Program and Plan

City of Lodi Storm Water Management Program available for download at
http://www.lodi.gov/stormwater/pdf/Lodi%20SWMP%20Rev%20April%202012%20-%20Final.pdf

Multi-Agency Post-Construction Stormwater Standards Manual available for download at
http://www.lodi.gov/stormwater/pdf/Post-Construction%20Standards%20Manual%202015-06-30%20FINAL.pdf

Appendix N - NCPA Agreement

CITY COUNCIL
LARRY D. HANSEN, Mayor
PHIL KATZAKIAN,
Mayor Pro Tempore
SUSAN HITCHCOCK
BOB JOHNSON
JOANNE MOUNCE

CITY OF LODI

PUBLIC WORKS DEPARTMENT
CITY HALL, 221 WEST PINE STREET / P.O. BOX 3006
LODI, CALIFORNIA 95241-1910
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EMAIL pwdept@lodi.gov
http://www.lodi.gov

BLAIR KING,
City Manager

RANDI JOHL,
City Clerk

D. STEPHEN SCHWABAUER,
City Attorney

F. WALLY SANDELIN,
Public Works Director

July 24, 2009

Ed Warner
NCPA Lodi Energy Center
661 Commerce Drive
Roseville, CA 95678

Subject: Agreement to Serve Recycled Water to NCPA

Subject to agreement of business terms, the City of Lodi has agreed to serve recycled water to NCPA's Lodi Energy Center (LEC). NCPA will be submitting a Supplement to the Application for Certification (AFC) with the California Energy Commission (CEC). The City of Lodi can supply the required 1800 acre feet of recycle water per year that is contained in the AFC Supplement.

The City of Lodi currently serves NCPA's STIG facility, the San Joaquin County Mosquito and Vector Control facility, and adjacent City owned agricultural land with recycled water. As discussed in a meeting held between NCPA and the City of Lodi on July 13, 2009, the City of Lodi has sufficient capacity to serve both the LEC plant as well as existing users even with the increased water need resulting from the change in equipment described in the AFC Supplement. This commitment will not adversely affect any existing or future planned recycled water users.

We trust that this addresses the CEC's request. If you need additional information please do not hesitate to contact me at (209) 333-6740.

Sincerely,

F Wally Sandelin

for Charles E. Swimley Jr., P.E.
Water Services Manager

RECEIVED
JUL 27 2009
CITY OF LODI
MUNICIPAL SERVICE CENTER

K:\WP\LETTERS\LRecycledWatertoNCPA.doc

7/24/09

Appendix O - Recycled Water Master Plan

City of Lodi
Recycled Water Master Plan

Final Report

Prepared by:

RMC
Water and Environment

November 2008

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Appendix J	Recycled Water Alternatives Evaluation Backup Information
Appendix K	City of Lodi and WID Water Service Rates
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Chapter 6 Project Alternative Analysis

6.1 Introduction

The purpose of this chapter is to present the recycled water project alternatives developed and evaluated as part of this RWMP. The objective of this chapter is to identify a preferred project (or set thereof) that meets the following objectives:

- Maximize the beneficial use of highly treated recycled water in order to reduce groundwater overdraft,
- Improve water supply reliability by providing recycled water during peak demand periods, and
- Provide an interim solution for the use of the City's untreated WID water.

6.2 Alternatives Development

Four conceptual distribution system alternatives (A, B, C, and D) were developed based on discussions with City staff and the results of the Market Assessment conducted for this RWMP and presented in the *Conceptual Alternatives TM* (**Appendix C**). The alternatives were intentionally developed to examine transmission mains only; service laterals, which will provide recycled water to customers that are not adjacent to a transmission main, were not included. The extent of service laterals required, if necessary, will be determined during a later facility planning phase. For each alternative, potential recycled water users identified in the Market Assessment were assigned to the conceptual pipeline alignment based on proximity to the alignment. Alternatives A, B, and C include potential customers both within the City limits and near the White Slough WPCF, while Alternative D includes primarily agricultural customers near the WPCF. The methodology used to select potential users for each conceptual alternative are described in further detail in the *Conceptual Alternatives TM.*

The assumptions regarding available water supplies were based on the potential recycled water and non-potable water supplies presented in the *Recycled Water Market Assessment TM* (**Appendix B**) and the *Key Assumptions TM* (**Appendix A**).

The conceptual alternatives were each developed to provide options for delivering recycled water from the White Slough WPCF to specific potential users within the City's RWSA. Alternatives A, B, and C may use Woodbridge Irrigation District (WID) water in addition to the recycled water from the WPCF to meet customer peak irrigation demands (and reduce storage costs), while Alternative D uses recycled water from the White Slough WPCF only. Alternatives A, B, C, and D are summarized in **Table 6-1**. Maps of the conceptual alternatives are included in **Appendix C**.

Table 6-1: Summary of Conceptual Alternatives

Alternative		A	B	C	D-1 [g]	D-2 [h]
Customer Information	No. of schools served/total [a]	8/19	12/19	10/19	0/19	0/19
	No. of parks served/total [b]	17/36	17/36	15/36	0/36	0/36
	Acres of potential agricultural customers served [c]	800	810	877	1,133	1,183
Total Length	feet	86,080	94,310	78,340	28,790	37,030
	miles	16.3	17.9	14.8	5.5	7.0
Pipe Diameters	6-in	6,100	6,560	5,550	–	–
	8-in	10,050	22,280	11,170	–	–
	12-in	22,760	22,960	19,110	–	15,120
	16-in	11,570	6,470	6,470	4,220	4,220
	24-in	33,700	26,030	26,030	23,530	8,330
	30-in	1,890	10,000	10,010	1,040	9,360
Looped System		Yes	Yes	No	No	Yes
Major Facilities		▪ Two pump stations ▪ Seasonal storage pond(s)	▪ Two pump stations ▪ Seasonal storage pond(s)	▪ Two pump stations ▪ Seasonal storage pond(s)	▪ One pump station ▪ Seasonal storage pond(s)	▪ One pump station ▪ Seasonal storage pond(s)
Total Demand [i] (RW Yield)	ADD [d] (mgd)	5.2	5.2	5.2	3.3	3.3
	MDD [e] (mgd)	14.4	14.4	14.4	8.5	8.5
	MHD [f] (mgd)	19.7	19.7	19.9	14.5	14.5
Interim WID Water Use		Yes	Yes	Yes	No [j]	No [j]

Footnotes:

a. A total of 19 schools were identified as potential recycled water customers in the *Market Assessment TM*.
b. A total of 36 parks were identified as potential recycled water customers in the *Market Assessment TM*.
c. Acreages differ among the alternatives due to 1) differing amounts of supply remaining after meeting demands from non-agricultural potential users under each alternative, and 2) the differing irrigation demands for the crop types assumed for potential agricultural users assigned to each alternative.
d. Average Day Demand.
e. Maximum Day Demand. Assumes that the *existing* NCPA facility is not operating.
f. Maximum (Peak) Hour Demand. Assumes that the *existing* NCPA facility is not operating. Represents demands from agricultural irrigation and *potential* NCPA facility, which are assumed to be supplied during the day. Urban irrigation demands, which are assumed to be supplied at night, are not included for Alternatives A, B, and C.
g. Non-looped alternative
h. Looped alternative
i. Does **NOT** include recycled water demands for water pollution control measures.
j. Interim WID water use may be feasible by diverting water from WID canals other than the South Main Canal, but doing so would require modification of the City's water supply agreement with WID.

Based on City-provided comments and feedback on the conceptual alternatives presented in the *Conceptual Alternatives TM*, two conceptual alternatives (Alternative A and the looped version of Alternative D) were selected for further refinement and evaluation. Alternatives B and C were not selected for further evaluation, due to the fact that they closely resemble Alternative A in terms of the total potential recycled water usage, but lacked several of the perceived benefits of Alternative A such as ease of constructability and lower capital costs. The non-looped version of Alternative D was not selected due the fact that it would a) feature a greater quantity of larger diameter pipes, b) require a crossing of the UPRR tracks, c) would not offer the benefits of a looped system, and d) feature an increased likelihood for the need for multiple service laterals. A regional alternative for the use of recycled water was not addressed in the *Conceptual Alternatives TM*. Instead, the City of Lodi is working with the City of Stockton to evaluate a regional alternative for the use of Lodi's available recycled water supplies in parallel with this Master Plan.

The subsequent portions of this chapter are related to Alternatives A, Alternative D, and a No Project Alternative only. The evaluation criteria for these alternatives are presented in Section 6.3.1 below.

6.2.1 Design Criteria

Hydraulic analyses, using H_2OMap Water modeling software, were performed to determine the estimated sizes for the backbone pipelines, pump stations, and storage facilities required to provide recycled water to the service area for the project alternatives evaluated. The hydraulic criteria shown in **Table 6-2** were used as a basis for these analyses.

Users that are not adjacent to the backbone pipeline system will receive recycled water from service laterals. The hydraulic analyses performed for this RWMP did not include the development of service laterals. The anticipated length, sizes, and costs for service laterals are reflected in the estimated costs for the preferred project (Chapter 7).

Table 6-2: Design Criteria

Criteria	Value	Unit
Design velocity range	2-10	feet per second (fps)
Minimum delivery pressure [a]	80	psi
Maximum system pressure	150	psi
Minimum pipe size	6	inches
Available pipe sizes	6, 8, 10, 12, 16, 24, 30	inches
Maximum head loss [b]	7	feet per 1,000 feet of pipe
Minor head loss	5	% of velocity headloss

Footnotes:

a. During peak hour demand conditions, and measured at the transmission main. Although significantly higher than the City's potable water system, a higher pressure requirement has been assumed for irrigation systems, based on discussions with City Parks Department.

b. Head loss calculated using Hazen-Williams equation, with C = 130.

Additionally, the following criteria and assumptions were developed for pump stations and seasonal storage facilities.

Pump Stations

Pump stations must be capable of pumping a range of flows based on varying demand. The following design criteria were used to establish planning level pump station facilities and cost estimates:

- Construction on City property

- Size for peak hour demands
- Install variable frequency drives (VFDs)
- No back-up power supply
- One standby pump
- Minimum pump efficiency of 75%
- At least 2 pumps should be the same size

Seasonal Storage Options

As discussed in Section 4.2, the City is currently examining the possibility of using additional treated municipal effluent (recycled water) for the dilution and blending of cannery flows and biosolids in the vicinity of the White Slough WPCF. According to a memorandum titled *TM No. 2: Land Application: Future Nitrogen Loading Conditions* (Appendix H), 892 MG of the City's municipal effluent will be required for this purpose in the future. Although it is unknown at this time whether the amount of effluent required will in fact be used by the City, the potential reduction in available treated effluent supply has been treated as a demand for the purposes of this RWMP (referred to henceforth as "on-site" recycled water demand). Under this assumption, the City would be significantly constrained in any attempt to serve recycled water to customers elsewhere in the RWSA (i.e., "off-site" demand) unless seasonal storage is utilized. After discussions with City staff, RMC recommends the following two seasonal storage options be considered:

- **Seasonal Storage for On- and Off-Site Demands:** Recycled water from the White Slough WPCF would be seasonally stored in order to meet both on-site *and* off-site recycled water demands. Storage ponds would be filled with recycled water during months when recycled water demand is low or absent (e.g., January), and would be drawn from the ponds throughout the growing season, when both on-site and off-site demands are at their peak. The storage ponds would be sized such that the ponds would be empty or nearly empty at the end of the growing season. Under this alternative, supplemental sources of water would be unnecessary to meet peak demands in the off-site recycled water system.
- **Seasonal Storage for On-Site Demands:** Recycled water would be seasonally stored in order to meet on-site recycled water demands *only*, resulting in a smaller total storage volume than that required for both on- and off-site demands. The storage ponds would be filled with recycled water during months when recycled water demand is low or absent (e.g., January), and would be drawn from the ponds throughout the on-site demand season. During the on-site demand period, daily production from the White Slough WPCF would remain available to meet off-site demands. Any off-site demands exceeding the daily output of the WPCF would be met by incorporating a supplemental source of water (i.e., WID or groundwater) into the recycled water distribution system.

Another option was considered in which recycled water is not seasonally stored, requiring on-site and off-site demands to "compete" for the daily production from the White Slough WPCF. This option was ruled out by City staff since such a "competition" scenario is inconsistent with the City's goals of maximizing the use of its recycled water supplies[14].

The following analyses of off-site recycled water distribution alternatives assume either (1) seasonal storage for on- *and* off-site demands, or (2) seasonal storage for on-site demands *only*. While the no-storage option is not assumed, a no-storage scenario is implied as part of the No Project alternative

[14] The City could satisfy approximately 1,700 AFY of demand under a no-storage scenario, which is less than the City's current groundwater overdraft rate (the City pumps approximately 17,000 AFY, while the sustainable yield was determined to be approximately 15,000 AFY).

described below. The storage option is indicated for each of the distribution system alternatives described below.

The seasonal storage ponds are assumed to be lined, in order to mitigate the potential for percolation/infiltration. Additionally, it should be noted that if the assumptions relating to the on-site demands are changed or negated in the future, the size, and scope of seasonal storage alternatives could be dramatically changed.

At the present time, the City does not have any available land to site seasonal storage ponds other than the City-owned property surrounding the White Slough WPCF.

6.2.2 Description of Distribution System Alternatives

Alternative A – Seasonal Storage for On- and Off-Site Demands

The layout for Alternative A is shown in **Figure 6-1**. The main corridors for this alignment include: North Thornton Road, West Kingdon Road, Harney Lane, along the western edge of the future development areas (Westside and Southwest Gateway) west of Lower Sacramento Road between Harney Lane and the main WID South Main Canal, and along the WID South Main Canal from Harney Lane to Turner Road. One major crossing of the WID canal is required at Harney Lane under this alternative. Other crossings of the WID canal would be expected for the irrigation laterals serving the various schools, parks, and other users near the main transmission lines. The length of the transmission mains totals approximately 87,000 lineal feet, with pipe diameter sizes ranging from 6-inches to 30-inches. A pump station would also be located at the White Slough WPCF to meet the required system pressures required for distribution.

During peak irrigation demand periods (June, July, and August), the daily recycled water supply from the White Slough WPCF would not be sufficient to meet demands for this service area. Therefore, seasonally stored recycled water supplies located near the White Slough WPCF would be used in order to meet peak demands. The approximate volume of the seasonal storage pond(s) would be 3,000 AF.

Refer to Attachment B of **Appendix B** for reference information about each of the potential users identified in Figure 6-1, including users names (where applicable), meter numbers (where applicable), locations, demands, type of use, and site size.

Alternative A – Seasonal Storage for On-Site Demands

Alternative A could also be implemented using Seasonal Storage for On-Site Demands. Under this alternative, the alignment would follow the same corridors described above and the distribution system would be the same. One major crossing of the WID canal is required at Harney Lane under this alternative. Other crossings of the WID canal would be expected for the irrigation laterals serving the various schools, parks, and other users near the main transmission lines. The layout this alternative is shown in **Figure 6-2**.

Approximately 2,400 AF of recycled water would be seasonally stored in order to meet "on-site" demands. During peak irrigation demand periods (June, July, and August), the recycled water supply from the White Slough WPCF would not be sufficient to meet the demand for the "off-site" recycled water users. Therefore, additional water supplies would be added from a proposed WID canal intake/pump station, assumed to be located at Beckman Park, to the recycled water distribution system in order to serve the total "off-site" users' demand[15]. The actual location of the WID intake would be determined during the design phase for this project.

[15] Incorporating WID supplies would not increase the size of the pipeline facilities in Alternative A. Rather, utilizing raw WID water will reduce the required volume of seasonal storage, in turn reducing the total unit cost of water in the system. Refer to **Appendix J** for detailed cost information.

Refer to Attachment B of **Appendix B** for reference information about each of the potential users identified in Figure 6-2, including users names (where applicable), meter numbers (where applicable), locations, demands, type of use, and site size.

Alternative D – Seasonal Storage for On- and Off-Site Demands

Alternative D is illustrated in **Figure 6-3.** The main corridors of this alignment include Kingdon Road and Harney Lane west of the Union Pacific Railroad tracks. The transmission mains length totals approximately 37,000 lineal feet in total length with pipe diameter sizes ranging from 12-inches to 30-inches. One pump station located at the White Slough WPCF would be required to meet the irrigation demands under Alternative D.

Although the daily recycled water output from the White Slough WPCF would be sufficient to meet peak irrigation demands during June, July, and August under the Seasonal Storage for On-Site Demands option, a 3 MG recycled water storage tank at the WPCF would be required for operational storage. As such, it has been assumed that increasing the size of seasonal storage ponds by approximately 500 MG to accommodate Alternative D demands (requiring approximately 1,600 AF of total storage) would be preferred over the construction and operation of a large (3 MG) operational storage tank. Thus, Seasonal Storage for On- and Off-Site Demands remains the preferred option for Alternative D.

Refer to Attachment B of **Appendix B** for reference information about each of the potential users identified in Figure 6-3, including users names (where applicable), meter numbers (where applicable), locations, demands, type of use, and site size.

Water Quality Impacts of Recycled Water Project Alternatives

No negative water quality impacts on the City's effluent receiving waters (Dredger Cut and the Delta), including impacts to beneficial uses, are anticipated as a result of removing and/or reducing effluent discharge during portions of the year. Since Dredger Cut and the Delta are both tidally influenced, water level changes in either will not be significantly influenced by the reduction or removal of effluent flows.

Additionally, the City does not expect any adverse water quality impacts to groundwater as a result of using recycled water for irrigation. In fact, the use of the City's treated effluent for irrigation may improve groundwater quality in some areas of the City's RWSA (mainly in the western portion of the RWSA, near Interstate 5) which currently experience elevated TDS levels as a result of saltwater intrusion from the Delta.

Figure 6-1: Alternative A – Seasonal Storage for On- and Off-Site Demands

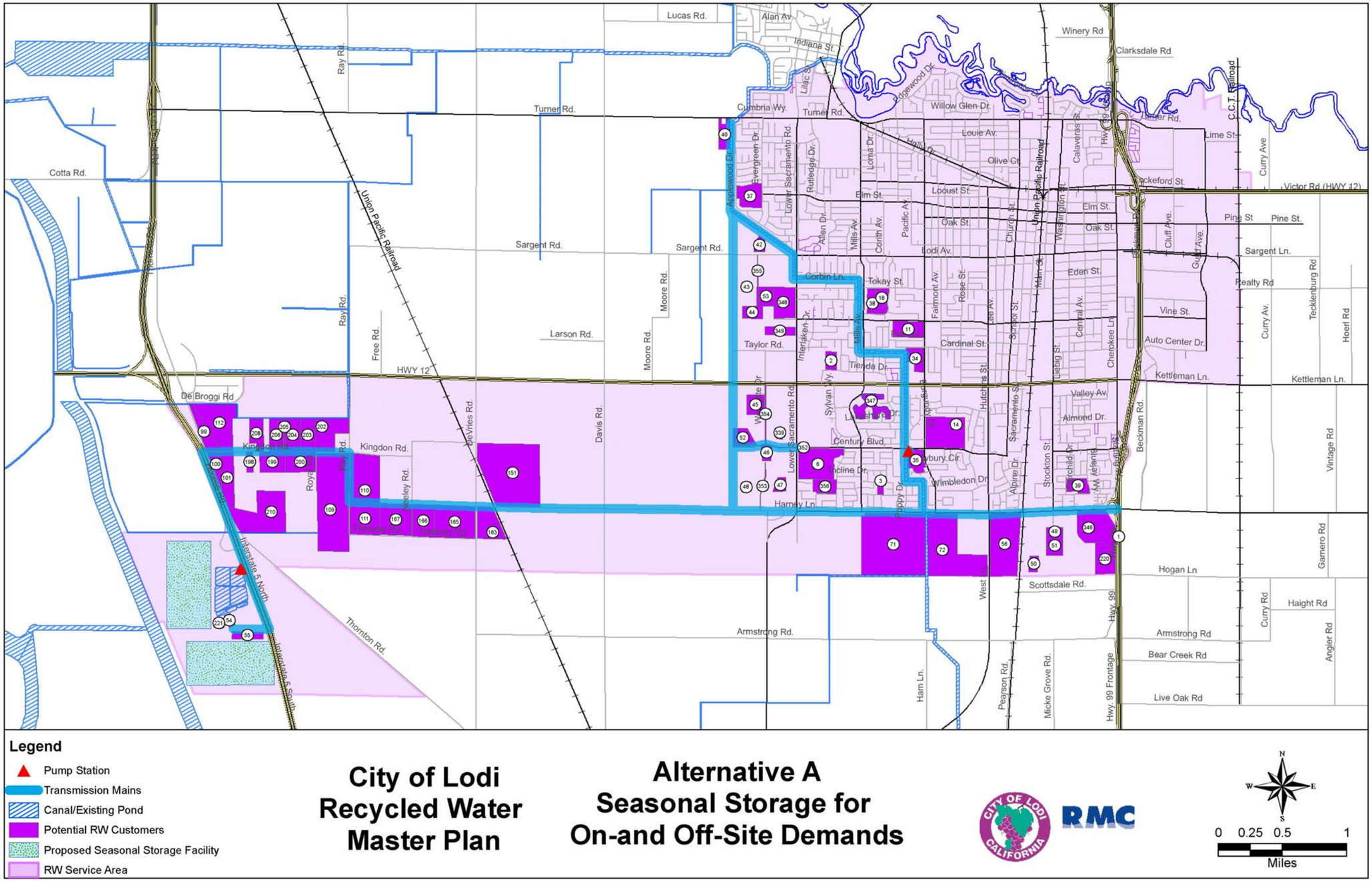


Figure 6-2: Alternative A – Seasonal Storage for On-Site Demands

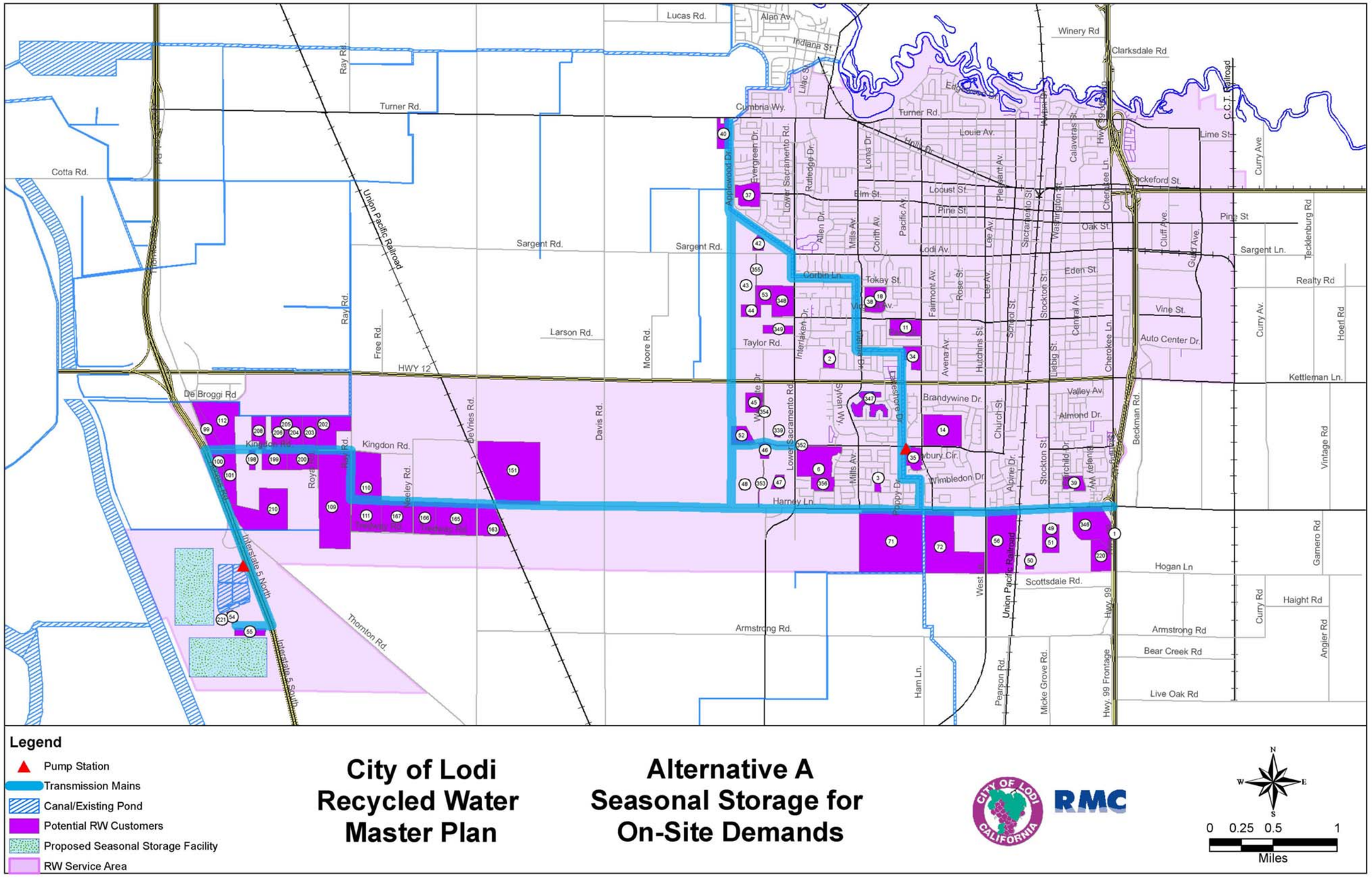
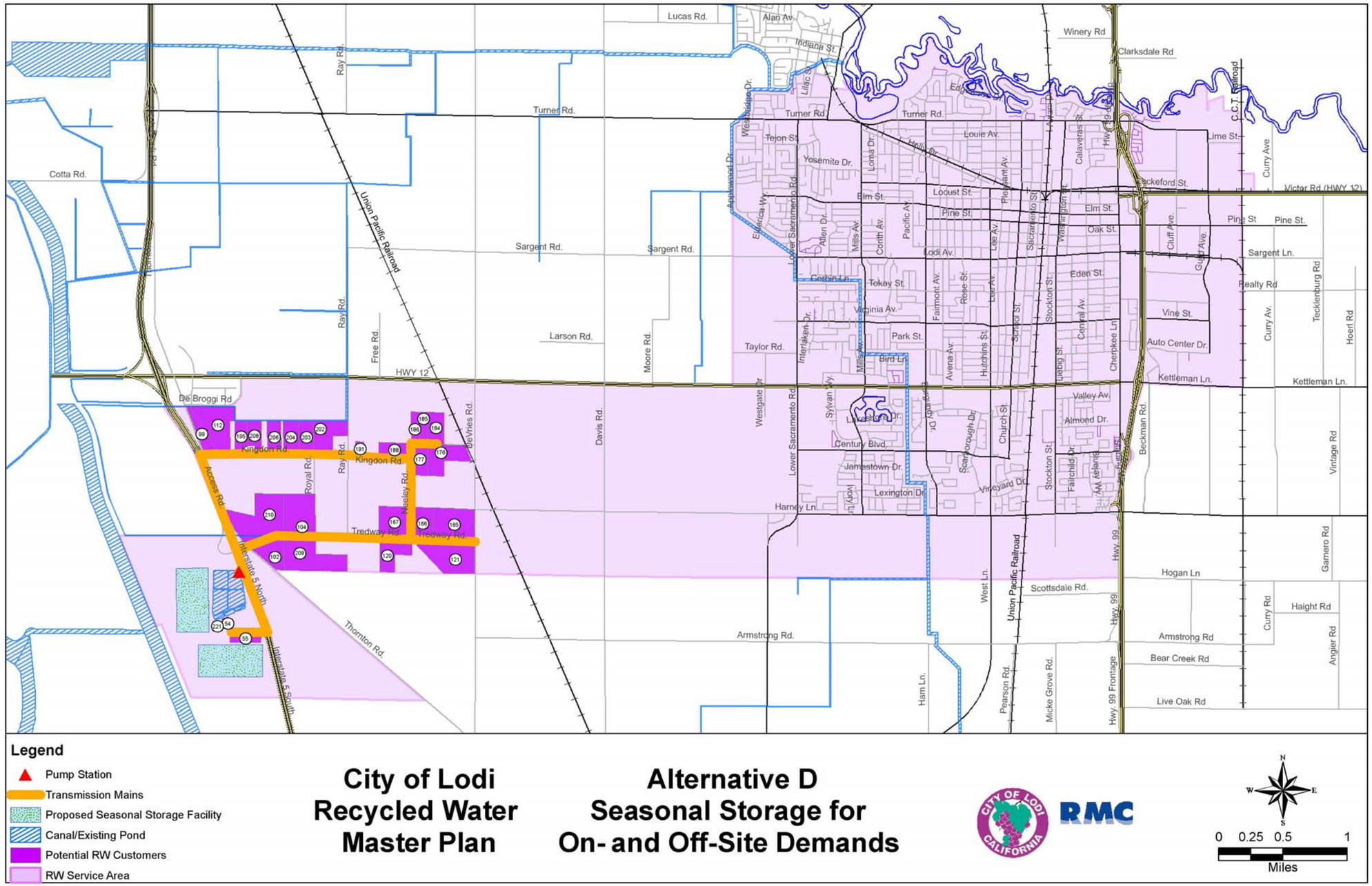


Figure 6-3: Alternative D – Seasonal Storage for On- and Off-Site Demands



No Project Alternative

In addition to the project alternatives discussed above, as part of this study a "No Project" alternative was also considered. The "No Project" alternative represents a scenario in which recycled water use within the City's RWSA is not implemented.

Although the "No Project" alternative would avoid substantial implementation capital costs and potential short-term environmental impacts, such as traffic impacts from construction activities, impacts to portions of the City's parks and schools, and noise impacts from operation of equipment and vehicles, there would be several major long-term consequences associated with failing to implement any of the alternatives identified as part of this study:

- **Groundwater supplies would not be offset.** Unless the City uses its WID supplies for a non-potable distribution system, City of Lodi customers would continue to use groundwater for irrigation, contributing to further basin overdraft.
- **Water supply reliability would not be improved.** Customers within the City's RWSA would continue to rely on an overdrafted groundwater basin and/or dry-year susceptible surface water during peak demand periods.
- **Available recycled water would not be put to beneficial use.** Lodi will not be able to fully utilize available (buildout) capacity of its 8.5 mgd White Slough WPCF. The available tertiary treated water would not be used to benefit the community (e.g., irrigation of agricultural areas, parks, and schools)

6.2.3 Non-Recycled Water Alternative

As discussed previously, the City is planning to construct a surface water treatment plant to treat its WID surface water supplies for use by potable water customers within the City. The City plans to proceed with this project regardless of the outcome of this RWMP. Although use of the City's surface water supplies will partially offset groundwater supplies and improve water supply reliability, the City's recycled water supplies will not be put to beneficial use without a recycled water project. Preliminary cost estimates for the City's surface water treatment plant are not included, as the project is still under study.

6.2.4 Water Conservation/Reduction Analysis

The City has a variety of water conservation (or demand management) measures in place. Chapter 5 of the City's 2005 UWMP discusses the existing demand management measures in detail. In addition to the existing measures, the City is in the process of implementing a water metering program. It is anticipated that the transition from a flat commodity rate to charges based on metered water consumption will promote additional water conservation, resulting in reduced use of groundwater and/or surface water supplies. The assumed reduction in demand as a result of metering is discussed in the City's 2005 UWMP.

Even with an assumed reduction in demand from water metering, the city is expects to face supply shortages in the future, as indicated in **Figure 1-1**. As discussed previously, the City considers its recycled water supplies as a possible solution to the need for future (non-potable) water supplies.

6.3 Alternative Evaluation

This section presents the results of the evaluation conducted for each alternatives identified in Section 6.2.2.

6.3.1 Evaluation Criteria

The criteria used to evaluate the recycled water project alternatives are summarized below in **Table 6-3.** Additionally, the hydraulic analysis results were used to develop the facility requirements which were the basis for the cost estimates used as part of the evaluation process.

Table 6-3: Evaluation Criteria

Evaluation Criteria	Description
Estimated Cost	Total cost per acre-foot of water delivered (capital costs to implement alternative, as well as operational costs).
Flexibility	Ease with which (1) plans can be changed to address unforeseen circumstances, including ability to alter the plan to account for changes in planning assumptions regarding future demand patterns, projected resources or other uncertainties, and (2) project can be phased.
Meet Project Goals	Ability to meet the project objectives established throughout this RWMP.
Ease of Implementation	Ease with which alternative can be designed, permitted, and constructed. This also includes the ability to overcome obstacles (such as utility crossings).
Environmental/Social Impacts	Various impacts including construction-related impacts.
Regional Plan Adaptability	Degree of synergy with potential regional recycled water system.

Hydraulic Analysis

A hydraulic analysis using H_2OMap was performed to determine the estimated size for the pipelines, pump stations, and storage facilities required to serve the recycled water service area. The hydraulic criteria shown in **Table 6-2** were used as a basis for the model. Alternative A was modeled under two storage scenarios:

- Seasonal Storage for On- and Off-Site Demands included seasonal storage at the White Slough WPCF, allowing the exclusive use of recycled water in the distribution system throughout the year.
- Seasonal Storage for On-Site Demands assumed a constant recycled water production of 8.5 mgd at the WPCF. Additional supplies needed for peak demands were added to the system via a WID canal intake and pump station near Beckman Park.

Alternative D was modeled using Seasonal Storage for On- and Off-Site Demands assumptions, allowing the exclusive use of recycled water in the distribution system throughout the year. Schematics illustrating the configuration of the Alternative A (Storage Options 1 and 2) and Alternative D hydraulic models can be found in **Appendix J**. See also Figure 6-1, Figure 6-2, and Figure 6-3.

Alternatives Description

The facilities required for each alternative based on the hydraulic analyses performed using the H_2OMap Water hydraulic model are summarized in **Table 6-4**. The facility requirements are discussed in more detail below.

Table 6-4: Summary of Facilities for Each Alternative

	Pipe Diameter (inches)	Length of Transmission Main [a] (LF)	Storage Facility and Pump Station
Alternative A Seasonal Storage for On- and Off-Site Demands	30”	210	• Approx. 3,000 AF seasonal storage facility [b] adjacent to the White Slough WPCF (for both “on-site” and “off-site” recycled water demands) [c] • 1,590-hp pump station at WPCF (5 duty and 1 standby 265-hp pumps)
	24”	44,710	
	16”	2,600	
	12”	26,360	
	8”	8,200	
	6”	5,270	
	Total	**87,340**	
Alternative A Seasonal Storage for On-Site Demands	30”	210	• Approx. 2,400 AF seasonal storage facility [b] adjacent to the White Slough WPCF (for “on-site” recycled water demands only) [c] • 780-hp pump station at WPCF (3 duty and 1 standby 195-hp pumps) • 405-hp pump station at WID canal (2 duty and 1 standby 135-hp pumps)
	24”	44,710	
	16”	2,600	
	12”	26,360	
	8”	8,200	
	6”	5,270	
	Total	**87,340**	
Alternative D Seasonal Storage for On- and Off-Site Demands	30”	190	• Approx. 1,600 AF seasonal storage facility [b] adjacent to the White Slough WPCF (for both “on-site” and “off-site” recycled water demands) [c] • 930-hp pump station at WPCF (5 duty and 1 standby 155-hp pumps)
	24”	8,150	
	16”	12,530	
	12”	12,280	
	Total	**33,140**	

Footnotes:

a. Due to refinements made during hydraulic analyses, lengths differ slightly from lengths presented for the Conceptual Alternatives in Table 6-1.

b. Refer to Section 6.2.1 for a description of seasonal storage options and “on-site” and “off-site” recycled water demands.

c. For cost estimation purposes, all seasonal storage facilities have been assumed to be 10 feet deep. Refer to **Appendix J** for detailed information.

Alternative A – Seasonal Storage for On-and Off-Site Demands

- ***White Slough WPCF:*** To deliver recycled water to the identified potential customers, the City would need to operate five 265-hp pumps at the White Slough WPCF during peak hour demand conditions, and one pump during average day demand conditions. At least one pump would be on a VFD in order to allow the pump to ramp down for the reduced average day flows. A sixth pump would be included for redundancy.
- ***Transmission Mains:*** The alternative would require approximately 42,000 lineal feet (LF) of PVC pipe and 45,000 LF of welded steel pipe (WSP)[16]. See **Appendix J** for detailed information.

[16] For cost estimating purposes, pipe material has been assumed to be PVC for pipe diameters between 6- and 16-inches, and steel for pipe diameters 18-inches and larger. Other pipe materials may be appropriate for this application and should be investigated further during the design phase.

- ***Storage:*** Seasonal Storage for On-and Off-Site Demands is assumed for this alternative. A storage pond with a volume of approximately 3,000 AF would be required to store the recycled water required to supply the demands in both the on-site and off-site systems. See **Appendix J** for detailed seasonal storage pond information.

Alternative A – Seasonal Storage for On-Site Demands

- ***White Slough WPCF:*** To deliver recycled water to the identified potential customers, the City would need to operate three 195-hp pumps at the White Slough WPCF during peak hour demand conditions, and one pump during average day demand conditions. At least one pump would be on a VFD in order to allow the pump to ramp down for the reduced average day flows. A fourth pump would be included for redundancy.
- ***Transmission Mains:*** The alternative would require approximately 42,000 LF of PVC pipe and 45,000 LF of WSP (same as above). See **Appendix J** for detailed information.
- ***Storage:*** Seasonal Storage for On-Site Demands is assumed for this alternative. A storage pond with a volume of approximately 2,400 AF would be required to store the recycled water to supply the demands in the on-site system (in order to reserve as-needed daily production from the WPCF for the off-site system). See **Appendix J** for detailed seasonal storage pond information.
- ***WID Canal Intake and Booster Pump Station:*** In order to meet demands exceeding the daily production at the WPCF (8.5 mgd), the incorporation of WID water supplies would be necessary. An intake and booster pump station consisting of three 135-hp pumps (two duty and one standby) would be required near the WID canal. The recommended location of the intake and pump station is at Beckman Park.

Alternative D – Seasonal Storage for On-and Off-Site Demands

- ***White Slough WPCF:*** To deliver recycled water to the identified potential customers, the City would need to operate five 155-hp pumps at the White Slough WPCF during peak hour demand conditions, and one pump during average day demand conditions. At least one pump would be on a VFD in order to allow the pump to ramp down for the reduced average day flows. A sixth pump would be included for redundancy.
- ***Transmission Mains:*** The alternative would require approximately 25,000 LF of PVC pipe and 8,300 LF of WSP. See **Appendix J** for detailed information.
- ***Storage:*** Seasonal Storage for On-and Off-Site Demands is assumed for this alternative. A storage pond with a volume of approximately 1,600 AF would be required to store the recycled water required to supply the demands in both the on-site and off-site systems. See **Appendix J** for detailed seasonal storage pond information.

6.3.2 Evaluation Results

Based on the evaluation criteria presented in **Table 6-3** and the cost estimates presented in **Table 6-6**, the alternatives were evaluated as shown in **Table 6-5** below. A weighting factor was applied to each of the evaluation criteria in order to reflect the relative importance of each criterion from the City's perspective. For each criterion, alternatives are scored on a scale of (1) to (3), with (1) being most favorable and (3) being least favorable. The No Project alternative was not ranked.

Table 6-5: Project Alternative Evaluation Results

Evaluation Criteria	Description	Criterion Weight	Alternative A		Alternative D	
			Score [a]	Comment	Score [a]	Comment
Estimated Cost	Total cost per acre-foot of water delivered (capital and operational cost)	50%	3	Capital Cost: $116.7 - $136 M Unit Cost: $2,077- 2,422/AF	1	Capital Cost: $65.9 M Unit Cost: $1,807/AF
Flexibility	Ability to change plans to address unforeseen circumstances, and project phasing capability	25%	2	Project is limited to users along corridor	2	Project is limited to users along corridor
Meet Project Goals	Ability to meet project goals	10%	1	Meets all project goals	2	Does not provide an interim use for WID water
Ease of Implementation	Ease with which alternative can be designed, permitted, and constructed	5%	2	Citywide construction	1	Least amount of construction; no trenchless crossings
Environmental/ Social Impacts	Various impacts including risk of impact to biological systems and construction related impacts	5%	2	Citywide construction	1	Least amount of construction
Regional Plan Adaptability	Degree of synergy with potential regional recycled water system	5%	3	18% of annual recycled water supplies remain available for a regional system	2	37% of annual recycled water supplies remain available for a regional system
		Total Score:	**2.45**		**1.40**	

Footnotes:

a. Criterion ranking: (1) most favorable; (3) least favorable.

Cost Estimates

Planning level cost estimates were developed for each alternative. The cost estimates are summarized in **Table 6-6**. Many of the unit cost assumptions used to develop the cost estimates are presented in the *Key Assumptions TM* in **Appendix A**; additional assumptions are presented with the detailed cost estimates for each alternative in **Appendix J**.

Table 6-6: Project Alternative Cost Estimates

Alternative	Potential Demand Met with Recycled Water (AFY)	Estimated Cost			Unit Cost of Recycled Water $/AF
		Total Project Cost ($M)	O&M Cost ($M/yr)	Annualized Cost ($M/yr)	
Alternative A (Seasonal Storage for On-and Off-Site Demands)	4,996	136.4	1.43	12.1	**2,422**
Alternative A (Seasonal Storage for On- Site Demands)	4,996	116.7	1.25	10.4	**2,077**
Alternative D (Seasonal Storage for On-and Off-Site Demands)	3,720	65.9	0.72	5.9	**1,807**
No Project Alternative	0	0 [a]	0 [a]	0 [a]	**0** [a]

Footnote:

a. Costs not associated with the construction of recycled water distribution system facilities are unknown at this time.

Agricultural Reuse Project

The project with the most favorable score is Alternative D for the following reasons:

- **Cost effectiveness.** Alternative D would have the lowest capital cost ($65.9M) and cost per AF of recycled water ($1,807) of the project alternatives.
- **Minimal Impacts.** Alternative D would avoid construction near residential areas, parks and schools, as well as crossings at the UPRR tracks and the WID canal.
- **Multiple Benefits.** Alternative D (as opposed to the No Project alternative) would reduce local dependence on groundwater for irrigation, improve water supply reliability, and utilize existing and future production of recycled water at the White Slough WPCF.

As shown in **Table 6-7**, the total capital cost for Alternative D is $65.9M. A more detailed cost estimate is provided in **Appendix J**.

Table 6-7: Estimated Costs for Alternative D

Project Element	Estimated Cost, $
Pipeline	6,017,000
Pump Station	580,000
Storage Facility	19,834,000
Raw Construction Cost	**27,033,000**
Contractor Overhead & Profit (10%)	5,407,000
Change Order Allowance (5%)	1,352,000
Subtotal Construction Cost	**33,792,000**
Land and Right of Way [a]	7,966,000
Planning Phase Unknown Allowance (30%)	10,138,000
Construction Cost	**51,896,000**
Environmental Documentation (2%)	1,038,000
Engineering, Administration, and Legal (10%)	5,190,000
Construction Management (15%)	7,784,000
Capital Cost	**65,908,000**
Annual O&M Costs	712,000
Annualized Capital Costs [b]	5,164,000
Total Annualized Costs	**5,868,000**
Cost per AF [c]	**1,807**

Footnotes:

a. Comprised of land costs for seasonal storage ponds.
b. Assumes 6% interest over 25 years.
c. The unit cost does not include the O&M cost associated with operating the White Slough WPCF, nor does in include any offsets for potential future water service expansion capital costs.

Urban Non-Potable Water System Project

Because Alternative D does not provide an interim use for WID water, it is also recommended that a second, parallel project be pursued to achieve this objective. Specifically, it is recommended that the City construct a non-potable water distribution system to supply raw WID water to urban customers for irrigation purposes. This system could be integrated with Alternative D in the future, at which point recycled water would replace WID water and the City's WID supplies would be treated and used solely for its potable distribution system.

Although a non-potable system would likely resemble the urban portions of Alternative A, various aspects of the project would require further study and cannot be quantified at this time. Additionally, portions of a non-potable system using WID water initially would not be eligible for the SWRCB Water Recycling Funding Program.

6.3.3 Recommended Project

Based on the results of the project evaluation results provided in the previous section, Alternative D is the preferred project based on cost and facility requirements. However, the potential recycled water users for this alternative are currently using water extracted from private wells or receiving water from WID. The cost for pumping from private wells is $40/AFY. The cost of WID water is approximately $36/AFY. At this time, it does not appear that a cost effective project is available that would attract these potential users from accepting recycled water over the current supply of water.

Chapter 7 Preferred Project

Based on the results described in Chapters 5 and 6, the City will need to evaluate opportunities for outside funding to reduce costs for a recycled water system relative to currently available sources. However, it is anticipated that the City, in its efforts to develop sustainable long term water supplies for the community will continue to keep these water supply options open. The potential for moving forward with the following two parallel projects to achieve the City's water supply and wastewater management objectives will need to be evaluated on an ongoing basis:

- **An agricultural reuse project** (Alternative D, discussed in Chapter 6). This system would be supplied with recycled water.
- **A non-potable water system serving urban customers**. It is envisioned that this non-potable system will ultimately be supplied with recycled water; in the short term, the system would be supplied with raw WID water.

The agricultural reuse project is the primary focus of the remainder of this report.

The non-potable system serving urban customers is not discussed in detail, as it will require separate study outside the scope of this project. Discussion of how it might integrate with Alternative D in the future is included in **Section 7.2**.

7.1 Agricultural Reuse Project (Alternative D)

Alternative D was selected as the preferred project, although not cost effective at this time, for the following reasons:

- **Cost effectiveness.** Alternative D would have the lowest capital cost ($65.9M) and cost per AF of recycled water ($1,807) of the recycled water project alternatives.
- **Timing of Demand.** All of the target agricultural users for the preferred project currently require water for irrigation, meaning that demands will be present immediately upon construction of the project. With the exception of the planned NCPA facility, the industrial target users included in this project currently use recycled water from the City.
- **Users Served.** Most of the target agricultural users that would be served by Alternative D currently rely on groundwater from an overdrafted basin. The eastern portion of the City's RWSA, which will be accessible to the preferred project, experiences higher groundwater salinity due to sea water intrusion from the Delta. Reducing groundwater extraction by these users and meeting their demands with recycled water will benefit the region's groundwater supply.
- **Minimal Impacts.** Alternative D would avoid construction near residential areas, parks and schools, as well as crossings at the UPRR tracks and the WID canal. It is likely that major streets would also be avoided, minimizing traffic impacts.
- **Multiple Benefits.** Alternative D would reduce local dependence on groundwater for irrigation, improve water supply reliability, and utilize existing and future production of recycled water at the White Slough WPCF.

7.1.1 Target Users

The recommended project would provide approximately 3,700 AFY of recycled water to agricultural customers, as well as several industrial customers adjacent to the White Slough WPCF. The specific agricultural users accepting recycled water have not been determined at this time. Target agricultural customers, however, are listed in **Table 7-1**. Similarly, the exact acreage that will be irrigated will depend on the types of crops being grown.

Table 7-1 lists the acreages and estimated recycled water demands of the target users for the preferred project. As discussed in Chapter 8 (Implementation Plan), the City plans to initiate a focused outreach

campaign with agricultural users to develop a clearer understanding of interested users and their demands. Additional target users may be included in the future, depending upon the relative interest of users initially contacted and the magnitude of their recycled water demands.

Table 7-1: Agricultural Reuse Project Target Users

User ID	Acreage	Estimated Recycled Water Demand, AFY
54	3.38	560
55	9.17	142
99	16.38	36
102	36.06	67
104	52.48	98
112	50.77	112
120	28.66	87
121	57.46	107
165	50.94	95
166	27.51	51
167	39.21	73
176	34.53	76
177	19.57	43
184	19.98	37
185	9.94	19
186	10.19	19
188	19.20	42
191	5.11	10
195	14.65	27
202	33.05	100
203	18.83	35
204	19.75	37
206	17.86	33
208	15.80	48
209	62.35	116
210	67.49	126
221	2.29	1,524
Totals	**743**	**3,720**

7.1.2 Primary Facilities

Table 7-2 summarizes primary facilities required to for this project. These facilities include a 930-hp recycled water pump station at the White Slough WPCF, approximately 33,300 LF of transmission mains, and approximately 1,600 AF of seasonal storage volume.

It is also likely that additional screening, filtering and/or chlorination facilities will be required to treat stored water before distribution, in order to removed algae and provide the required chlorine residual. These facilities will be particularly important once the preferred agricultural reuse project is integrated

with the City's planned non-potable system. Costs for these facilities are unknown but are anticipated to be relatively low compared to the capital cost of this project.

Table 7-2: Agricultural Reuse Project Facilities

Project Facilities	Quantity	Unit
Pipelines		
6-in	-	LF
8-in	-	LF
12-in	15,120	LF
16-in	4,220	LF
24-in	8,330	LF
30-in	9,360	LF
Storage		
Seasonal Storage Ponds	1,600	AF
Pumping		
930-hp Pump Station	1	ea
Number of Duty Pumps	5	ea
Pump Size	155	hp

7.1.3 Cost Estimate

Table 7-3 presents the estimated costs for the project.

Table 7-3: Agricultural Reuse Project Estimated Costs

Facility		Estimated Cost
Recycled Water Storage and Pumping		
Pump Station Facilities		$580,000
Seasonal Storage Ponds		$19,834,418
	Total	**$20,414,418**
Recycled Water Backbone Pipeline	**$/lf**	
12 in diameter pipe	$124	$1,525,430
16 in diameter pipe	$176	$2,202,856
24 in diameter pipe	$273	$2,226,590
30 in diameter pipe	$337	$62,273
Recycled Water Service Laterals [a]	**$/lf**	
n/a	n/a	$0
	Total	**$6,017,000**
Pipeline Appurtenances		
Appurtenances	10% of pipeline	$602,000
	Total	**$602,000**
	Raw Construction Cost	**$27,033,000**
	Contractor OH&P (10%)	$5,407,000
	Change Order Allowance (5%)	$1,352,000
	Subtotal Construction Cost	**$33,792,000**
	Land & Right of Way	$7,966,000
	Construction Phase Allowance (30%)	$10,138,000
	Subtotal Construction Cost	**$51,896,000**
	Environmental Documentation (2%)	$1,038,000
	Engineering, Administration, and Legal (10%)	$5,190,000
	Construction Management (15%)	$7,784,000
	Total Project Cost	**$65,908,000**
Operations & Maintenance		
	Annual Operation	$53,432
	Annual Maintenance	$659,000
	Total	**$712,000**
	Present Worth O&M	**$9,557,000**
	Total Present Worth Cost	**$75,465,000**
	Annualized Costs	**$5,868,000**
	Recycled Water Yield, AFY	**3,720**
	Annual Unit Cost, $/AF [b]	**$1,800**

Footnote:

a. The total potential recycled water demand that is adjacent to the proposed backbone pipeline system exceeds the available supply. Therefore, no service laterals are anticipated.

b. Rounded to nearest $50/AF

7.1.4 Implementation Considerations

Key issues that will need to be taken into consideration prior to implementing any alternative include the following:

- **Construction/traffic impacts** – Although the alignment presented in this report does not include any major roadways, changes may occur which force a portion of the alignment into busier roads. In any event, traffic impacts will need to be evaluated prior to confirming the alignment.
- **User retrofit needs** – The majority of the agricultural customers proposed for this project use groundwater from private wells for irrigation currently, and will require retrofits to accept and distribute recycled water from a City-owned transmission main or service lateral. Several of the target users also accept nonpotable, raw WID water for irrigation either currently or at some point in the past; since these deliveries are made using WID's canal system, these users would also require retrofits to accept recycled water. The locations, design, and operation of the user retrofits will need to be considered during subsequent outreach, planning and design phases of this project.
- **Back-up water supply requirements** – Since most of the target agricultural users currently irrigate with private well water, and would retain their wells after accepting recycled water, back-up water supply connections (to potable water or otherwise) are not anticipated to be necessary.
- **Water quality needs** – Additional investigation and coordination with potential agricultural customers and agronomists regarding specific water quality concerns, objectives, and any on-going maintenance needs will need to be conducted.

7.1.5 User Assurances

Securing user assurances will play a vital role in advancing the project and making it cost-effective, as pipeline lengths, and therefore project costs, are sensitive to user commitments. The target agricultural users are outside Lodi's city limits, and are therefore not subject to any City policies pertaining to the use of recycled water. Further, it remains to be determined how to provide potential agricultural users with appropriate incentives and benefits to switch from groundwater or WID water to recycled water. The City plans to work closely with target users to develop an appropriate package of benefits; at that time, use agreements will also be developed.

Maximizing user assurances will also involve addressing water quality needs. To this end, the City plans to work closely with target users and agronomists to develop specific water quality objectives.

7.1.6 Economic Analysis

The project would provide several important benefits to the City and its customers:

- **Reduced Groundwater Extraction** – Using recycled water for agricultural irrigation will reduce groundwater extraction from an already overdrafted basin, thereby increasing the amount of groundwater available to the region. Additionally, reducing groundwater extraction towards the western end of the City's RWSA may help to stem saltwater intrusion from the Delta into the underlying aquifer, thereby protecting the groundwater quality for all users in the region.
- **Reduced Wastewater Discharge** – Available tertiary treated water will be used to benefit the Lodi community, namely for the irrigation of agricultural areas, and Lodi will be allowed to more fully utilize the White Slough WPCF's available capacity. Seasonally storing recycled for irrigation will dramatically reduce the City's wastewater discharges to the Delta.

Benefits to agricultural users outside City limits include the following:

- **High-Quality Irrigation Water** – The City's recycled water is generally of high quality, and is expected to be of comparable or higher quality for typical irrigation practices than groundwater

from wells inside the RWSA, particularly in the western portion of the RWSA, where salt water intrusion has diminished the quality of groundwater wells.

- **Reduced Salt-Water Intrusion** – By using recycled water for irrigation, agricultural customers would reduce salt water intrusion from the Delta via reduced groundwater extractions, thereby acting to protect regional groundwater resources and help ensure the quality of private groundwater wells as a backup supply.
- **Improved Water Supply Reliability** – Agricultural customers using recycled water will reduce their susceptibility to drought conditions, especially those using WID water as a supply source, as recycled water production is not significantly influenced by climatic changes.
- **Availability of Pressurized Water** – The City will distribute recycled water in a pressurized pipeline network, providing agricultural users with adequate pressures for most irrigation purposes.

Given the project's unit cost and the benefits listed above, the City believes that the project warrants further investigation. However, a more detailed cost/benefit analysis will need to be completed prior to implementation to confirm the financial viability of the project (see Chapter 8).

7.2 Urban Non-Potable Water System Project

The urban non-potable water system project would utilize the City's existing WID supplies for a period of time prior to the construction and implementation of the City's planned surface water treatment plant. WID water will be distributed to urban customers via a nonpotable distribution system that would resemble portions of Alternative A presented in Chapter 6. After the completion of the surface water treatment plant, whereupon WID supplies would be used to meet potable demands, the City plans to integrate the non-potable distribution system with the agricultural reuse project. The size and scope of the integrated recycled water distribution system, as well as the recycled water availability at the time of integration, will be determined through separate studies and are not discussed in this report, as they cannot be determined at this time.

Target users for the non-potable project, regardless of the non-potable supply (raw WID water or recycled water), will likely include the potential urban customers identified for Alternative A. Additional target users for the non-potable system may be identified through the course of additional studies.

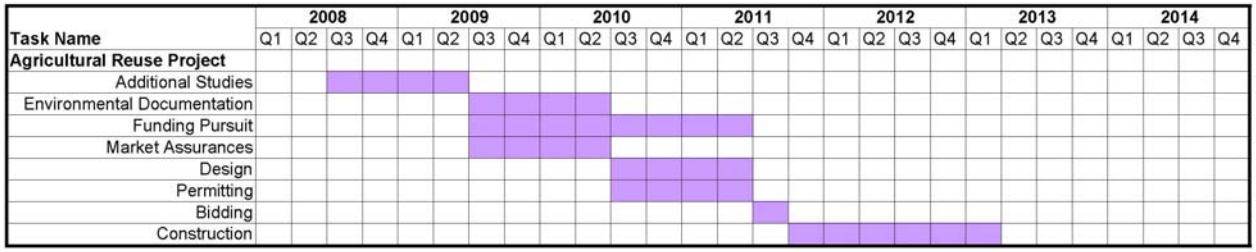
In the short term, the non-potable system would be supplied by raw WID water. In the long term, upon integration with the agricultural reuse project, the City plans to supply the non-potable system with recycled water. The connection between the two projects will require further study.

Upon integration with the agricultural reuse project, it is likely that the resulting distribution system will require several incremental improvements to accommodate changes in demands, pressures, and storage needs. In particular, it is likely that the size or number of seasonal storage ponds would need to increase, and that some form of booster pumping may be necessary to maintain adequate pressures for urban customers. More detailed information about required facilities is not available at this time, and will be developed through the course of future studies.

Chapter 8 Implementation Plan

At this time, an economically feasible project is not available. In the event that funding opportunities become available which would substantially reduce the cost of the preferred project, a hypothetical implementation schedule for the Agricultural Reuse Project is shown in **Figure 8-1**. The schedule depends heavily upon the outcome of several additional studies, including outreach to target agricultural users and the development of appropriate funding mechanisms and revenue sources. The dates shown in **Figure 8-1**, therefore, are subject to change.

Figure 8-1: Implementation Schedule



Supplemental Planning Activities, including Financial Planning

Prior to engaging in more in-depth pre-design and environmental documentation, the City should conduct a number of additional studies and outreach activities. These studies and activities should include: additional, focused outreach to target agricultural users to better understand recycled water interests and concerns; development of specific water quality objectives and control measures for potential users; and, further investigations of the economic feasibility of the project in the form of a detailed financial plan.

The detailed financial plan should look carefully at the revenue sources necessary to recover funds obtained to construct the preferred project. Because the target agricultural users currently have access to one or more lower cost supply sources (i.e., private groundwater wells and/or WID water), incentives for switching to recycled water will likely be necessary. The City will need to consider the limit in revenue that any incentives may impose.

Potential revenue sources for the project could include:

- **Revenue from Recycled Water Sales** – It is anticipated that the City will establish the price of recycled water comparable to or lower than the price of WID and groundwater supplies in order to provide an incentive to target recycled water customers to connect to the system. This practice is common in the recycled water industry, with recycled water prices ranging between 50% and 90% of the price of water being replaced.
- **Revenue from Recycled Water Surcharge** – A surcharge could be imposed on all City potable water users. This surcharge, however, would be infeasible until customers within City limits begin to use recycled water, which will not occur until the City's planned non-potable project is integrated with the agricultural reuse project.
- **Wastewater User Charges** – The City is in the process of studying the application of industrial (primarily cannery) wastes and biosolids in the vicinity of the White Slough WPCF. If the results of the study indicate that the City has been over-applying its treated effluent for blending and dilution purposes, the City may have recourse to link the promotion of recycled water use to its sewer rates. The City expects to have the results from this study in 2009.
- **Development Impact Fees –** Depending on the timing and location of new development, the City may be able to charge development impact fees for the construction of a recycled water distribution system. It is unlikely, however, that this option will become available until the City's planned non-potable project is integrated with the agricultural reuse project.

Environmental Documentation

Development of this project has been undertaken with California Environmental Quality Act (CEQA) Requirements, permitting, rights of way and construction issues in mind. The formal CEQA process, however, has not been initiated. Following completion of the additional planning studies listed above, the required environmental documentation (EIR or Mitigated Negative Declaration, depending on circumstances) will be prepared. These steps represent the preliminary planning stage for the preferred project, enabling pre-design and design to begin thereafter.

Funding Pursuit

Securing outside funding will improve the feasibility of the preferred project. The mechanisms to fund the recommended project, however, have yet to be developed. It is therefore recommended that the City considers outside funding sources while completing the financial planning effort. Potential sources of outside funding are listed in **Table 8-1**.

Table 8-1: Potential Outside Funding Sources

Outside Funding Source	Comment
SWRCB Construction Grant	City has applied for a SWRCB Facilities Planning Grant for the planning phase of this project and consequently has a higher priority for obtaining a construction grant. A grant can cover 25% of eligible project costs provided funds are available. It is a competitive process. Readiness to proceed is currently the main criterion for selection. Funds are available from repayments to the Proposition 13 fund. For fiscal year 2008/09 the SWRCB anticipates having approximately $13M available for grant funding. On an annual basis, 60% and 40% of the available funds are allocated to Northern California and Southern California projects, respectively. The project would need to be placed on the SRF Priority Project List to be considered.
Proposition 84 through the IRWMP	The City can pursue Proposition 84 funds via the Eastern San Joaquin Integrated Regional Water Management Plan (IRWMP) prepared by GBA, which includes conjunctive use and recycled water projects in which Lodi plans to participate. Proposition 84 funds will be allocated to water supply, water quality, and other projects meeting the RWQCB Region 5 goals through the IRWMP process. Proposition 84 funds will be awarded by DWR through a competitive process. Guidelines for Proposition 84 funding are anticipated for July 2008. It is conceivable that the City may be successful in funding a portion of the preferred project through Proposition 84 grants, but the possible amount is unknown at this time.
SWRCB State Revolving Fund (SRF) Loan	The City can apply for the SRF Loan program which provides low interest loans to public agencies using a priority list process. If this funding is available and additional upfront capital funding is needed for the project, the City could apply for this 20-year loan.

Market Assurances

The City will develop market assurances for users located in the vicinity of the proposed backbone system. These market assurances could take the form of use agreements. A recycled water ordinance could not be enforced since the target users are located outside of the City boundaries.

Permitting, Design and Construction

Table 8-2 lists major jurisdictional and stakeholder agencies and identifies required permits and approvals required for implementing the preferred project.

Table 8-2: Jurisdictional and Stakeholder Agencies for Permitting or Review

Agency Name	Permits or Special Topics
Federal Aviation Administration	Notice of Proposed Construction or Alteration
City of Lodi Public Works Department	Grading and Excavation Permit
City of Lodi	Encroachment and Street Work Permit
San Joaquin County	Grading, Excavation, Encroachment and Street Work Permits
San Joaquin County Office of Emergency Services	Hazardous Material Permit, if necessary
San Joaquin Valley Air Pollution Control District	Authority to Construct and Permit to Operate
California Regional Water Quality Control Board	NPDES Permit for construction activities and construction Storm Water Pollution Prevention Plan (SWPPP)
California Department of Public Health	Title 22 – Recycled Water Regulations
California Department of Fish and Game	Stream Bed Alteration Agreement/Waiver, if necessary
California Occupational Safety and Health Administration	Underground Classification for Tunnels, if necessary
Caltrans	Encroachment Permit
Pacific Gas and Electric, cable and telecom providers	Infrastructure review

Assuming that adequate funding can be pursued in FY09/10 and secured in FY10/11, the project could move into pre-design and design in FY10/11 and into construction in FY11/12. The Project could be online by mid 2013.

Appendix A Key Assumptions TM

Technical Memorandum

City of Lodi Recycled Water Master Plan

Subject:	**Key Assumptions**
Prepared For:	Wally Sandelin (Lodi)
Prepared by:	Andy Smith (RMC) Deana Donohue (RMC)
Reviewed by:	Helene Kubler (RMC)
Date:	May 9, 2007
Reference:	0140-003

1 Introduction

The purpose of this technical memorandum (TM) is to document the key assumptions that will be used for development of the Recycled Water Master Plan (RWMP) project components. It is anticipated that a number of adjustments and/or updates to the assumptions will need to be made as the market assessment progresses and conceptual alternatives are developed. This TM is only intended to provide a reasonable starting point.

This TM and any subsequent changes and/or updates to the assumptions will be incorporated in the RWMP Report.

This TM is organized as follows:

1 Introduction

2 Market Assessment Methodology

3 Design Criteria

4 Cost Criteria

2 Market Assessment Methodology

The goals of the recycled water Market Assessment phase of this project are to identify potential uses of recycled water within the City's recycled water service area (RWSA) under a 2030[1] planning horizon. The RWSA is shown in **Figure 1**.

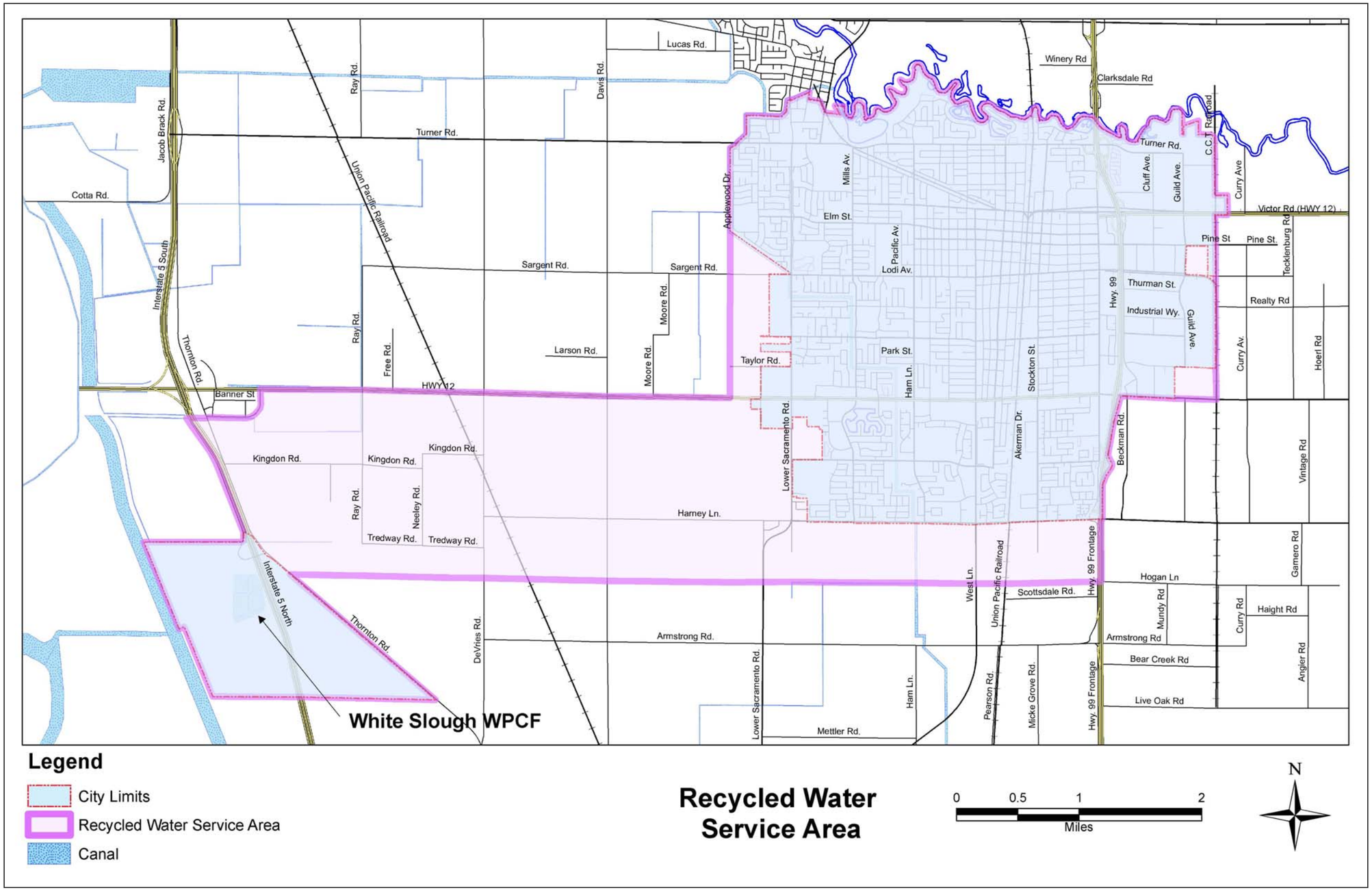
The Market Assessment will include a detailed examination of:

- Potential users and demands within the RWSA,
- Recycled water and surface water (for blending) supply availability, and
- Other implementation issues, such as the quality of recycled water and surface water supplies.

The methodologies and assumptions that will be used to conduct the Market Assessment are summarized in this section.

[1] The City's 2005 Urban Water Management Plan used a 2030 planning horizon, so the same will be used for this study.

Figure 1: City of Lodi RWSA



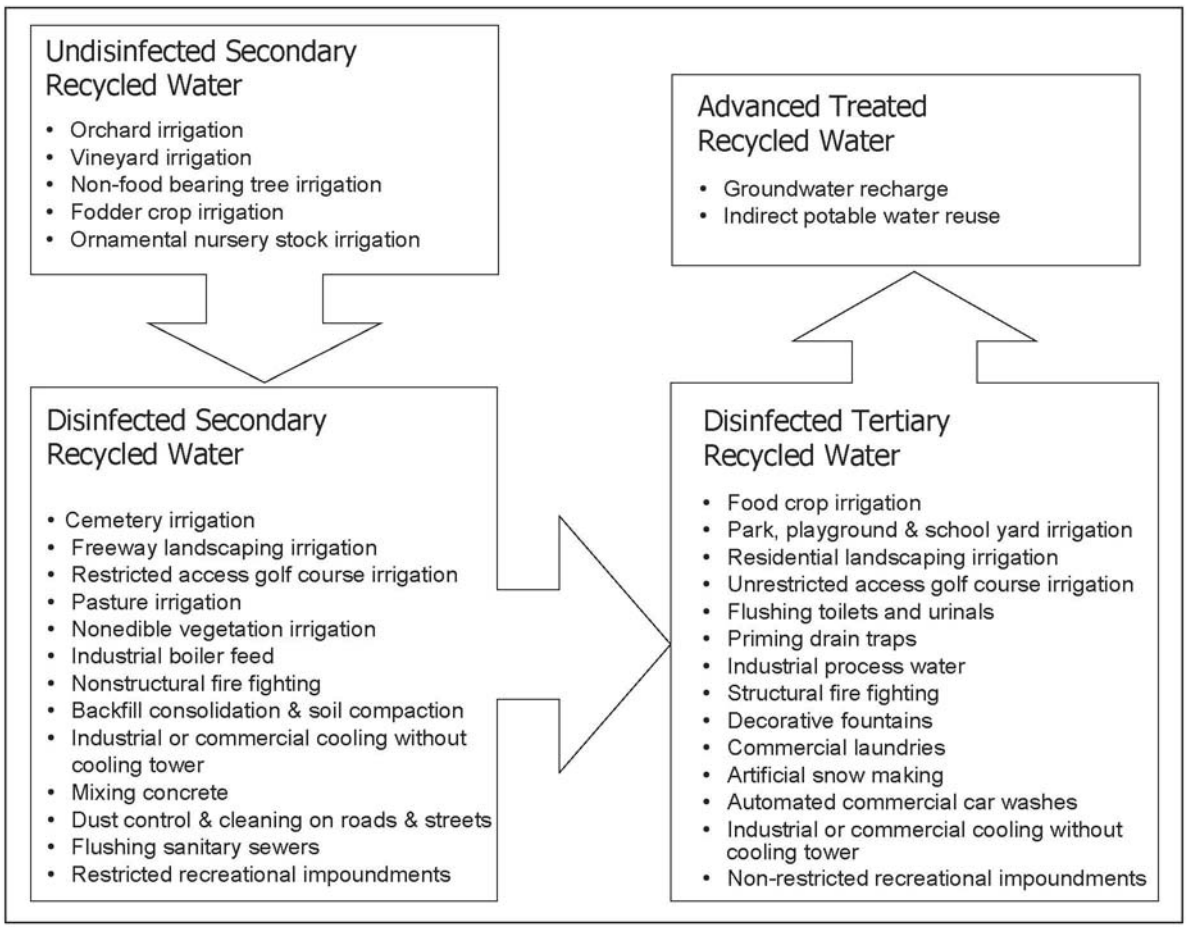
2.1 User Identification

The following health laws govern the use of recycled water in California:

- Health and Safety Code (Division 104; Part 12)
- Water Code (Division 7; Chapters 2, 6, 7 and 22)
- Title 22, California Code of Regulations (Division 4; Chapters 1, 2, and 3)
- Title 17, California Code of Regulations (Division 1; Chapter 5)

General recycled water uses that are currently allowed under these laws and the associated treatment requirements are presented in **Figure 2**. A complete detailed list of allowable recycled water uses is provided in **Attachment A**.

Figure 2: General Allowable Recycled Water Uses



Source: Title 22, California Code of Regulations (2001)

As illustrated in Figure 2, all uses except groundwater recharge are allowed with disinfected tertiary recycled water as the treatment level. All recycled water produced at White Slough Water Pollution Control Facility (WSWPCF) meets the requirements for disinfected tertiary recycled water, which will help maximize the potential for recycled water use within the planning area.

Allowable uses within the Service Area that will be considered as part of the Market Assessment are listed in **Table 1**.

Table 1: Allowable Recycled Water Uses within the Service Area

Type of Use	Category	Subcategory	Comments
Irrigation	Urban	Basins/Parks and Playgrounds	▪ Wilderness" areas (e.g., Mokelumne River Wilderness) will not be assumed to be irrigable, with the exception of a portion of the Lodi Lake Park & Wilderness Area.
		Schools	▪ Location of existing schools are included in the GIS data provided by the City
			▪ The Delta College facilities will not be served by the Lodi recycled water system based on the facilities' remote location in relation to other likely users
		Median Strips/Freeway Landscaping	▪ The total area for existing highway and freeway median strips includes the area between the inner shoulders of both directions.
			▪ Parts of Highway 99 and Highway 12 feature such median strips.
			▪ Interstate 5 does not feature such median strips within the Service Area.
		Artificial Lakes	▪ Mallard Lake is the only artificial lake identified in the Service Area
		Cemeteries	
		Residential Landscape Irrigation	▪ Irrigation in new development areas only will be considered, as retrofitting existing residential areas would be impractical and prohibitive
		Golf Courses	▪ There are no existing or planned golf course in the RWSA
	Agricultural	Food Crops	▪ Edible Root Crops
		Orchards	
		Vineyards	
		Ornamental Nursery	▪ Potential users include Mainland Nursery, located at the intersection of the WID main canal and Turner Road
		Sod Farms	
Other Uses	Industrial	Process water	
		Cooling	
	Commercial	Toilet Flushing	
		Cooling	
	Municipal	Dust control	▪ Department of Public Works and contractors would be main users
		Sewer flushing	▪ Department of Public Works would be main user

Source: Adapted from Title 22 of the California Code of Regulations

A number of allowable uses identified in **Figure 2** will not be considered in the market assessment and are not listed in **Table 1**, for the following reasons:

- Allowable use is not relevant to the Service Area (e.g., artificial snow making)
- Potential demand associated with the uses is relatively small and will not drive the alternatives definition and Master Plan recommendations. These uses include decorative fountains, automatic

car washes, and commercial laundry facilities. These uses should be considered at the design level in cases where a user is in close proximity to the recycled water pipeline alignment.

Specific potential users will be identified and a preliminary list has been provided in **Table 2**. The identification of potential recycled water users within each category will be based on relevant, available data and discussions with City staff. The relevant, available data as of March 2007 is as follow:

- Geographic Information System (GIS) data provided by the City:
  - Aerial photography
  - Existing and planned parks and schools
  - Parcel base map
  - Undeveloped parcels that straddle railroad tracks will not be included as potential users
  - Zoning base map
- Preliminary mapping and land use acreages for several recently annexed areas, including the Westside, Southwest Gateway, and Reynolds Ranch (includes Blue Shield Call Center) developments/annexations.
- Irrigation meter data
- Preliminary list of major industrial and commercial users developed by the City, see **Table 2**.

Table 2: Preliminary List of Major Industrial and Commercial Users

User Name	Use Category	Comment
Certainteed	Industrial	Based on its location, the City does not anticipate serving this facility during the initial phase(s) of the RWMP. Certainteed will still be considered as a potential user, however.
NCPA Power Plant • Existing Plant • New Plant	Industrial	The existing NCPA power plant facility, located adjacent to WSWPCF, may obtain Title 22 certification in the future. If Title 22 certification is obtained, secondary treated effluent could be provided to the facility instead of tertiary treated effluent (WYA, 2006). For the purposes of the RWMP, however, it will be assumed that the existing NCPA facility will continue to require tertiary treated effluent. A second NCPA power plant will be considered as a potential recycled water customer for this RWMP, based on recent discussions with City staff. A demand of 1.5 mgd will be assumed for the facility. The facility is anticipated to be operational in 2012.
SJCV & MCD Fish Rearing Ponds	Industrial	
Blue Shield Call Center	Commercial	The Blue Shield Call Center will use recycled water supplied by the City for landscape irrigation. The building/call center will be located in the southeastern corner of the Reynolds Ranch development, will comprise about 20 acres, and will be complete in 2008

Source: City input (January 2007)

2.2 Demand Assessment

Demands for the potential recycled water users will be estimated during the Market Assessment phase of this project, prior to the development of Conceptual Alternatives for the recycled water distribution system.

The proposed methodologies for estimating the average annual recycled water demand for each category of potential users based on available data is listed in **Table 3**. A detailed description of these methodologies and the basis for the peaking factors are described in this section.

Table 3: Proposed Demand Estimate Methodologies

Type of Use	Category	Use Subcategory or User Name	Metered Water Use?	Direct Input?	Demand Estimate Methodology [2] Applied
Irrigation	Urban	Basins/Parks or Playgrounds - Existing	Y	N	A
		Schools Existing/Undeveloped	Y/N	N	A/B
		Median Strips/Freeway Landscaping - Existing	Y	N	A
		Cemeteries - Existing	N	N	B
		Basins/Parks or Playgrounds – Existing/Undeveloped	N	N	B
		Residential - Undeveloped	N	N	C
		Landscape Irrigation in Commercial Areas- General Undeveloped	N	N	C
		Landscape Irrigation in Industrial Areas - General Undeveloped	N	N	C
		Mainland Nursery	N	N	B or D
		Mallard Lake	N	Y	D
		Other Uses - City of Lodi Public Works	N	Y	D
	Agricultural	Vineyards – Existing	N	N	B
		Orchards – Existing	N	N	B
		Miscellaneous Field Crops - Existing	N	N	B
Non-Irrigation	Industrial	Certainteed	N	Y	D
		NCPA Power Plant	Y	Y	D
		SJCV & MCD Fish Rearing Ponds	Y	Y	D
		Potential NCPA Plant	N	Y	D
		Industrial - General Undeveloped	N	N	C
	Commercial	Blue Shield Building	N	Y	D
		Commercial - General Undeveloped	N	N	C

[2] "A" = Irrigation demand based on water use data
"B" = Irrigation demand based on landscape/crop coefficient data
"C" = Irrigation and non-irrigation demands based on water usage factors
"D" = Irrigation and non-irrigation demands based on direct input

2.2.1 Average Annual Demand Estimate

Methodology A – Irrigation Demand Based on Water Use Data

Methodology A relies on actual recorded water use data. This data will be used to determine the average annual irrigation demand (ID) for potential recycled water users with available metered water use data, including existing schools, parks, and Caltrans median strips (see **Table 3**) . The data provided by the City includes annual deliveries for the period from 2001 to current. The City's records do not typically denote usage (irrigation or combined) of the water measured by a meter. Therefore, simplifying assumptions were made about the percentage of the metered water that is used specifically for irrigation since obtaining this information could require significant field reconnaissance.

$$\text{Average Annual Water Use} = \frac{\sum V_i}{N_y}$$

$$\text{Average Annual ID Estimate} = (\text{Average Annual Water Use}) \times (K_{irr})$$

Where:

V_i = The volume of metered water for a given year

N_y = The number of years with available meter data

K_{irr} = Percentage of metered water assumed to be used for irrigation per **Table 4**

Table 4: Metered Water Use Assumptions

User Category	Use Subcategory	K_{irr}(%)
Urban	Basins/Parks or Playgrounds	95%
	Schools - Existing	60%
	Median Strips/Freeway Landscaping	100%
	Cemeteries	95%

Methodology B – Irrigation Demand based on Landscape/Crop Coefficient Data

Methodology B will be used for potential users where meter data is not available (see Table 3). Methodology B is based on *A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California*, developed by the University of California Cooperative Extension (UC Extension) and California Department of Water Resources (DWR). Irrigation demand will be determined by utilizing precipitation, infiltration, irrigation efficiency and leaching rate data to calculate evapotranspiration values. Precipitation data will be obtained from the California Irrigation Management Information System (CIMIS) website. Infiltration, irrigation efficiency, and loss rate factors will be based upon UC Extension/DWR data, as well as previous RMC experience.

CIMIS Station #166 (Lodi West), located near Lodi[3], will be used as the source for the City's evapotranspiration and precipitation data. Monthly precipitation data records are available for CIMIS Station #166 between September 2000 and January 2007. This data will be compared with precipitation data provided by the City and data recorded from October 1983 to January 2001 at the currently inactivated Lodi-area CIMIS Station #42.

[3] Elevation equals 25 feet; latitude equals 38°07'48"N / 38.13; longitude equals 121°22'57"W / -121.38. The station is located on a large farming operation in a permanent pasture. The pasture is used to raise young bulls and is kept well maintained (Source: CIMIS website).

Data from the California Polytechnic State University, San Luis Obispo Irrigation Training and Research Center (ITRC) will be used in the determination of evapotranspiration rates for non-turfgrass crops (i.e., vineyards, orchards, and miscellaneous field crops).

The following equation will be used to determine unit irrigation demand for Methodology B:

$$ID = \frac{\left[(K_c)\times(ET_o)-(P)\times(I)\right]\times K_{LR}}{12\times e_i}$$

Or:

$$ID = \frac{\left[(ET_c)-(P)\times(I)\right]\times K_{LR}}{12\times e_i}$$

Where:

ID	=	Unit Irrigation Demand (feet)
K_c	=	Crop coefficient (unitless)
ET_o	=	Evapotranspiration, from CIMIS Station #166 (inches)
ET_c	=	Evapotranspiration for a given crop, per ITRC [4] (inches)
P	=	Average precipitation, from CIMIS Station #166 (inches)
I	=	Percent Infiltration (unitless)
K_{LR}	=	Leaching Rate Factor (unitless)
e_i	=	Irrigation Efficiency (unitless)

The irrigation demand will be determined by using the unit irrigation demand calculated previously, the total area of the parcel to be irrigated, and the percentage of the total parcel area that is assumed to be irrigated. The following equation will be used to calculate the irrigation demand for a parcel:

$$ID_i = (ID)\times(A)\times(K_a)$$

Where:

ID_i	=	Irrigation demand for a specific potential recycled water user (acre-feet)
A	=	Total area of the parcel to be irrigated (acres)
K_a	=	Percentage of total area assumed to be irrigable (unitless)

The total acreages for all future potential recycled water users in the Service Area will be obtained using planning information in the GIS database, discussions with City staff, developers, or other commercial and industrial customers.

The estimated percentage of parcel area assumed to be irrigable (K_a) for each of the various categories of potential recycled water users and the estimated unit irrigation demand for relevant use categories is listed in **Table 5**.

[4] Cal Poly Irrigation Training and Research Center, *http://www.itrc.org/etdata/etmain.htm*

Table 5: Irrigable Parcel Area Assumptions and Estimated Unit Irrigation Demand

User Category	Type of Use	K_a (%)	Estimated ID[5] (afy/acre)
Urban	Basins/Parks or Playgrounds	85%	3.38
	Schools - Existing	40%	3.38
	Cemeteries	85%	3.38
	Median Strips/Freeway Landscaping	100%	3.38
Agricultural	Vineyards[6]	100%	2.23
	Orchards[6]	100%	3.06
	Miscellaneous Field Crops[6]	100%	1.89

Methodology C – Irrigation and Non-Irrigation Demands based on Water Usage Factors

For potential future residential, commercial and industrial users, irrigation and non-irrigation demands will be determined by multiplying the water use factor (WUF) associated with the type of development by a percentage of the WUF (K_{WUF}) assumed to represent the amount of total water demand that may be met with recycled water. The assumed values for WUF and K_{WUF} are listed in **Table 6**. The following equation will be used to determine demands for Methodology C:

$$\text{Non - Irrigation Demand} = (K_{WUF}) \times (WUF)$$

Table 6: WUF and K_{WUF} Assumptions

User Category	User Subcategory	WUF	Units	K_{WUF} (%)
Urban	Residential Development	6,983[7]	gpcd	5% to 40%[8]
	Commercial Development	2,750[9]	gpad	5%
	Industrial Development	2,200[9]	gpad	5%

Methodology D – Direct Input

A summary of the specific recycled water users is listed in **Table 7**; the direct water usage input is anticipated to be provided from the City or obtained directly from the potential user during a Large User Workshop to be held during the Market Assessment.

[5] The ET value was calculated using assumed values for crops, irrigation efficiencies, and infiltration efficiencies. A detailed description of how these numbers were developed is provided in the Market Assessment TM
[6] Does not apply to agricultural parcels that, by inspection of aerial photography, are comprised primarily by dwelling unit(s).
[7] Source: City of Lodi Design Standards. Assumes 285 gallons per capita per day (gpcd), 3.5 persons per dwelling unit (DU), and 7 DU per gross acre (6,983 = 285 x 3.5 x 7). 7 DU/acre is the aggregate historical residential density provided by the City.
[8] 5% corresponds to a non-aggressive scenario (irrigation of public spaces, dual plumbing of public buildings). 40% correspond to an aggressive scenario similar to approach taken by El Dorado Irrigation District (residential irrigation and dual plumbing of public buildings).

Table 7: Major Industrial and Commercial Users

Potential User	Source of Demand Information
Blue Shield Call Center	TBD[9]
Certainteed	TBD[8]
Mainland Nursery	TBD[8]
Mallard Lake	City
Existing NCPA Power Plant	City
Future Potential NCPA Plant	City
SJCV & MCD Fish Rearing Ponds	TBD[8]
City of Lodi Public Works	City

2.2.2 Peak Day Demand and Peak Day Peaking Factors

Peak day demands for a specific potential user will be calculated by multiplying its average day demand by a peak day peaking factor, as shown below:

$$\text{Peak Day Demand} = (\text{Peak Day Peaking Factor}) \times (\text{Average Day Demand})$$

For irrigation demands, the peak day peaking factor will be determined by calculating the ratio of the irrigation demand for the peak month (July) and the average annual irrigation demand as shown in the equation below:

$$\text{Peak Day Peaking Factor} = \frac{\text{ID (Peak Month)}}{\text{ID (Average Annual)}}$$

2.2.3 Peak Hour and Peak Hour Peaking Factors

The peak hour demand for a given potential user will be calculated by multiplying the peak day demand by a peaking factor as shown below:

$$\text{Peak Hour Demand} = (\text{Peak Hour Peaking Factor}) \times (\text{Peak Day Demand})$$

The peak hour peaking factor greatly depends on the user. The peak hour peaking factors assumed for each user will therefore be documented in the Market Assessment TM.

2.3 Water Supply Assessment

The assumptions relative to available recycled water supply are presented in this section.

2.3.1 Recycled Water Supplies

The White Slough Water Pollution Control Facility (WSWPCF) will be considered the sole source of unblended tertiary disinfected recycled water for the City's recycled water system. In 2006, the WSWPCF produced an average tertiary disinfected recycled water flow of approximately 6.2 mgd. For the purposes of this RWMP, recycled water supplies will be assumed as shown in **Table 8**. Assuming the

[9] TBD= The source of direct water usage input is not known at this time and will be determined as part of the Market Assessment.

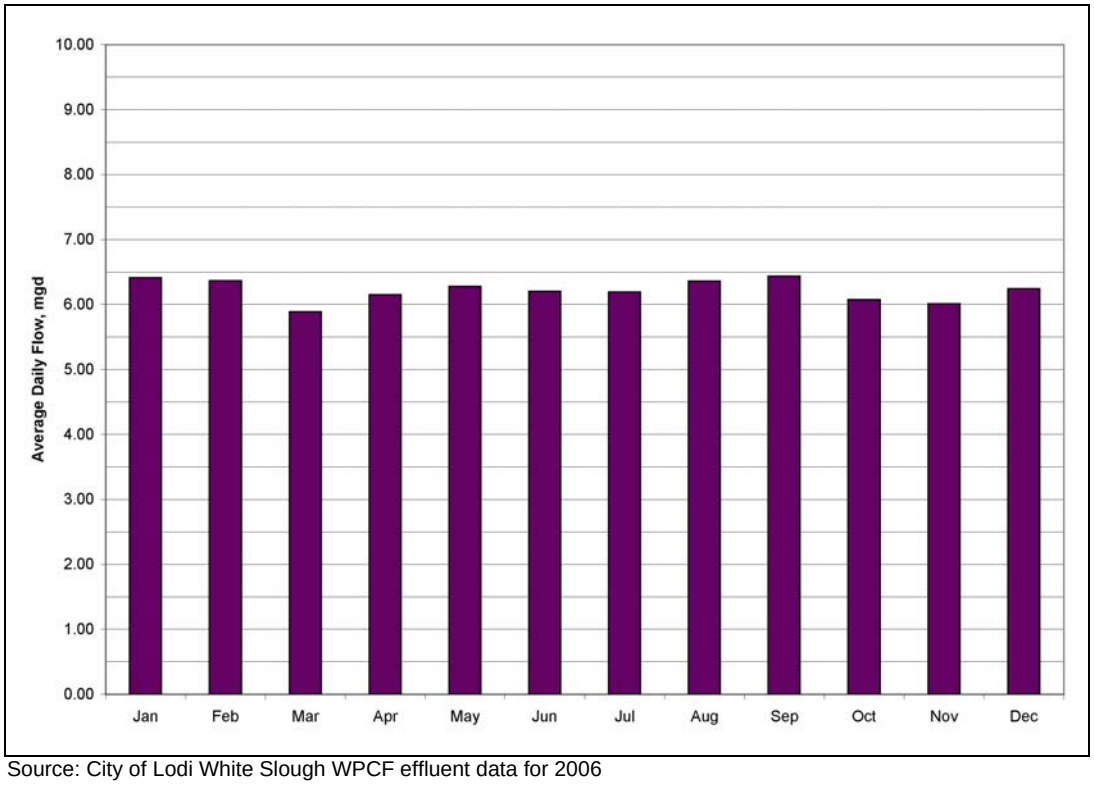
planning horizon to be approximately 25 years with the build out occurring in the year 2030, the peak supply is expected to be 8.5 mgd.

Table 8: Recycled Water Supply Assumptions

Supply Scenario	Average Daily, Available Recycled Water Supply (mgd)
2006	6.2
Build out	Up to 8.5[10]

The average monthly effluent flowrates for the White Slough WPCF are presented in **Figure 3**. Based on these data, no significant seasonal variations in wastewater effluent will be assumed. It will be assumed, however, that a portion of the White Slough WPCF effluent will be seasonally reserved for dilution of blended biosolids and industrial wastewater effluent for land application in the vicinity of the treatment plant – which may effectively result in seasonal limits to the amount of effluent available for a recycled water distribution system. It is assumed that the City/WYA will provide RMC with the quantities of "off limits" municipal wastewater effluent. RMC will coordinate with the City as this information is updated and will incorporate these updates into Market Assessment TM

Figure 3: 2006 Average Monthly Effluent Flow at White Slough WPCF



Source: City of Lodi White Slough WPCF effluent data for 2006

[10] West Yost Associates (WYA) is currently assisting the City in a study to determine the amount of municipal wastewater effluent required for dilution of blended biosolids and industrial wastewater effluent, for land application in the vicinity of the WSWPCF. It is assumed that the City/WYA will provide RMC with the quantities of "off limits" municipal wastewater effluent upon completion of the study.

Flag City

Flag City is a small community located approximately 1 mile north of the White Slough WPCF. The community is currently unsewered, but is involved in discussions with the City of Lodi regarding the feasibility of becoming sewered. If Flag City were to become sewered, its wastewater would be conveyed south to the White Slough WPCF for treatment and disposal. Because the discussions between staff at both the City and Flag City are very preliminary, no additional recycled water supplies will be assumed to be available from a potential connection to Flag City.

Satellite Treatment (Scalping) Alternatives

Some recycled water systems include satellite treatment, or scalping, of wastewater from upstream sanitary sewers to facilitate treatment at locations closer to potential reuse sites. Evaluation of satellite treatment was in the original scope. The City expressed concern that satellite treatment would be a long term implementation component to the recycled water system in terms of phasing. Therefore, the City staff did not want to evaluate this alternative as part of the RWMP in order to focus on the short term goal of providing RW to potential users in the short term. Due to the WWTP's distance from the City, however, satellite treatment may well prove to be cost effective. Therefore, the City may wish to evaluate it in the future.

2.3.2 WID Supplies

Approximately 6,000 acre-feet per year (AFY) of Mokelumne River surface water from the Woodbridge Irrigation District (WID) will be available as a potential source for an interim or blended recycled water supply. According to terms of the contract between the City and WID, the City may divert surface water from this supply between March 1 and October 15, annually. During the months when surface water could be incorporated into the system, surface water would be expected to comprise approximately 41 percent of a blended supply. **Table 9** presents the total demand and the anticipated groundwater and surface water supplies available to meet that demand beginning in 2012.

Table 9: 2012 Recycled Water Supply Assumptions

Month	Total Demand	Groundwater Supply		Surface Water Supply	
	AF	AF	%	AF	%
Jan	805	805	100%	0	0%
Feb	744	744	100%	0	0%
Mar	978	580	59%	398	41%
Apr	1307	775	59%	532	41%
May	1817	1077	59%	739	41%
Jun	2239	1327	59%	911	41%
Jul	2454	1455	59%	999	41%
Aug	2334	1384	59%	950	41%
Sep	1993	1182	59%	811	41%
Oct	1621	961	59%	660	41%
Nov	1015	1015	100%	0	0%
Dec	895	895	100%	0	0%

Additionally, the City has a substantial amount of "banked" WID water, representing the amount of undiverted (paid for) water from years during which this water right was not exercised. Therefore, for approximately the first 10 to 20 years after start up of the City's recycled water distribution system, 6,000 AFY could be treated for potable purposes, while the "banked" water could be used for non-potable uses

and will be evaluated for distribution as an annual amount over several years. The amount of annual distribution of this water will be developed and analyzed as part of the Market Assessment TM.

2.3.3 Recycled Water Supply Policy

In the event that the Market Assessment indicates that recycled water demand will exceed the recycled water supply, RMC will work with City staff and discuss the possible development of a City policy for serving recycled water. This policy may include placing limits on the amount of recycled water that the City will commit to serving to the identified users. If necessary, recommendations for such a policy will be documented in the Market Assessment TM. The demand and water supply assessment portions of the RWMP will need to be completed prior to determining whether a policy for serving recycled water is necessary.

2.4 Water Quality Assessment

For the purposes of calculating average concentrations of water quality constituents, undetected constituents are assumed to be present at concentrations equal to one-half the detection limit. This assumption is consistent with NPDES reporting guidelines and provides a conservative estimate of water quality concentrations.

Concentrations of each constituent in the current groundwater supply were assumed to be equal to the average concentration of all monitored wells for that constituent. Because different areas within the City receive varying proportions of supply from different wells, water quality concentrations were not weighted by flow rate; all wells are assumed to contribute equally to the overall groundwater concentrations reported herein.

Current recycled water quality is assumed to be equal to reported White Slough effluent water quality.

The quality of WID surface water was estimated to be approximately equal to the average water quality concentrations reported by USGS for monitoring performed on the Mokelumne River at Woodbridge, CA (Station 11325500) from 1973 to 1993. Because the City has not yet conceptualized the surface water treatment process, potential effects of water treatment on drinking water quality could not be estimated, and treated surface water quality was assumed to be approximately equal to untreated surface water quality.

In the future, the City will blend approximately 6,000 AFY of surface water with groundwater. The water quality of this blend is estimated assuming all constituents behave conservatively, and surface water and groundwater are blended at a ratio of 59 percent groundwater to 41 percent surface water from March through October of each year. Section 2.3.2 provides the basis for this assumption. Concentrations of each constituent in the blended drinking water supply will be estimated as follows:

$$C_{blend} = 0.41 * C_{SW} + 0.59 * C_{GW}$$

Where:

C_{blend} = Concentration of constituent in blended supply

C_{SW} = Concentration of constituent in surface water supply

C_{GW} = Concentration of constituent in groundwater supply

To calculate projected recycled water quality following the introduction of surface water into the drinking water supply; it will be assumed that the same percent change in constituent concentrations observed through in the drinking water supply would be observed in the recycled water supply. Concentrations of

each constituent in recycled water quality resulting from the introduction of surface water into the drinking water supply were estimated as follows:

$$C_{RW,blend} = C_{RW,current} * \left(1 - \frac{C_{GW} - C_{blemd}}{C_{GW}}\right)$$

Where:

$C_{RW,blend}$ = Concentration of constituent in recycled water (blended drinking water supply)

$C_{RW,current}$ = Concentration of constituent in current recycled water supply

C_{GW} = Concentration of constituent in groundwater supply

C_{blend} = Concentration of constituent in blended supply

Water Quality data will be presented in detail in the Market Assessment TM.

3 Design Criteria

Design criteria will be based on existing City standards provided to RMC, and RMC's experience with similar recycled water planning and design projects. Criterion defined herein is planning level design and will provide the basis to size the proposed facilities and develop reasonable budgetary cost estimates.

3.1 Pipeline Design Criteria

For the purpose of completing this analysis and preparing a cost estimate, pipe material will be assumed to be PVC for pipe diameters between 8- and 16-inches and steel for pipe diameters 18-inches and larger. Other pipe materials may be appropriate for this application and should be investigated further during the design phase.

Based on experience with similar sized systems and discussions with City staff, the following criteria will be used.

- Design velocity range: 2 - 10 feet per second
- Minimum delivery pressure of 50 pounds per square inch (psi) during peak hour measured at the transmission main
- Maximum system pressure: 150 psi
- Minimum pipe size: 6-inch
- Head loss to be less than 3 feet per 1,000 feet
- Head loss calculated using Hazen-Williams equation
- Minor head loss: 5% of velocity headloss
- Construction of pipeline to be in existing City right-of-way or Woodbridge Irrigation District easement/right-of-way, where possible

3.1.1 Hydraulic Analysis

RMC will construct and analyze a skeletonized hydraulic model of the proposed distribution system using an Excel spreadsheet type format. RMC will create and analyze a minimum of two recycled water system operational scenarios for the most likely pipe alignment to examine near-term and future demand scenarios for sizing of pipeline and storage facilities. These scenarios will be developed and evaluated as part of the Conceptual Alternatives TM.

3.1.2 Alignment Alternatives

RMC will develop alternative corridors for the distribution system piping alignment. The development of each alternative will consider potential users to be served, priorities for phased construction, as well as technical issues such as existing locations of major utilities, construction difficulty, and operations and maintenance requirements. RMC will develop and evaluate alignment corridor alternatives during the Conceptual Alternatives TM task. A preliminary utility research will be conducted; however, will be limited to information provided by the City.

3.2 Pumping/Storage Facility Design Criteria

Pump stations must be capable of pumping a range of flows based on varying demand. The following design criteria will be used to establish planning level pump station and storage facilities description and cost estimates:

Pump Stations

- Construction on City property
- Size for peak hour demands
- Install Variable frequency drives (VFD's)
- No back-up power supply
- One standby pump
- Minimum pump efficiency of 75%
- At least 2 pumps should be the same size

A combination of at least two pumps will be used in the model to deliver the flow. The pumps will be the same size since systems are often designed this way to increase redundancy, maximize even pump use, and maximize commonality of spare parts.

Storage Tanks

- Construction on City property or Sites dedicated for pump facilities in future developments
- Storage supply for 50% of peak day demand
- Base of tanks at grade
- Closed steel tanks
- Height < 32-feet to minimize visual impact (30-feet side water depth plus 2-feet of freeboard)

4 Cost Criteria

Planning level cost estimates will be developed using the methodology outlined in **Table 10**. A preliminary list of unit costs to be used to estimate raw construction cost is provided in **Table 11**.

Table 10: Planning Level Cost Estimate Assumptions

Project Costs Equation	Assumptions
Raw Construction Cost	See **Table 11** for unit costs to be used
+ Contractor Overhead & Profit	10% of Raw Construction Cost
+ Change Order Allowance	5% of Raw Construction Cost
= Subtotal Construction Cost	
+ Land & Right-of-Way Cost	0
+ Construction Phase Unknown Allowance	30% of Construction Cost
= Subtotal Construction Cost	
+ Environmental Documentation	2% of Total Construction Cost
+ Engineering	15% of Total Construction Cost
+ Construction Management	15% of Total Construction Cost
+ Administration & Legal	10% of Total Construction Cost
= Total Project Cost	

Table 11: Preliminary Unit Cost Assumptions

Item	Units	Cost ($)	Description/Assumptions
DISTRIBUTION			
Open Trench			Open trench construction with shoring, resurfacing (assumes paved areas); assumes normal utility congestion. These unit costs are based on recent bids in Northern California.
6”-14” PVC pipe	$/LF	47 - 150	
18”-36” Steel pipe	$/LF	210-400	
Bore and Jack			
8”-16” Pipe	$/LF	600	These costs should be verified based on recent local bid results.
18”-20” Pipe	$/LF	750	
24”-27” Pipe	$/LF	750	
30” Pipe	$/LF	750	
36” Pipe	$/LF	900	
VALVES			
Pressure Reducing Valve	$/unit	50,000	An allowance of $50,000 is assumed for pressure reducing valves for 24-inch and 36-inch diameter pipelines.
STORAGE			
Storage Tank	Per Gallon	0.80	Above ground, steel tank. This cost is based on recent bids in Northern California; this cost should be verified based on recent local bid results.
PUMPING			
Pump Station	Per gpm and TDH	290K+1860/hp	Pump Station costs
USER CONNECTION			
Meter & Valves:			Costs based on City of Roseville Master Plan – Recycled Water Distribution System Feasibility Study (2000).
User Demand (afy)			
<10	$/User	10,000	
>10	$/User	50,000	
Lateral from Backbone	$/LF	50	Assume all laterals to be 6” diameter for cost estimates
O&M			
Storage Tank Maintenance	$/Year	72	Assumes 60 hours of labor per MG per year
Distribution System Maintenance	%	1%	1% of total pipeline construction costs
Pump Station:			
Operation Cost	Kwh	0.12	
Maintenance Cost	%	15%	15% of pump station capital costs.
OTHER			
ENR CCI Index	-	8490	Average between 20 Cities and San Francisco February 2007 index
Life-cycle Interest Rate	%	5.50%	
Life-cycle Period	Years	25	
Land & Right-of-Way	$/Acres		Assumes all project facilities will be constructed on City land.

ATTACHMENT A

RECYCLED WATER USES ALLOWED IN CALIFORNIA

RECYCLED WATER USES [(A)] ALLOWED IN CALIFORNIA

	Treatment Levels			
Irrigation	**Disinfected Tertiary Recycled Water**	**Disinfected Secondary-2.2 Recycled Water**	**Disinfected Secondary-23 Recycled Water**	**Un-disinfected Secondary Recycled Water**
Food crops where recycled water contacts the edible portion of the crop, including all root crops	**Allowed**	Not allowed	Not allowed	Not allowed
Parks & playgrounds	**Allowed**	Not allowed	Not allowed	Not allowed
School yards	**Allowed**	Not allowed	Not allowed	Not allowed
Residential landscaping	**Allowed**	Not allowed	Not allowed	Not allowed
Unrestricted access gold courses	**Allowed**	Not allowed	Not allowed	Not allowed
Any other irrigation uses not prohibited by other provisions of the California Code of Regulations	**Allowed**	Not allowed	Not allowed	Not allowed
Food crops where edible portion is produced above ground and not contacted by recycled water	**Allowed**	**Allowed**	Not allowed	Not allowed
Cemeteries	**Allowed**	**Allowed**	**Allowed**	Not allowed
Freeway landscaping	**Allowed**	**Allowed**	**Allowed**	Not allowed
Restricted access golf courses	**Allowed**	**Allowed**	**Allowed**	Not allowed
Ornamental nursery stock and sod farms	**Allowed**	**Allowed**	**Allowed**	Not allowed
Pasture for milk animals	**Allowed**	**Allowed**	**Allowed**	Not allowed
Non-edible vegetation with access control to prevent use as a park, playground or school yard	**Allowed**	**Allowed**	**Allowed**	Not allowed
Orchards with no contact between edible portion and recycled water	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Vineyards with no contact between edible portion and recycled water	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Non food-bearing trees, including Christmas trees not irrigated less than 14 days before harvest	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Fodder crops (e.g. alfalfa) and fiber crops (e.g. cotton)	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Seed crops not eaten by humans	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Food crops that undergo commercial pathogen-destroying processing before consumption by humans	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Ornamental nursery stock, sod farms not irrigated less than 14 days before harvest	**Allowed**	**Allowed**	**Allowed**	**Allowed**

RECYCLED WATER USES [A] ALLOWED IN CALIFORNIA

	Treatment Levels			
Other Uses	**Disinfected Tertiary Recycled Water**	**Disinfected Secondary-2.2 Recycled Water**	**Disinfected Secondary-23 Recycled Water**	**Un-disinfected Secondary Recycled Water**
Groundwater recharge	Allowed under special case-by-case permits by RWQCBs [b]			
Flushing toilets & urinals	**Allowed**	Not allowed	Not allowed	Not allowed
Priming drain traps	**Allowed**	Not allowed	Not allowed	Not allowed
Landscape impoundments without decorative fountains	**Allowed**	**Allowed**	**Allowed**	Not allowed
Industrial and commercial cooling or air conditioning involving cooling tower, evaporative condenser, or spraying that creates a mist	**Allowed** [c]	Not allowed	Not allowed	Not allowed
Industrial process water that may contact workers	**Allowed**	Not allowed	Not allowed	Not allowed
Structural fire fighting	**Allowed**			Not allowed
Nonstructural fire fighting	**Allowed**	**Allowed**	**Allowed**	Not allowed
Decorative fountains	**Allowed**	Not allowed	Not allowed	Not allowed
Consolidation of backfill material around potable water pipelines	**Allowed**	Not allowed	Not allowed	Not allowed
Backfill consolidation around nonpotable piping	**Allowed**	**Allowed**	**Allowed**	Not allowed
Soil compaction	**Allowed**	**Allowed**	**Allowed**	Not allowed
Mixing concrete	**Allowed**	**Allowed**	**Allowed**	Not allowed
Dust control on roads and streets	**Allowed**	**Allowed**	**Allowed**	Not allowed
Cleaning roads, sidewalks, and outdoor work areas	**Allowed**	**Allowed**	**Allowed**	Not allowed
Flushing sanitary sewers	**Allowed**	**Allowed**	**Allowed**	**Allowed**

(a) Refer to the full text of the latest version of Title-22: California Water Recycling Criteria. This chart is only a guide to the June 2001 version.
(b) Refer to Groundwater Recharge Guidelines, California Department of Health Services.
(c) Drift Eliminators and/or biocides are required

Appendix B Market Assessment TM

FINAL Technical Memorandum

City of Lodi Recycled Water Master Plan

Subject:	**Recycled Water Market Assessment**
Prepared For:	Lyman Chang
Prepared by:	Andy Smith (RMC) Deana Donohue (RMC)
Reviewed by:	Helene Kubler (RMC) Dave Richardson (RMC)
Date:	August 3, 2007
Reference:	0140-003.02

1 Introduction

This technical memorandum (TM) presents the results of the Recycled Water Market Assessment (Market Assessment) conducted as part of the City of Lodi Recycled Water Master Plan (RWMP). The City's Recycled Water Service Area (Service Area or RWSA) is shown in **Figure 1**. The City's Service Area was originally defined in the *City of Lodi Water Recycling Facilities Planning Grant Application, September 2006*, and was subsequently updated for this project. This project was conducted for a planning horizon from the current year (2007) to a potential buildout in the year 2030.

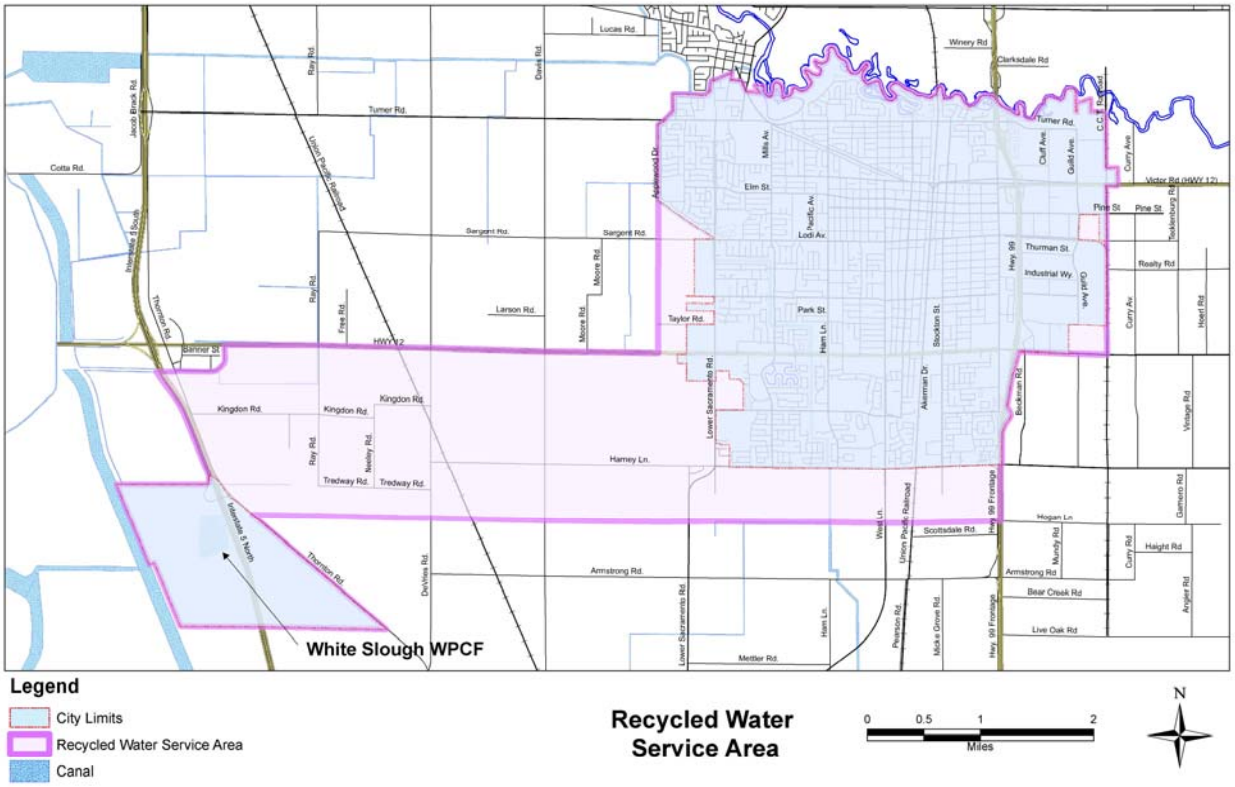
The purpose of the Market Assessment was to identify specific potential urban, commercial, industrial, and agricultural recycled water users within the RWSA and estimate recycled water demands for these users. The results presented in this TM will provide the basis for the subsequent development and evaluation of project alternatives, the development of recommended projects, and the preparation of an implementation plan.

The Market Assessment data analyzed as part of this task were based on a review of readily available and relevant documents, City-provided Geographic Information System (GIS) data[1], discussions with City staff, and RMC's experience with similar recycled water projects. The documents reviewed during the Market Assessment are as follows:

- City of Lodi 1989 General Plan[2];
- City of Lodi 2005 Urban Water Management Plan, *April 2006 (RMC)*;
- City of Lodi Wastewater Master Plan, *January 2001 (West Yost Associates)*;
- Joint City of Stockton, City of Lodi Effluent Disposal and Reuse Study, *October 2004 (West Yost Associates)*
- Lodi White Slough WPCF Soil and GW Investigation Existing Conditions Report, *September 2006 (West Yost Associates);* and,
- City of Lodi Park, Recreation, and Open Space Plan, *January 1994*.

[1] Includes aerial photography, parks, schools, parcels, and zoning information.
[2] The City is in the process of updating its General Plan. The 1989 General Plan's planning horizon extends to 2007.

Figure 1: Recycled Water Service Area



Key methodology and design assumptions were developed prior to the Market Assessment and documented in the *Key Assumptions TM*, dated April, 2007. The key design assumptions were used as a guideline for evaluating the potential recycled water users.

This TM is divided into the following sections:

1 Introduction
2 Recycled Water User Identification
3 Recycled Water Demand Assessment
4 Water Supply Assessment
5 Water Quality Assessment
6 Conclusions

2 Recycled Water User Identification

This section presents and summarizes the potential urban, commercial, industrial, and agricultural recycled water users identified within the RWSA. Allowable uses within the RWSA considered as part of the Market Assessment are listed in **Table 1**. Refer to the *Key Assumptions TM* in **Attachment A** for a more detailed description of the user categories and/or subcategories summarized in Table 1.

The potential users identified in the Market Assessment are summarized in Section 2.4. Sections 2.1, 2.2, and 2.3 present additional information about the identification of potential urban; commercial and industrial; and agricultural users, respectively. **Table B-1** in **Attachment B** presents a detailed list of all identified users, their land use categories, names (where applicable), gross and net irrigable acreages, and their estimated recycled water demands.

Table 1: Allowable Recycled Water Uses within the RWSA

Type of Use	Category	Subcategory	Comments
Irrigation	Urban	Basins/Parks and Playgrounds	• Wilderness" areas (e.g., Mokelumne River Wilderness) will not be assumed to be irrigable, with the exception of a portion of the Lodi Lake Park & Wilderness Area.
		Schools	• Location of existing schools are included in the GIS data provided by the City • The Delta College facilities will not be served by the Lodi recycled water system based on the facilities' remote location in relation to other likely users
		Median Strips/Freeway Landscaping	• The total area for existing highway and freeway median strips includes the area between the inner shoulders of both directions. • Parts of Highway 99 feature such median strips. • Highway 12 and Interstate 5 do not feature such median strips within the RWSA.
		Cemeteries	
		Golf Courses	There are no existing or planned golf courses in the RWSA
	Agricultural	Food Crops	
		Orchards	
		Vineyards	
		Ornamental Nursery	Potential users include Mainland Nursery, located at the intersection of the WID main canal and Turner Road
		Sod Farms	
Other Uses	Industrial	Process water	
		Cooling	
	Commercial	Toilet Flushing	
		Cooling	
	Municipal	Dust control	Department of Public Works and contractors would be main users
		Sewer flushing	Department of Public Works would be main user

2.1 Urban Recycled Water Users

The potential urban users identified in the City's Service Area are shown in **Figure 2**. The potential urban users include: parks, storm water detention basins, an artificial lake, cemeteries, schools and other institutions, and median strips. Potential recycled water uses that may apply to these users include irrigation of vegetation. Potential recycled water uses that were not enumerated at this time include: toilet flushing in public buildings; dust control; sewer flushing; decorative fountains; commercial laundry; and automatic car washes. These uses do not appear in Figure 2.

2.2 Commercial & Industrial Recycled Water Users

Figure 3 presents the locations of potential commercial and industrial facilities recycled water users in the City's Service Area. The existing commercial and industrial facilities identified as potential recycled water users include: an existing Northern California Power Agency (NCPA) power plant, San Joaquin County Vector & Mosquito Control District (SJCV&MCD) fish rearing ponds, Certainteed, and Mainland

Nursery. The potential future facilities include an additional NCPA power plant, a Blue Shield Call Center in the Reynolds Ranch development area, and undeveloped commercial and industrial areas. Potential recycled water uses that may apply to these users include: landscape irrigation, industrial process water, operational water, air conditioning and/or toilet flushing in new commercial and industrial developments, or other uses not identified at the time of this study. It should be noted that some of the currently undeveloped commercial and industrial areas may in fact be developed prior to the implementation of the RWMP. Determination of those currently undeveloped commercial and industrial areas that could reasonably be served recycled water in the future will be made during the development of the Conceptual Alternatives, and presented in the Conceptual Alternatives TM. Additional information about specific potential industrial and commercial users identified in the RWSA is provided in **Table 2**.

Table 2: Potential Major Industrial and Commercial Users

User Name	Use Category	Existing?	Comment
Certainteed	Industrial	Y	
Mainland Nursery	Industrial	Y	
NCPA Power Plant	Industrial		
Existing Plant		Y	The existing NCPA power plant facility, located adjacent to WSWPCF, may obtain Title 22 certification in the future. If Title 22 certification is obtained, secondary treated effluent could be provided to the facility instead of tertiary treated effluent (WYA, 2006). For the purposes of the RWMP, however, it will be assumed that the existing NCPA facility will continue to require tertiary treated effluent. The existing NCPA plant is used for peaking power only.
New Plant		N	A new base-load NCPA power plant will be considered as a potential recycled water customer for this RWMP, based on discussions with City staff. Normal and peak demands of 1.7 mgd and 2.5 mgd, respectively, will be assumed for the facility. The facility is anticipated to be operational in 2012.
SJCV & MCD Fish Rearing Ponds	Industrial	Y	
Blue Shield Call Center	Commercial	N	The Blue Shield Call Center will use recycled water supplied by the City for landscape irrigation. The building/call center will be located in the southeastern corner of the Reynolds Ranch development, will comprise about 20 acres, and will be complete in 2008

Source: City input (January 2007)

2.3 Agricultural Recycled Water Users

Potential agricultural users identified in the City's Service Area are shown in **Figure 4**. The anticipated recycled water use for all agricultural users is crop irrigation.

2.4 Potential User Summary

The potential recycled water users identified for this Master Plan are shown in **Figure 5**. As discussed above, **Table B-1** in **Attachment B** presents a detailed list of all identified users, their land use

categories, names (where applicable), gross and net irrigable acreages, and their estimated recycled water demands.

Table 3: Summary of Potential Recycled Water Users

User Category	User Subcategory	Gross Acreage
Urban	Parks	351
	Lake	18
	Cemeteries	56
	Schools	319
	Median Strips	18
	Subtotal	**762**
Commercial & Industrial	Undeveloped Commercial	117
	Undeveloped Industrial	263
	Specific/Major Commercial	22
	Specific/Major Industrial	100
	Subtotal	**502**
Agricultural	Vineyards	1,768
	Orchards	581
	Miscellaneous Field Crops	1,862
	Subtotal	**4,211**
	TOTAL	**5,475**

Figure 2: Potential Urban Recycled Water Users

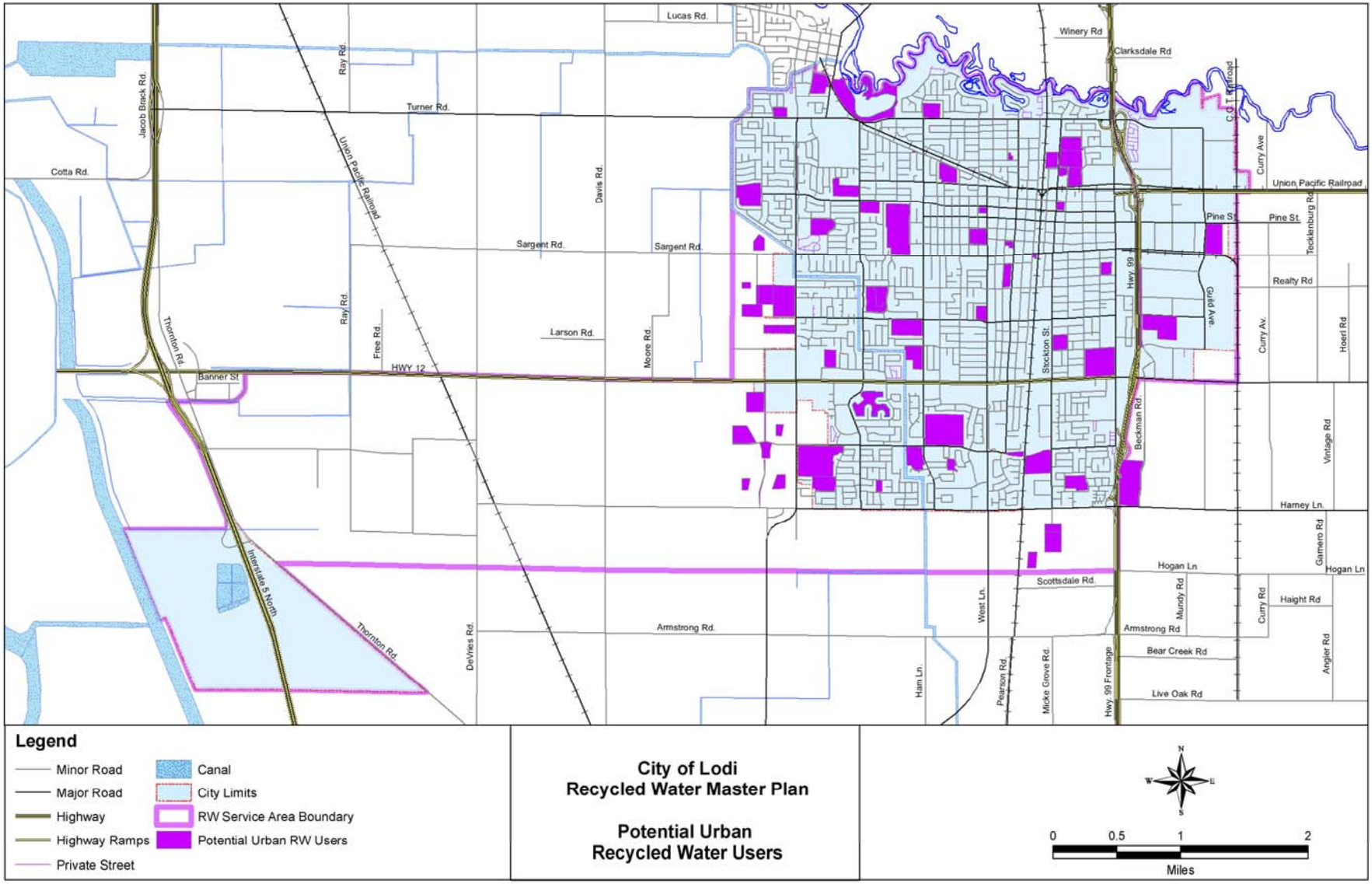


Figure 3: Potential Commercial & Industrial Recycled Water Users

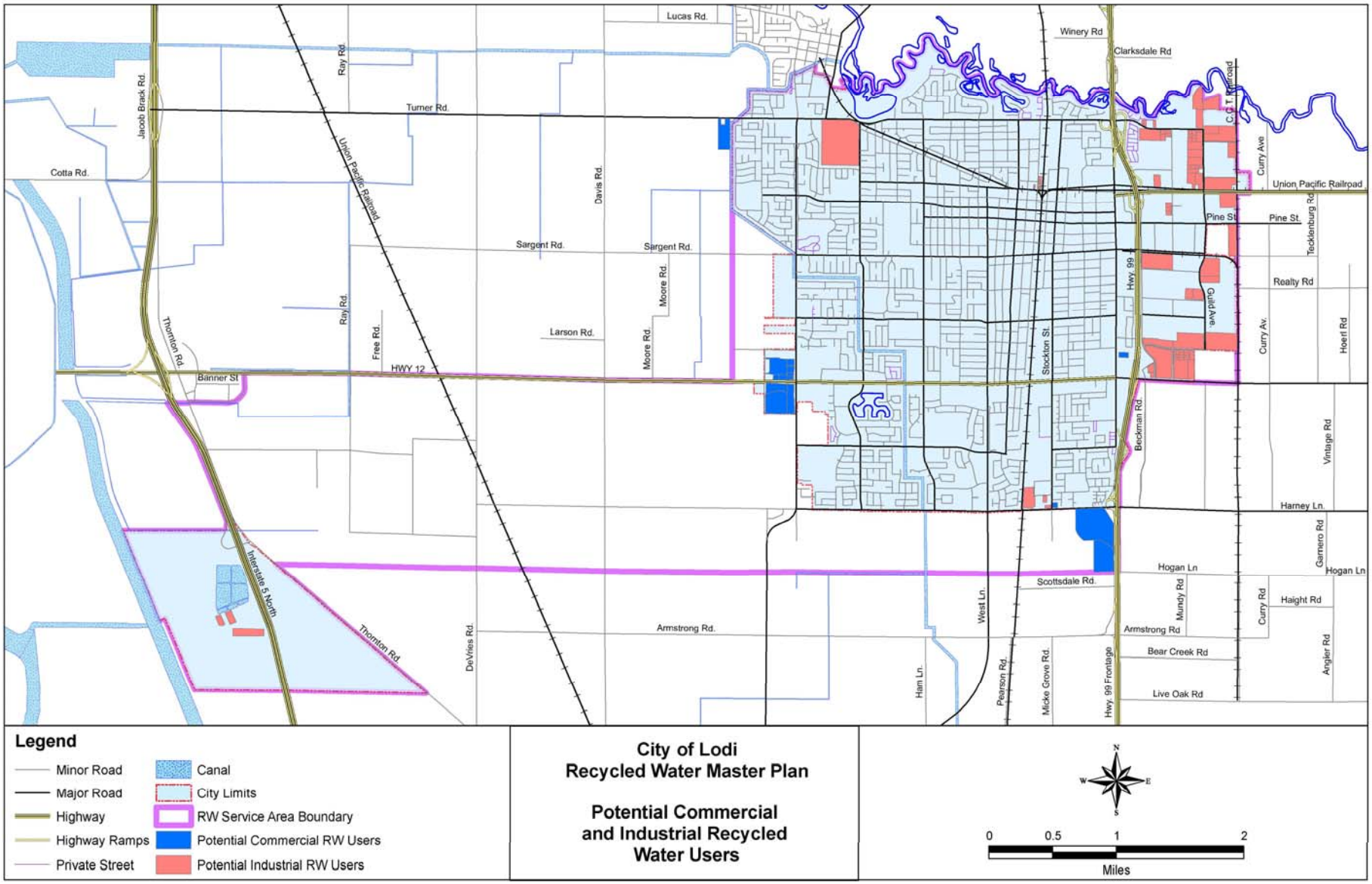


Figure 4: Identified Potential Agricultural Recycled Water Users

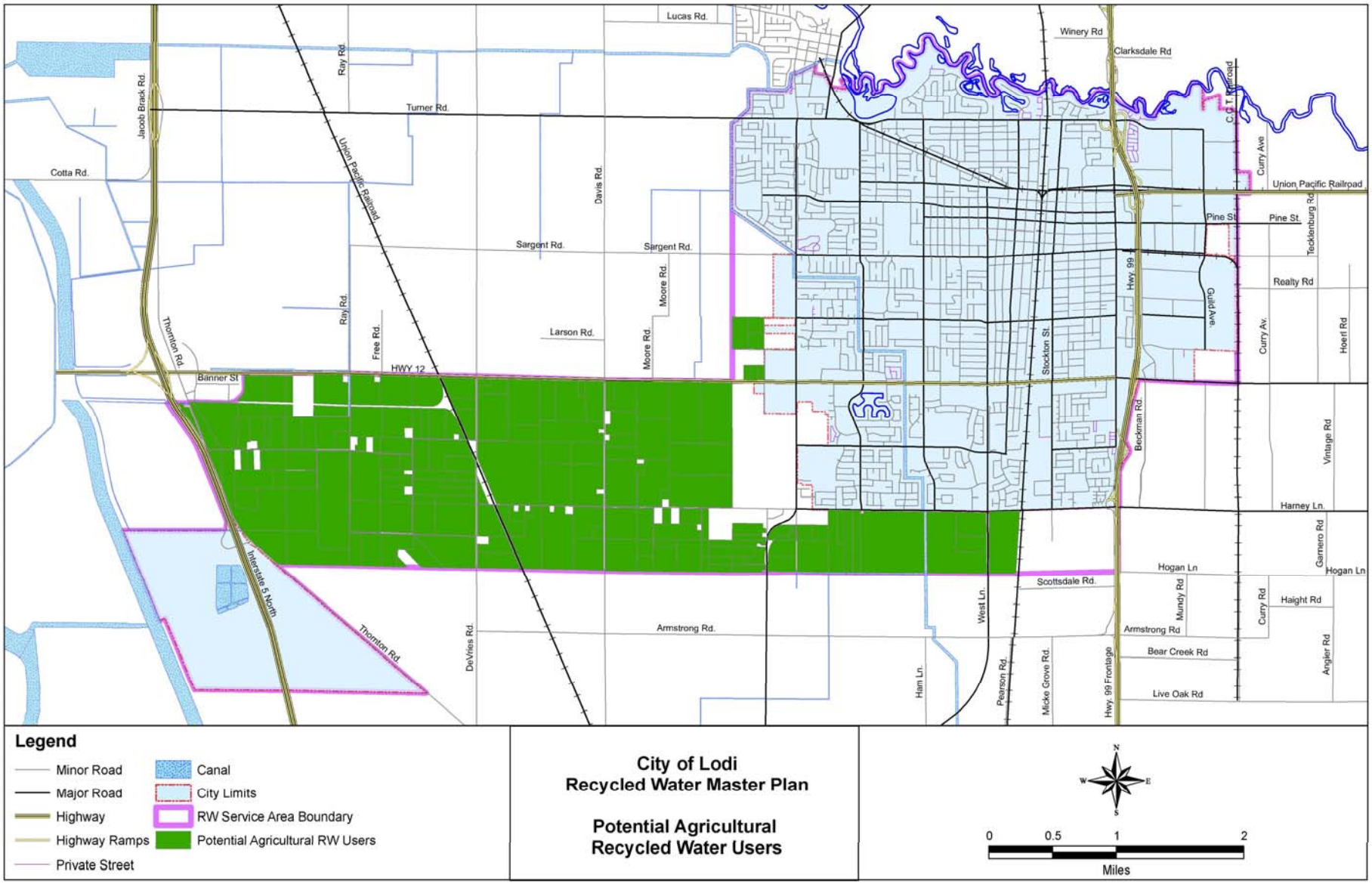
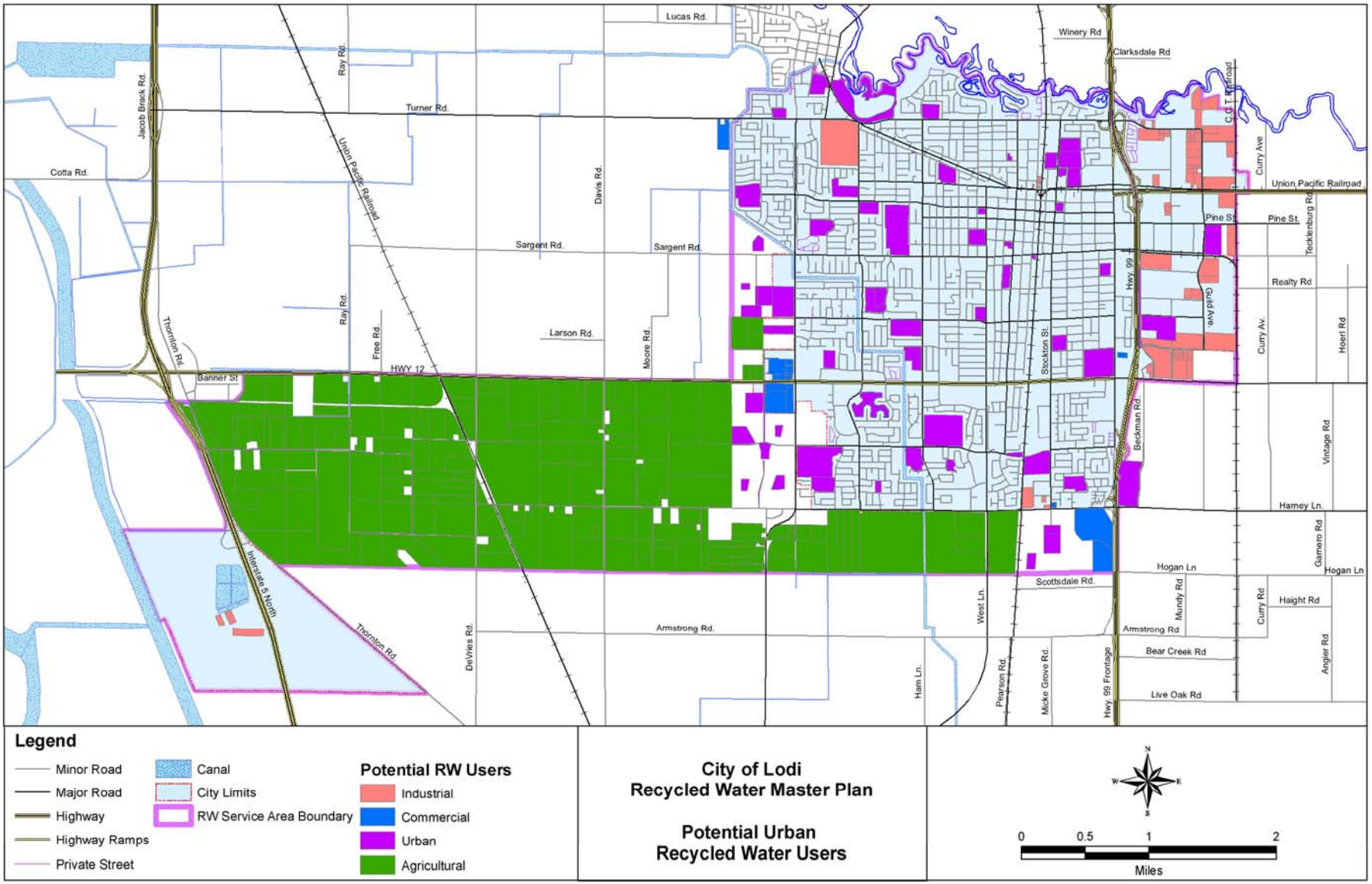


Figure 5: Summary of Potential Recycled Water Users



3 Recycled Water Demand Assessment

3.1 Recycled Water Demand Estimate Methodologies

The recycled water demands for the potential recycled water users were determined according to the demand estimate methodologies presented in the *Key Assumptions TM* (April 2007) and summarized in **Table 4** and the paragraphs below. The methodologies applied to each of the user subcategories are presented in **Table 6**.

Table 4: Summary of Demand Estimate Methodologies

Methodology	Application
Methodology A	Used to determine irrigation demand based on available water use data
Methodology B	Used to determine irrigation demand based on landscape-specific crop coefficient and evapotranspiration data when water use data is not available
Methodology C	Used to determine irrigation and non-irrigation demands based on water usage factors when water use data and acreage irrigated are not available
Methodology D	Used to develop demand estimates when direct input is available from individual users or the City

Methodology A – Irrigation Demand Based on Water Use Data

Methodology A was used to determine irrigation demand (ID) for potential recycled water users with available metered water use data. Available meter data for potential users, which were provided by the City, are included in **Attachment C**. Assumptions were made about the percentage of the metered water that was used specifically for irrigation in the event that meter data for irrigation purposes only were not available. Refer to the *Key Assumptions TM* (Attachment A) for the equations used with Methodology A, and for further discussion of the assumptions made.

Methodology B – Irrigation Demand based on Landscape/Crop Coefficient Data

Methodology B was used to determine the irrigation demands of potential recycled users without available metered water use data. Area-specific evapotranspiration (ET_o) data were obtained using California Irrigation Management Information System (CIMIS) data for a location near the City of Lodi (there is one active CIMIS station in the City's vicinity, and one inactive station). The closest active station is Station #166 (Lodi West); the ET_o used for this study is from Station #166. Data from the California Polytechnic State University, San Luis Obispo Irrigation Training and Research Center (ITRC) were used in the determination of evapotranspiration rates for non-turfgrass crops (i.e., vineyards, orchards, and miscellaneous field crops).

Attachment C includes the values of crop coefficients, evapotranspiration, precipitation, infiltration, leaching rate factors, and irrigation efficiencies that were used with to develop monthly unit irrigation demands for the Lodi area. Refer to the *Key Assumptions TM* (Attachment A) for the equations used with Methodology B, and for further discussion of the assumptions made.

Methodology C – Irrigation and Non-Irrigation Demands based on Water Usage Factors

Methodology C was used to determine the potential future irrigation and non-irrigation demands for undeveloped residential, commercial and industrial areas. Demands were determined by multiplying the water use factor (WUF) specific to each potential user's land use classification by a percentage assumed to represent the amount of total water demand that may be met with recycled water. Refer to the *Key*

Assumptions TM (Attachment A) for the equations used with Methodology C, and for further discussion of the assumptions made.

This methodology is considered acceptable for the purposes of this Master Plan given available information, and because only the backbone system will be developed. When designing the local system necessary to serve the specific users, however, the demand estimates derived from Methodology C should be refined, and a local "master plan" should be prepared by the City and/or the developers.

Methodology D – Direct Input

Methodology D, which requires direct input (from the user, the City, or both) on estimated recycled water demands, has been used for a number of specific potential industrial and commercial users. A summary of the potential industrial and commercial recycled water users in this category is presented in **Table 5**.

It should be noted that prior to the Recycled Water Feasibility Workshop/Large User Meetings conducted as part of the preparation of this Master Plan, demand estimate "placeholders" for several of the potential users in Table 5 have been developed using Methodology C.

Table 5: Major Industrial and Commercial Users

Potential User	Source of Demand Information
Blue Shield Call Center	TBD [a]
Certainteed	TBD [a]
Mainland Nursery	TBD [a]
Existing NCPA Power Plant	City
Future Potential NCPA Plant	City
SJCV & MCD Fish Rearing Ponds	City
City of Lodi Public Works	City

Footnote:
a. At the submittal of this TM, demand estimate has been developed using Methodology C.

Table 6: User-Specific Application of Demand Estimate Methodologies

Type of Use	Category	Use Subcategory or User Name	Metered Water Use?	Direct Input?	Demand Estimate Methodology Applied
Irrigation	Urban	Basins/Parks or Playgrounds - Existing	Y	N	A
		Schools Existing/Undeveloped	Y/N	N	A/B
		Median Strips/Freeway Landscaping - Existing	Y	N	A
		Cemeteries - Existing	N	N	B
		Basins/Parks or Playgrounds – Existing/Undeveloped	N	N	B
		Landscape Irrigation in Commercial Areas- General Undeveloped	N	N	C
		Landscape Irrigation in Industrial Areas - General Undeveloped	N	N	C
		Mainland Nursery	N	N	B
		Other Uses - City of Lodi Public Works	N	Y	D
	Agricultural	Vineyards – Existing	N	N	B
		Orchards – Existing	N	N	B
		Miscellaneous Field Crops - Existing	N	N	B
Irrigation and Non-Irrigation	Industrial	Certainteed	N	Y	D
		NCPA Power Plant	Y	Y	D
		SJCV & MCD Fish Rearing Ponds	Y	Y	D
		Potential NCPA Plant	N	Y	D
		Industrial - General Undeveloped	N	N	C
	Commercial	Blue Shield Building	N	Y	C
		Commercial - General Undeveloped	N	N	C

3.2 Peak Day and Peak Hour Demands

Peak day and peak hour demands for potential users were calculated according to the equations presented in the *Key Assumptions TM* (Attachment A). The peak day and peak hour peaking factors used for these equations are presented in **Table 7**. Non-irrigation uses of recycled water (e.g., toilet flushing, industrial process water, etc.) do not always experience seasonal or diurnal fluctuations in demand. For this reason, the estimated demands associated with undeveloped commercial and industrial areas, which include both irrigation and non-irrigation components, were peaked conservatively, as if the demands were solely irrigation-based. Peak day and peak hour demands for major potential industrial and commercial users were determined on a case-by-case basis.

Table 7: Peak Day and Hour Peaking Factors

Type of Use	Peak Day Peaking Factor	Peak Hour Peaking Factor
Irrigation: Miscellaneous Field Crop	4.7 [a]	2.0
Irrigation: Orchard	2.7 [a]	2.0
Irrigation: Vineyard	3.1 [a]	2.0
Irrigation: Turf Grass [b]	2.3 [a]	3.0
Irrigation: Turf Grass - Parks	4.0 [c]	2.0
Irrigation: Undeveloped Commercial and Industrial Areas	2.3 [a,d]	3.0
Non-Irrigation Uses	-- [e]	-- [e]

Footnote:

a. Based on information presented in **Attachment C**.
b. For all turfgrass irrigation areas other than City parks.
c. Assumed peaking factor, based on discussions with City staff in May 2007. Although current (May 2007) peaking factors at City parks are higher, the City intends to reevaluate its park irrigation practices in the future.
d. Assumes irrigation of turfgrass.
e. Peak day and peak hour peaking factors determined on a case-by-case basis. Refer to **Attachment C**.

3.3 Potential Recycled Water Demands

A summary of the potential recycled water demands for the users identified in Section 2, which were calculated according the methodologies and assumptions discussed in Section 3.1, are presented in **Table 8**. The total estimated annual demands for potential urban; commercial and industrial; and agricultural users are approximately 1,750 AFY, 1,850 AFY, and 9,150 AFY, respectively. A summary analysis of these demands is presented in Section 3.5.

Table 8: Summary of Potential Recycled Water Demands [a]

User Category	User Subcategory	ADD (afy)	ADD (mgd)	PDD (mgd)	PHD (gpm)	PHD (mgd)
Urban [b]	Parks	1,009	0.73	2.92	4,057	5.84
	Lake	70	0.06	0.15	203	0.29
	Cemeteries	161	0.14	0.34	466	0.67
	Schools	414	0.31	0.73	1,019	1.47
	Median Strips	61	0.03	0.06	90	0.13
	Subtotal	**1,731**	**1.29**	**4.24**	**6,419**	**9.24**
Commercial & Industrial	Undeveloped Commercial	16	0.01	0.03	46	0.07
	Undeveloped Industrial	32	0.03	0.07	94	0.14
	Specific/Major Commercial [c]	37	0.03	0.08	158	0.23
	Specific/Major Industrial [d]	1,745	2.33	3.10	2,576	3.71
	Subtotal	**1,831**	**2.41**	**3.28**	**2,874**	**4.14**
Agricultural	Vineyards	3,900	3.48	10.75	14,937	21.51
	Orchards	1,758	1.57	4.27	5,924	8.53
	Miscellaneous Field Crops	3,476	3.10	14.44	20,061	28.89
	Subtotal	**9,134**	**8.15**	**29.46**	**40,922**	**58.93**
	TOTAL	**12,696**	**11.85**	**36.98**	**50,215 [e]**	**72.31 [e]**

Footnotes:

a. Demand estimate methodology varies depending on available information, and category and type of uses. The City should update demand estimates for undeveloped commercial and industrial areas as more specific information for each new development area (e.g., specific land use type and/or water demand projections) becomes available. Demand estimate updates could be part of the preparation of specific plans associated with each new development.

b. Urban demand estimates do not include the following uses/users:
   - Small urban uses (e.g., toilet flushing in public buildings, decorative fountains, automatic commercial car washes). These uses should be considered as part of the design phase of the recommended recycled water projects.
   - Structural fire fighting. This use was not included.
   - Dust control. No data was available on water usage. It is assumed that fill station(s) would be installed along the recycled water backbone system to serve this use.
   - Sewer flushing. Demand information has not been developed at this time. It is assumed that fill station(s) could be installed along the recycled water backbone system to serve this use.

c. Includes Blue Shield Mainland Nursery.

d. Includes NCPA power plants; SJCV & MCD Fish Rearing Ponds; and Certainteed for average demands. For peak day and peak hour demands, existing NCPA power plant is not included, as the City anticipates that upon construction of the future base load NCPA plant, use of the existing peaking plant will diminish. Additional discussion regarding this assumption will be included in the Conceptual Alternatives TM.

e. Although peak hour demands are totaled, the peak usage periods for different user subcategories are expected to vary. Peak hour demands may be met with storage, the necessity and/or feasibility of which will be determined during the development of Conceptual Alternatives.

Potential recycled water demands not included in Table 8, including small urban uses, dust control, and sewer flushing, may be identified and incorporated during the design phase of recycled water projects recommended in the City's Recycled Water Master Plan, or during subsequent updates to the Master Plan itself.

3.4 User Interest and Barriers to Use

Major issues related to receiving recycled water will be confirmed through discussions with potential recycled water users. Based on RMC's experience with recycled water projects in other settings these issues can typically be categorized into three categories:

1. Perceived human health effects and user-based recycled water quality needs;
2. Delivery pressure and reliability; and,
3. Funding for on-site retrofits and other capital improvements and recycled water rates.

Perceived Human Health Effects and User-Based Water Quality Needs

Recycled water produced at the White Slough WPCF must meet a number of quality requirements set in Title 22 to protect public health.

Addressing user concerns about health protection in case of ingestion or occasional contact typically involves a series of measures, including clear signage warning that recycled water is not for drinking purposes, as well as a public awareness program to communicate with the public about recycled water and its use.

The quality of the recycled water relative to user-based needs (above and beyond public health considerations) is another typical concern. The constituents found in the recycled water produced at White Slough WPCF, as well as the potential impacts of the application of recycled water within the City's RWSA, are presented in Section 5 below.

To mitigate potentially negative impacts of recycled water application, implementation of best management practices (e.g., reduction of fertilizer application, annual flushing of irrigation systems with potable water to leach salts to the deeper vadose zone, etc.) should be considered on a case-by-case basis.

The quality of recycled water relative to uses other than irrigation, in particular for industrial process water or cooling, should be considered on a case-by-case basis as the needs greatly vary from one customer to another.

Delivery Pressure and Reliability Needs

Potential recycled water users will likely anticipate delivery pressure that would match the current delivery pressures of the water system. This issue can be addressed during the planning and design phase of the recycled water facilities. Preliminary Design Criteria for the proposed recycled water system are summarized in the *Key Assumptions TM*, dated April, 2007.

Reliability needs should be considered during the design phase of the recycled water facilities, after the City establishes an appropriate level of service for its customers. However, reliability is considered less of a critical issue for irrigation users than for a power plant, for example. Lodi is located in an area that experiences dry, hot summers, and availability of water remains a concern even for irrigation users. Recycled water production needs to meet strict regulatory standards; there is a potential, therefore, for the White Slough WPCF to cease production and/or distribution of recycled water for a period of time in the event of a plant upset. At that time, the City would need to rely on operational storage, located either at the treatment plant on in the distribution system, to provide continuous service to its customers. The amount of operational storage to be provided will be developed and presented in the *Conceptual Alternatives TM*.

Funding for On-Site Retrofits and Recycled Water Rates

Potential recycled water users may also have concerns about the cost of converting facilities or building new facilities to allow the use of recycled water, and/or about the price of recycled water as it compares to current potable water rates, a concern which may be exacerbated for users that have their own wells.

These matters will need be carefully considered by RMC and the City in order to balance the need to recover the City's costs with the advantages of pricing the water attractively (or providing other incentives) to potential users. Potential funding and/or financing options will be presented and discussed in the RWMP document.

3.5 Demand Assessment Summary

This section presents a summary of the demand assessment based on the analysis performed for the potential market and the projected supply of recycled water available.

Potential RWMP Demands vs. UWMP Demand Projections

The potential recycled water demands presented in **Table 8** were compared to the *total* projected water demands presented in Table 4-5 of the City's 2005 UWMP (RMC, 2006). The results of the comparison are presented below in **Table 9**. (NOTE: Because the user subcategories developed for this RWMP do not perfectly match the City's UWMP customer classifications, only a subset of the RWMP user subcategories was used in the comparison). As the table indicates, the percentage of total (i.e., potable and non-potable) demands projected in the UWMP that could potentially be met with recycled water are 0%, 25% and 8% for residential, commercial/institutional, and industrial UWMP customer classes, respectively. It is assumed that 100% of the City's landscaping demands for parks and median strips could also be met with recycled water.

Table 9: Comparison of Potential Recycled Water Demands to UWMP Water Demand Projections

UWMP Customer Class [a] (UWMP Table 4-5)	Equivalent RWMP User Subcategories [a]	Equivalent UWMP Annual Demand Estimate [b] (AFY)	RWMP Potential Annual Demand (AFY)	Total UWMP Estimated Demand Potentially Met with Recycled Water (%)
SFR	Undeveloped Residential	3,454	0	0%
MFR		1,299		
Commercial/ Institutional	Undeveloped Commercial	1,816	16	25%
	Schools – Existing and Undeveloped		431	
	Mainland Nursery		3	
Industrial	Undeveloped Industrial	428	32	8%
	Certainteed		3	

Footnotes:
a. It is assumed that 100% of the City's landscaping demands for parks and median strips could also be met with recycled water.
b. Includes only new demands from the period 2005-2030.

Service Plausibility and Elimination of Potential Users

The total annual demands presented in Table 8 (11.8 mgd ADD) may exceed the available supplies presented in Section 4.1, depending on whether the City develops additional seasonal storage facilities. As such, it will likely not be feasible to serve all of the potential demands identified in this Market Assessment. Based on the results of both the Large Users Workshops (see Section 3.6 below), and the

subsequent development of the Conceptual Alternatives for this project, certain potential users will necessarily be excluded from a list of users to be served. Potential users may be eliminated due to a variety of reasons, including proximity to proposed distribution system alignments, costs of retrofit/service, negative perception of recycled water, or incompatible water quality requirements.

Peak Hour Demands and Storage

It should be noted that the peak hour demands presented in Table 9 may or may not be met with system storage. The necessity and/or feasibility of system storage will be determined during the development of Conceptual Alternatives.

3.6 Large Users Workshops

Two "Large Users Workshops" were conducted in June 2007 to provide an overview of the RWMP to potential recycled customers in the City's RWSA, as well as to solicit feedback regarding the appeal and/or suitability of recycled water use by potential customers. Presentation materials and meeting minutes from both the Agricultural and Urban Large Users Workshops are included in **Attachment F**.

4 Recycled Water Supply Assessment

This section provides a comparison of the potential recycled water demand and available supply. Additionally, a discussion of delivery pressure and reliability needs, potential user interest, and potential barrier to recycled water use are included in this section.

4.1 White Slough WPCF Supply

The White Slough WPCF is the sole source of unblended tertiary disinfected recycled water for the City's recycled water system. In 2006, the White Slough WPCF produced an average tertiary disinfected recycled water flow of approximately 6.2 mgd. For the purposes of this Master Plan, recycled water supplies have been assumed as shown in **Table 10**. Assuming the planning horizon to be approximately 25 years with buildout occurring in the year 2030, the peak supply is expected to be 8.5 mgd. During the growing season, a portion of the City's municipal wastewater effluent is assumed to be required for dilution of blended biosolids and industrial wastewater effluent for land application in the vicinity of the White Slough WPCF. As such, the amount of recycled water that will be available for distribution during this period may be reduced, depending on whether the City develops additional seasonal storage facilities. According to West Yost Associates (WYA), who is assisting the City in this matter, approximately 188 million gallons (MG) will be required during the peak recycled water demand month of July. The corresponding supply available for distribution to the recycled water customers identified in this Market Assessment would be approximately 2.4 mgd (for the month of July).

Table 10: Recycled Water Supply Assumptions

Supply Scenario	Available Recycled Water Supply (mgd)
2006	6.2
General Plan Buildout	2.4 [a] to 8.5 [b]

Footnotes:

a. During the growing season, a portion of the City's municipal effluent is assumed to be required for dilution of blended biosolids and industrial wastewater effluent for land application in the vicinity of the WSWPCF. West Yost Associates has estimated the maximum monthly requirement to be approximately 188 MG (6.1 mgd) during the month of July. (8.5 mgd – 6.1 mgd = 2.4 mgd)

b. The City is currently in the process of updating its General Plan, and expects that the White Slough WPCF's current permitted capacity of 8.5 mgd will be adequate for the expansions to the City's General Plan boundary (which are expected to result from the current update process).

4.2 WID Supply

Approximately 6,000 acre-feet per year (AFY) of Mokelumne River surface water from the Woodbridge Irrigation District (WID) will be available as a potential source for an interim or blended recycled water supply. According to terms of the contract between the City and WID (**Attachment D**), the City may divert surface water from this supply between March 1 and October 15, annually.

California Department of Public Health (CDPH) (formerly the California Department of Health Services) standards for recycled water systems would *not* require additional treatment or water quality monitoring of prior to or following the blending of raw WID water, assuming a) that the raw water is blended with recycled water downstream of the White Slough WPCF, and b) that the blended water in intended for non-potable use.

Additionally, the City has a substantial amount of "banked" WID water, representing the amount of undiverted (paid for) water from years during which this water right was not exercised. Therefore, for approximately the first 10 to 20 years after start up of the City's recycled water distribution system, 6,000 AFY could be treated for potable purposes, while the "banked" water could be used for non-potable uses and will be evaluated for distribution as an annual amount over several years. Based on discussions with City staff, approximately 24,000 AF of WID water is banked as of April 2007. This banked supply may be used to supplement both available recycled water supplies from White Slough WPCF and the normal 6,000 AFY of WID surface water for a certain period of time. At the direction of City staff, a potential strategy for delivering the 24,000 AFY of banked water to users near the main WID canal has been developed. From the pool of potential users identified in Section 2, a subset of users within a distance of 1,000 feet from the main WID canal was identified. The potential demands from the identified subset are presented below.

Table 11: Potential Demands for Banked WID Supply

Potential Users	Average Daily Demand (afy)	Peak Day Demand (mgd)	Peak Hour Demand (gpm)
Potential Users within 1,000 feet of main WID canal [a]	522	1.23	1,759

Footnote:
a. Does not include potential agricultural users.

Assuming that 24,000 AFY is available for distribution to these users, the demands associated with the identified subset could be met with banked WID water for a period of 46 years. Upon receiving input from the City, RMC will refine this preliminary strategy for inclusion in the *Conceptual Alternatives TM*.

4.3 Supply Assessment Summary

The available supplies discussed in Sections 4.1 and 4.2 above are summarized in **Table 12**. The results shown in Table 12 indicate that total annual available WID and recycled water supplies are adequate to meet the total annual potential recycled water demands presented in Table 8.

Table 12: Summary of Available Supplies and Potential Demands

	Supply Source	Available Supply (mgd)	Available Supply (afy)
Available Supplies	White Slough WPCF	6.2 [a,c] to 8.5 [b,c]	6,945 [a,c] to 9,521 [b,c]
	Annual WID Surface Water Delivery	5.4 [d]	6,000 [e]
	Banked WID Surface Water Delivery	0.5 [f]	522 [g]
	Total	n/a	**13,467 to 16,043**
	User Category	**Average Daily Demand [h] (mgd)**	**Average Daily Demand [h] (afy)**
Potential Demands	Urban	1.3	1,731
	Commercial & Industrial	2.4	1,831
	Agricultural	8.1	9,134
	Total	**11.8**	**12,696**

Footnotes:

a. Based on 2006 effluent data.
b. The City is currently in the process of updating its General Plan, and expects that the White Slough WPCF's current permitted capacity of 8.5 mgd will be adequate for the expansions to the City's General Plan boundaries (which are expected to result from the current update process).
c. During the month of July, approximately 188 MG (6.1 mgd) of municipal wastewater effluent are assumed to be required for dilution of blended biosolids and industrial wastewater effluent for land application in the vicinity of the White Slough WPCF (8.5 mgd – 6.1 mgd = 2.4 mgd). Effluent required for this purpose may be seasonally stored at the White Slough WPCF.
d. Calculated based on annual contract amount (i.e., 6,000 AF/365 days). The actual daily diversion rate may be higher. See also footnote "e."
e. The contract between WID and the City is for a period of 40 years. Refer to Attachment D.
f. Calculated based on assumed annual supply (i.e., 522 AF/365 days). See footnotes "g."
g. Assumes a total banked supply of 24,000 AF, delivered over a period of 46 years (46 x 522 = 24,000). Refer to Section 4.3.
h. Refer to Table 8.

As discussed in Section 3.5, it may not be plausible to serve all of the potential demands identified in this Market Assessment, and certain potential users will necessarily be excluded from a list of users to be served. Following the Large Users Workshops scheduled for June 2007 and the development of the Conceptual Alternatives for this project, the list of users and demands to be served, as well as the supplies to be utilized, will be updated. Additional adjustments to anticipated supplies and demands may also be required as the Master Plan progresses.

5 Water Quality Assessment

This section provides a summary of existing and projected recycled water quality, identifies the water quality constituents of potential concern for various potential recycled water users, and evaluates the suitability of recycled water supplies for various potential end-uses.

5.1 Lodi White Slough WPCF Effluent Water Quality Data

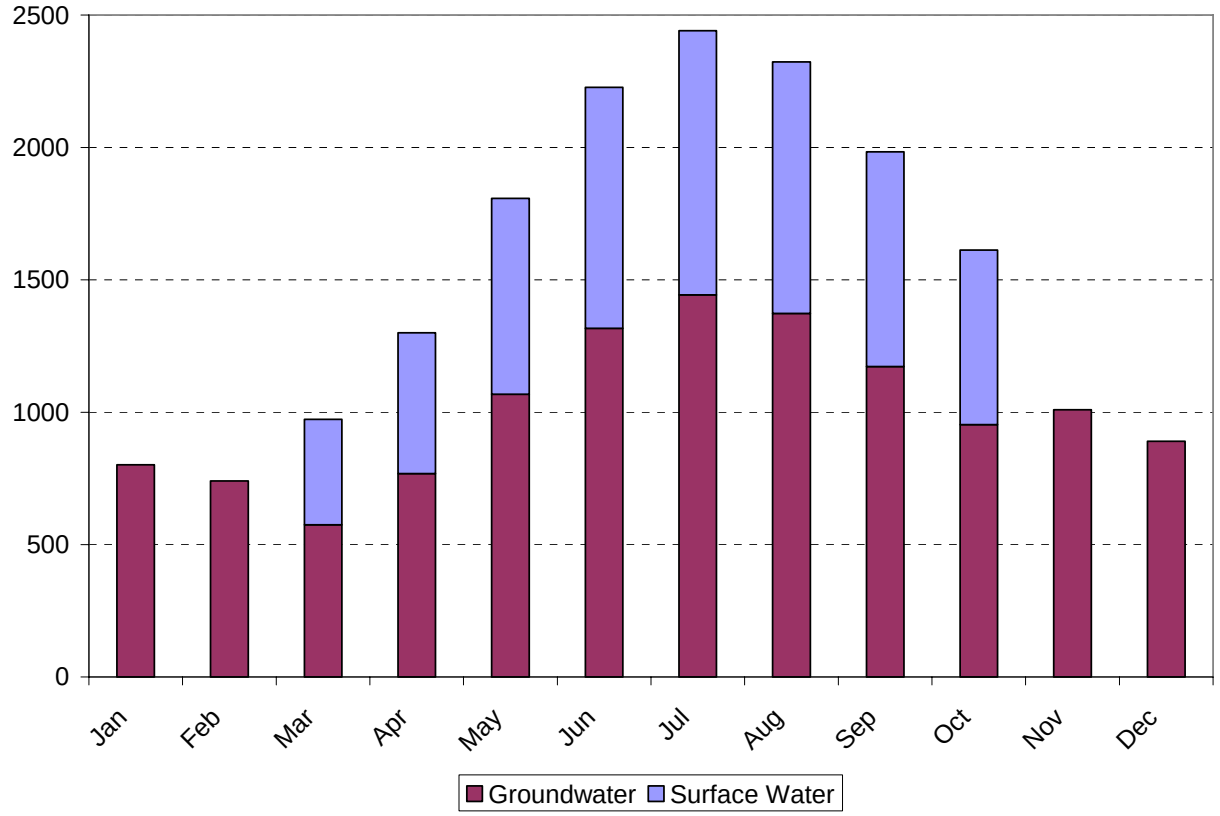
Water quality information for the City's recycled water supplies were collected and analyzed for several constituents of interest throughout 2005 and 2006. The White Slough WPCF effluent water quality for select constituents of interest is summarized in **Table E-1** in **Appendix E**.

Recycled water quality is heavily influenced by drinking water quality. The City of Lodi's current drinking water source is local groundwater.

5.2 Local Groundwater/Surface Water Quality

Beginning in 2011, the City plans to incorporate 6,000 AFY of Mokelumne River surface water supplies into its drinking water system, to be delivered between March 1 and October 15 of each year. Based on the City's 2005 Urban Water Management Plan update, annual demands with metering are projected to reach approximately 18,113 AFY in 2011. During the months of March through October, when surface water is incorporated into the system, surface water would be expected to comprise approximately 41 percent of the total supply. **Figure 6** presents anticipated groundwater and surface water supplies in 2011.

Figure 6: Projected 2011 Monthly Groundwater and Surface Water Deliveries (with Metering)



The water quality of Mokelumne River surface water differs significantly from local groundwater supplies for many of the constituents of potential concern, as identified in **Table E-2** in Appendix E. Changing the quality of drinking water supplies can be expected to cause a related change in recycled water quality. Water quality monitoring data for local groundwater supplies and Mokelumne River supplies at Woodbridge, CA, near the anticipated diversion location, is presented in Table E-2. In addition, projected blended water quality is presented. It should be noted that the blended water quality presented herein assumes all parameters can be treated as conservative. This assumption should be confirmed through bench-scale water quality testing on blended supplies.

Based on the estimated blended water quality presented in Table E-2, it can be reasonably expected that future recycled water quality will differ from existing recycled water quality for several key constituents of potential concern. **Table E-3** in Appendix E presents projected future recycled water quality, based on estimated changes in drinking water quality resulting from incorporation of surface water supplies. These

estimates were developed by assuming the percent reduction in concentration anticipated to occur in the drinking water supply would also be observed in the recycled water supply. As shown in this table, concentrations of several constituents in recycled water supplies are expected to decrease following introduction of surface water into the drinking water supply.

5.3 Water Quality for Specific Recycled Water Uses

Various recycled water quality constituents may be of potential concern, depending upon the end use. Water quality needs for end uses that extend beyond Title 22 regulatory requirements are summarized below.

5.3.1 Irrigation Uses

Recycled water may be used for a variety of potential irrigation uses, including golf courses, cemeteries, freeway landscaping, schoolyards, parks, playgrounds, and residential irrigation.

All irrigation waters contain some amount of dissolved mineral salts and chemicals. In general, recycled water has a higher salinity content (reported as total dissolved solids or TDS) than potable water. The rate at which salts accumulate in the soil depends not only on their concentration in the water, but the amount applied, local precipitation rates, and the physical characteristics of the soil.

The suitability of water for irrigation is closely related to the type and concentration of chemical constituents present. Constituents of concern include: salinity, sodium hazard (as determined by the sodium adsorption ratio, SAR), and potential toxicity to plant foliage and roots from other specific constituents. The following paragraphs provide additional detail for these constituents of concern as they relate to use of recycled water for irrigation.

Salinity

Grasses which are generally cut short (a stress in itself) are more sensitive to salts than grasses which are not cut short. TDS is a measurement of dissolved solids in the water supply, and is closely related to salinity and electrical conductivity. Good permeability and drainage allow the leaching of excess salts from the root zone when greens are subject to heavy irrigation or flushing.[3]

The City may choose to implement a Salinity Management Plan to monitor salinity impacts to irrigated lands, and to evaluate the effectiveness of the following protective measures:

- **Use of Gypsum.** The use of additional products (such as granulated gypsum) could assist in maintaining concentrations of certain salinity-related constituents at acceptable levels in the root zone. Gypsum has been used successfully in the past to reduce SAR.
- **Modified Irrigation Practices.** It may be necessary to increase watering in order to keep irrigated areas from drying out. When irrigated areas dry out, soluble salts can be drawn back into the root zone at concentrations that could affect plant health.
- **Blending.** Blending recycled water supplies with potable or raw water can help reduce salt buildup.

Sodium Adsorption Ratio (SAR)

Soil permeability is reduced when the irrigation water has a high in sodium content.[4] High sodium content can cause the breakdown of soil clay particles, reducing soil aeration and water infiltration and percolation. The likely effect on soil permeability can be evaluated through consideration of the water's SAR in conjunction with the soil electrical conductivity (EC). Additional information about SAR is presented in Appendix E.

[3] WateReuse Meeting, October 15, 2004. Chardonnay Course, Napa.
[4] Harivandi 1999, Interpreting Turfgrass Irrigation Water Test Results.

Based on the City's current WWTP effluent water quality monitoring data, the existing recycled water supply has a SAR value of approximately 2.9. Based on the City's average effluent bicarbonate concentration of 3.1 meq/L, the adjusted SAR may be a more appropriate reference point. The City's current recycled water has an adjusted SAR value of approximately 4.0 (refer to **Table E-1** in Appendix E).

Based on projected changes in drinking water quality resulting from blending new surface water supplies with existing groundwater supplies, and assuming water quality concentrations in recycled water will change in proportion to the changes observed in drinking water, the City's SAR and adjusted SAR values are anticipated to change from current values of 2.9 and 4.0 to approximately 3.1 and 3.9, respectively, following introduction of surface water supplies.

Other Constituents

The tolerance of plants to various water quality constituents differs by crop/plant type. In addition to salinity and sodium, other constituents of concern include: pH, chloride, boron, chlorine, nutrients (nitrogen, phosphorus, and potassium), and suspended solids. These constituents can have impacts on crops ranging from plant toxicity, which results in leaf burn, to the plugging of sprinkler head openings. Monitoring of irrigated crops during the startup of the recycled water system is recommended.

Researchers have studied crop/plant tolerance to salinity and other constituents and have published water quality guidelines for many agricultural crops and landscape plants. The University of California has compiled this data and developed general guidelines for assessing the suitability of recycled water for irrigation. These guidelines, summarized in conjunction with the City's current and projected water quality data in **Table 13,** are general and flexible and are often modified based on local experience and special conditions of crop, soil, and irrigation method. Recycled water supplies may also retain a trace chlorine residual resulting from the drinking water disinfection process; however, chlorine residuals at concentrations less than 1 mg/L are not expected to be harmful to plants. Some sensitive crop types may be damaged at concentrations as low as 0.05 mg/l, and some woody plants may accumulate chlorine in tissues.

Based on the recycled water quality data collected in 2005 and 2006 and reported in **Table E-1**, the City's recycled water is considered borderline for potential water quality-related problems when used for irrigation.

When the City incorporates surface water into the system, recycled water quality is expected to change. As a result, the City's recycled water is anticipated to generally improve in quality, but would still be considered borderline for potential water quality-related problems when used for irrigation.

Recycled water supplies may also contain trace concentrations of elements which can be harmful to plant life at elevated concentrations. Guidelines for maximum concentrations of trace elements in recycled water used for irrigation are presented in **Table E-4** in Appendix E.

Concentrations of trace constituents monitored in the City's current recycled water supplies currently fall below recommended maximum concentrations It is anticipated that, upon incorporating surface water into the City's drinking water supply, recycled water concentrations for these constituents will remain below the recommended guidelines. Because the City does not currently monitor recycled water supplies for cobalt, lithium, molybdenum, or vanadium, the suitability of recycled water supplies for irrigation cannot be evaluated with respect to these parameters.

Table 13: Salinity Guidelines[5]

Problem and Related Parameters	Units	Water Quality Guidelines			City of Lodi Recycled Water Quality Data	
		No problem	Increasing Problems	Severe Problems	Existing	Future (Estimated)
Salinity[a]						
Electrical Conductivity	mmhos/cm	<0.75	0.75 – 3.0	>3.0	0.63	0.41
Total Dissolved Solids	mg/L	<480	480 –	>1,920	377	245
Soil Water Infiltration[b]						
If SAR = 0 to 3 & EC =		>0.7	0.7 – 0.2	<0.2	0.63	
If SAR = 3 to 6 & EC =		>1.2	1.2 – 0.3	<0.3		0.41
If SAR = 6 to 12 & EC =		>1.9	1.9 – 0.5	<0.5		
Permeability						
Adjusted SAR[c]		<6.0	6.0 – 9.0	>9.0	4	3.9
Specific ion toxicity from root absorption[d]						
Adjusted SAR		<3.0	3.0 – 9.0	>9.0	4	3.9
Chloride	mg/L	<142	142 – 355	> 355	64	41
Boron	mg/L	<0.5	0.5 – 2.0	2.0 – 10.0	0.2	--[e]
Foliar absorption – Sprinklers[f]						
Sodium	mg/L	<69	>69	---	73	47.4
Chloride	mg/L	<106	>106	---	73	41
Miscellaneous						
HCO_3 (Sprinklers)	mg/l	<90	90 – 520	>520	188	122
NH_4-N and NO_3-N	mg/l	<5	5 – 30	>30	8	--[e]

Footnotes:

a. Assumes water for crop plus needed water for leaching requirement will be applied.
b. Evaluate using EC and SAR together (Harivandi 1999).
c. Permeability problems, related to low EC or high adjusted SAR of water, can be reduced if necessary by adding gypsum. Usual application rate per acre-foot of applied water is from 200 to about 1,000 pounds. 234 pounds of 100% gypsum added to 1 acre-foot of water would supply 1 meq/1 of calcium and raise the EC about 0.1 mmhos.
d. Most tree crops and woody ornamentals are sensitive to sodium and chloride. Most annual crops are not sensitive.
e. Estimated future water quality unknown.
f. Leaf areas wet by sprinklers may show a leaf burn due to sodium or chloride absorption under low humidity/high-evaporation conditions.

5.3.2 Industrial Cooling Water

Recycled water can be used as a water supply for water-cooled industrial processes. In a cooling process, a portion of recirculating cooling water is evaporated, to provide cooling. Evaporation of the cooling water causes a loss of pure water to the atmosphere, concentrating dissolved solids in the remaining cooling water supply. In order to keep concentrations below the maximum allowable for a given cooling process, a portion of the concentrated cooling water is discharged (called blowdown or bleed), and the remainder is supplemented with new water (called makeup water) that contains a lower concentration of dissolved solids, providing some level of dilution. The constituent concentration in the cooling water is governed by the makeup water quality and feed rate as well as the blowdown or bleed rate. Higher quality makeup water containing lower concentrations of constituents will allow an increased number of

[5] Harivandi, A. Interpreting Turfgrass Irrigation Water Test Results; UC Davis Division of Agriculture and Natural Resources (UC ANR), Publication 8009; 1999.

cooling cycles before reaching the maximum allowable constituent concentration. Constituents of interest for recycled water used in industrial cooling processes are summarized in **Table E-5** in Appendix E.

Concentration of dissolved solids over time can cause scale buildup, blockages, and corrosion to cooling system materials unless carefully managed. Specific issues associated with water quality constituents of concern are highly dependent on the cooling tower construction materials. The effect of water quality constituents of concern on various types of construction materials are presented in **Table E-6** in Appendix E.

Based on the maximum recommended concentrations for the parameters identified in **Table E-5**, the City's current recycled water supply is suitable for use in industrial cooling applications. Alkalinity and phosphate concentrations may be somewhat high for this application; however, implementation of targeted treatment processes can minimize potential impacts of these constituents. Application-specific treatment approaches should be developed to optimize recycled water quality for process cooling as appropriate.

The integration of surface water into the drinking water supply will not alter the suitability of the recycled water quality for this purpose.

5.3.3 Boiler Feed Water

The pressure and design of a boiler are the criteria used to determine the necessary water quality of steam generation to avoid deposits, corrosion, and carryover of contaminants into the steam. Boiler feedwater includes condensate from generated steam and treated makeup water used to reduce the presence of contaminants and dilute contaminants present in boiler condensate. Generally, boiler feedwater is treated to reduce hardness, to remove or control insoluble scales of calcium and magnesium, and to control silica and aluminum concentrations. These constituents are the principal cause of scale buildup in boilers. A common approach to removing these constituents is lime treatment (including flocculation, sedimentation, and recarbonation) followed by multi-media filtration, carbon adsorption, and nitrogen removal. Higher pressure processes generally require higher quality feedwater; some high-pressure boilers may require reverse osmosis or ion exchange treatment.[6]

The guidelines for recommended maximum concentrations for boiler feedwater quality are presented in **Table E-7** in Appendix E.

The City's current groundwater supply and the projected blended groundwater and surface water supply would both require treatment prior to use as boiler feedwater. Similarly, the City's current and projected future recycled water would require additional treatment prior to use as boiler feedwater.

5.3.4 Industrial Process Water

Water quality requirements for use in industrial processes vary depending upon the process. The semiconductor industry requires exceptionally high quality water; conversely, the tanning industry can use relatively low quality water. **Table E-8** in Appendix E presents water quality requirements for a variety of industrial processes.

Based on current recycled water quality monitoring information, existing and future recycled water would require treatment for use in the pulp and paper, chemical, petrochemical, textile, coal, and cement industries. Additional monitoring would be required prior to implementation.

[6] Santa Clara Valley Water District. Advanced Recycled Water Treatment Feasibility Project, TM 2: Market Assessment, Table 9. August, 2003.

5.4 Recycled Water Quality Monitoring

Water quality data for several constituents of particular interest in the City's existing recycled water supply was not available at the time of this study and additional specific end uses could not be determined. A recycled water quality monitoring program should be implemented as part of the power plant connection in the future to provide adequate information to allow the City to make reasonable determinations as to the suitability of the supply – or necessary treatment – to support other proposed end uses.

5.5 Water Quality Summary

The City's current and future recycled water supply is generally of good quality for a variety of uses. Although the current sodium concentration of 73 mg/L is near the upper end of a desirable range of sodium concentrations, the future recycled water is anticipated to have a sodium concentration of approximately 47 mg/L, well below the maximum desirable concentration.

The City's current and future recycled water supply is suitable for use in industrial cooling applications, although alkalinity and phosphate concentrations may be somewhat high. Targeted treatment processes can alleviate potential impacts from these constituents. The City's current groundwater supply, projected blended groundwater and surface water supply, and current and projected recycled water would all require additional treatment prior to use as boiler feedwater. Water quality requirements for other industrial processes vary greatly depending upon the process. Current and future recycled water supplies would require additional treatment prior to use in the pulp and paper, chemical, petrochemical, textile, coal, and cement industries.

Recycled water typically has higher salinity content than potable water, although several protective measures can be used to reduce negative impacts. Additionally, the City may choose to implement a salinity management program to monitor salinity impacts to irrigated lands and evaluate the effectiveness of the protective measures. Current recycled water constituent concentrations are below recommended values for trace elements currently being monitored. When the City blends surface water into existing groundwater supplies, the improved drinking water quality is expected improve overall recycled water quality as well.

A recycled water quality monitoring program should be implemented to allow the City to make reasonable determinations as to the suitability of the supply or necessary treatment to support other proposed end uses.

6 Conclusions & Next Steps

Based on the information presented in this TM, there appears to be adequate justification for further development of a RWMP for the City. During the subsequent phase of this project, Conceptual Alternatives will be developed for the delivery of recycled water in Lodi. As part of the Conceptual Alternative development process, the list of potential users will be modified as necessary to achieve the optimal balance between maximized beneficial use of recycled water, technical feasibility, operational flexibility, (phased) constructability, and capital expenditures.

Attachment B: Detailed List of Potential Recycled Water Users

Attachment B

Table B-1

						Water Meter Information	Irrigation Demand								WUF-Based Irrigation and Non-Irrigation Demand										Total Demand				
Area	Potential User ID	Acres	Category	Name	Existing?	Water Meter Data?	Metered Average Day Demand	Irrigable Area	Unit Irrigation Demand	Irrigation Demand	Average Day Demand	Peak Day Demand	Peak Hour Demand		WUF	Unadjusted Average Day Demand	K_{WUF}	Adjust Average Day Demand	Additional Demand	Total Average Day Demand	Annual Demand	Peak Day Demand	Peak Hour Demand		Total Peak Hour Demand		Total Peak Day Demand	Total Average Annual Demand	
(sq. ft.)					(Y/N)	(Y/N)	(gpd)	(acres)	(AFY/acre)	(AFY)	(gpd)	(gpd)	(gpm)	(mgd)	(gpd/acre)	(gpd)	(%)	(gpd)	(gpd)	(gpd)	(afy)	(gpd)	(gpm)	(mgd)	(gpm)	(mgd)	(mgd)	(mgd)	(afy)
47,400.7684	62	1.0882	Agricultural	Miscellaneous Field Crop	Y	N	-	1.08	1.89	2.0	1,813	8,439	12	0.02	-	-	0%	-		-	-	-	-	-	12	0.02	0.01	0.00	2.0
91,944.8323	61	2.1108	Agricultural	Miscellaneous Field Crop	Y	N	-	2.09	1.89	3.9	3,517	16,370	23	0.03	-	-	0%	-		-	-	-	-	-	23	0.03	0.02	0.00	3.9
92,095.5000	154	2.1142	Agricultural	Miscellaneous Field Crop	Y	N	-	2.09	1.89	3.9	3,523	16,397	23	0.03	-	-	0%	-		-	-	-	-	-	23	0.03	0.02	0.00	3.9
92,599.7254	63	2.1258	Agricultural	Miscellaneous Field Crop	Y	N	-	2.10	1.89	4.0	3,542	16,487	23	0.03	-	-	0%	-		-	-	-	-	-	23	0.03	0.02	0.00	4.0
110,884.9380	205	2.5456	Agricultural	Miscellaneous Field Crop	Y	N	-	2.52	1.89	4.8	4,242	19,742	27	0.04	-	-	0%	-		-	-	-	-	-	27	0.04	0.02	0.00	4.8
132,539.1870	142	3.0427	Agricultural	Vineyard	Y	N	-	3.01	2.23	6.7	5,993	18,513	26	0.04	-	-	0%	-		-	-	-	-	-	26	0.04	0.02	0.01	6.7
159,475.2500	193	3.6610	Agricultural	Miscellaneous Field Crop	Y	N	-	3.62	1.89	6.8	6,101	28,394	39	0.06	-	-	0%	-		-	-	-	-	-	39	0.06	0.03	0.01	6.8
161,687.3120	124	3.7118	Agricultural	Vineyard	Y	N	-	3.67	2.23	8.2	7,311	22,585	31	0.05	-	-	0%	-		-	-	-	-	-	31	0.05	0.02	0.01	8.2
170,292.3370	218	3.9094	Agricultural	Vineyard	Y	N	-	3.87	2.23	8.6	7,700	23,787	33	0.05	-	-	0%	-		-	-	-	-	-	33	0.05	0.02	0.01	8.6
172,192.1780	149	3.9530	Agricultural	Orchard	Y	N	-	3.91	3.06	12.0	10,678	29,010	40	0.06	-	-	0%	-		-	-	-	-	-	40	0.06	0.03	0.01	12.0
173,373.5930	77	3.9801	Agricultural	Miscellaneous Field Crop	Y	N	-	3.94	1.89	7.4	6,633	30,868	43	0.06	-	-	0%	-		-	-	-	-	-	43	0.06	0.03	0.01	7.4
178,818.1860	217	4.1051	Agricultural	Orchard	Y	N	-	4.06	3.06	12.4	11,088	30,126	42	0.06	-	-	0%	-		-	-	-	-	-	42	0.06	0.03	0.01	12.4
178,929.5520	219	4.1077	Agricultural	Orchard	Y	N	-	4.07	3.06	12.4	11,095	30,145	42	0.06	-	-	0%	-		-	-	-	-	-	42	0.06	0.03	0.01	12.4
182,281.7500	133	4.1846	Agricultural	Orchard	Y	N	-	4.14	3.06	12.7	11,303	30,710	43	0.06	-	-	0%	-		-	-	-	-	-	43	0.06	0.03	0.01	12.7
185,464.3750	190	4.2577	Agricultural	Miscellaneous Field Crop	Y	N	-	4.22	1.89	7.9	7,095	33,021	46	0.07	-	-	0%	-		-	-	-	-	-	46	0.07	0.03	0.01	7.9
189,988.0230	87	4.3615	Agricultural	Vineyard	Y	N	-	4.32	2.23	9.6	8,590	26,538	37	0.05	-	-	0%	-		-	-	-	-	-	37	0.05	0.03	0.01	9.6
193,268.9150	88	4.4368	Agricultural	Vineyard	Y	N	-	4.39	2.23	9.8	8,739	26,996	37	0.05	-	-	0%	-		-	-	-	-	-	37	0.05	0.03	0.01	9.8
206,468.5620	161	4.7399	Agricultural	Miscellaneous Field Crop	Y	N	-	4.69	1.89	8.8	7,899	36,760	51	0.07	-	-	0%	-		-	-	-	-	-	51	0.07	0.04	0.01	8.8
221,222.5000	197	5.0786	Agricultural	Vineyard	Y	N	-	5.03	2.23	11.2	10,003	30,901	43	0.06	-	-	0%	-		-	-	-	-	-	43	0.06	0.03	0.01	11.2
222,637.6250	191	5.1111	Agricultural	Miscellaneous Field Crop	Y	N	-	5.06	1.89	9.5	8,517	39,639	55	0.08	-	-	0%	-		-	-	-	-	-	55	0.08	0.04	0.01	9.5
223,119.3130	198	5.1221	Agricultural	Vineyard	Y	N	-	5.07	2.23	11.3	10,088	31,166	43	0.06	-	-	0%	-		-	-	-	-	-	43	0.06	0.03	0.01	11.3
233,325.2410	215	5.3564	Agricultural	Vineyard	Y	N	-	5.30	2.23	11.8	10,550	32,591	45	0.07	-	-	0%	-		-	-	-	-	-	45	0.07	0.03	0.01	11.8
252,249.0000	196	5.7908	Agricultural	Vineyard	Y	N	-	5.73	2.23	12.8	11,406	35,235	49	0.07	-	-	0%	-		-	-	-	-	-	49	0.07	0.04	0.01	12.8
258,784.5630	164	5.9409	Agricultural	Miscellaneous Field Crop	Y	N	-	5.88	1.89	11.1	9,900	46,075	64	0.09	-	-	0%	-		-	-	-	-	-	64	0.09	0.05	0.01	11.1
278,455.3750	92	6.3925	Agricultural	Vineyard	Y	N	-	6.33	2.23	14.1	12,590	38,895	54	0.08	-	-	0%	-		-	-	-	-	-	54	0.08	0.04	0.01	14.1
295,445.1880	98	6.7825	Agricultural	Miscellaneous Field Crop	Y	N	-	6.71	1.89	12.7	11,302	52,602	73	0.11	-	-	0%	-		-	-	-	-	-	73	0.11	0.05	0.01	12.7
296,267.5000	169	6.8014	Agricultural	Miscellaneous Field Crop	Y	N	-	6.73	1.89	12.7	11,334	52,749	73	0.11	-	-	0%	-		-	-	-	-	-	73	0.11	0.05	0.01	12.7
308,835.2020	81	7.0899	Agricultural	Vineyard	Y	N	-	7.02	2.23	15.6	13,964	43,139	60	0.09	-	-	0%	-		-	-	-	-	-	60	0.09	0.04	0.01	15.6
310,665.0630	214	7.1319	Agricultural	Miscellaneous Field Crop	Y	N	-	7.06	1.89	13.3	11,885	55,312	77	0.11	-	-	0%	-		-	-	-	-	-	77	0.11	0.06	0.01	13.3
321,625.1870	207	7.3835	Agricultural	Orchard	Y	N	-	7.31	3.06	22.3	19,944	54,186	75	0.11	-	-	0%	-		-	-	-	-	-	75	0.11	0.05	0.02	22.3
327,393.1870	85	7.5159	Agricultural	Miscellaneous Field Crop	Y	N	-	7.44	1.89	14.0	12,525	58,290	81	0.12	-	-	0%	-		-	-	-	-	-	81	0.12	0.06	0.01	14.0
328,498.0000	84	7.5413	Agricultural	Miscellaneous Field Crop	Y	N	-	7.47	1.89	14.1	12,567	58,487	81	0.12	-	-	0%	-		-	-	-	-	-	81	0.12	0.06	0.01	14.1
335,017.5000	116	7.6909	Agricultural	Miscellaneous Field Crop	Y	N	-	7.61	1.89	14.4	12,816	59,648	83	0.12	-	-	0%	-		-	-	-	-	-	83	0.12	0.06	0.01	14.4
345,438.8120	180	7.9302	Agricultural	Vineyard	Y	N	-	7.85	2.23	17.5	15,619	48,251	67	0.10	-	-	0%	-		-	-	-	-	-	67	0.10	0.05	0.02	17.5
345,672.2600	135	7.9355	Agricultural	Vineyard	Y	N	-	7.86	2.23	17.5	15,630	48,284	67	0.10	-	-	0%	-		-	-	-	-	-	67	0.10	0.05	0.02	17.5
366,833.8740	86	8.4213	Agricultural	Vineyard	Y	N	-	8.34	2.23	18.6	16,587	51,240	71	0.10	-	-	0%	-		-	-	-	-	-	71	0.10	0.05	0.02	18.6
381,457.0870	178	8.7570	Agricultural	Miscellaneous Field Crop	Y	N	-	8.67	1.89	16.3	14,593	67,916	94	0.14	-	-	0%	-		-	-	-	-	-	94	0.14	0.07	0.01	16.3
394,032.5000	153	9.0457	Agricultural	Miscellaneous Field Crop	Y	N	-	8.96	1.89	16.9	15,074	70,155	97	0.14	-	-	0%	-		-	-	-	-	-	97	0.14	0.07	0.02	16.9
409,894.8130	106	9.4099	Agricultural	Miscellaneous Field Crop	Y	N	-	9.32	1.89	17.6	15,681	72,979	101	0.15	-	-	0%	-		-	-	-	-	-	101	0.15	0.07	0.02	17.6
420,480.5820	59	9.6529	Agricultural	Vineyard	Y	N	-	9.56	2.23	21.3	19,012	58,733	82	0.12	-	-	0%	-		-	-	-	-	-	82	0.12	0.06	0.02	21.3
421,413.4400	60	9.6743	Agricultural	Miscellaneous Field Crop	Y	N	-	9.58	1.89	18.1	16,122	75,030	104	0.15	-	-	0%	-		-	-	-	-	-	104	0.15	0.08	0.02	18.1
421,740.0000	64	9.6818	Agricultural	Miscellaneous Field Crop	Y	N	-	9.59	1.89	18.1	16,134	75,088	104	0.15	-	-	0%	-		-	-	-	-	-	104	0.15	0.08	0.02	18.1
422,378.1880	182	9.6965	Agricultural	Vineyard	Y	N	-	9.60	2.23	21.4	19,098	58,998	82	0.12	-	-	0%	-		-	-	-	-	-	82	0.12	0.06	0.02	21.4
426,124.1740	76	9.7825	Agricultural	Miscellaneous Field Crop	Y	N	-	9.68	1.89	18.3	16,302	75,869	105	0.15	-	-	0%	-		-	-	-	-	-	105	0.15	0.08	0.02	18.3
428,100.0000	68	9.8278	Agricultural	Orchard	Y	N	-	9.73	3.06	29.7	26,546	72,124	100	0.14	-	-	0%	-		-	-	-	-	-	100	0.14	0.07	0.03	29.7
430,156.8750	171	9.8750	Agricultural	Vineyard	Y	N	-	9.78	2.23	21.8	19,450	60,085	83	0.12	-	-	0%	-		-	-	-	-	-	83	0.12	0.06	0.02	21.8
432,955.8750	185	9.9393	Agricultural	Miscellaneous Field Crop	Y	N	-	9.84	1.89	18.6	16,563	77,085	107	0.15	-	-	0%	-		-	-	-	-	-	107	0.15	0.08	0.02	18.6
434,191.5630	94	9.9677	Agricultural	Vineyard	Y	N	-	9.87	2.23	22.0	19,632	60,649	84	0.12	-	-	0%	-		-	-	-	-	-	84	0.12	0.06	0.02	22.0
434,304.6880	100	9.9703	Agricultural	Miscellaneous Field Crop	Y	N	-	9.87	1.89	18.6	16,615	77,325	107	0.15	-	-	0%	-		-	-	-	-	-	107	0.15	0.08	0.02	18.6
435,581.7220	65	9.9996	Agricultural	Miscellaneous Field Crop	Y	N	-	9.90	1.89	18.7	16,664	77,553	108	0.16	-	-	0%	-		-	-	-	-	-	108	0.16	0.08	0.02	18.7
437,539.3460	58	10.0445	Agricultural	Orchard	Y	N	-	9.94	3.06	30.4	27,132	73,714	102	0.15	-	-	0%	-		-	-	-	-	-	102	0.15	0.07	0.03	30.4
438,900.6250	95	10.0758	Agricultural	Vineyard	Y	N	-	9.98	2.23	22.2	19,845	61,306	85	0.12	-	-	0%	-		-	-	-	-	-	85	0.12	0.06	0.02	22.2
440,748.1870	173	10.1182	Agricultural	Miscellaneous Field Crop	Y	N	-	10.02	1.89	18.9	16,861	78,472	109	0.16	-	-	0%	-		-	-	-	-	-	109	0.16	0.08	0.02	18.9
442,193.2960	75	10.1514	Agricultural	Orchard	Y	N	-	10.05	3.06	30.7	27,420	74,498	103	0.15	-	-	0%	-		-	-	-	-	-	103	0.15	0.07	0.03	30.7
444,006.3750	186	10.1930	Agricultural	Miscellaneous Field Crop	Y	N	-	10.09	1.89	19.0	16,986	79,053	110	0.16	-	-	0%	-		-	-	-	-	-	110	0.16	0.08	0.02	19.0
452,510.6810	201	10.3882	Agricultural	Orchard	Y	N	-	10.28	3.06	31.4	28,060	76,236	106	0.15	-	-	0%	-		-	-	-	-	-	106	0.15	0.08	0.03	31.4
464,321.8130	192	10.6594	Agricultural	Miscellaneous Field Crop	Y	N	-	10.55	1.89	19.9	17,763	82,670	115	0.17	-	-	0%	-		-	-	-	-	-	115	0.17	0.08	0.02	19.9
515,743.1870	179	11.8398	Agricultural	Vineyard	Y	N	-	11.72	2.23	26.1	23,320	72,040	100	0.14	-	-	0%	-		-	-	-	-	-	100	0.14	0.07	0.02	26.1
546,921.5620	170	12.5556	Agricultural	Miscellaneous Field Crop	Y	N	-	12.43	1.89	23.4	20,923	97,376	135	0.19	-	-	0%	-		-	-	-	-	-	135	0.19	0.10	0.02	23.4
593,853.6130	82	13.6330	Agricultural	Vineyard	Y	N	-	13.50	2.23	30.1	26,851	82,950	115	0.17	-	-	0%	-		-	-	-	-	-	115	0.17	0.08	0.03	30.1
596,836.4380	125	13.7015	Agricultural	Vineyard	Y	N	-	13.56	2.23	30.2	26,986	83,367	116	0.17	-	-	0%	-		-	-	-	-	-	116	0.17	0.08	0.03	30.2
597,665.6520	148	13.7205	Agricultural	Vineyard	Y	N	-	13.58	2.23	30.3	27,024	83,483	116	0.17	-	-	0%	-		-	-	-	-	-	116	0.17	0.08	0.03	30.3
599,415.1280	216	13.7607	Agricultural	Miscellaneous Field Crop	Y	N	-	13.62	1.89	25.7	22,931	106,722	148	0.21	-	-	0%	-		-	-	-	-	-	148	0.21	0.11	0.02	25.7
613,279.1250	194	14.0790	Agricultural	Vineyard	Y	N	-	13.94	2.23	31.1	27,730	85,664	119	0.17	-	-	0%	-		-	-	-	-	-	119	0.17	0.09	0.03	31.1
617,683.1950	80	14.1801	Agricultural	Vineyard	Y	N	-	14.04	2.23	31.3	27,929	86,279	120	0.17	-	-	0%	-		-	-	-	-	-	120	0.17	0.09	0.03	31.3
633,431.2150	183	14.5416	Agricultural	Miscellaneous Field Crop	Y	N	-	14.40	1.89	27.1	24,232	112,778	157	0.23	-	-	0%	-		-	-	-	-	-	157	0.23	0.11	0.02	27.1
638,295.1250	195	14.6532	Agricultural	Miscellaneous Field Crop	Y	N	-	14.51	1.89	27.4	24,418	113,644	158	0.23	-	-	0%	-		-	-	-	-	-	158	0.23	0.11	0.02	27.4
645,259.9370	113	14.8131	Agricultural	Miscellaneous Field Crop	Y	N	-	14.66	1.89	27.7	24,685	114,885	160	0.23	-	-	0%	-		-	-	-	-	-	160	0.23	0.11	0.02	27.7
645,638.5000	174	14.8218	Agricultural	Vineyard	Y	N	-	14.67	2.23	32.7	29,193	90,184	125	0.18	-	-	0%	-		-	-	-	-	-	125	0.18	0.09	0.03	32.7
655,300.3130	103	15.0436	Agricultural	Orchard	Y	N	-	14.89	3.06	45.5	40,635	110,401	153	0.22	-	-	0%	-		-	-	-	-	-	153	0.22	0.11	0.04	45.5
658,721.0290	146	15.1222	Agricultural	Orchard	Y	N	-	14.97	3.06	45.8	40,847	110,978	154	0.22	-	-	0%	-		-	-	-	-	-	154	0.22	0.11	0.04	45.8
688,286.5000	208	15.8009	Agricultural	Orchard	Y	N	-	15.64	3.06	47.8	42,680	115,959	161	0.23	-	-	0%	-		-	-	-	-	-	161	0.23	0.12	0.04	47.8
713,612.0630	99	16.3823	Agricultural	Vineyard	Y	N	-	16.22	2.23	36.1	32,266	99,679	138	0.20	-	-	0%	-		-	-	-	-	-	138	0.20	0.10	0.03	36.1
717,670.0630	168	16.4754	Agricultural	Miscellaneous Field Crop	Y	N	-	16.31	1.89	30.8	27,455	127,777	177	0.26	-	-	0%	-		-	-	-	-	-	177	0.26	0.13	0.03	30.8
718,511.3410	79	16.4948	Agricultural	Vineyard	Y	N	-	16.33	2.23	36.4	32,488	100,363	139	0.20	-	-	0%	-		-	-	-	-	-	139	0.20	0.10	0.03	36.4
751,258.9990	78	17.2465	Agricultural	Orchard	Y	N	-	17.07	3.06	52.2	46,585	126,568	176	0.25	-	-	0%	-		-	-	-	-	-	176	0.25	0.13	0.05	52.2
753,405.3750	162	17.2958	Agricultural	Miscellaneous Field Crop	Y	N	-	17.12	1.89	32.3	28,822	134,139	186	0.27	-	-	0%	-		-	-	-	-	-	186	0.27	0.13	0.03	32.3
754,328.9380	152	17.3170	Agricultural	Miscellaneous Field Crop	Y	N	-	17.14	1.89	32.3	28,857	134,304	187	0.27	-	-	0%	-		-	-	-	-	-	187	0.27	0.13	0.03	32.3
761,591.8750	213	17.4837	Agricultural	Miscellaneous Field Crop	Y	N	-	17.31	1.89	32.6	29,135	135,597	188	0.27	-	-	0%	-		-	-	-	-	-	188	0.27	0.14	0.03	32.6
765,402.0000	211	17.5712	Agricultural	Miscellaneous Field Crop	Y	N	-	17.40	1.89	32.8	29,281	136,275	189	0.27	-	-	0%	-		-	-	-	-	-	189	0.27	0.14	0.03	32.8
777,895.1250	206	17.8580	Agricultural	Miscellaneous Field Crop	Y	N	-	17.68	1.89	33.3	29,759	138,499	192	0.28	-	-	0%	-		-	-	-	-	-	192	0.28	0.14	0.03	33.3
778,923.3390	83	17.8816	Agricultural	Vineyard	Y	N	-	17.70	2.23	39.5	35,219	108,801	151	0.22	-	-	0%	-		-	-	-	-	-	151	0.22	0.11	0.04	39.5
787,690.6870	175	18.0829	Agricultural	Vineyard	Y	N	-	17.90	2.23	39.9	35,616	110,026	153	0.22	-	-	0%	-		-	-	-	-	-	153	0.22	0.11	0.04	39.9
815,750.4730	74	18.7271	Agricultural	Vineyard	Y	N	-	18.54	2.23	41.3	36,885	113,945	158	0.23	-	-	0%	-		-	-	-	-	-	158	0.23	0.11	0.04	41.3
820,057.0000	203	18.8259	Agricultural	Miscellaneous Field Crop	Y	N	-	18.64	1.89	35.1	31,372	146,006	203	0.29	-	-	0%	-		-	-	-	-	-	203	0.29	0.15	0.03	35.1
836,257.9380	188	19.1978	Agricultural	Vineyard	Y	N	-	19.01	2.23	42.4	37,812	116,810	162	0.23	-	-	0%	-		-	-	-	-	-	162	0.23	0.12	0.04	42.4
852,281.1470	177	19.5657	Agricultural	Vineyard	Y	N	-	19.37	2.23	43.2	38,536	119,048	165	0.24	-	-	0%	-		-	-	-	-	-	165	0.24	0.12	0.04	43.2
854,191.0000	70	19.6095	Agricultural	Orchard	Y	N	-	19.41	3.06	59.3	52,968	143,909	200	0.29	-	-	0%	-		-	-	-	-	-	200	0.29	0.14	0.05	59.3
854,551.6480	69	19.6178	Agricultural	Orchard	Y	N	-	19.42	3.06	59.4	52,990	143,970	200	0.29	-	-	0%	-		-	-	-	-	-	200	0.29	0.14	0.05	59.4
857,404.8790	57	19.6833	Agricultural	Orchard	Y	N	-	19.49	3.06	59.6	53,167	144,451	201	0.29	-	-	0%	-		-	-	-	-	-	201	0.29	0.14	0.05	59.6
860,146.8750	204	19.7463	Agricultural	Miscellaneous Field Crop	Y	N	-	19.55	1.89	36.9	32,906	153,144	213	0.31	-	-	0%	-		-	-	-	-	-	213	0.31	0.15	0.03	36.9
864,357.5800	93	19.8429	Agricultural	Vineyard	Y	N	-	19.64	2.23	43.8	39,082	120,735	168	0.24	-	-	0%	-		-	-	-	-	-	168	0.24	0.12	0.04	43.8
870,368.6150	184	19.9809	Agricultural	Miscellaneous Field Crop	Y	N	-	19.78	1.89	37.3	33,297	154,964	215	0.31	-	-	0%	-		-	-	-	-	-	215	0.31	0.15	0.03	37.3
874,249.1880	199	20.0700	Agricultural	Miscellaneous Field Crop	Y	N	-	19.87	1.89	37.5	33,445	155,655	216	0.31	-	-	0%	-		-	-	-	-	-	216	0.31	0.16	0.03	37.5
922,396.4370	115	21.1753	Agricultural	Miscellaneous Field Crop	Y	N	-	20.96	1.89	39.5	35,287	164,227	228	0.33	-	-	0%	-		-	-	-	-	-	228	0.33	0.16	0.04	39.5
941,479.9380	107	21.6134	Agricultural	Miscellaneous Field Crop	Y	N	-	21.40	1.89	40.3	36,017	167,625	233	0.34	-	-	0%	-		-	-	-	-	-	233	0.34	0.17	0.04	40.3
944,970.0630	150	21.6935	Agricultural	Miscellaneous Field Crop	Y	N	-	21.48	1.89	40.5	36,151	168,246	234	0.34	-	-	0%	-		-	-	-	-	-	234	0.34	0.17	0.04	40.5
946,432.3750	114	21.7271	Agricultural	Miscellaneous Field Crop	Y	N	-	21.51	1.89	40.6	36,207	168,506	234	0.34	-	-	0%	-		-	-	-	-	-	234	0.34	0.17	0.04	40.6

Attachment B

Table B-1

						Water Meter Information	Irrigation Demand								WUF-Based Irrigation and Non-Irrigation Demand										Total Demand				
Area	Potential User ID	Acres	Category	Name	Existing?	Water Meter Data?	Metered Average Day Demand	Irrigable Area	Unit Irrigation Demand	Irrigation Demand	Average Day Demand	Peak Day Demand	Peak Hour Demand		WUF	Unadjusted Average Day Demand	K_{WUF}	Adjust Average Day Demand	Additional Demand	Total Average Day Demand	Annual Demand	Peak Day Demand	Peak Hour Demand		Total Peak Hour Demand		Total Peak Day Demand	Total Average Annual Demand	
(sq. ft.)					(Y/N)	(Y/N)	(gpd)	(acres)	(AFY/acre)	(AFY)	(gpd)	(gpd)	(gpm)	(mgd)	(gpd/acre)	(gpd)	(%)	(gpd)	(gpd)	(gpd)	(afy)	(gpd)	(gpm)	(mgd)	(gpm)	(mgd)	(mgd)	(mgd)	(afy)
1,013,793.0200	212	23.2735	Agricultural	Miscellaneous Field Crop	Y	N	-	23.04	1.89	43.4	38,783	180,500	251	0.36	-	-	0%	-		-	-	-	-	-	251	0.36	0.18	0.04	43.4
1,026,800.2500	123	23.5721	Agricultural	Orchard	Y	N	-	23.34	3.06	71.3	63,671	172,989	240	0.35	-	-	0%	-		-	-	-	-	-	240	0.35	0.17	0.06	71.3
1,033,350.6200	200	23.7225	Agricultural	Miscellaneous Field Crop	Y	N	-	23.49	1.89	44.3	39,532	183,982	256	0.37	-	-	0%	-		-	-	-	-	-	256	0.37	0.18	0.04	44.3
1,080,740.7600	90	24.8104	Agricultural	Vineyard	Y	N	-	24.56	2.23	54.7	48,866	150,960	210	0.30	-	-	0%	-		-	-	-	-	-	210	0.30	0.15	0.05	54.7
1,084,771.8700	127	24.9029	Agricultural	Miscellaneous Field Crop	Y	N	-	24.65	1.89	46.5	41,499	193,137	268	0.39	-	-	0%	-		-	-	-	-	-	268	0.39	0.19	0.04	46.5
1,095,426.6200	101	25.1475	Agricultural	Miscellaneous Field Crop	Y	N	-	24.90	1.89	46.9	41,906	195,034	271	0.39	-	-	0%	-		-	-	-	-	-	271	0.39	0.20	0.04	46.9
1,098,736.1300	131	25.2235	Agricultural	Vineyard	Y	N	-	24.97	2.23	55.6	49,680	153,473	213	0.31	-	-	0%	-		-	-	-	-	-	213	0.31	0.15	0.05	55.6
1,109,961.8700	156	25.4812	Agricultural	Miscellaneous Field Crop	Y	N	-	25.23	1.89	47.6	42,462	197,622	274	0.40	-	-	0%	-		-	-	-	-	-	274	0.40	0.20	0.04	47.6
1,158,498.6900	108	26.5955	Agricultural	Orchard	Y	N	-	26.33	3.06	80.5	71,838	195,177	271	0.39	-	-	0%	-		-	-	-	-	-	271	0.39	0.20	0.07	80.5
1,186,760.8100	172	27.2443	Agricultural	Orchard	Y	N	-	26.97	3.06	82.4	73,591	199,939	278	0.40	-	-	0%	-		-	-	-	-	-	278	0.40	0.20	0.07	82.4
1,189,874.3600	145	27.3158	Agricultural	Vineyard	Y	N	-	27.04	2.23	60.3	53,801	166,204	231	0.33	-	-	0%	-		-	-	-	-	-	231	0.33	0.17	0.05	60.3
1,197,243.3100	158	27.4849	Agricultural	Vineyard	Y	N	-	27.21	2.23	60.6	54,134	167,233	232	0.33	-	-	0%	-		-	-	-	-	-	232	0.33	0.17	0.05	60.6
1,198,281.0000	166	27.5087	Agricultural	Miscellaneous Field Crop	Y	N	-	27.23	1.89	51.3	45,841	213,346	296	0.43	-	-	0%	-		-	-	-	-	-	296	0.43	0.21	0.05	51.3
1,224,880.2500	163	28.1194	Agricultural	Miscellaneous Field Crop	Y	N	-	27.84	1.89	52.5	46,859	218,082	303	0.44	-	-	0%	-		-	-	-	-	-	303	0.44	0.22	0.05	52.5
1,232,501.5100	136	28.2943	Agricultural	Vineyard	Y	N	-	28.01	2.23	62.4	55,728	172,158	239	0.34	-	-	0%	-		-	-	-	-	-	239	0.34	0.17	0.06	62.4
1,236,009.3800	105	28.3749	Agricultural	Miscellaneous Field Crop	Y	N	-	28.09	1.89	53.0	47,285	220,064	306	0.44	-	-	0%	-		-	-	-	-	-	306	0.44	0.22	0.05	53.0
1,248,470.7100	91	28.6609	Agricultural	Vineyard	Y	N	-	28.37	2.23	63.2	56,450	174,388	242	0.35	-	-	0%	-		-	-	-	-	-	242	0.35	0.17	0.06	63.2
1,248,581.8100	120	28.6635	Agricultural	Orchard	Y	N	-	28.38	3.06	86.7	77,424	210,354	292	0.42	-	-	0%	-		-	-	-	-	-	292	0.42	0.21	0.08	86.7
1,252,159.1200	73	28.7456	Agricultural	Vineyard	Y	N	-	28.46	2.23	63.4	56,617	174,904	243	0.35	-	-	0%	-		-	-	-	-	-	243	0.35	0.17	0.06	63.4
1,275,580.5000	134	29.2833	Agricultural	Vineyard	Y	N	-	28.99	2.23	64.6	57,676	178,175	247	0.36	-	-	0%	-		-	-	-	-	-	247	0.36	0.18	0.06	64.6
1,322,910.5900	67	30.3698	Agricultural	Orchard	Y	N	-	30.07	3.06	91.9	82,033	222,876	310	0.45	-	-	0%	-		-	-	-	-	-	310	0.45	0.22	0.08	91.9
1,407,936.2300	89	32.3218	Agricultural	Vineyard	Y	N	-	32.00	2.23	71.3	63,661	196,663	273	0.39	-	-	0%	-		-	-	-	-	-	273	0.39	0.20	0.06	71.3
1,426,372.0600	118	32.7450	Agricultural	Vineyard	Y	N	-	32.42	2.23	72.2	64,494	199,238	277	0.40	-	-	0%	-		-	-	-	-	-	277	0.40	0.20	0.06	72.2
1,428,957.8900	122	32.8044	Agricultural	Miscellaneous Field Crop	Y	N	-	32.48	1.89	61.2	54,666	254,417	353	0.51	-	-	0%	-		-	-	-	-	-	353	0.51	0.25	0.05	61.2
1,439,733.3500	202	33.0517	Agricultural	Orchard	Y	N	-	32.72	3.06	100.0	89,277	242,558	337	0.49	-	-	0%	-		-	-	-	-	-	337	0.49	0.24	0.09	100.0
1,446,491.4400	160	33.2069	Agricultural	Miscellaneous Field Crop	Y	N	-	32.87	1.89	62.0	55,337	257,539	358	0.52	-	-	0%	-		-	-	-	-	-	358	0.52	0.26	0.06	62.0
1,473,689.5600	187	33.8313	Agricultural	Orchard	Y	N	-	33.49	3.06	102.4	91,383	248,279	345	0.50	-	-	0%	-		-	-	-	-	-	345	0.50	0.25	0.09	102.4
1,504,104.3800	176	34.5295	Agricultural	Vineyard	Y	N	-	34.18	2.23	76.2	68,009	210,096	292	0.42	-	-	0%	-		-	-	-	-	-	292	0.42	0.21	0.07	76.2
1,570,771.7800	102	36.0600	Agricultural	Miscellaneous Field Crop	Y	N	-	35.70	1.89	67.3	60,091	279,666	388	0.56	-	-	0%	-		-	-	-	-	-	388	0.56	0.28	0.06	67.3
1,631,762.6900	119	37.4601	Agricultural	Orchard	Y	N	-	37.09	3.06	113.3	101,185	274,910	382	0.55	-	-	0%	-		-	-	-	-	-	382	0.55	0.27	0.10	113.3
1,660,853.7500	111	38.1280	Agricultural	Miscellaneous Field Crop	Y	N	-	37.75	1.89	71.2	63,537	295,705	411	0.59	-	-	0%	-		-	-	-	-	-	411	0.59	0.30	0.06	71.2
1,669,045.7500	117	38.3160	Agricultural	Vineyard	Y	N	-	37.93	2.23	84.5	75,467	233,135	324	0.47	-	-	0%	-		-	-	-	-	-	324	0.47	0.23	0.08	84.5
1,672,101.6200	130	38.3862	Agricultural	Vineyard	Y	N	-	38.00	2.23	84.7	75,605	233,562	324	0.47	-	-	0%	-		-	-	-	-	-	324	0.47	0.23	0.08	84.7
1,680,888.9700	66	38.5879	Agricultural	Miscellaneous Field Crop	Y	N	-	38.20	1.89	72.0	64,304	299,272	416	0.60	-	-	0%	-		-	-	-	-	-	416	0.60	0.30	0.06	72.0
1,685,889.7500	189	38.7027	Agricultural	Orchard	Y	N	-	38.32	3.06	117.1	104,541	284,029	394	0.57	-	-	0%	-		-	-	-	-	-	394	0.57	0.28	0.10	117.1
1,708,159.7500	167	39.2140	Agricultural	Miscellaneous Field Crop	Y	N	-	38.82	1.89	73.2	65,347	304,127	422	0.61	-	-	0%	-		-	-	-	-	-	422	0.61	0.30	0.07	73.2
1,708,720.8300	96	39.2268	Agricultural	Miscellaneous Field Crop	Y	N	-	38.83	1.89	73.2	65,368	304,227	423	0.61	-	-	0%	-		-	-	-	-	-	423	0.61	0.30	0.07	73.2
1,718,242.6300	97	39.4454	Agricultural	Vineyard	Y	N	-	39.05	2.23	87.0	77,691	240,007	333	0.48	-	-	0%	-		-	-	-	-	-	333	0.48	0.24	0.08	87.0
1,944,387.5600	132	44.6370	Agricultural	Orchard	Y	N	-	44.19	3.06	135.1	120,571	327,579	455	0.66	-	-	0%	-		-	-	-	-	-	455	0.66	0.33	0.12	135.1
2,075,912.5000	128	47.6564	Agricultural	Miscellaneous Field Crop	Y	N	-	47.18	1.89	89.0	79,416	369,603	513	0.74	-	-	0%	-		-	-	-	-	-	513	0.74	0.37	0.08	89.0
2,095,074.5700	137	48.0963	Agricultural	Vineyard	Y	N	-	47.62	2.23	106.1	94,730	292,644	406	0.59	-	-	0%	-		-	-	-	-	-	406	0.59	0.29	0.09	106.1
2,136,757.0900	143	49.0532	Agricultural	Vineyard	Y	N	-	48.56	2.23	108.2	96,614	298,466	415	0.60	-	-	0%	-		-	-	-	-	-	415	0.60	0.30	0.10	108.2
2,204,487.0600	155	50.6081	Agricultural	Vineyard	Y	N	-	50.10	2.23	111.7	99,677	307,926	428	0.62	-	-	0%	-		-	-	-	-	-	428	0.62	0.31	0.10	111.7
2,211,351.0600	112	50.7656	Agricultural	Vineyard	Y	N	-	50.26	2.23	112.0	99,987	308,885	429	0.62	-	-	0%	-		-	-	-	-	-	429	0.62	0.31	0.10	112.0
2,218,948.1300	165	50.9400	Agricultural	Miscellaneous Field Crop	Y	N	-	50.43	1.89	95.1	84,888	395,070	549	0.79	-	-	0%	-		-	-	-	-	-	549	0.79	0.40	0.08	95.1
2,231,585.8800	144	51.2302	Agricultural	Vineyard	Y	N	-	50.72	2.23	113.0	100,902	311,712	433	0.62	-	-	0%	-		-	-	-	-	-	433	0.62	0.31	0.10	113.0
2,278,917.7700	157	52.3168	Agricultural	Miscellaneous Field Crop	Y	N	-	51.79	1.89	97.7	87,182	405,747	564	0.81	-	-	0%	-		-	-	-	-	-	564	0.81	0.41	0.09	97.7
2,286,126.0000	104	52.4822	Agricultural	Miscellaneous Field Crop	Y	N	-	51.96	1.89	98.0	87,458	407,030	565	0.81	-	-	0%	-		-	-	-	-	-	565	0.81	0.41	0.09	98.0
2,327,879.4400	159	53.4408	Agricultural	Vineyard	Y	N	-	52.91	2.23	117.9	105,256	325,162	452	0.65	-	-	0%	-		-	-	-	-	-	452	0.65	0.33	0.11	117.9
2,476,379.6200	110	56.8499	Agricultural	Miscellaneous Field Crop	Y	N	-	56.28	1.89	106.1	94,736	440,904	612	0.88	-	-	0%	-		-	-	-	-	-	612	0.88	0.44	0.09	106.1
2,490,542.8100	181	57.1750	Agricultural	Vineyard	Y	N	-	56.60	2.23	126.1	112,611	347,883	483	0.70	-	-	0%	-		-	-	-	-	-	483	0.70	0.35	0.11	126.1
2,503,036.2500	121	57.4618	Agricultural	Miscellaneous Field Crop	Y	N	-	56.89	1.89	107.3	95,756	445,650	619	0.89	-	-	0%	-		-	-	-	-	-	619	0.89	0.45	0.10	107.3
2,514,012.0900	147	57.7138	Agricultural	Vineyard	Y	N	-	57.14	2.23	127.3	113,672	351,161	488	0.70	-	-	0%	-		-	-	-	-	-	488	0.70	0.35	0.11	127.3
2,526,234.6900	126	57.9944	Agricultural	Vineyard	Y	N	-	57.41	2.23	127.9	114,225	352,869	490	0.71	-	-	0%	-		-	-	-	-	-	490	0.71	0.35	0.11	127.9
2,716,040.8600	209	62.3517	Agricultural	Miscellaneous Field Crop	Y	N	-	61.73	1.89	116.4	103,904	483,574	672	0.97	-	-	0%	-		-	-	-	-	-	672	0.97	0.48	0.10	116.4
2,940,026.7100	210	67.4937	Agricultural	Miscellaneous Field Crop	Y	N	-	66.82	1.89	126.0	112,473	523,453	727	1.05	-	-	0%	-		-	-	-	-	-	727	1.05	0.52	0.11	126.0
3,083,549.3200	56	70.7886	Agricultural	Orchard	Y	N	-	70.08	3.06	214.2	191,210	519,499	722	1.04	-	-	0%	-		-	-	-	-	-	722	1.04	0.52	0.19	214.2
3,318,960.5700	138	76.1929	Agricultural	Vineyard	Y	N	-	75.43	2.23	168.1	150,068	463,598	644	0.93	-	-	0%	-		-	-	-	-	-	644	0.93	0.46	0.15	168.1
3,327,112.1200	129	76.3800	Agricultural	Vineyard	Y	N	-	75.62	2.23	168.5	150,437	464,737	645	0.93	-	-	0%	-		-	-	-	-	-	645	0.93	0.46	0.15	168.5
3,381,515.2600	139	77.6289	Agricultural	Vineyard	Y	N	-	76.85	2.23	171.3	152,897	472,336	656	0.94	-	-	0%	-		-	-	-	-	-	656	0.94	0.47	0.15	171.3
3,443,698.7600	141	79.0564	Agricultural	Vineyard	Y	N	-	78.27	2.23	174.4	155,708	481,022	668	0.96	-	-	0%	-		-	-	-	-	-	668	0.96	0.48	0.16	174.4
3,462,129.0800	140	79.4795	Agricultural	Vineyard	Y	N	-	78.68	2.23	175.3	156,542	483,596	672	0.97	-	-	0%	-		-	-	-	-	-	672	0.97	0.48	0.16	175.3
4,231,356.3400	72	97.1386	Agricultural	Vineyard	Y	N	-	96.17	2.23	214.3	191,323	591,043	821	1.18	-	-	0%	-		-	-	-	-	-	821	1.18	0.59	0.19	214.3
5,338,276.1900	109	122.5500	Agricultural	Miscellaneous Field Crop	Y	N	-	121.32	1.89	228.8	204,220	950,447	1,320	1.90	-	-	0%	-		-	-	-	-	-	1,320	1.90	0.95	0.20	228.8
5,958,399.1200	151	136.7860	Agricultural	Miscellaneous Field Crop	Y	N	-	135.42	1.89	255.3	227,943	1,060,856	1,473	2.12	-	-	0%	-		-	-	-	-	-	1,473	2.12	1.06	0.23	255.3
6,717,941.2100	71	154.2227	Agricultural	Miscellaneous Field Crop	Y	N	-	152.68	1.89	287.9	257,000	1,196,088	1,661	2.39	-	-	0%	-		-	-	-	-	-	1,661	2.39	1.20	0.26	287.9
9,746.7022	32	0.2238	Basin/Park	Candy Cane Park	Y	Y	1,081	0.19	3.38	0.6	1,081	4,322	6	0.01	-	-	0%	-		-	-	-	-	-	6	0.01	0.00	0.00	1.2
23,014.4218	24	0.5283	Basin/Park	Maple Square	Y	N	-	0.45	3.38	1.5	1,357	5,427	8	0.01	-	-	0%	-		-	-	-	-	-	8	0.01	0.01	0.00	1.5
42,529.5925	23	0.9763	Basin/Park	Van Buskirk Park	Y	Y	3,461	0.83	3.38	2.8	3,461	13,844	19	0.03	-	-	0%	-		-	-	-	-	-	19	0.03	0.01	0.00	3.9
80,272.4108	19	1.8428	Basin/Park	Emerson Park	Y	Y	6,212	1.57	3.38	5.3	6,212	24,846	35	0.05	-	-	0%	-		-	-	-	-	-	35	0.05	0.02	0.01	7.0
89,628.0977	43	2.0576	Basin/Park	Westside	N	N	-	1.75	3.38	5.9	5,284	21,136	29	0.04	-	-	0%	-		-	-	-	-	-	29	0.04	0.02	0.01	5.9
104,587.5640	25	2.4010	Basin/Park	Armory Park	Y	Y	4,871	2.04	3.38	6.9	4,871	19,484	27	0.04	-	-	0%	-		-	-	-	-	-	27	0.04	0.02	0.00	5.5
110,509.4850	27	2.5369	Basin/Park	Century Park	Y	N	-	2.16	3.38	7.3	6,515	26,060	36	0.05	-	-	0%	-		-	-	-	-	-	36	0.05	0.03	0.01	7.3
115,268.8010	22	2.6462	Basin/Park	Hale Park	Y	Y	5,845	2.25	3.38	7.6	5,845	23,381	32	0.05	-	-	0%	-		-	-	-	-	-	32	0.05	0.02	0.01	6.5
116,637.8420	3	2.6776	Basin/Park	Century Meadows Park	Y	N	-	2.28	3.38	7.7	6,876	27,505	38	0.06	-	-	0%	-		-	-	-	-	-	38	0.06	0.03	0.01	7.7
132,947.3470	339	3.0521	Basin/Park	Southwest Gateway	Y	N	-	2.59	3.38	8.8	7,838	31,351	44	0.06	-	-	0%	-		-	-	-	-	-	44	0.06	0.03	0.01	8.8
136,250.6570	48	3.1279	Basin/Park	Southwest Gateway	N	N	-	2.66	3.38	9.0	8,033	32,130	45	0.06	-	-	0%	-		-	-	-	-	-	45	0.06	0.03	0.01	9.0
164,375.4660	33	3.7735	Basin/Park	English Oaks Park	Y	Y	9,156	3.21	3.38	10.9	9,156	36,624	51	0.07	-	-	0%	-		-	-	-	-	-	51	0.07	0.04	0.01	10.3
209,237.2610	4	4.8034	Basin/Park	Katzakian Park	Y	Y	16,807	4.08	3.38	13.8	16,807	67,229	93	0.13	-	-	0%	-		-	-	-	-	-	93	0.13	0.07	0.02	18.8
235,614.6090	49	5.4090	Basin/Park	Reynolds Ranch	N	N	-	4.60	3.38	15.6	13,891	55,562	77	0.11	-	-	0%	-		-	-	-	-	-	77	0.11	0.06	0.01	15.6
242,724.7270	50	5.5722	Basin/Park	Reynolds Ranch	N	N	-	4.74	3.38	16.0	14,310	57,239	79	0.11	-	-	0%	-		-	-	-	-	-	79	0.11	0.06	0.01	16.0
242,857.1020	30	5.5752	Basin/Park	Legion Park	Y	Y	9,533	4.74	3.38	16.0	9,533	38,133	53	0.08	-	-	0%	-		-	-	-	-	-	53	0.08	0.04	0.01	10.7
243,878.7730	42	5.5987	Basin/Park	Westside	N	N	-	4.76	3.38	16.1	14,378	57,511	80	0.12	-	-	0%	-		-	-	-	-	-	80	0.12	0.06	0.01	16.1
259,697.2170	46	5.9618	Basin/Park	Southwest Gateway	N	N	-	5.07	3.38	17.1	15,310	61,241	85	0.12	-	-	0%	-		-	-	-	-	-	85	0.12	0.06	0.02	17.1
265,195.4470	47	6.0880	Basin/Park	Southwest Gateway	N	N	-	5.17	3.38	17.5	15,634	62,538	87	0.13	-	-	0%	-		-	-	-	-	-	87	0.13	0.06	0.02	17.5
309,115.4230	21	7.0963	Basin/Park	Softball Complex	Y	Y	22,462	6.03	3.38	20.4	22,462	89,848	125	0.18	-	-	0%	-		-	-	-	-	-	125	0.18	0.09	0.02	25.2
350,366.5820	2	8.0433	Basin/Park	Roget Park	Y	N	-	6.84	3.38	23.1	20,656	82,623	115	0.17	-	-	0%	-		-	-	-	-	-	115	0.17	0.08	0.02	23.1
366,367.5340	29	8.4106	Basin/Park	John Blakely Park	Y	Y	17,520	7.15	3.38	24.2	17,520	70,079	97	0.14	-	-	0%	-		-	-	-	-	-	97	0.14	0.07	0.02	19.6
404,298.9410	26	9.2814	Basin/Park	Lawrence Park	Y	Y	12,258	7.89	3.38	26.7	12,258	49,032	68	0.10	-	-	0%	-		-	-	-	-	-	68	0.10	0.05	0.01	13.7
431,784.3780	31	9.9124	Basin/Park	Hutchins Street Square	Y	N	-	8.43	3.38	28.5	25,456	101,822	141	0.20	-	-	0%	-		-	-	-	-	-	141	0.20	0.10	0.03	28.5
489,573.0300	224	11.2391	Basin/Park	Grape Bowl	Y	Y	2,521	9.55	3.38	32.3	2,521	10,084	14	0.02	-	-	0%	-		-	-	-	-	-	14	0.02	0.01	0.00	2.8
499,886.3460	44	11.4758	Basin/Park	Westside	N	N	-	9.75	3.38	33.0	29,470	117,882	164	0.24	-	-	0%	-		-	-	-	-	-	164	0.24	0.12	0.03	33.0
524,622.9640	38	12.0437	Basin/Park	Vinewood Park	Y	Y	30,566	10.24	3.38	34.6	30,566	122,262	170	0.24	-	-	0%	-		-	-	-	-	-	170	0.24	0.12	0.03	34.2
561,766.6760	34	12.8964	Basin/Park	Kofu Park	Y	N	-	10.96	3.38	37.1	33,119	132,474	184	0.26	-	-	0%	-		-	-	-	-	-	184	0.26	0.13	0.03	37.1
572,823.3460	36	13.1502	Basin/Park	Henry Glaves Park	Y	N	-	11.18	3.38	37.8	33,770	135,082	188	0.27	-	-	0%	-		-	-	-	-	-	188	0.27	0.14	0.03	37.8
599,861.3930	45	13.7709	Basin/Park	Southwest Gateway	N	N	-	11.71	3.38	39.6	35,364	141,458	196	0.28	-	-	0%	-		-	-	-	-	-	196	0.28	0.14	0.04	39.6
602,726.0410	35	13.8367	Basin/Park	Beckman Park	Y	N	-	11.76	3.38	39.8	35,533	142,133	197	0.28	-	-	0%	-		-	-	-	-	-	197	0.28	0.14	0.04	39.8
906,711.0810	37	20.8152	Basin/Park	Peterson Park	Y	Y	62,370	17.69	3.38	59.9	62,370	249,479	346	0.50	-	-	0%	-		-	-	-	-	-	346	0.50	0.25	0.08	69.9

Attachment B

Table B-1

						Water Meter Information	Irrigation Demand								WUF-Based Irrigation and Non-Irrigation Demand										Total Demand				
Area	Potential User ID	Acres	Category	Name	Existing?	Water Meter Data?	Metered Average Day Demand	Irrigable Area	Unit Irrigation Demand	Irrigation Demand	Average Day Demand	Peak Day Demand	Peak Hour Demand		WUF	Unadjusted Average Day Demand	K_{WUF}	Adjust Average Day Demand	Additional Demand	Total Average Day Demand	Annual Demand	Peak Day Demand	Peak Hour Demand		Total Peak Hour Demand		Total Peak Day Demand	Total Average Annual Demand	
(sq. ft.)					(Y/N)	(Y/N)	(gpd)	(acres)	(AFY/acre)	(AFY)	(gpd)	(gpd)	(gpm)	(mgd)	(gpd/acre)	(gpd)	(%)	(gpd)	(gpd)	(gpd)	(afy)	(gpd)	(gpm)	(mgd)	(gpm)	(mgd)	(mgd)	(mgd)	(afy)
908,501.0010	28	20.8563	Basin/Park	Samuel D. Salas Park	Y	N	-	17.73	3.38	60.0	53,560	214,241	298	0.43	-	-	0%	-		-	-	-	-	-	298	0.43	0.21	0.05	60.0
1,155,884.0700	20	26.5354	Basin/Park	Pixley Park	Y	Y	22	22.56	3.38	76.3	22	89	0	0.00	-	-	0%	-		-	-	-	-	-	0	0.00	0.00	0.00	0.0
1,776,487.6400	223	40.7825	Basin/Park	Lodi Lake Park & Wilderness Area	Y	Y	32,108	34.67	3.38	117.3	32,108	128,430	178	0.26	-	-	0%	-		-	-	-	-	-	178	0.26	0.13	0.03	36.0
1,985,986.8000	6	45.5920	Basin/Park	DeBenedetti Park	N	N	-	38.75	3.38	131.1	117,083	468,331	650	0.94	-	-	0%	-		-	-	-	-	-	650	0.94	0.47	0.12	131.1
861,768.5620	226	19.7835	Cemetery	Lodi Memorial Cemetery	Y	N	-	16.82	3.38	56.9	50,805	118,953	165	0.24	-	-	0%	-		-	-	-	-	-	165	0.24	0.12	0.05	56.9
1,569,256.5100	227	36.0252	Cemetery	Cherokee Memorial Park	Y	N	-	30.62	3.38	103.6	92,515	216,610	301	0.43	-	-	0%	-		-	-	-	-	-	301	0.43	0.22	0.09	103.6
416,103.0130	349	9.5524	Church	St. John's Episcopal	Y	N		3.82	3.38	12.9	11,544	27,029	56	0.08	-	-	0%	-		-	-	-	-	-	56	0.08	0.03	0.01	12.9
38,478.1420	305	0.8833	Commercial	C-S	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	2,429	5%	121		121	0.1	284	0.4	0.00	0.4	0.0006	0.0003	0.0001	0.1
41,253.2481	229	0.9470	Commercial	C-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	2,604	5%	130		130	0.1	305	0.4	0.00	0.4	0.0006	0.0003	0.0001	0.1
51,867.4731	304	1.1907	Commercial	C-S	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	3,274	5%	164		164	0.2	383	0.5	0.00	0.5	0.0008	0.0004	0.0002	0.2
56,490.3797	302	1.2968	Commercial	C-S	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	3,566	5%	178		178	0.2	418	0.6	0.00	0.6	0.0008	0.0004	0.0002	0.2
75,932.5301	303	1.7432	Commercial	C-S	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	4,794	5%	240		240	0.3	561	0.8	0.00	0.8	0.0011	0.0006	0.0002	0.3
83,280.5625	306	1.9119	Commercial	C-S	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	5,258	5%	263		263	0.3	615	0.9	0.00	0.9	0.0012	0.0006	0.0003	0.3
83,471.5565	294	1.9162	Commercial	C-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	5,270	5%	263		263	0.3	617	0.9	0.00	0.9	0.0012	0.0006	0.0003	0.3
87,316.7746	307	2.0045	Commercial	C-S	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	5,512	5%	276		276	0.3	645	0.9	0.00	0.9	0.0013	0.0006	0.0003	0.3
303,373.5130	300	6.9645	Commercial	C-S	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	19,152	5%	958		958	1.1	2,242	3.1	0.00	3.1	0.0045	0.0022	0.0010	1.1
357,422.6900	301	8.2053	Commercial	C-S	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	22,565	5%	1,128		1,128	1.3	2,642	3.7	0.01	3.7	0.0053	0.0026	0.0011	1.3
510,374.6880	308	11.7166	Commercial	C-S	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	32,221	5%	1,611		1,611	1.8	3,772	5.2	0.01	5.2	0.0075	0.0038	0.0016	1.8
582,061.4050	40	13.3623	Commercial	Mainland Nursery	Y	N	-	10.02	3.38	33.9	30,278	70,892	148	0.21	-	-	0%	-		-	-	-	-	-	148	0.21	0.07	0.03	33.9
796,466.3460	299	18.2844	Commercial	C-S	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	50,282	5%	2,514		2,514	2.8	5,886	8.2	0.01	8.2	0.0118	0.0059	0.0025	2.8
978,659.3510	220	22.4669	Commercial	Blue Shield Call Center	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	61,784	5%	3,089		3,089	3.5	7,233	10.0	0.01	10	0.01	0.01	0.00	3.5
2,023,331.2600	346	46.4493	Commercial	Reynolds Ranch	N	N	-	-	3.38	0.0	-	-	-	0.00	2,750	127,736	5%	6,387		6,387	7.2	14,954	20.8	0.03	21	0.0299	0.0150	0.01	7.2
5,211.3929	320	0.1196	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	263	5%	13		13	0.0	31	0.0	0.00	0	0.00	0.00	0.00	0.0
6,955.2392	321	0.1597	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	351	5%	18		18	0.0	41	0.1	0.00	0	0.00	0.00	0.00	0.0
7,431.5183	318	0.1706	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	375	5%	19		19	0.0	44	0.1	0.00	0	0.00	0.00	0.00	0.0
7,584.7635	317	0.1741	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	383	5%	19		19	0.0	45	0.1	0.00	0	0.00	0.00	0.00	0.0
8,194.0867	319	0.1881	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	414	5%	21		21	0.0	48	0.1	0.00	0	0.00	0.00	0.00	0.0
12,674.2294	316	0.2910	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	640	5%	32		32	0.0	75	0.1	0.00	0	0.00	0.00	0.00	0.0
17,111.1053	256	0.3928	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	864	5%	43		43	0.0	101	0.1	0.00	0	0.00	0.00	0.00	0.0
20,961.5175	249	0.4812	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,059	5%	53		53	0.1	124	0.2	0.00	0	0.00	0.00	0.00	0.1
20,996.7489	279	0.4820	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,060	5%	53		53	0.1	124	0.2	0.00	0	0.00	0.00	0.00	0.1
20,996.7489	280	0.4820	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,060	5%	53		53	0.1	124	0.2	0.00	0	0.00	0.00	0.00	0.1
21,675.9253	237	0.4976	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,095	5%	55		55	0.1	128	0.2	0.00	0	0.00	0.00	0.00	0.1
21,681.8384	282	0.4977	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,095	5%	55		55	0.1	128	0.2	0.00	0	0.00	0.00	0.00	0.1
21,739.6040	257	0.4991	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,098	5%	55		55	0.1	129	0.2	0.00	0	0.00	0.00	0.00	0.1
21,797.4914	281	0.5004	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,101	5%	55		55	0.1	129	0.2	0.00	0	0.00	0.00	0.00	0.1
22,285.9902	315	0.5116	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,126	5%	56		56	0.1	132	0.2	0.00	0	0.00	0.00	0.00	0.1
22,784.4720	285	0.5231	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,151	5%	58		58	0.1	135	0.2	0.00	0	0.00	0.00	0.00	0.1
22,820.7382	288	0.5239	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,153	5%	58		58	0.1	135	0.2	0.00	0	0.00	0.00	0.00	0.1
22,889.2711	286	0.5255	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,156	5%	58		58	0.1	135	0.2	0.00	0	0.00	0.00	0.00	0.1
22,956.1723	290	0.5270	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,159	5%	58		58	0.1	136	0.2	0.00	0	0.00	0.00	0.00	0.1
23,192.1081	239	0.5324	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,171	5%	59		59	0.1	137	0.2	0.00	0	0.00	0.00	0.00	0.1
23,923.6956	287	0.5492	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,208	5%	60		60	0.1	141	0.2	0.00	0	0.00	0.00	0.00	0.1
23,923.6956	289	0.5492	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,208	5%	60		60	0.1	141	0.2	0.00	0	0.00	0.00	0.00	0.1
24,815.0599	241	0.5697	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,253	5%	63		63	0.1	147	0.2	0.00	0	0.00	0.00	0.00	0.1
24,838.2345	247	0.5702	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,254	5%	63		63	0.1	147	0.2	0.00	0	0.00	0.00	0.00	0.1
24,907.2573	248	0.5718	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,258	5%	63		63	0.1	147	0.2	0.00	0	0.00	0.00	0.00	0.1
24,914.4478	238	0.5720	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,258	5%	63		63	0.1	147	0.2	0.00	0	0.00	0.00	0.00	0.1
25,235.8259	283	0.5793	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,275	5%	64		64	0.1	149	0.2	0.00	0	0.00	0.00	0.00	0.1
25,676.9179	235	0.5895	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,297	5%	65		65	0.1	152	0.2	0.00	0	0.00	0.00	0.00	0.1
25,872.5335	284	0.5940	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,307	5%	65		65	0.1	153	0.2	0.00	0	0.00	0.00	0.00	0.1
26,392.5485	246	0.6059	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,333	5%	67		67	0.1	156	0.2	0.00	0	0.00	0.00	0.00	0.1
26,934.9311	296	0.6183	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,360	5%	68		68	0.1	159	0.2	0.00	0	0.00	0.00	0.00	0.1
31,789.2940	240	0.7298	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,606	5%	80		80	0.1	188	0.3	0.00	0	0.00	0.00	0.00	0.1
32,006.9713	260	0.7348	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,617	5%	81		81	0.1	189	0.3	0.00	0	0.00	0.00	0.00	0.1
32,999.7278	262	0.7576	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,667	5%	83		83	0.1	195	0.3	0.00	0	0.00	0.00	0.00	0.1
33,704.9419	258	0.7738	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,702	5%	85		85	0.1	199	0.3	0.00	0	0.00	0.00	0.00	0.1
34,360.3303	236	0.7888	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,735	5%	87		87	0.1	203	0.3	0.00	0	0.00	0.00	0.00	0.1
35,409.5841	293	0.8129	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,788	5%	89		89	0.1	209	0.3	0.00	0	0.00	0.00	0.00	0.1
37,551.2170	259	0.8621	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,897	5%	95		95	0.1	222	0.3	0.00	0	0.00	0.00	0.00	0.1
38,219.4708	264	0.8774	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	1,930	5%	97		97	0.1	226	0.3	0.00	0	0.00	0.00	0.00	0.1
41,448.5448	295	0.9515	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	2,093	5%	105		105	0.1	245	0.3	0.00	0	0.00	0.00	0.00	0.1
41,651.2402	265	0.9562	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	2,104	5%	105		105	0.1	246	0.3	0.00	0	0.00	0.00	0.00	0.1
43,059.3355	266	0.9885	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	2,175	5%	109		109	0.1	255	0.4	0.00	0	0.00	0.00	0.00	0.1
61,446.8742	261	1.4106	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	3,103	5%	155		155	0.2	363	0.5	0.00	1	0.00	0.00	0.00	0.2
77,808.8213	278	1.7862	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	3,930	5%	196		196	0.2	460	0.6	0.00	1	0.00	0.00	0.00	0.2
83,449.0660	250	1.9157	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	4,215	5%	211		211	0.2	493	0.7	0.00	1	0.00	0.00	0.00	0.2
89,736.7388	292	2.0601	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	4,532	5%	227		227	0.3	531	0.7	0.00	1	0.00	0.00	0.00	0.3
99,918.2659	221	2.2938	Industrial	Potential NCPA Plant	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	5,046	5%	252	1,700,000	1,700,252	1,904.5	2,500,000	1,736.1	2.50	1,736	2.50	2.50	1.36	1,523.6
104,861.2700	242	2.4073	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	5,296	5%	265		265	0.3	620	0.9	0.00	1	0.00	0.00	0.00	0.3
130,551.5800	263	2.9971	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	6,594	5%	330		330	0.4	772	1.1	0.00	1	0.00	0.00	0.00	0.4
135,378.5790	272	3.1079	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	6,837	5%	342		342	0.4	800	1.1	0.00	1	0.00	0.00	0.00	0.4
147,318.5210	54	3.3820	Industrial	NCPA Power Plant	Y	N	-	-	3.38	0.0	-	-	-	0.00	2,200	7,440	5%	372	500,000	500,372	560.5	-	-	-	-	-	-	0.07	76.7
164,617.4880	251	3.7791	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	8,314	5%	416		416	0.5	973	1.4	0.00	1	0.00	0.00	0.00	0.5
179,085.6190	252	4.1112	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	9,045	5%	452		452	0.5	1,059	1.5	0.00	1	0.00	0.00	0.00	0.5
184,480.0740	271	4.2351	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	9,317	5%	466		466	0.5	1,091	1.5	0.00	2	0.00	0.00	0.00	0.5
200,881.1430	244	4.6116	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	10,146	5%	507		507	0.6	1,188	1.6	0.00	2	0.00	0.00	0.00	0.6
203,548.1230	243	4.6728	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	10,280	5%	514		514	0.6	1,203	1.7	0.00	2	0.00	0.00	0.00	0.6
204,823.9120	245	4.7021	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	10,345	5%	517		517	0.6	1,211	1.7	0.00	2	0.00	0.00	0.00	0.6
207,908.8320	231	4.7729	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	10,500	5%	525		525	0.6	1,229	1.7	0.00	2	0.00	0.00	0.00	0.6
211,163.4680	254	4.8476	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	10,665	5%	533		533	0.6	1,249	1.7	0.00	2	0.00	0.00	0.00	0.6
215,944.5330	277	4.9574	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	10,906	5%	545		545	0.6	1,277	1.8	0.00	2	0.00	0.00	0.00	0.6
216,741.8750	270	4.9757	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	10,947	5%	547		547	0.6	1,281	1.8	0.00	2	0.00	0.00	0.00	0.6
223,766.6580	234	5.1370	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	11,301	5%	565		565	0.6	1,323	1.8	0.00	2	0.00	0.00	0.00	0.6
313,277.2070	233	7.1919	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	15,822	5%	791		791	0.9	1,852	2.6	0.00	3	0.00	0.00	0.00	0.9
329,406.0310	232	7.5621	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	16,637	5%	832		832	0.9	1,948	2.7	0.00	3	0.00	0.00	0.00	0.9
339,107.9480	275	7.7848	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	17,127	5%	856		856	1.0	2,005	2.8	0.00	3	0.00	0.00	0.00	1.0
374,494.2500	228	8.5972	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	18,914	5%	946		946	1.1	2,214	3.1	0.00	3	0.00	0.00	0.00	1.1
399,239.8320	55	9.1653	Industrial	SJCV & MCD Fish Rearing Ponds	Y	N	-	-	3.38	0.0	-	-	-	0.00	2,200	20,164	5%	1,008	126,027	127,036	142.3	600,000	833.3	1.20	833	1.20	0.60	0.13	142.3
399,934.3740	255	9.1812	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	20,199	5%	1,010		1,010	1.1	2,365	3.3	0.00	3	0.00	0.00	0.00	1.1
423,346.0270	268	9.7187	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	21,381	5%	1,069		1,069	1.2	2,503	3.5	0.01	3	0.01	0.00	0.00	1.2
435,684.9720	267	10.0020	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	22,004	5%	1,100		1,100	1.2	2,576	3.6	0.01	4	0.01	0.00	0.00	1.2
465,320.9660	276	10.6823	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	23,501	5%	1,175		1,175	1.3	2,751	3.8	0.01	4	0.01	0.00	0.00	1.3
558,413.5400	269	12.8194	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	28,203	5%	1,410		1,410	1.6	3,302	4.6	0.01	5	0.01	0.00	0.00	1.6
617,612.2280	253	14.1784	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	31,193	5%	1,560		1,560	1.7	3,652	5.1	0.01	5	0.01	0.00	0.00	1.7
633,927.8840	230	14.5530	Industrial	M-2	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	32,017	5%	1,601		1,601	1.8	3,748	5.2	0.01	5	0.01	0.00	0.00	1.8
743,726.4470	274	17.0736	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	37,562	5%	1,878		1,878	2.1	4,397	6.1	0.01	6	0.01	0.00	0.00	2.1
807,304.7920	222	18.5332	Industrial	Certainteed	Y	N	-	-	3.38	0.0	-	-	-	0.00	2,200	40,773	5%	2,039	-	2,039	2.3	4,773	6.6	0.01	7	0.01	0.00	0.00	2.3

Attachment B

Table B-1

						Water Meter Information	Irrigation Demand								WUF-Based Irrigation and Non-Irrigation Demand										Total Demand				
Area	Potential User ID	Acres	Category	Name	Existing?	Water Meter Data?	Metered Average Day Demand	Irrigable Area	Unit Irrigation Demand	Irrigation Demand	Average Day Demand	Peak Day Demand	Peak Hour Demand		WUF	Unadjusted Average Day Demand	K_{WUF}	Adjust Average Day Demand	Additional Demand	Total Average Day Demand	Annual Demand	Peak Day Demand	Peak Hour Demand		Total Peak Hour Demand		Total Peak Day Demand	Total Average Annual Demand	
(sq. ft.)					(Y/N)	(Y/N)	(gpd)	(acres)	(AFY/acre)	(AFY)	(gpd)	(gpd)	(gpm)	(mgd)	(gpd/acre)	(gpd)	(%)	(gpd)	(gpd)	(gpd)	(afy)	(gpd)	(gpm)	(mgd)	(gpm)	(mgd)	(mgd)	(mgd)	(afy)
882,367.2530	273	20.2564	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	44,564	5%	2,228		2,228	2.5	5,217	7.2	0.01	7	0.01	0.01	0.00	2.5
1,007,422.0200	291	23.1272	Industrial	M-1	N	N	-	-	3.38	0.0	-	-	-	0.00	2,200	50,880	5%	2,544		2,544	2.8	5,956	8.3	0.01	8	0.01	0.01	0.00	2.8
774,683.4310	347	17.7843	Lake	Mallard Lake	Y	N	-	-	-	0.0	-	-	-	0.00	-	-	0%	-	62,533	62,533	70.0	146,413	203.4	0.29	203	0.29	0.15	0.06	70.0
41,250.1012	355	0.9470	Median Strip	Westgate Dr	N	N	-	0.95	3.38	3.2	2,861	6,699	9	0.01	-	-	0%	-		-	-	-	-	-	9	0.01	0.01	0.00	3.2
61,663.2432	353	1.4156	Median Strip	Westgate Dr	N	N	-	1.42	3.38	4.8	4,277	10,014	14	0.02	-	-	0%	-		-	-	-	-	-	14	0.02	0.01	0.00	4.8
76,932.9051	1	1.7661	Median Strip	Hwy. 99	Y	Y	4,609	1.77	3.38	6.0	4,609	10,791	15	0.02	-	-	0%	-		-	-	-	-	-	15	0.02	0.01	0.00	5.2
78,720.4552	354	1.8072	Median Strip	Westgate Dr	N	N	-	1.81	3.38	6.1	5,460	12,784	18	0.03	-	-	0%	-		-	-	-	-	-	18	0.03	0.01	0.01	6.1
109,748.8030	352	2.5195	Median Strip	Century Blvd	N	N	-	2.52	3.38	8.5	7,612	17,822	25	0.04	-	-	0%	-		-	-	-	-	-	25	0.04	0.02	0.01	8.5
205,382.5460	351	4.7149	Median Strip	Hwy. 99	Y	Y	1,650	4.71	3.38	16.0	1,650	3,863	5	0.01	-	-	0%	-		-	-	-	-	-	5	0.01	0.00	0.00	1.8
212,222.6040	0	4.8720	Median Strip	Hwy. 99	Y	Y	1,077	4.87	3.38	16.5	1,077	2,522	4	0.01	-	-	0%	-		-	-	-	-	-	4	0.01	0.00	0.00	1.2
74,500.3482	297	1.7103	Residential	R-LD	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	11,942	0%	-		-	-	-	-	-	-	-	-	-	-
76,880.2489	310	1.7649	Residential	R-2	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	12,324	0%	-		-	-	-	-	-	-	-	-	-	-
80,629.0907	298	1.8510	Residential	R-LD	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	12,925	0%	-		-	-	-	-	-	-	-	-	-	-
80,924.7396	343	1.8578	Residential	HDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	12,972	0%	-		-	-	-	-	-	-	-	-	-	-
96,205.2372	309	2.2086	Residential	R-2	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	15,421	0%	-		-	-	-	-	-	-	-	-	-	-
164,030.7330	311	3.7656	Residential	R-2	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	26,293	0%	-		-	-	-	-	-	-	-	-	-	-
220,684.3120	332	5.0662	Residential	LDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	35,375	0%	-		-	-	-	-	-	-	-	-	-	-
229,698.7760	312	5.2732	Residential	R-2	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	36,820	0%	-		-	-	-	-	-	-	-	-	-	-
277,495.3060	225	6.3704	Residential	R-MD	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	44,481	0%	-		-	-	-	-	-	-	-	-	-	-
294,440.4570	334	6.7594	Residential	MDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	47,198	0%	-		-	-	-	-	-	-	-	-	-	-
343,913.5330	329	7.8952	Residential	LDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	55,128	0%	-		-	-	-	-	-	-	-	-	-	-
366,186.8600	325	8.4065	Residential	MDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	58,698	0%	-		-	-	-	-	-	-	-	-	-	-
370,293.1670	313	8.5008	Residential	R-1	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	59,357	0%	-		-	-	-	-	-	-	-	-	-	-
374,866.4390	327	8.6057	Residential	HDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	60,090	0%	-		-	-	-	-	-	-	-	-	-	-
397,800.5220	314	9.1322	Residential	R-1 (plus R-C-P and C-S)	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	63,766	0%	-		-	-	-	-	-	-	-	-	-	-
420,121.4290	338	9.6447	Residential	HDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	67,344	0%	-		-	-	-	-	-	-	-	-	-	-
442,310.3970	324	10.1540	Residential	HDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	70,901	0%	-		-	-	-	-	-	-	-	-	-	-
479,619.9630	328	11.0106	Residential	MDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	76,881	0%	-		-	-	-	-	-	-	-	-	-	-
517,248.8900	331	11.8744	Residential	LDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	82,913	0%	-		-	-	-	-	-	-	-	-	-	-
596,166.2390	344	13.6861	Residential	HDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	95,563	0%	-		-	-	-	-	-	-	-	-	-	-
639,710.0730	333	14.6857	Residential	LDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	102,543	0%	-		-	-	-	-	-	-	-	-	-	-
640,199.5600	341	14.6970	Residential	MDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	102,622	0%	-		-	-	-	-	-	-	-	-	-	-
648,617.7420	342	14.8902	Residential	MDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	103,971	0%	-		-	-	-	-	-	-	-	-	-	-
750,563.3590	336	17.2306	Residential	LDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	120,312	0%	-		-	-	-	-	-	-	-	-	-	-
811,034.7220	335	18.6188	Residential	MDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	130,006	0%	-		-	-	-	-	-	-	-	-	-	-
951,590.4930	326	21.8455	Residential	MDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	152,536	0%	-		-	-	-	-	-	-	-	-	-	-
1,021,676.1700	337	23.4545	Residential	LDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	163,771	0%	-		-	-	-	-	-	-	-	-	-	-
1,106,731.5500	345	25.4071	Residential	LDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	177,405	0%	-		-	-	-	-	-	-	-	-	-	-
1,254,728.2600	323	28.8046	Residential	LDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	201,128	0%	-		-	-	-	-	-	-	-	-	-	-
1,757,410.3400	340	40.3446	Residential	MDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	281,706	0%	-		-	-	-	-	-	-	-	-	-	-
1,907,334.1500	322	43.7864	Residential	LDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	305,738	0%	-		-	-	-	-	-	-	-	-	-	-
3,066,679.8500	330	70.4013	Residential	LDR	N	N	-	-	3.38	0.0	-	-	-	0.00	6,983	491,577	0%	-		-	-	-	-	-	-	-	-	-	-
71,944.7415	9	1.6516	School	St. Anne's School (private)	Y	N	-	0.66	3.38	2.2	1,996	4,673	10	0.01	-	-	0%	-		-	-	-	-	-	10	0.01	0.00	0.00	2.2
225,688.3490	8	5.1811	School	Heritage Primary Elementary School	Y	Y	6,072	2.07	3.38	7.0	6,072	14,217	30	0.04	-	-	0%	-		-	-	-	-	-	30	0.04	0.01	0.01	6.8
307,466.7010	15	7.0585	School	Needham Elementary School	Y	Y	7,493	2.82	3.38	9.6	7,493	17,543	37	0.05	-	-	0%	-		-	-	-	-	-	37	0.05	0.02	0.01	8.4
342,777.1870	18	7.8691	School	Vinewood Elementary School	Y	Y	10,980	3.15	3.38	10.7	10,980	25,708	54	0.08	-	-	0%	-		-	-	-	-	-	54	0.08	0.03	0.01	12.3
387,454.8890	17	8.8947	School	Erma B. Reese Elementary School	Y	Y	8,300	3.56	3.38	12.0	8,300	19,434	40	0.06	-	-	0%	-		-	-	-	-	-	40	0.06	0.02	0.01	9.3
415,510.6610	7	9.5388	School	Lakewood Elementary School	Y	Y	9,950	3.82	3.38	12.9	9,950	23,297	49	0.07	-	-	0%	-		-	-	-	-	-	49	0.07	0.02	0.01	11.1
448,219.7400	10	10.2897	School	Lawrence Elementary School	Y	Y	2,334	4.12	3.38	13.9	2,334	5,464	11	0.02	-	-	0%	-		-	-	-	-	-	11	0.02	0.01	0.00	2.6
487,322.0510	53	11.1874	School	Westside	N	N	-	4.47	3.38	15.1	13,520	31,655	66	0.09	-	-	0%	-		-	-	-	-	-	66	0.09	0.03	0.01	15.1
501,136.3010	13	11.5045	School	George Washington Elementary School	Y	Y	13,339	4.60	3.38	15.6	13,339	31,231	65	0.09	-	-	0%	-		-	-	-	-	-	65	0.09	0.03	0.01	14.9
503,134.8020	39	11.5504	School	Lois E. Borchardt Elementary School	Y	N	-	4.62	3.38	15.6	13,959	32,682	68	0.10	-	-	0%	-		-	-	-	-	-	68	0.10	0.03	0.01	15.6
511,716.4990	16	11.7474	School	Woodbridge Elementary School	Y	Y	2,489	4.70	3.38	15.9	2,489	5,827	12	0.02	-	-	0%	-		-	-	-	-	-	12	0.02	0.01	0.00	2.8
553,957.5460	356	12.7171	School	Larson School	Y	N		5.09	3.38	17.2	15,369	35,983	75	0.11	-	-	0%	-		-	-	-	-	-	75	0.11	0.04	0.02	17.2
562,434.9140	51	12.9117	School	Reynolds Ranch	N	N	-	5.16	3.38	17.5	15,604	36,534	76	0.11	-	-	0%	-		-	-	-	-	-	76	0.11	0.04	0.02	17.5
567,737.0760	5	13.0334	School	Millswood School	Y	Y	13,861	5.21	3.38	17.6	13,861	32,454	68	0.10	-	-	0%	-		-	-	-	-	-	68	0.10	0.03	0.01	15.5
571,736.6400	52	13.1253	School	Southwest Gateway	N	N	-	5.25	3.38	17.8	15,862	37,138	77	0.11	-	-	0%	-		-	-	-	-	-	77	0.11	0.04	0.02	17.8
849,060.4120	11	19.4917	School	Lodi Middle School	Y	Y	30,054	7.80	3.38	26.4	30,054	70,368	147	0.21	-	-	0%	-		-	-	-	-	-	147	0.21	0.07	0.03	33.7
1,143,206.0600	348	26.2444	School	Jim Elliot School	Y	N	-	10.50	3.38	35.5	31,716	74,259	155	0.22	-	-	0%	-		-	-	-	-	-	155	0.22	0.07	0.03	35.5
1,445,331.6400	350	33.1802	School	Lodi Academy	Y	N	-	13.27	3.38	44.9	40,098	93,884	196	0.28	-	-	0%	-		-	-	-	-	-	196	0.28	0.09	0.04	44.9
1,924,061.0000	12	44.1704	School	Lodi High School	Y	Y	8,651	17.67	3.38	59.8	8,651	20,256	42	0.06	-	-	0%	-		-	-	-	-	-	42	0.06	0.02	0.01	9.7
2,058,444.4400	14	47.2554	School	Tokay High School	Y	Y	67,063	18.90	3.38	64.0	67,063	157,018	327	0.47	-	-	0%	-		-	-	-	-	-	327	0.47	0.16	0.07	75.1
		5,887 acres						**4,674 acres**		**10,843 afy**	**9,426,300 gpd**	**33,652,174 gpd**	**47,342 gpm**	**68.17 mgd**		**4,277,951 gpd**		**49,912 gpd**	**2,388,561 gpd**	**2,438,473 gpd**	**2,731 afy**	**3,359,453 gpd**	**2,930 gpm**	**4.22 mgd**	**50,271 gpm**	**72.39 mgd**	**37.01 mgd**	**11.09 mgd**	**12,426 afy**

Attachment C: Supplemental Demand Estimate Methodology Information

Attachment C

Table C-1

Water Meter Data

Category	Acct#	Meter #	Annual Water Use (gal) 2006	2005	2004	2003	2002
Existing Parks							
Blakely Park	3987	12085195	6,919,000	6,821,760	6,892,820	5,572,600	7,450,080
Candy Cane Park	3900	3211812	445,060	552,772	404,668	262,548	410,652
Emerson Park	3902	3167720	2,398,836	2,502,060	2,484,108	2,157,232	2,390,608
English Oaks Common	3947	2163311	4,128,960	2,962,080	3,594,140	3,425,840	3,478,200
Hale Park	3926	10763073	2,241,008	2,153,492	2,256,716	1,906,652	2,671,108
Katzakian Park	39856	12951612	6,518,820	5,647,400	6,152,300	5,684,800	8,284,100
Lawrence Park	3922	3239416	160,820	131,648	155,584	116,688	92,752
	4022	1219452	4,108,614	4,302,870	5,194,112	4,141,227	5,143,772
		Total	4,269,434	4,434,518	5,349,696	4,257,915	5,236,524
Legion Park	3912	2514264	3,491,664	3,556,740	4,051,168	3,559,732	3,654,728
Van Buskirk Park	3962	3213267	1,238,688	1,608,200	1,345,652	1,187,824	1,268,608
Vinewood Park	4020	1154106	12,774,344	12,721,236	10,121,936	11,674,784	11,425,700
Chapman Field	3920	1184484	1,653,080	1,758,690	2,153,492	1,586,508	2,205,852
Grape Bowl	3848	38266084	11,669	16,531	23,188	48,246	10,996
	3978	39016510	718,454	897,002	1,462,938	926,398	727,654
		Total	730,123	913,533	1,486,126	974,644	738,650
Peterson Park	3874	7567862	94,996	118,184	71,808	112,948	85,272
	3875	7471935	22,974,820	21,901,440	25,888,280	22,791,560	25,776,080
		Total	23,069,816	22,019,624	25,960,088	22,904,508	25,861,352
Pixley Park	4015	14194758	3,740	170	24,684	3,516	10,472
Zupo Field	4022	1184994	8,158,877	10,070,705	10,465,216	6,979,573	7,476,260
Lodi Lake Park	4009	7475583	5,912,940	5,142,500	5,830,660	5,565,120	7,293,000
	24860	9551741	2,756,380	2,483,360	3,036,880	2,905,980	2,950,860
	24860	9603238	3,119,160	2,999,480	3,833,500	3,878,380	3,960,660
	51427	53545218	1,496	2,244	2,444	5,229	
		Total	11,789,976	10,627,584	12,703,484	12,354,709	14,204,520
Existing Lodi Unified School District Schools							
Beckman Elementary School	11942	14123352	6,533,780	6,331,072	8,591,528	7,898,880	2,695,044
Ellerth Larson Elementary School	61686	49001173	707,630	282,071			
	61686	56462084	27,565,206	8,392,859			
		Total	28,272,836	8,674,930	0	0	0
Heritage Primary Elementary School	11927	14118618	3,193,960	3,141,600	4,282,300	3,443,792	4,407,964
Joe Serna Jr Charter School	49983	2832336	347,072	0	1,403,996	1,115,268	1,557,336
	49983	13321197	383,739	844,492	340,340	1,835,592	74,800
	50631	7253153	11,661	55,569	216,920	108,460	85,272
		Total	742,472	900,061	1,961,256	3,059,320	1,717,408
Lakewood Elementary School	11928	1117985	4,437,734	3,974,124	4,488,748	5,000,380	5,510,725
	11928	2477444	1,425,464	1,293,292	1,206,524	1,415,216	1,512,456
		Total	5,863,198	5,267,416	5,695,272	6,415,596	7,023,181
Lawrence Elementary School	11919	58500582	5,241,341	43,691	50,408	59,930	58,307
	11919	2614775	411,684	53,856	83,776	486,200	608,872
		Total	5,653,025	97,547	134,184	546,130	667,179
Needham School	11922	2538880	353,804	318,648	590,172	484,704	379,236
	11923	1150865	3,243,178	2,877,855	3,369,441	3,493,160	3,029,250
	11938	33447251	814,123	755,031	1,048,696	836,339	899,246
	11940	39726644	70,005	60,334	60,102	54,350	52,293
		Total	4,481,110	4,011,868	5,068,411	4,868,553	4,360,025
Nichols Elementary School	11925	1144059	866,468	907,735	1,088,714	1,218,118	1,330,542
	11925	10632568	1,733,213	14,212	18,700	62,832	68,816
	11925	26566782	10,674,648	8,765,191	10,165,320	7,962,430	8,460,927
		Total	13,274,329	9,687,138	11,272,734	9,243,380	9,860,285

Attachment C

Table C-1

Category	Acct#	Meter #	Annual Water Use (gal) 2006	2005	2004	2003	2002
Reese Elementary School	11926	1227875	872,617	942,854	928,941	922,209	1,100,607
	11933	1117984	3,659,216	3,794,604	4,574,342	4,189,548	4,262,104
		Total	4,531,833	4,737,458	5,503,283	5,111,757	5,362,711
Vinewood Elementary School	11943	1661524	2,567,338	2,285,888	2,698,036	2,522,256	2,625,480
	11943	8590732	3,374,520	2,803,504	4,623,388	4,938,296	4,958,514
		Total	5,941,858	5,089,392	7,321,424	7,460,552	7,583,994
Washington Elementary School	11932	1115741	4,904,524	3,450,449	5,285,966	5,372,510	5,336,830
	11932	31226386	3,967,078	3,033,888	3,465,484	2,762,364	2,992,748
		Total	8,871,602	6,484,337	8,751,450	8,134,874	8,329,578
Woodbridge Elementary School	11931	8717866	688,160	706,860	867,680	3,164,040	2,143,020
Lodi Middle School	11929	1245309	3,505,128	3,539,536	3,924,756	3,006,212	3,366,748
	11945	4938911	13,213,420	12,592,124	17,782,952	14,114,760	16,369,980
		Total	16,718,548	16,131,660	21,707,708	17,120,972	19,736,728
Millswood Middle School	51343	14098218	8,019,308	943,527			
	51343	49001166	561,000	7,340,520	128,447	0	0
		Total	8,580,308	8,284,047	128,447	0	0
Liberty High School	11947	29717823	549,885	609,029	797,817	391,952	505,872
Lodi High School	11934	41016394	132,351	106,388	165,555	164,283	250,228
	25596	1260298	6,006,829	3,988,336	4,689,212	3,513,356	4,443,120
		Total	6,689,065	4,703,753	5,652,584	4,069,591	5,199,220
Tokay High School	25564	7476732	21,239,340	18,142,740	22,312,840	20,431,620	21,123,520
	25564	9304555	23,453,173	17,791,180	19,937,940	19,885,580	19,664,920
		Total	44,692,513	35,933,920	42,250,780	40,317,200	40,788,440
Other Customers							
Caltrans medians and interchanges	3068	41040669	439,076	457,926	399,357	376,842	292,842
	33382	8713428	3,487,924	3,241,832	1,681,504	0	0
	33383	6921706	38,896	152,592	9,724	505,648	2,303,840

Irrigation Demand: Turfgrass

	A	B	C	D	E	F	G	H	I	J	M	K	L
	Month	Turfgrass Coefficient [a], K_c	ET_o [b] (in)	Average Precipitation [c] (in)	Percent Infiltrate [d]	Leaching Rate Factor [e]	Irrigation Efficiency [f]	Irrigation Demand [g] (in)	Percent of Annual Demand [h]	Monthly Peaking Factor [i]	Days/Month	Unit Area (acres)	Monthly Irrigation Demand [j] (af/acre-month)	Daily Average Flow [l] (mgd)
1	January	0.8	0.95	1.93	75%	1.1	80%	0.0	0%	0.00	31	1	0.00	0.000
2	February	0.8	1.66	1.81	75%	1.1	80%	0.0	0%	0.00	28	1	0.00	0.000
3	March	0.8	3.18	2.18	75%	1.1	80%	1.2	3%	0.37	31	1	0.10	0.001
4	April	0.8	4.19	1.60	75%	1.1	80%	3.0	7%	0.87	30	1	0.25	0.003
5	May	0.8	6.23	0.47	75%	1.1	80%	6.4	16%	1.88	31	1	0.53	0.006
6	June	0.8	6.74	0.11	75%	1.1	80%	7.3	18%	2.16	30	1	0.61	0.007
7	July	0.8	7.20	0.00	75%	1.1	80%	7.9	20%	**2.34**	31	1	0.66	0.007
8	August	0.8	6.31	0.09	75%	1.1	80%	6.8	17%	2.02	31	1	0.57	0.006
9	September	0.8	4.74	0.05	75%	1.1	80%	5.2	13%	1.52	30	1	0.43	0.005
10	October	0.8	3.06	0.64	75%	1.1	80%	2.7	7%	0.80	31	1	0.23	0.002
11	November	0.8	1.36	1.35	75%	1.1	80%	0.1	0%	0.03	30	1	0.01	0.000
12	December	0.8	0.79	3.46	75%	1.1	80%	0.0	0%	0.00	31	1	0.00	0.000
13	**Annual Total**		**46.40**	**13.68**				**40.6**	**100%**		**365**		**3.38 afy/acre**	**0.036**
14	**Average**		**3.87**	**1.14**			**3.38**					**0.28**	**0.003**

Footnotes:

a The crop coefficient is assumed to be a year-round cool season species of turfgrass (OWUE source, conversation w/ OWEU staff).
b From CIMIS Station #166 (Lodi West), Sept 2000 to Present
c From CIMIS Station #166 (Lodi West), Sept 2000 to Present
d Assumed to be 75 percent infiltration rate into the vegetation root zone
e Represents a 10 percent leaching rate through the vegetation root zone
f Assumes efficiency of 80 percent (i.e., 20 percent of applied irrigation water is lost to evaporation)
g Irrigation demand calculated using Methodology A;equals {[(A*B)-(C*D)]*E}/F
h equals G/G13
i equals G/G14
j equals (M/12)/G
l equals (K/J)*(325,851.4/1,000,000)

Irrigation Demand: Misc. Field Crops

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	Month	1997 Field and Row Crop Coefficient [a], K_c	1997 ET_o [b] (in)	1997 ET_c [b] (in)	1997 Precipitation [b] (in)	ET_o [c] (in)	Average Precipitation [d] (in)	Percent Infiltrate [e]	Leaching Rate Factor [f]	Irrigation Efficiency [g]	Irrigation Demand [h] (in/acre)	Percent of Annual Demand	Monthly Peaking Factor	Days/Month	Unit Area (acres)	Monthly Irrigation Demand (af/acre-month)	Daily Average Flow (mgd)
1	January	1.08	0.73	0.79	6.81	0.95	1.93	75%	1.1	80%	0.00	0%	0.00	31	1	0.00	0.000
2	February	0.39	2.12	0.83	0.27	1.66	1.81	75%	1.1	80%	0.00	0%	0.00	28	1	0.00	0.000
3	March	0.49	4.01	1.98	1.34	3.18	2.18	75%	1.1	80%	0.00	0%	0.00	31	1	0.00	0.000
4	April	0.23	5.56	1.27	0.22	4.19	1.60	75%	1.1	80%	0.00	0%	0.00	30	1	0.00	0.000
5	May	0.33	7.32	2.41	0.21	6.23	0.47	75%	1.1	80%	2.34	10%	1.24	31	1	0.19	0.002
6	June	0.86	7.58	6.54	0.20	6.74	0.11	75%	1.1	80%	7.88	35%	4.18	30	1	0.66	0.007
7	July	0.89	7.98	7.07	0.13	7.20	0.00	75%	1.1	80%	8.78	39%	**4.65**	31	1	0.73	0.008
8	August	0.42	6.76	2.84	0.34	6.31	0.09	75%	1.1	80%	3.56	16%	1.89	31	1	0.30	0.003
9	September	0.01	5.39	0.07	0.07	4.74	0.05	75%	1.1	80%	0.03	0%	0.02	30	1	0.00	0.000
10	October	0.17	3.47	0.58	0.64	3.06	0.64	75%	1.1	80%	0.05	0%	0.03	31	1	0.00	0.000
11	November	0.43	1.05	0.45	4.15	1.36	1.35	75%	1.1	80%	0.00	0%	0.00	30	1	0.00	0.000
12	December	0.89	0.99	0.88	2.12	0.79	3.46	75%	1.1	80%	0.00	0%	0.00	31	1	0.00	0.000
13	**Annual Total**		**52.96**				**13.68**				**22.6**	**100%**		**365**		**1.89 afy/acre**	**0.020**
14	**Average**		**4.41**				**1.14**				**1.9**					**0.16**	**0.002**

Footnotes:

a Equals C/B
b Source: ITRC
c From CIMIS Station #166 (Lodi West), Sept 2000 to Present
d From CIMIS Station #166 (Lodi West), Sept 2000 to Present
e Assumed to be 75 percent infiltration rate into the vegetation root zone
f Represents a 10 percent leaching rate through the vegetation root zone
g Assumes efficiency of 80 percent (i.e., 20 percent of applied irrigation water is lost to evaporation)
h Irrigation demand calculated using Methodology A;equals {[(A*E)-(F*G)]*H}/I
i equals J/J13
j equals J/J14
k equals (N/12)/J
l equals (O/M)*(325,851.4/1,000,000)

Irrigation Demand: Vine Crops

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	Month	1997 Vine Crop Coefficient [a], K_c	1997 ET_o [b] (in)	1997 ET_c [b] (in)	1997 Precipitation [b] (in)	ET_o [c] (in)	Average Precipitation [d] (in)	Percent Infiltrate [e]	Leaching Rate Factor [f]	Irrigation Efficiency [g]	Irrigation Demand [h] (in/acre)	Percent of Annual Demand	Monthly Peaking Factor	Days/Month	Unit Area (acres)	Monthly Irrigation Demand (af/acre-month)	Daily Average Flow (mgd)
1	January	1.07	0.73	0.78	6.81	0.95	1.93	75%	1.1	90%	0.00	0%	0.00	31	1	0.00	0.000
2	February	0.62	2.12	1.32	0.27	1.66	1.81	75%	1.1	90%	0.00	0%	0.00	28	1	0.00	0.000
3	March	0.51	4.01	2.04	1.34	3.18	2.18	75%	1.1	90%	0.00	0%	0.00	31	1	0.00	0.000
4	April	0.35	5.56	1.96	0.22	4.19	1.60	75%	1.1	90%	0.33	1%	0.15	30	1	0.03	0.000
5	May	0.55	7.32	4.02	0.21	6.23	0.47	75%	1.1	90%	3.75	9%	1.68	31	1	0.31	0.003
6	June	0.78	7.58	5.92	0.20	6.74	0.11	75%	1.1	90%	6.33	16%	2.84	30	1	0.53	0.006
7	July	0.78	7.98	6.24	0.13	7.20	0.00	75%	1.1	90%	6.88	17%	**3.09**	31	1	0.57	0.006
8	August	0.74	6.76	5.03	0.34	6.31	0.09	75%	1.1	90%	5.65	14%	2.54	31	1	0.47	0.005
9	September	0.53	5.39	2.87	0.07	4.74	0.05	75%	1.1	90%	3.03	7%	1.36	30	1	0.25	0.003
10	October	0.36	3.47	1.26	0.64	3.06	0.64	75%	1.1	90%	0.77	2%	0.35	31	1	0.06	0.001
11	November	0.50	1.05	0.53	4.15	1.36	1.35	75%	1.1	90%	0.00	0%	0.00	30	1	0.00	0.000
12	December	0.97	0.99	0.97	2.12	0.79	3.46	75%	1.1	90%	0.00	0%	0.00	31	1	0.00	0.000
13	**Annual Total**		**52.96**				**13.68**				**26.7**	**66%**		**365**		**2.23 afy/acre**	**0.024**
14	**Average**		**4.41**				**1.14**				**2.2**					**0.19**	**0.002**

Footnotes:

a Equals C/B
b Source: ITRC
c From CIMIS Station #166 (Lodi West), Sept 2000 to Present
d From CIMIS Station #166 (Lodi West), Sept 2000 to Present
e Assumed to be 75 percent infiltration rate into the vegetation root zone
f Represents a 10 percent leaching rate through the vegetation root zone
g Assumes efficiency of 80 percent (i.e., 20 percent of applied irrigation water is lost to evaporation)
h Irrigation demand calculated using Methodology A;equals {[(A*E)-(F*G)]*H}/I
i equals J/J13
j equals J/J14
k equals (N/12)/J
l equals (O/M)*(325,851.4/1,000,000)

Irrigation Demand: Deciduous Orchards

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	Month	1997 Deciduous Orchard Crop Coefficient [a], K_c	1997 ET_o [b] (in)	1997 ET_c [b] (in)	1997 Precipitation [b] (in)	ET_o [c] (in)	Average Precipitation [d] (in)	Percent Infiltrate [e]	Leaching Rate Factor [f]	Irrigation Efficiency [g]	Irrigation Demand [h] (in/acre)	Percent of Annual Demand	Monthly Peaking Factor	Days/Month	Unit Area (acres)	Monthly Irrigation Demand (af/acre-month)	Daily Average Flow (mgd)
1	January	1.05	0.73	0.77	6.81	0.95	1.93	75%	1.1	80%	0.00	0%	0.00	31	1	0.00	0.000
2	February	0.40	2.12	0.85	0.27	1.66	1.81	75%	1.1	80%	0.00	0%	0.00	28	1	0.00	0.000
3	March	0.36	4.01	1.43	1.34	3.18	2.18	75%	1.1	80%	0.00	0%	0.00	31	1	0.00	0.000
4	April	0.38	5.56	2.10	0.22	4.19	1.60	75%	1.1	80%	0.52	1%	0.17	30	1	0.04	0.000
5	May	0.75	7.32	5.47	0.21	6.23	0.47	75%	1.1	80%	5.92	15%	1.94	31	1	0.49	0.005
6	June	0.83	7.58	6.29	0.20	6.74	0.11	75%	1.1	80%	7.57	19%	2.48	30	1	0.63	0.007
7	July	0.84	7.98	6.69	0.13	7.20	0.00	75%	1.1	80%	8.30	20%	**2.72**	31	1	0.69	0.007
8	August	0.86	6.76	5.78	0.34	6.31	0.09	75%	1.1	80%	7.33	18%	2.40	31	1	0.61	0.006
9	September	0.78	5.39	4.20	0.07	4.74	0.05	75%	1.1	80%	5.02	12%	1.64	30	1	0.42	0.005
10	October	0.63	3.47	2.20	0.64	3.06	0.64	75%	1.1	80%	2.01	5%	0.66	31	1	0.17	0.002
11	November	0.40	1.05	0.42	4.15	1.36	1.35	75%	1.1	80%	0.00	0%	0.00	30	1	0.00	0.000
12	December	0.88	0.99	0.87	2.12	0.79	3.46	75%	1.1	80%	0.00	0%	0.00	31	1	0.00	0.000
13	**Annual Total**		**52.96**				**13.68**				**36.7**	**90%**		**365**		**3.06 afy/acre**	**0.033**
14	**Average**		**4.41**				**1.14**				**3.1**					**0.25**	**0.003**

Footnotes:

a Equals C/B
b Source: ITRC
c From CIMIS Station #166 (Lodi West), Sept 2000 to Present
d From CIMIS Station #166 (Lodi West), Sept 2000 to Present
e Assumed to be 75 percent infiltration rate into the vegetation root zone
f Represents a 10 percent leaching rate through the vegetation root zone
g Assumes efficiency of 80 percent (i.e., 20 percent of applied irrigation water is lost to evaporation)
h Irrigation demand calculated using Methodology A;equals {[(A*E)-(F*G)]*H}/I
i equals J/J13
j equals J/J14
k equals (N/12)/J
l equals (O/M)*(325,851.4/1,000,000)

Attachment E: Water Quality Information

Table E-1: WSWPCF Effluent Water Quality[a]

Constituent	Units	Range	Average	Number of Samples
Ammonia	mg/L	0.03 - 25	2	207
Nitrate	mg/L as N	1.4 - 12.9	5.9	24
Calcium	mg/L		Not tested	
Chloride	mg/L		Not tested	
Chlorine residual	mg/L	Not detected		699
Electrical Conductivity	mmhos/cm	0.53 - 0.97	0.63	699
Hardness	mg/L as $CaCO_3$	102 - 128	118	13
	meq/L	2 - 3	2	
Magnesium	mg/L	8.7 - 14	12	24
	meq/L	0.7 - 14	0.99	
pH	pH units	6.2 – 8.0	7.0	689
Alkalinity	mg/L as $CaCO_3$	120 - 230	153	24
Bicarbonate	mg/L as HCO_3	150 - 290	188	24
	meq/L	2.5 - 4.8	3.1	
Phosphorus	mg/L	140 - 1200	338	8
Sodium	mg/L	66 - 85	73	24
	meq/L	2.9 - 3.7	3	
Silica	mg/L as SiO_2	65 - 72	69	24
Temperature	degF	60 - 88	73	694
Total Dissolved Solids	mg/L	150 - 540	377	24
Total Suspended Solids	mg/L	0.1 - 22	3	663
Aluminum	ug/L	Not detected – 40	35	6
Arsenic	ug/L	2 - 4	3	13
Beryllium	ug/L	Not detected (1)		8
Boron	ug/L	190 - 240	200	24
Cadmium	ug/L	Not detected (1)		8
Chromium	ug/L	Not detected (5)		8
Cobalt	ug/L		Not tested	
Copper	ug/L	Not detected - 13	3	2 - 13
Fluoride	mg/L	0.1 - 0.54	0.20	24
Iron	ug/L	100 - 200	100	24
Lead	ug/L	Not detected - 1	1	20
Lithium	ug/L		Not tested	
Manganese	ug/L	11.7 - 41.6	27.6	12
Molybdenum	ug/L		Not tested	
Nickel	ug/L	Not detected (5)		8
Selenium	ug/L	Not detected (20)		8
Vanadium	ug/L		Not tested	
Zinc	ug/L	2.5 - 69	33.9	22
CALCULATED VALUES				
SAR			2.9	
Adjusted SAR			4.0	

Footnotes:

i. Recycled water monitoring data provided by West Yost Associates. Non-detects assumed to be equal to one half of the detection limit for averaging purposes.

Table E-2: Groundwater, Surface Water, and Blended Water Quality

Constituent	Units	Groundwater Quality[a]	Surface Water Quality[b]	Blended Water Quality (Estimated)[c]
Ammonia	mg/L as N	Not tested	0.03	*Unknown*
Nitrate	mg/L as N	2	Not tested	*Unknown*
Calcium	mg/L	29	5	*19*
	meq/L	1.4	0.2	*0.9*
Chloride	mg/L	15	2	*10*
Chlorine residual	mg/L	Not applicable	1.8	*Unknown*
Electrical Conductivity	mmhos/cm	0.34	0.05	*0.22*
Hardness	mg/L as $CaCO_3$	129	18	*83*
	meq/L	3	0.4	*2*
Magnesium	mg/L	Not tested	1.5	*Unknown*
	meq/L		0.12	
pH	pH units	7.2	7.3	*7.3*
Alkalinity	mg/L as $CaCO_3$	134	19	*87*
Bicarbonate	mg/L as HCO_3	164	24	*107*
	meq/L	2.7	0.4	*1.7*
Phosphorus	mg/L	Not tested	0.03	*Unknown*
Sodium	mg/L	22	3	*14.0*
	meq/L	0.9	0.1	*0.6*
Silica	mg/L as SiO_2	Not tested	9	*Unknown*
Temperature	degF	Not tested	59	*Unknown*
Total Dissolved Solids	mg/L	249	37	*162*
Total Suspended Solids	mg/L	Not tested	10	*Unknown*
Aluminum	ug/L	44	22	*34.7*
Arsenic	ug/L	4	0.8	*2.9*
Beryllium[d]	ug/L	Not detected (1)	0.3	*Unknown*
Boron	ug/L	Not tested	Not tested	*Unknown*
Cadmium[d]	ug/L	Not detected (1)	0.6	*Unknown*
Chromium[d]	ug/L	Not detected (10)	1.1	*Unknown*
Cobalt	ug/L	Not tested	1.2	*Unknown*
Copper	ug/L	Not detected (50)	3.2	*Unknown*
Fluoride	mg/L	0.10	0.07	*0.1*
Iron	ug/L	56	67	*60.2*
Lead	ug/L	Not detected (5)	1.6	*Unknown*
Lithium	ug/L	Not tested	2.3	*Unknown*
Manganese	ug/L	Not detected (20)	7.7	*Unknown*
Molybdenum	ug/L	Not tested	Not detected (5)	*Unknown*
Nickel	ug/L	Not detected (10)	0.8	*Unknown*
Selenium	ug/L	Not detected (5)	Not tested	*Unknown*
Vanadium	ug/L	Not tested	Not tested	*Unknown*
Zinc	ug/L	25	10.6	*18.9*
CALCULATED VALUES				
SAR[e]		*0.8*	0.3	*0.9*
Adjusted SAR[e]		*0.7*	0.2	*0.6*

Footnotes:

a. Groundwater quality is reported as the range and average concentrations for all wells in 2005. Non-detects assumed to be equal to one half of the detection limit for averaging purposes.

b. Surface water quality reported as the average of data reported by USGS for Station 11325500 (Mokelumne River at Woodbridge, CA) for 1973 through 1994 (website: M:\Lodi WTP\WQ Data\Woodbridge\WQN Station 11325500 MOKELUMNE R A WOODBRIDGE CA.htm) with monitoring data collected by the City of Lodi at four locations from May, 2006 through April of 2007. Non-detects assumed to be equal to one half of the detection limit for averaging purposes.

c. Estimated values in italics. Assumes 6,000 AFY delivered in months March through October beginning in 2011. Based on projected demands for 2012 as developed for the City of Lodi 2005 Urban Water Management Plan, surface water would comprise approximately 41% of supply on a monthly basis during these months. **Blended water quality assumes conservative behavior of constituents.**

d. Numbers in parentheses are one-half of the method detection limit.

e. Because groundwater magnesium data is not available, SAR and adjusted SAR for groundwater were estimated using hardness as a surrogate value for calcium plus magnesium.

Table E-3: Anticipated Changes to Recycled Water Quality

Constituent	Units	Estimated Reduction in Concentration with Surface Water	Projected Future Recycled Water Quality[a]	Anticipated Change[a]	Notes
Ammonia	mg/L as N	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Nitrate	mg/L as N	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Calcium	mg/L	*34%*	*19*	*Reduction*	Reduction in source hardness
	meq/L		*1.0*		
Chloride	mg/L	*36%*	*41*	*Reduction*	Reduction in source chloride
Chlorine residual	mg/L	*Unknown*	*Unknown*	*Unknown*	Surface water disinfection requirement
Electrical Conductivity	mmhos/cm	*35%*	*0.4*	*Reduction*	Reduction in source EC
Hardness	mg/L as $CaCO_3$	*35%*	*76*	*Reduction*	Reduction in source hardness
	meq/L		*1.5*		
Magnesium	mg/L	*Unknown*	*Unknown*	*Reduction*	Reduction in source hardness
	meq/L				
pH	pH units	*0%*	*6.9*	*No change*	Similar pH, significantly higher alkalinity in groundwater
Alkalinity	mg/L as $CaCO_3$	*35%*	*99*	*Reduction*	Estimated based on mass balance
Bicarbonate	mg/L as HCO_3	*35%*	*122*	*Reduction*	Estimated based on mass balance
	meq/L		*2.0*		
Phosphorus	mg/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Sodium	mg/L	*35%*	*47.4*	*Reduction*	Reduction in source sodium
	meq/L		*2.1*		
Silica	mg/L as SiO_2	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Temperature	degF	*Unknown*	*Unknown*	*Unknown*	Temperature changes driven by use
Total Dissolved Solids	mg/L	*35%*	*245*	*Reduction*	Reduction in source TDS
Total Suspended Solids	mg/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Aluminum	ug/L	*20%*	*28*	*Reduction*	Reduction in source aluminum
Arsenic	ug/L	*34%*	*2*	*Reduction*	Reduction in source arsenic
Beryllium	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Boron	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Cadmium	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Chromium	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Cobalt	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Copper	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Fluoride	mg/L	*12%*	*0.2*	*Reduction*	Reduction in source fluoride
Iron	ug/L	*8%*	*108*	*Increase*	Increase in source iron
Lead	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Lithium	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Manganese	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Molybdenum	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Nickel	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Selenium	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Vanadium	ug/L	*Unknown*	*Unknown*	*Unknown*	Change in concentrations unknown
Zinc	ug/L	*23%*	*26*	*Reduction*	Reduction in source zinc
CALCULATED VALUES					
SAR			*3.1*	*Increase*	
adjSAR			*3.9*	*Reduction*	

Footnotes:

a. Estimated values are italicized. For the purposes of this analysis, it was assumed that recycled water quality concentrations will change in proportion to the change in drinking water parameter concentrations resulting from blending groundwater and surface water supplies. Refer to Table E-3 for estimated blended drinking water quality.

SAR is the ratio of the concentration of sodium ions to the concentration of calcium plus magnesium as shown in the following equation.

$$SAR = \frac{[Na]}{\sqrt{\left(\left([Ca]+[Mg]\right) \div 2\right)}}$$

An adjusted SAR should be used when the carbonates or bicarbonates are high. For example, for bicarbonate content greater than 2.0 milliequivalents per liter (meq/L, 120 parts per million, ppm) and carbonate content greater than 0.5 meq/L (15 ppm).[7] The adjusted SAR is calculated by the following formula.[8]

$$Adjusted\ SAR = \frac{[Na]}{\sqrt{\left([HCO_3]/\left([Ca]+[Mg]\right) \div 2\right)}}$$

This method includes the added effects of precipitation and dissolution of calcium in soils and is related to carbonate/bicarbonate concentration. Cation and bicarbonate concentrations are expressed in meq/L.

Table E-4: Guidelines for Trace Elements in Irrigation Supplies[9,10]

Element	Recommended Maximum Concentration (ug/L)	Notes
Aluminum	5000	Can cause non-productivity in acid soils (pH < 5.5), but more alkaline soils at pH > 7.0 will precipitate the ion and eliminate any toxicity.
Arsenic	100	Toxicity to plants varies widely, ranging from 12 mg/l for Sudan grass to less than 0.05 mg/l for rice.
Beryllium	100	Toxicity to plants varies widely, ranging from 5 mg/l for kale to 0.5 mg/l for bush beans.
Cadmium	10	Toxic to beans, beets and turnips at concentrations as low as 0.1 mg/l in nutrient solutions. Conservative limits recommended due to its potential for accumulation in plants and soils to concentrations that may be harmful to humans.
Chromium	100	Not generally recognized as an essential growth element. Conservative limits recommended due to lack of knowledge on its toxicity to plants.
Cobalt	50	Toxic to tomato plants at 0.1 mg/l in nutrient solution. Tends to be inactivated by neutral and alkaline soils.
Copper	200	Toxic to a number of plants at 0.1 to 1.0 mg/l in nutrient solutions.
Fluoride	1000	Inactivated by neutral and alkaline soils.
Iron	5000	Not toxic to plants in aerated soils, but can contribute to soil acidification and loss of availability of essential phosphorus and molybdenum. Overhead sprinkling may result in unsightly deposits on plants, equipment and buildings.
Lead	5000	Can inhibit plant cell growth at very high concentrations.
Lithium	2500	Tolerated by most crops up to 5 mg/l; mobile in soil. Toxic to citrus at low concentrations (<0.075 mg/l). Acts similarly to boron.
Manganese	200	Toxic to a number of crops at a few-tenths to a few mg/l, but usually only in acid soils.
Molybdenum	10	Not toxic to plants at normal concentrations in soil and water. Can be toxic to livestock if forage is grown in soils with high concentrations of available molybdenum.
Nickel	200	Toxic to a number of plants at 0.5 mg/l to 1.0 mg/l; reduced toxicity at neutral or alkaline pH.
Selenium	20	Toxic to plants at concentrations as low as 0.025 mg/l and toxic to livestock if forage is grown in soils with relatively high levels of added selenium. As essential element to animals but in very low concentrations.
Titanium	-	Effectively excluded by plants; specific tolerance unknown.
Tungsten		
Vanadium	100	Toxic to many plants at relatively low concentrations.
Zinc	2000	Toxic to many plants at widely varying concentrations; reduced toxicity at pH > 6.0 and in fine textured or organic soils.
pH	6.0	Most effects of pH on plant growth are indirect (e.g., pH effects on heavy metal toxicity)

[7] Carrow, R.N. and R.R. Duncan, 1998. Salt-Affected Turfgrass Sites. Ann Arbour Press.
[8] Equation given by Caltest Laboratories, November 2004.
[9] Pescod, M.B. Wastewater Quality Guidelines for Agricultural Use, Table 10. Food and Agriculture Organization of the United Nations, Paper 47, Rome, 1992. Converted to ug/L from mg/L. Website: http://www.fao.org/docrep/T0551E/T0551E00.htm
[10] United States Environmental Protection Agency, September 2004. Guidelines for Water Reuse.

Table E-5: Constituents of Interest for Industrial Cooling Water Processes[11,12]

Element	Effects	Maximum Recommended Concentration	Units
Calcium	Calcium is particularly troublesome because certain calcium salts exhibit an inverse solubility in water. Unlike most salts in solution, which become more soluble with increasing temperature, calcium carbonate becomes less soluble with increasing temperature.	900	mg/L
Magnesium * Silicon Dioxide	Magnesium is usually not a problem unless silica levels are also high, resulting in magnesium silicate scale in the heat exchangers.	35,000 (without scale inhibitor), 75,000 (with scale inhibitor)	mg^2/L^2
Alkalinity	Bicarbonates normally dominate measured alkalinity. Under certain conditions, appreciable amounts of carbonate and hydroxide alkalinity may also be present. Alkalinity is an important means of predicting calcium carbonate scale potential.	30 (without scale inhibitor), 50 (with scale inhibitor)	mg/L as $CaCO_3$
Silica	Can produce difficult-to-remove scale deposits. Pretreatment or sidestream filtration is often required if the silica levels are above 150 mg/L (as SiO2).	150	mg/L
Total Suspended Solids	Not all suspended solids enter the cooling system with the makeup water. Some might be generated as corrosion and scale byproducts or from air/water contact. Suspended solids can adhere to biofilms and cause under-deposit corrosion.	100 - 300	mg/L
Total Dissolved Solids	Dissolved solids are concentrated in cooling processes, and can cause scaling and corrosion.	70,000	mg/L
Ammonia	Ammonia can promote biofilm development and growth in heat exchangers and cooling tower fill. It is also extremely corrosive to even well-passivated copper alloys at concentrations as low as 2.0 mg/L. Ammonia can combine with chloride to form chloramines which are volatile and are easily stripped from the water as it passes the tower, negating any disinfecting affect.	2.0	mg/L
Phosphate	Concentration levels equal to or less than 4.0 mg/L may not be a concern if the pH is controlled between 7.0 and 7.5 and there is a sufficient amount of dispersant. At this level the phosphate can provide a mild steel corrosion protection since phosphate is a common anionic inhibitor (although the system should not rely on recycled water as the only source for corrosion protection since the levels may fluctuate). At higher concentrations (calcium greater than 1,000 mg/L and phosphate greater than 20 mg/L) there is a potential for calcium phosphate scaling in the heat exchangers, especially at high heat loads and low cooling water flow rates. Phosphate can also act as a nutrient for biofilms	5.0	mg/L as orthoP
Chloride	Can be corrosive to most metals, especially mild steel. A chloride limit of 300 mg/L is often used for stainless steel, but limits for other metals may go as high as 1,000 mg/L.	300-1000	mg/L
Iron	Iron can combine with phosphate to form undesirable foulants, and may deactivate specialized polymers used to inhibit calcium phosphate scaling.	0.5	mg/L
Manganese	Elevated manganese concentrations can cause scaling.	0.5	mg/L
Sulfide	Sulfides can create scale-forming compounds, or under certain circumstances, an odor nuisance.	5	mg/L
Biological Oxygen Demand	Reflects the organic content for biological organisms and the associated demand for oxidizing biocide in addition to the amount used for bio fouling control.	No established value	
Nitrate+ Nitrite	Provides mild steel corrosion control at levels above 300 mg/L in the concentrated cooling water. Can contribute to reductions in stainless steel cracking and pitting erosion. Nitrates do not attack copper alloys or protect them from corrosion.	300	mg/L
Zinc	Can assist phosphates and nitrates in reducing mild steel corrosion rates and pitting tendencies. Levels in cooling water above 0.5 mg/L are beneficial, but levels above 3.0 mg/L can contribute to deposits.	0.5-3.0	mg/L
Organics	Can act as fertilizer for microorganisms. Water-soluble cationic polymers can react with some anionic treatment biocides, as well as some scale and corrosion inhibitors.	No established value	
Fluoride	At 10 mg/L or more can combine with calcium to cause scale formation.	10	mg/L
Copper	Copper can plate out on steel, causing localized galvanic corrosion that can rapidly penetrate thin steel heat exchanger tubes.	0.1	mg/L
Aluminum	Iron, copper, and aluminum can be generated as by-products of corrosion in the cooling system as a result of poor pH control or improper corrosion inhibition.	1.0	mg/L

[11] Loretitsch, Gary. Puckorius & Associates. Guidelines for Managing Water in Cooling Systems For Owners, Operators, and Environmental Managers, Table 2.05.
[12] DiFillippo, Michael N. Cooling Tower Water Quality Parameters for Degraded Water, Table 2-1. Prepared for the California Energy Commission, April 2006 (CEC-500-2005-170).

Table E-6: Effect of Water Quality Constituents on Cooling System Component Materials[13]

Type of Material	Effect of Water Quality Constituents
Galvanized Iron (copper and zinc coating)	Susceptible to corrosion (white rust) from high dissolved solids, particularly chloride and heavy metals; pH below 6.5 or above 8.5
Stainless Steel	Susceptible to corrosion (at lower rates than for mild steel) due to high dissolved solids—primarily chlorides that can cause stress corrosion cracking (SCC) or severe pitting. In the 304-SS alloy, chloride levels above 200 mg/l are of concern when deposit-forming conditions exist, but levels as high as 1,000 mg/l chloride levels do not cause corrosion in the absence of deposits. The 316-SS alloy can tolerate chloride levels of 5,000 mg/l when deposit-forming conditions exist, and 30,000 mg/l when surfaces are free of deposits. Biomass deposits can cause rapid pitting. Nitrates are known to reduce stainless steel corrosion.
Mild Steel	Susceptible to corrosion from high total dissolved solids; deposit-forming constituents such as suspended solids, biomass, and scale; heavy metals, such as copper. Ammonia contributes indirectly to steel corrosion through increases to biomass.
Copper alloys including Admiralty Brass and Muntz metal	Susceptible to corrosion from ammonia, high dissolved solids, and deposit-forming constituents such as suspended solids. Ammonia above 0.5 mg/l as NH3 can cause cracking of brass (Admiralty), severe corrosion of copper alloys, and contributes to biomass that can cause corrosion to copper alloy under deposits. The cracking of brass can be rapid and severe. Chloramines (chlorine plus ammonia) can cause cracking.
Wood	Needs to be protected from decay or chemical attack.
Plastics	Should be kept clean and free of deposits to prevent clogging, etc. Plastic film in particular needs to be kept clean and free of biomass buildup.

Table E-7: Recommended Industrial Boiler Feed Water Quality Criteria[14]

Parameter	Recommended Maximum Concentration by Pressure Level (mg/L)		
	Low (<150 psig)	Intermediate (150-700 psig)	High (>700 psig)
Silica	30	10	0.7
Aluminum	5	0.1	0.01
Iron	1	0.3	0.05
Manganese	0.3	0.1	0.01
Calcium	None identified	0.4	0.01
Magnesium	None identified	0.25	0.01
Ammonia	0.1	0.1	0.1
Bicarbonate	170	120	48
Total Dissolved Solids	700	500	200
Copper	0.5	0.05	0.05
Zinc	None identified	0.01	0.01
Total Hardness	35.0	1.0	0.07
Alkalinity	350	100	40
pH, units	7.0 – 10.0	8.2 – 10.0	8.2 – 9.0
Chemical oxygen demand	5	5	1.0
Dissolved oxygen	2.5	0.07	0.0007
Total Suspended Solids	10	5	0.5

[13] Loretitsch, Gary. Puckorius & Associates. Guidelines for Managing Water in Cooling Systems For Owners, Operators, and Environmental Managers, Table 2.01.
[14] Loretitsch, Gary. Puckorius & Associates. Guidelines for Managing Water in Cooling Systems For Owners, Operators, and Environmental Managers, Table 2.01.

Table E-8: Water Quality Requirements for Industrial Processes[15]

Parameter	Maximum Recommended Concentration by Industry (mg/L)							
	Pulp & Paper					Textiles		
	Mech. piping	Chemical, Unbleached	Pulp & Paper Bleached	Chemical	Petro-chemical & Coal	Sizing Suspension	Scouring, Bleach & Dye	Cement
Copper	-	-	-	-	0.05	0.01	-	-
Iron	0.3	1.0	0.1	0.1	1.0	0.3	0.1	2.5
Manganese	0.1	0.5	0.05	0.1	-	0.05	0.01	0.5
Calcium	-	20	20	68	75	-	-	-
Magnesium	-	12	12	19	30	-	-	-
Chloride	1,000	200	200	500	300	-	-	250
Bicarbonate	-	-	-	128	-	-	-	-
Nitrate	-	-	-	5	-	-	-	-
Sulfate	-	-	-	100	-	-	-	250
Silicon Dioxide	-	50	50	50	-	-	-	35
Hardness	-	100	100	250	350	25	35	-
Alkalinity	-	-	-	125	-	-	-	400
Total Dissolved Solids	-	-	-	1,000	1,000	100	100	600
Total Suspended Solids	-	10	10	5	10	5	5	500
Color	30	30	10	20	-	5	5	-
pH	6-10	6-10	6-10	6.2-8.3	6-9	-	-	6.5-8.5

Footnotes:
a. Concentrations are reported as mg/L for all parameters except pH, which is in pH units.

[15] United States Environmental Protection Agency, September 2004. Guidelines for Water Reuse, Table 2-4.

Appendix C Conceptual Alternatives TM

FINAL Technical Memorandum

Lodi Recycled Water Master Plan

Subject:	**Conceptual Recycled Water Alternatives**
Prepared For:	Lyman Chang, City of Lodi
Prepared by:	Andy Smith, Oscar Biondi
Reviewed by:	Deana Donohue, Helene Kubler, Glenn Hermanson
Date:	September 26, 2007
Reference:	0140-003.3

1 Introduction

The purpose of this technical memorandum (TM) is to present the conceptual recycled water alternatives developed as part of the City of Lodi Recycled Water Master Plan (RWMP). Based on this TM, the preferred conceptual alternative will be selected by the City, and later will be evaluated during the development of the Draft RWMP document.

The preferred alternatives will meet the following project objectives to the maximum extent practicable:

- Take full advantage of high quality recycled water to reduce groundwater overdraft, by providing recycled water to the maximum number of potential users while operating within the preferred design criteria;
- Improve water supply reliability by providing recycled water during peak demand periods; and
- Provide an interim solution for the use of the City's untreated WID water.

This TM is organized as follows:

- Introduction
- Project Alternative Definition
- Alternatives Demand Allocation
- Evaluation Criteria
- Conclusions

2 Project Alternative Definition

Four conceptual alternatives were developed based on discussions with City staff and the results of the Recycled Water Market Assessment conducted for this RWMP. The assumptions regarding available water supplies were based on the potential recycled water and non-potable water supplies presented in the *Draft Recycled Water Market Assessment TM* (RMC, 2007) and *Draft Key Assumptions TM* (RMC, 2007). The alternative designations do not reflect a preferred alternative or anticipated timing of implementation. The City does not anticipate the need to extend the recycled water system east of Highway 99 because of economic feasibility; hence, each of the conceptual alternatives includes pipes to the west of Highway 99 only.

Alternatives A, B, C, and D provide options for delivering recycled water (RW) from the White Slough Water Pollution Control Facility (WPCF) to specific potential users within the City's Recycled Water

Service Area (RWSA). Alternatives A, B, and C use Woodbridge Irrigation District (WID) water in addition to the recycled water from the WPCF to meet customer peak irrigation demands, while Alternative D uses recycled water from the White Slough WPCF only. It should be noted that a recycled water system could be designed to meet fire flow demands, but this analysis has not been performed to date. A regional alternative for the use of recycled water is not addressed in this TM. Instead, Lodi is working with the City of Stockton to evaluate a regional alternative for the use of Lodi's available recycled water supplies in parallel with this Master Plan (refer to Section 2.1 for more information about this study).

The proposed conceptual alternatives descriptions are presented in Section 2.1. Based on City-provided comments and feedback on the conceptual alternatives presented in this technical memorandum, further refinement and evaluation of the alternatives, including a discussion of potential storage requirements, will occur and will be presented in the Draft RWMP document. The proposed evaluation criteria are presented in Section 4.

The key characteristics for each alternative are summarized and presented in **Table 1**.

Table 1: Conceptual Recycled Water Alternatives

Alternative		A	B	C	D-1 [g]	D-2 [h]
Customer Information	No. of schools served/total [a]	8/19	12/19	10/19	0/19	0/19
	No. of parks served/total [b]	17/36	17/36	15/36	0/36	0/36
	Acres of potential agricultural customers served [c]	800	810	877	1,133	1,183
Approximate length	feet	86,100	94,300	78,300	37,000	28,800
	miles	16.3	17.9	14.8	7.0	5.5
Looped System		Yes	Yes	No	No	Yes
Major Facilities		▪ Two pump stations ▪ Seasonal storage pond(s)	▪ Two pump stations ▪ Seasonal storage pond(s)	▪ Two pump stations ▪ Seasonal storage pond(s)	▪ One pump station ▪ Seasonal storage pond(s)	▪ One pump station ▪ Seasonal storage pond(s)
Total Demand (RW Yield)	ADD [d] (mgd)	5.2	5.2	5.2	3.3	3.3
	MDD [e] (mgd)	14.4	14.4	14.4	8.5	8.5
	MHD [f,j] (mgd)	19.7	19.7	19.9	14.5	14.5
Interim WID Water Use		Yes	Yes	Yes	No [i]	No [i]

Footnotes:

a. A total of 19 schools were identified as potential recycled water customers in the *Draft Recycled Water Market Assessment TM* (RMC, 2007)
b. A total of 36 parks were identified as potential recycled water customers in the *Draft Recycled Water Market Assessment TM* (RMC, 2007).
c. Acreages differ among the alternatives due to 1) differing amounts of supply remaining after meeting demands from non-agricultural potential users under each alternative, and 2) the differing irrigation demands for the crop types assumed for potential agricultural users assigned to each alternative.
d. Average Day Demand.
e. Maximum Day Demand. Assumes that the existing NCPA facility is not operating.
f. Maximum (Peak) Hour Demand. Assumes that the existing NCPA facility is not operating.
g. Non-looped alternative
h. Looped alternative
i. Interim WID water use may be feasible by diverting water from WID canals other than the South Main Canal, but doing so would require modification of the City's water supply agreement with WID.
j. Represents agricultural irrigation and potential NCPA facility demands. Assumes daytime irrigation for agricultural demands, and nighttime irrigation for urban demands.

2.1 Alternative Descriptions

This section presents the conceptual alternatives alignment descriptions. Based on a preliminary evaluation, recommendations have been provided for consideration.

No Project Alternative

In addition to the four conceptual project alternatives discussed above, a "No Project" Alternative will also be considered. The "No Project Alternative" is a scenario in which a recycled water system is not implemented within the City. The selection of a "No Project" Alternative would limit the City's ability to reduce the wastewater discharges or improve water supply reliability through the offset of potable water supplies.

It should also be noted that the City is participating in a joint study with the City of Stockton in order to examine the feasibility of a joint Stockton-Lodi recycled water system. The joint study is taking place concurrently with Lodi's RWMP. Based on preliminary findings, the joint project would likely utilize recycled water from Lodi's White Slough WPCF in and around the northern portion of Stockton, but would not use recycled water for agricultural irrigation.

Alternative A - Harney Lane/WID Canal (Looped)

The main corridors of this alignment include: North Thornton Road, West Kingdon Road, Harney Lane, west edge of the future development areas (Westside and Southwest Gateway) west of Lower Sacramento Road between Harney Lane and the South Main WID canal, and along the South Main WID canal from Harney Lane to Turner Road. Based on preliminary modeling, Alternative A is approximately 86,000 lineal feet in total length (RW distribution main lines only), with pipe diameter sizes ranging from 6-inches to 24-inches.

During peak irrigation demand periods (June, July, and August), the recycled water supply from the White Slough WPCF will not be sufficient to meet the demand. Therefore, additional water supplies must be added to the recycled water distribution system in order to meet the increased demand. This water will come from a proposed WID canal intake/pump station assumed to be located in Beckman Park. A pump station will also be located at the White Slough WPCF. Although a location in Beckman Park has been proposed for the WID canal pump station based on City input, the actual location will be determined during the design phase for this project. One crossing of the WID canal is anticipated at Harney Lane under this alternative. Other crossings of the WID canal are expected for the distribution feeder pipelines serving the various schools and parks. Additionally, a seasonal storage pond or ponds would be necessary, based on the assumptions presented in the *Market Assessment TM*, in order to meet demands for this alternative. The layout for Alternative A is shown in **Figure 1**.

Alternative B - Harney Lane/Ham Lane (Looped)

The main corridors of this alignment include: North Thornton Road, West Kingdon Road, Harney Lane, Ham Lane, West Elm Street, and the west edge of the future development areas (Westside and Southwest Gateway) west of Lower Sacramento Road from Harney Lane to Turner Road. Based on preliminary modeling, Alternative B is approximately 94,000 lineal feet in total length (RW distribution main lines only), with pipe diameter sizes ranging from 6-inches to 24-inches.

During peak irrigation demand periods (June, July, August), the recycled water supply from the White Slough WPCF will not be sufficient to meet the demand. Therefore, additional water supplies must be added to the recycled water distribution system in order to meet the increased demand. This water will come from a proposed WID canal intake/pump station assumed to be located in Beckman Park. A pump station will also be located at the White Slough WPCF. Although a location in Beckman Park has been proposed for the WID canal pump station based on City input, the actual location will be determined during the design phase for this project. One crossing of the WID canal is anticipated at Harney Lane

under this alternative. Additionally, a seasonal storage pond or ponds would be necessary, based on the assumptions presented in the *Market Assessment TM*, in order to meet demands for this alternative. The layout for Alternative B is shown in **Figure 2.**

Alternative C - Harney Lane/Ham Lane (Non-looped)

The main corridors of this alignment include: North Thornton Road, West Kingdon Road, Harney Lane, Ham Lane, and adjacent to the future development areas (Westside and Southwest Gateway) west of Lower Sacramento Road from Harney Lane to West Lodi Avenue. Based on preliminary modeling, Alternative C is approximately 78,000 lineal feet in total length (RW distribution main lines only), with pipe diameter sizes ranging from 6-inches to 24-inches.

During peak irrigation demand periods (June, July, August), the recycled water supply from the White Slough WPCF will not be sufficient to meet the demand. Therefore, additional water supplies must be added to the recycled water distribution system in order to meet the increased demand This water will come from a proposed WID canal intake/pump station assumed to be located in Beckman Park. A pump station will also be located at the White Slough WPCF. Although a location in Beckman Park has been proposed for the WID canal pump station based on City input, the actual location will be determined during the design phase for this project. One crossing of the WID canal is anticipated at Harney Lane under this alternative. Additionally, a seasonal storage pond or ponds would be necessary, based on the assumptions presented in the *Market Assessment TM*, in order to meet demands for this alternative. The layout for Alternative C is shown in **Figure 3**.

Alternative D - Agricultural Users Only

The main corridors of this alignment include Tredway Lane and Harney Lane. Based on preliminary modeling, Alternative D is approximately 29,000 lineal feet in total length (RW distribution main lines only), with pipe diameter sizes ranging from 16-inches to 24-inches. One pump station located at the White Slough WPCF would be necessary to provide a minimum pressure of 80 psi at customer connection points and meet the irrigation demands. Alternative D would only supply recycled water to agricultural and industrial customers west of Lower Sacramento Road. Additionally, a seasonal storage pond or ponds may be necessary, based on the assumptions presented in the *Market Assessment TM*, in order to meet demands for this alternative. Alternative D is illustrated in **Figure 4**.

A looped variation of this alternative was also considered, and is shown in **Figure 5**. The looped scenario serves customers west of the Union Pacific Railroad tracks, has a total length of approximately 37,000 lineal feet (RW distribution main lines only), and features the same pump station and pipe diameter size range as the non-looped scenario. Both looped and non-looped scenarios have a reduced effective service area during peak hour flows, due to increased NCPA power plant demands near the White Slough WPCF, as well as a limited recycled water supply. In other words, as demands increase towards the peak hourly demand, the percentage of potential agricultural users shown in Figures 4 and 5 that can be irrigated decreases.

Qualitative Alternative Evaluation

A more detailed evaluation of the preferred conceptual alternatives will be completed during development of the Draft RWMP. In an effort to eliminate alternatives that may not be considered as a preferred alternative, RMC has reached the following preliminary conclusions and recommendations for the conceptual alternatives:

- Alternatives A, B, and C offer nearly identical recycled water and WID water usage. Alternative C is 1.5 miles and 3.1 miles shorter than Alternatives A and B, respectively. Based on preliminary modeling, it appears that Alternative C can provide adequate pressures under peak demand conditions using similar pumping capabilities as Alternatives A and B.

- Alternatives A and B both provide the benefits of a partially looped distribution system (i.e., consistent system pressures). Although Alternative B is 1.6 miles longer than Alternative A, Alternative B offers recycled water to the greatest number of schools and parks, and would likely be subject to fewer permitting and construction hurdles than Alternative A, as Alternative A would require a significant amount of construction along the main WID canal.
- The looped version of Alternative D is 1.5 miles shorter than the non-looped version, and is assumed to offer nearly identical recycled water usage.

During a meeting with the City to review the draft version of this TM, additional discussion of the alignment alternatives took place, resulting in the following assessments:

- Alternative A offers advantages over Alternatives B and C, due to the fact that there would be fewer utility crossings and less pavement disruption by following the South Main WID Canal.
- The looped version of Alternative D provides the benefits of a looped system, and could likely avoid crossing the UPRR tracks.
- Seasonal storage facilities could be designed and operated in several ways. Further evaluation of the selected alternatives will included conceptual development and analysis of seasonal storage facilities to meet the City's annual recycled water demands.

3 Alternatives Demand Allocation

A hydraulic model was created for all alternatives in an effort to select pipe sizes and to identify preliminary hydraulic deficiencies. Potential recycled water customers were assigned to each alternative alignment based on their proximity to the proposed distribution main alignments. In general, potential customers were assigned as follows:

Within the City limits:

Potential customers within a distance of 1,000 feet from the proposed alignments were included

In agricultural areas outside the City limits

Potential customers directly adjacent to the proposed alignments were considered. Due to the large number of potential customers in the agricultural areas and the limited quantity of available recycled water, not all users adjacent to the alignments were selected. Instead, customers' demands were incrementally assigned to the alternative until the desired total maximum day supply was reached.

Alternatives A, B and C were developed such that the maximum day (July) demands from their associated sets of potential recycled water customers equaled approximately 14.4 million gallons per day (mgd), which is equivalent to an assumed White Slough WPCF supply of 8.5 mgd and a WID supply of approximately 5.9 mgd. Alternative D was developed such that the maximum day demand equaled the anticipated supply of 8.5 mgd.

4 Evaluation Criteria

The proposed evaluation criteria, which will be used to identify and recommend the preferred alignment(s), are summarized in **Table 1**. The preferred alignment will ultimately be selected by the City.

Table 1: Alternative Evaluation Criteria

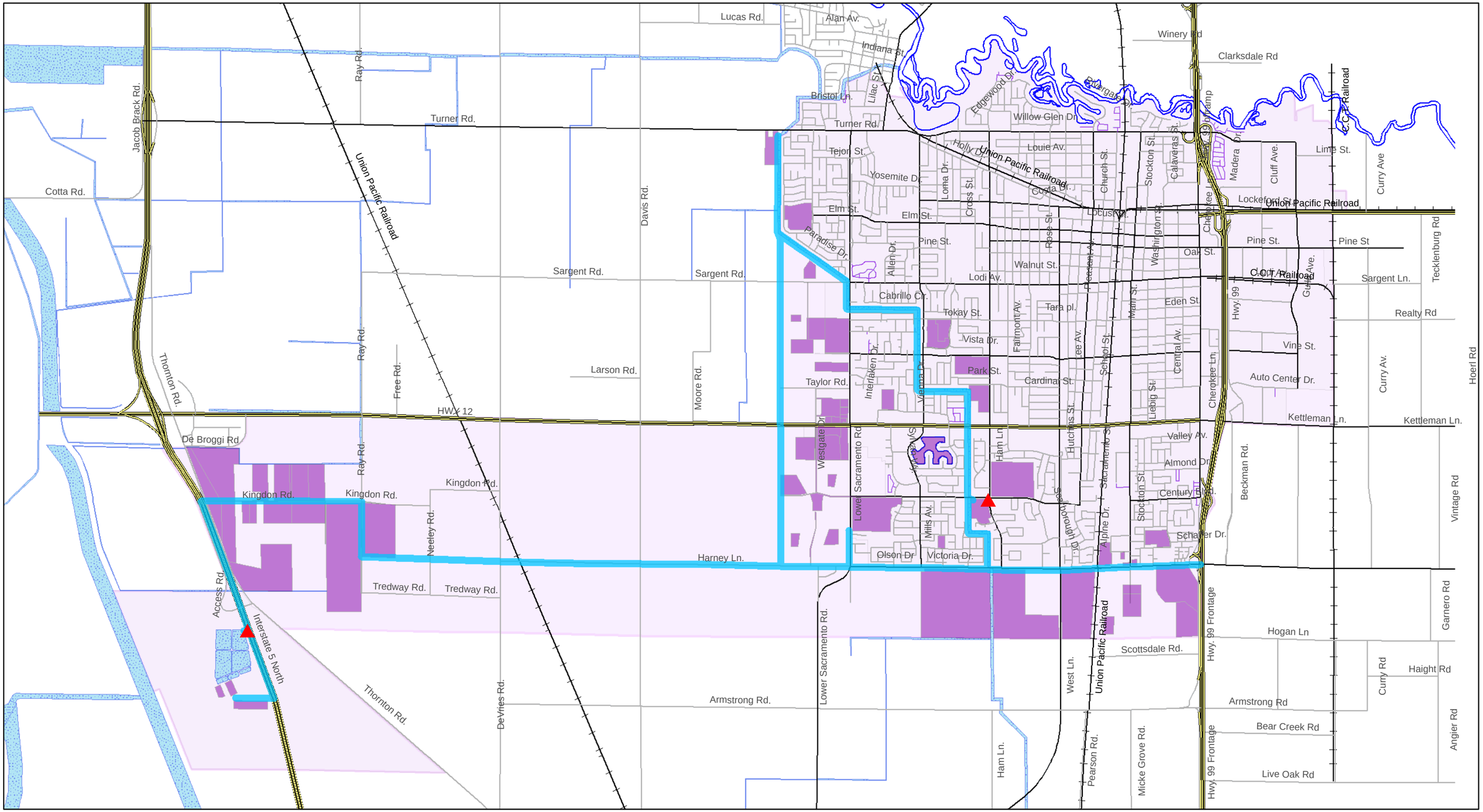
Evaluation Criteria [a]	Description
Estimated Cost	Total cost per acre-foot of water delivered (capital cost to implement alternative and operational cost).
Flexibility	Ease with which (1) plans can be changed to address unforeseen circumstances including ability to alter the plan to account for changes in planning assumptions regarding future demand patterns, projected resources or other uncertainties, and (2) project can be phased.
Meet Project Goals	Ability to meet project objectives established in Section 1 of this TM.
Ease of Implementation	Ease with which alternative can be designed, permitted, and constructed. This also includes the ability to overcome obstacles (such as utility crossings).
Social Impacts	Various impacts including construction related impacts.
Regional Plan Adaptability	Degree of synergy with potential regional recycled water system.
Revenue Potential	Revenue that the City can expect to collect for this service for use of maintenance or funding of the project.

Footnotes:
a. Environmental impacts, legal and regulatory issues, and technical feasibility were initially considered; however, these criteria do not significantly differentiate alternatives and were therefore not discussed further.

5 Conclusions

Each of the conceptual alternatives presented in this technical memorandum has been identified based on discussions with the City and the potential market of recycled users. These conceptual alternatives will be evaluated during the development of the Draft RWMP. In an effort to minimize the number for alignments to be evaluated while ensuring the selection of a minimum of two fundamental alternatives for a recycled water distribution system, a qualitative screening was conducted during the development of this TM. Following discussion with City staff, RMC recommends the City considers further refinement and evaluation of Alternative A and the looped version of Alternative D. Alternative A represents a looped, mixed agricultural and urban recycled water system, while the looped version of Alternative D provides a fundamentally different agriculture-only alternative. A preliminary comparison of the selected alternatives, using the evaluation criteria presented in Table 2, is presented in **Attachment A** to this TM.

The "No Project" Alternative will also be discussed in the Draft RWMP; however, this alternative is not considered preferable due to the need to offset the potable water supply and reduce wastewater discharge.



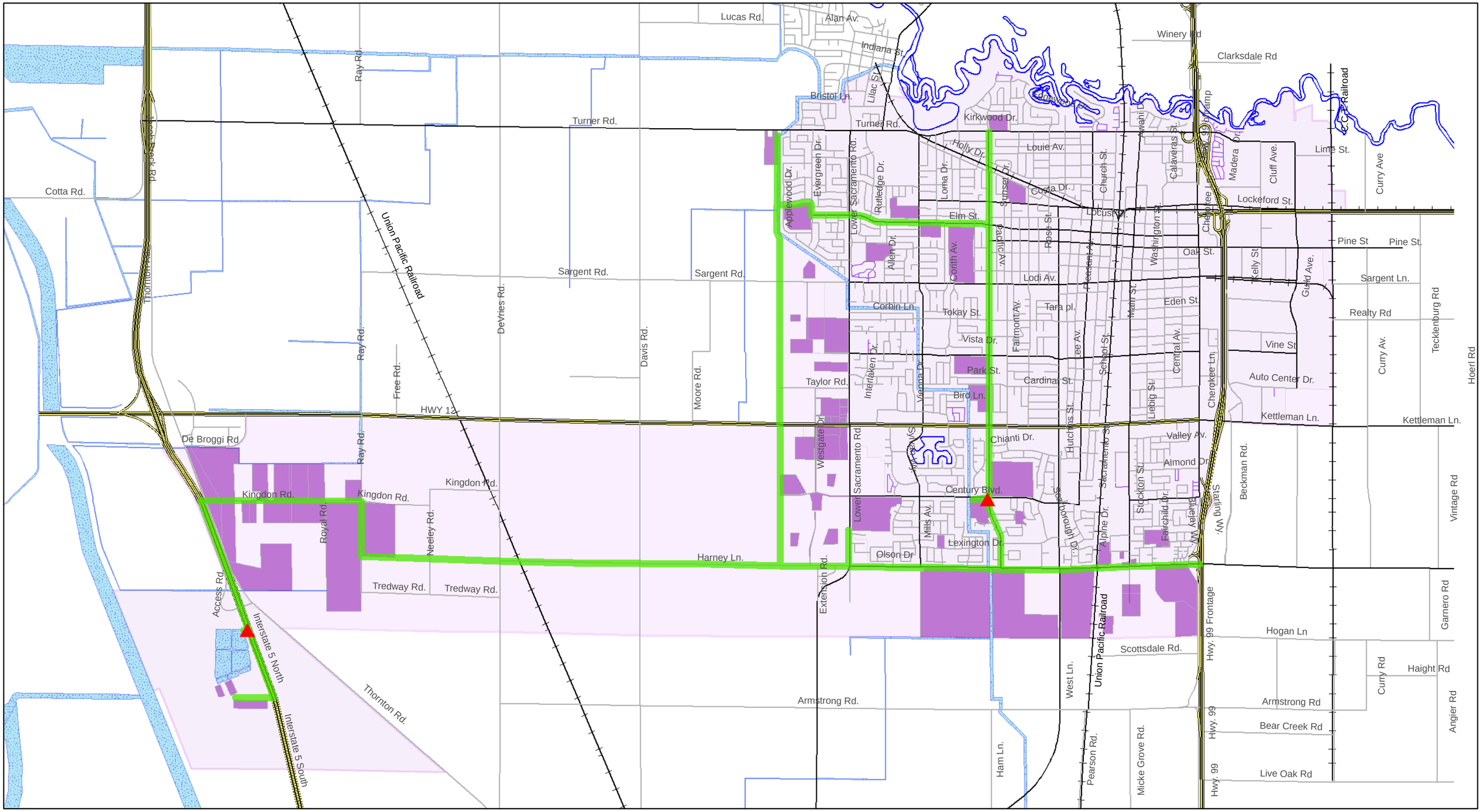
Legend

- City Limits
- RW Service Area
- Potential RW Customers
- Canal
- RW Distribution Main
- Pump Station

City of Lodi Recycled Water Master Plan

Figure 1 Alternative A

0 0.25 0.5 1 Miles



Legend

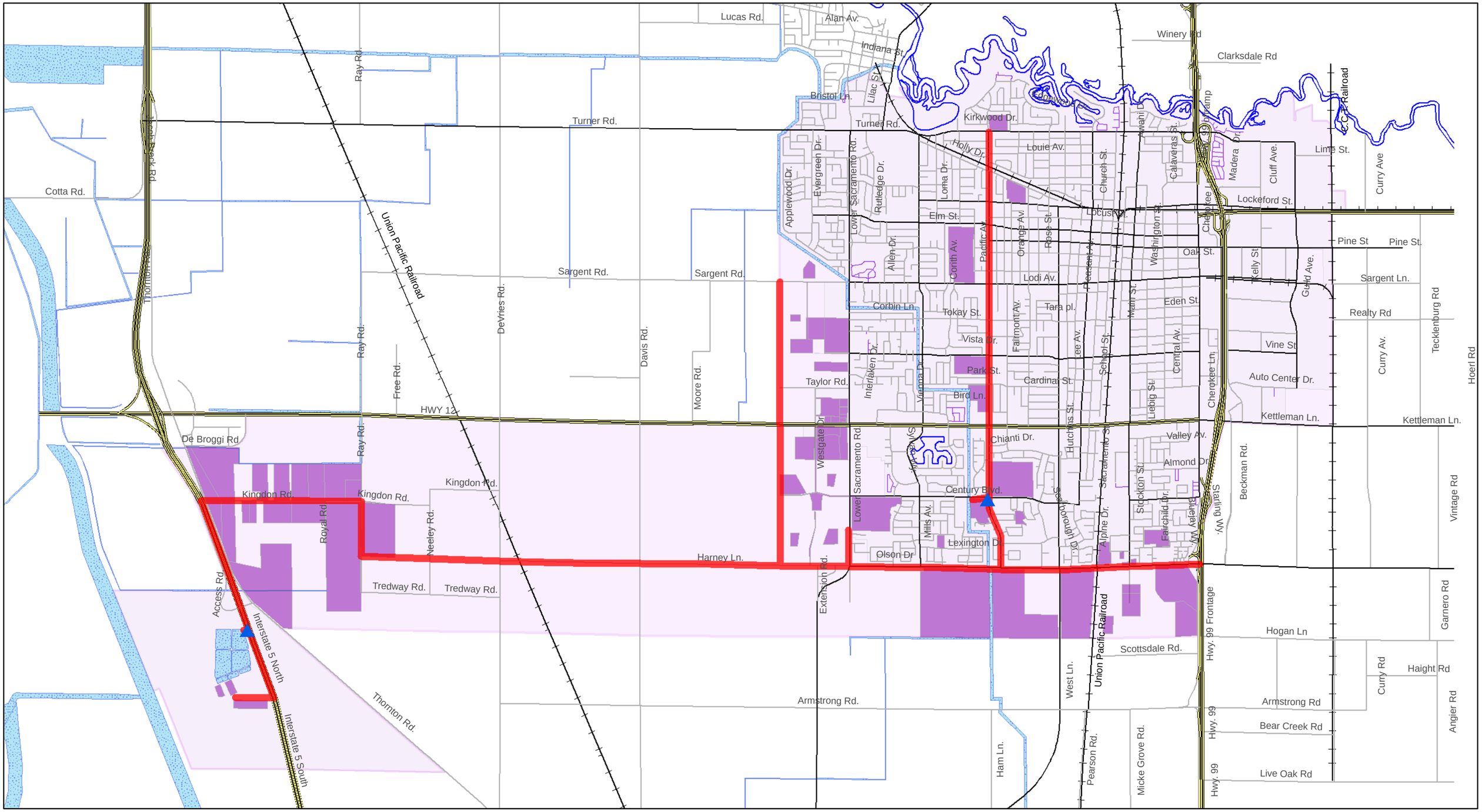
- City Limits
- RW Service Area
- Potential RW Customers
- Canal
- Pump Station
- RW Distribution Main

City of Lodi Recycled Water Master Plan

Figure 2 Alternative B

N W E S

0 0.25 0.5 1 Miles

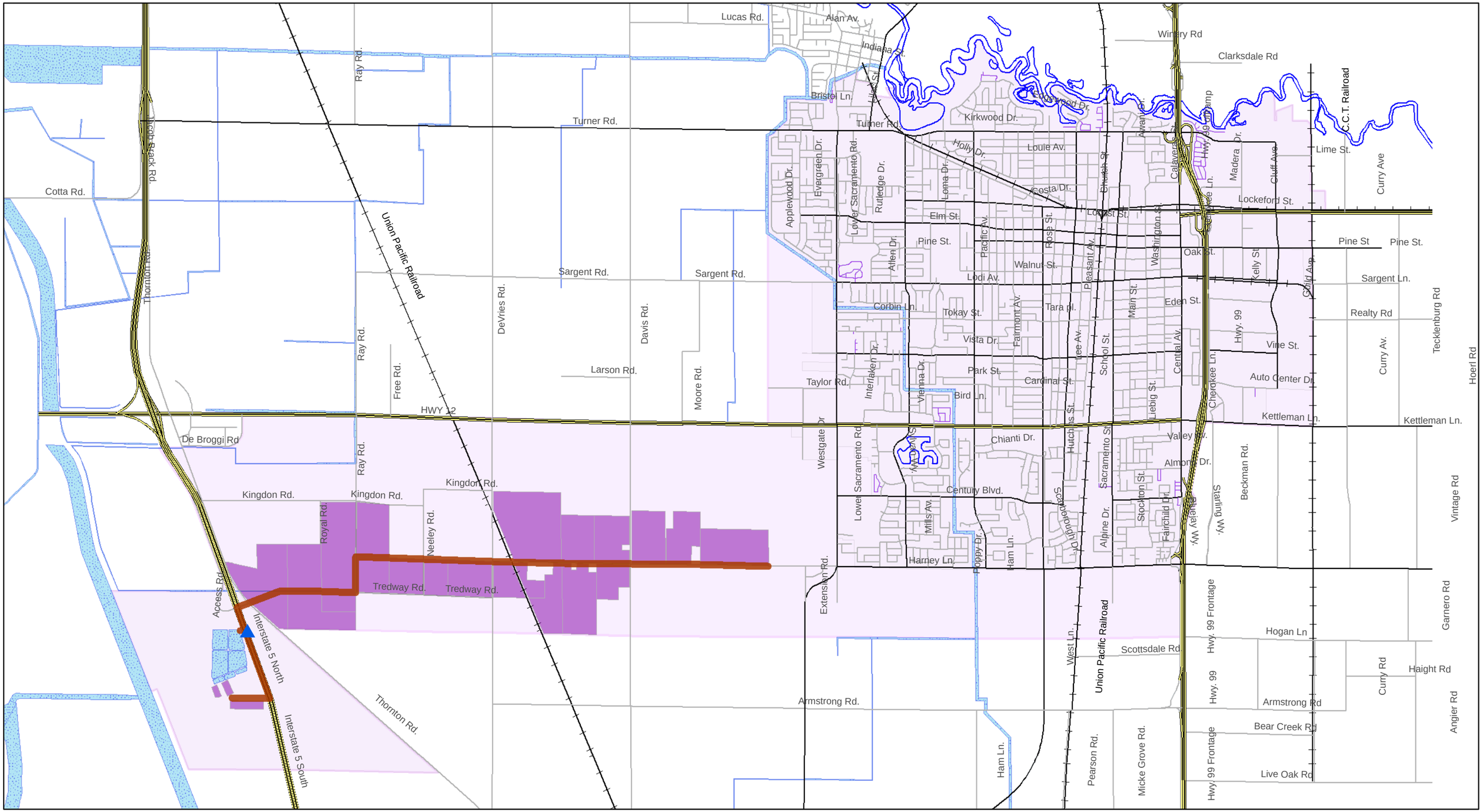


Legend

- City Limits
- RW Service Area
- Potential RW Customer
- Canal
- Pump Station
- RW Distribution Main

City of Lodi Recycled Water Master Plan

Figure 3 Alternative C



Legend

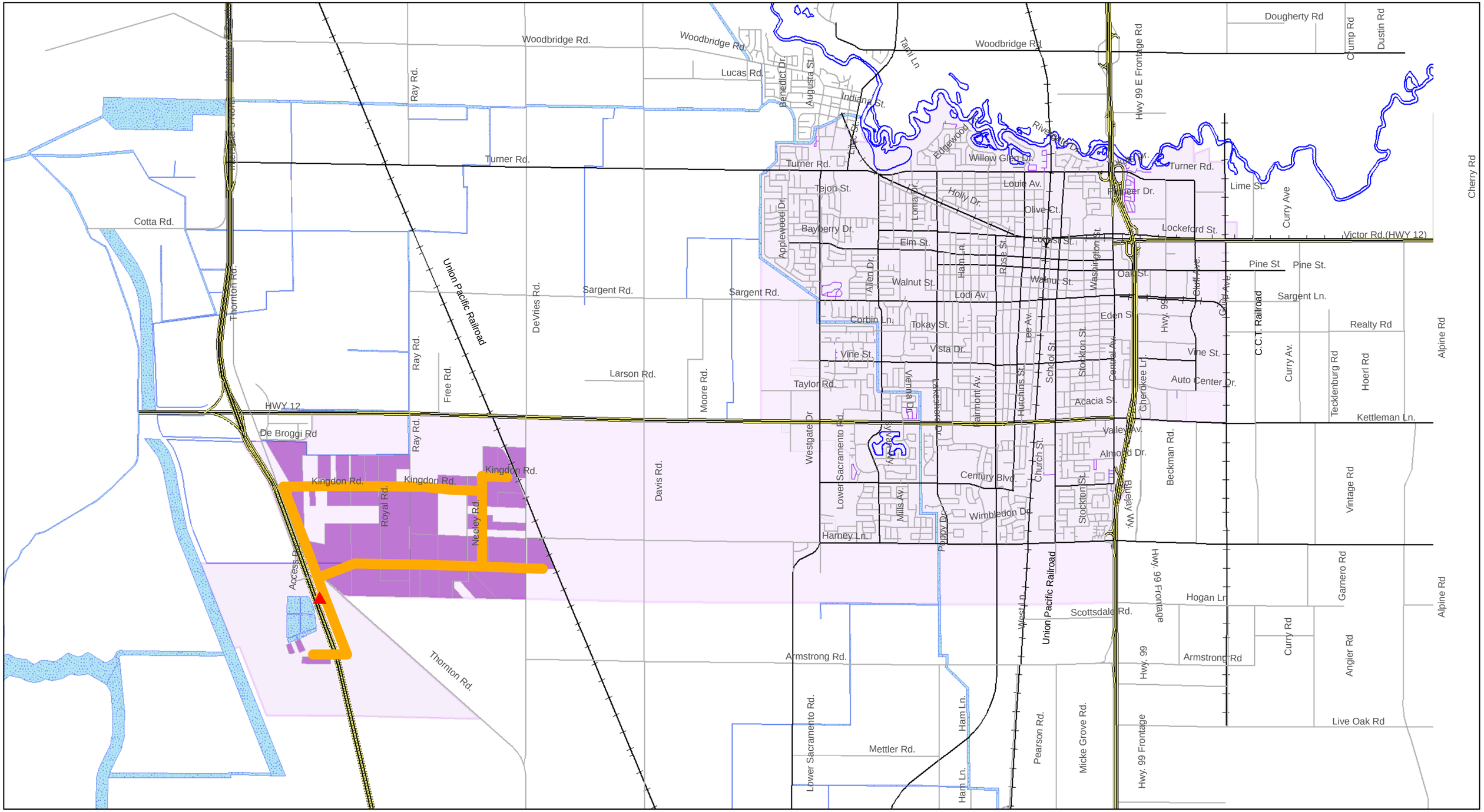
- City Limits
- RW Service Area
- Potential RW Customers
- Canal
- Pump Station
- RW Distribution Main

City of Lodi Recycled Water Master Plan

Figure 4
Alternative D - Non-Looped

N
W E
S

0 0.25 0.5 1
Miles



Legend

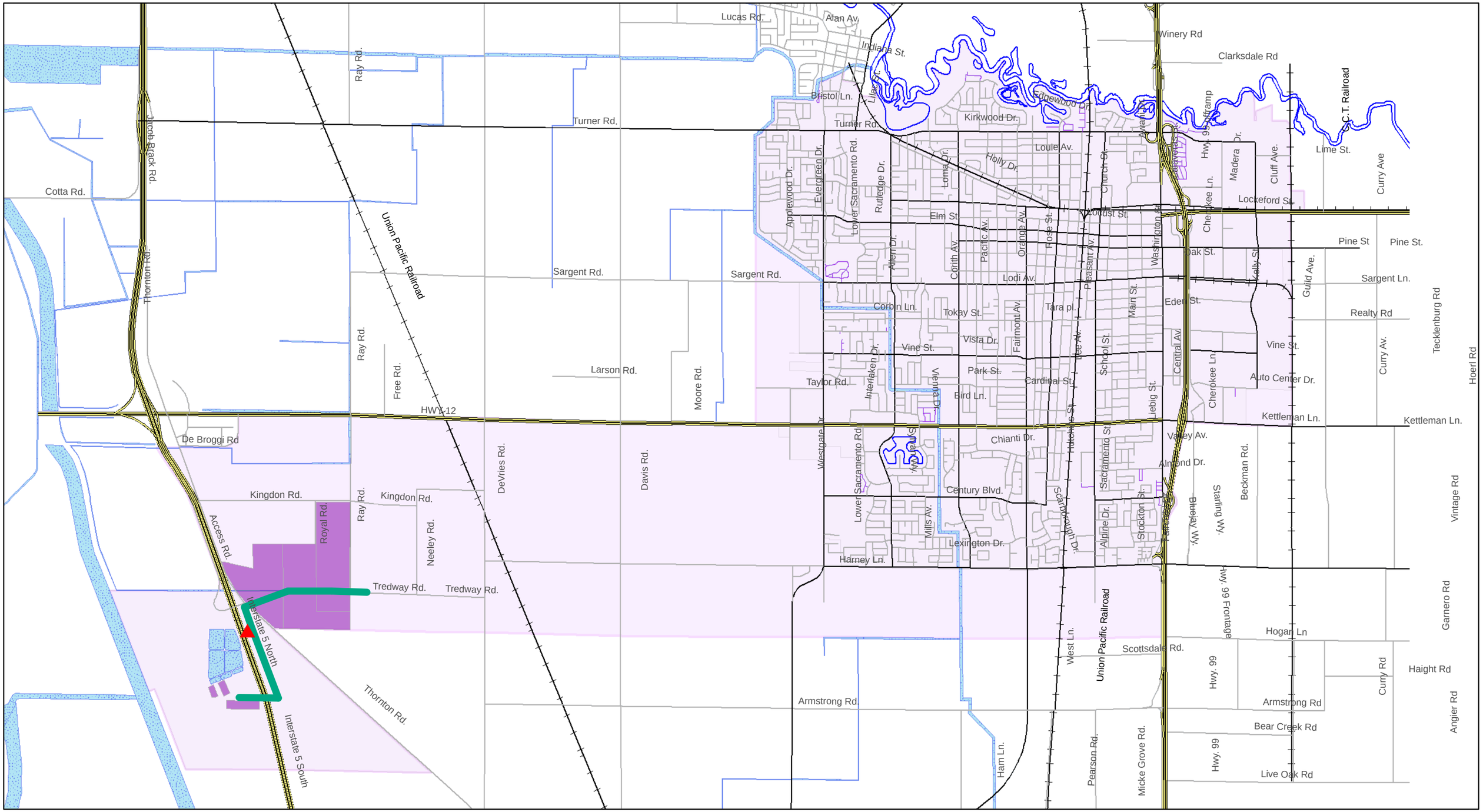
- City Limits
- RW Service Area
- Potential RW Customers
- Canal
- Pump Station
- RW Distribution Main

City of Lodi Recycled Water Master Plan

Figure 5 Alternative D - Looped

N
W E
S

0 0.3 0.6 1.2
Miles



Legend

- City Limits
- RW Service Area
- Potential RW Customers
- Canal
- Pump Station
- RW Distribution Main

City of Lodi Recycled Water Master Plan

Figure 6 Alternative D (Peak Hour Demands)

N
W E
S

0 0.25 0.5 1
Miles

Attachment A
Preliminary Evaluation of Selected Alternatives

City of Lodi

Recycled Water Master Plan

PRELIMINARY Conceptual Alternatives Evaluation

Evaluation Criteria	Description	Weighting Factor	Alternative A		Alternative D	
			Score	Comment	Score	Comment
Estimated Cost	Total cost per acre-foot of water delivered (capital and operational cost)	50%	3	Capital Cost: approx. $136 M Unit Cost: approx. $2,400/AF	1	Capital Cost: approx. $66 M Unit Cost: approx. $1,800/AF
Flexibility	Ability to change plans to address unforeseen circumstances, and project phasing capability	25%	2	Project is limited to users along corridor WCPF location limits flexibility	2	Project is limited to users along corridor WCPF location limits flexibility
Meet Project Goals	Ability to meet project goals	10%	1	Meets all project goals	2	Does not meet goal of using WID water as an iterim supply
Ease of Implementation	Ease with which alternative can be designed, permitted, and constructed	5%	2	Citywide construction Use of WID canal alignment reduces utility crossings and pavement disruption	1	Least amount of construction Minimal cost to City No trenchless crossings
Social Impacts	Various impacts including risk of impact to biological systems and construction related impacts	5%	2	Some construction impacts	1	Least amount of construction limits impacts
Regional Plan Adaptability	Degree of synergy with potential regional recycled water system	5%	3	Inability to incorporate a regional system	2	Inability to incorporate a regional system
Revenue Potential	Revenue that the City can expect to collect for this service for use of maintenance or funding of the project.	0%	1	Unknown at this time	1	Unknown at this time
		Total Score:	**2.45**		**1.40**	

Alternatives are scored from most favorable (1) to least favorable (3) depending on how well they meet each evaluation criteria

Appendix D Public Outreach Materials

CITY OF LODI - ***Recycled Water Master Plan***

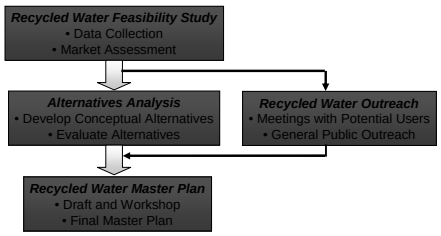
Workshop with Potential Recycled Water Users

June 6, 2007

Presenters:
Deana L. Donohue, P.E.
Dave Richardson, P.E.
Andy Smith

RMC

RWMP Project Approach

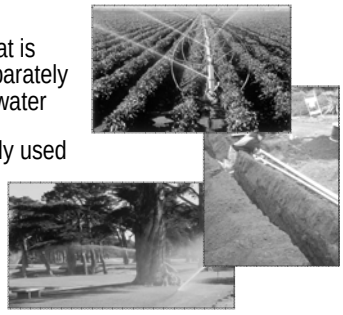


Goals and Objectives

- Understand the quality and benefits of recycled water
- Present Project Concept to Potential Users
- Answer Questions on Project Concepts and Opportunities
- Obtain Feedback and Information from Users to help define the project

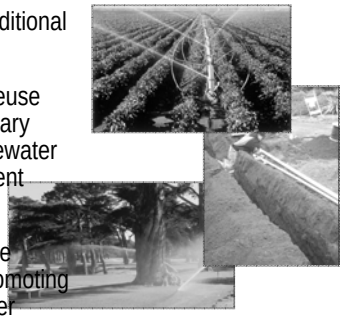
What is Recycled Water?

- Highly treated wastewater that is distributed separately from drinking water
- Most commonly used for irrigation

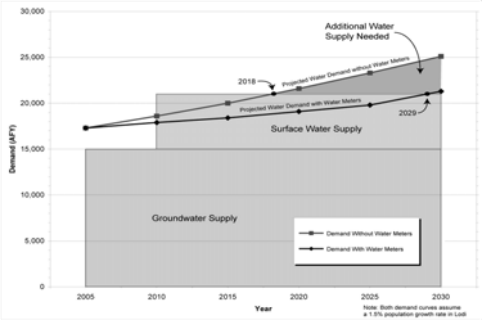


What are the Benefits of Recycled Water?

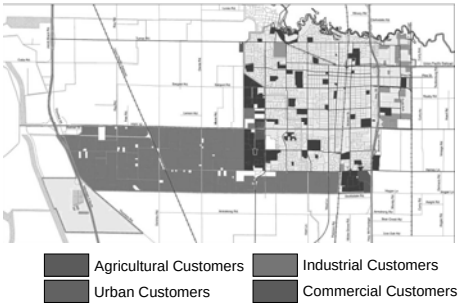
- Provide an Additional Water Supply
- Beneficially Reuse Available Tertiary Treated Wastewater (Reduce Effluent Discharge)
- Align with State Guidelines Promoting Recycled Water



The Need for Recycled Water in Lodi



Potential Recycled Water Market



Water Quantity

- Quantity available
  - White Slough WPCF Supply:
    - 6,900 – 9,500 Acre Feet per Year (AFY)
  - WID Surface Water Delivery:
    - 6,000 AFY Contracted (March 1 to October 15)
    - 2,400 AF (~500 AFY) Banked

Water Quality

- Quality suitable for a variety of irrigation purposes
  - Salinity (Total Dissolved Solids- TDS)
  - Sodium (Sodium Adsorption Rate-SAR)
  - Toxicity
    - pH
    - Chloride
    - Nitrogen
    - Potassium

Crop-Specific Quality & Quantity Issues

- Varying irrigation practices:
  - Most irrigate based on crop, soil type, and weather
  - Many growers using drip irrigation
- Many growers using good quality surface and/or well water
  - 200 mg/L TDS or lower
- Potential concerns:
  - Level of treatment (e.g., pathogens)
  - Filtration prior to drip irrigation
  - TDS and nitrogen content

Conceptual Alternative 1

Conceptual Alternative 2

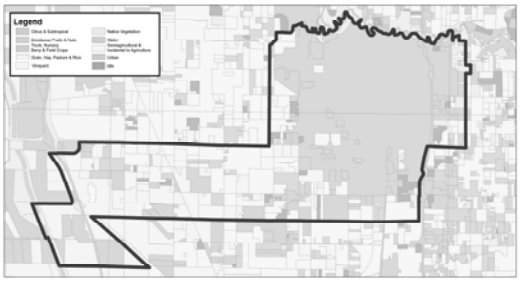
Conceptual Alternative 3

Goals and Objectives

- Understand the quality and benefits of recycled water
- Present Project Concept to Potential Users
- Answer Questions on Project Concepts and Opportunities
- Obtain Feedback and Information from potential Users to help define the project

Questions/Comments

Crop Types in the Lodi Area



Source: 1996 DWR Land Use Survey

Projected Recycled Water Quality vs. Interpretive Guidelines for Water Quality for Irrigation

Representative Water Quality Objectives for Irrigation[1]						White Slough WPCF Effluent Water Quality	Predicted Future Recycled Water Quality
Potential Customer Concern	**Related Constituents**	**Units**	**Good**	**Fair**	**Poor**		
Sprinkler Plugging	TSS	mg/L	No specific guidelines; less than 5 mg/L desirable			3	3
	Turbidity	NTU	No specific guidelines; less than 2 NTU desirable			<2	<2
Plant Salt Tolerance	TDS	mg/L	< 450	450 – 2,000	> 2,000	377	245
Soil Permeability	Adjusted Sodium Adsorption Ratio (SAR)	SAR ratio	< 6.0	6.0 – 9.0	> 9.0	4	3.9
Ion Toxicity to Plant Foliage or Root (Sprinkler)[2]	Sodium	mg/L	< 70	> 70	-	73	47.4
	Chloride	mg/L	< 100	> 100	-	73	41
	Boron	mg/L	< 0.5	0.5 – 1.0	>10	0.2	0
Miscellaneous	Bicarbonate (Sprinkler)	mg/L	<90	90-500	>500	188	122
	pH	pH unit	Normal range: 6.5 – 8.4			7.0 (range 6.2 – 8.0)	6.9

1. After Pettygrove and Asano, 1985; does not consider differences in tolerance among plant species, irrigation frequency, or specific site conditions such as soil texture, drainage, and chemical characteristics.
2. Plant Sensitivity to specific ions varies widely by plant species and irrigation method.

Meeting Minutes

City of Lodi Recycled Water Master Plan

Subject: Large Users Workshop - Ag
Prepared By: Andy Smith
Date/Time: June 6, 2007 / 1:00 p.m.
Location: Lodi
Project Number: 0140-003

Attendance:

- Lyman Chang, Chris Boyer, Wally Sandelin, Richard Prima (Lodi)
- Deana Donohue, Dave Richardson, Andy Smith (RMC)
- Barbara Butterworth, Rick Grewal, Gregg Meath, George Marion, Ray Coldani, John Cosisi (Public Attendees)

Meeting Objectives:

- Present project concepts to potential users
- Answer questions on project concepts and opportunities
- Obtain feedback and information from users to help define the project

Questions & Comments:

Question/Comment	Answer/Response
1. Would the RW be distributed via a pipeline? (versus a canal?)	Yes, there would be a pressure pipeline from the White Slough WPCF.
2. How would water get from the pipeline to a property that may be some distance away?	Additional pipe would be required (e.g., a lateral); we don't yet know where these laterals would be located (location would be based on interest), and we don't yet know who would be responsible for the costs.
3. What happens if RW contaminates the underlying GW?	The City would retain a certain amount of liability for cases such as these. Here's how the process would work: a. Conduct the RW feasibility study b. Define project(s) according to results of feasibility study c. The defined project would then go through CEQA d. If the project gets the OK (i.e., no non-mitigatable impacts), the City will then need use agreements with each customer. Limited liability would remain with the City.
4. What about areas outside the recycled water service area? Have they been considered as potential customers?	We had to take a realistic approach to looking for customers. There is likely more demand than supply, so the service area was defined to include the City limits and an area near a potential alignment between the treatment plant and the main City limits.
5. What if my neighbor uses RW? Will it contaminate my GW?	
6. The process for determining liability would be adversarial (i.e., plaintiff's would need attorney)	

Question/Comment	Answer/Response
7. Does the City plan to deal with nitrate loading problems [near the White Slough plant]? A study has said that we simply need to expand the land application area.	There are currently three (3) sources of nitrate in the area near the White Slough plant, and the City is currently constructing an upgrade to the plant that will provide a solution for the WW source. For other sources of nitrate (biosolids and cannery waste), solutions are being considered, and will be implemented in the future, but we're not sure how and when at this point.
8. The airport [east of the White Slough plant] is sensitive to wildlife accumulating near the airstrip. Will there be any new ponding requirements as a result of the proposed RW system?	There is a potential for new ponds. [When asked if there was any preference, on the airport's behalf, between "mucky" areas with standing water or deep ponds, the workshop attendee stated that they are essentially the same from a waterfowl standpoint.]
9. Nitrate is a big issue; can we "trust" that the City will do what it says (i.e., consistently meet the State-required effluent limits)?	An upgrade to the White Slough plant that will reduce nitrates in the effluent is under construction; effluent should consistently meet nitrate requirements once the upgrade is up and running.
10. This is a water supply project, right?	Yes, the water is valuable. The City is also conducting a joint RW planning study with Stockton at this time, and the City fully anticipates that Stockton will find a use for all of the available RW;
11. One of the meeting attendees stated that he has 15 wells, and every one has been condemned (following recent testing); there is now an issue of whether he can sell his produce. He has hired an attorney. He stated that he can "live with the water" for personal consumption. He also stated that he could "probably use all the available RW."	
12. The area north of the recycled water service area is mostly in WID boundaries.	
13. What about the cost of RW?	We don't yet know what the costs for the water will be. It would probably be a lot cheaper to use the RW nearer to the plant than in City.

Question/Comment	Answer/Response
14. WID has a "ground replenishment/recharge" fee; users pay a per-acre fee for GW recharge (meaning they pay for water they aren't using).	
15. How will you pressurize the RW? What are the associated costs?	The City would build a pump station. The cost of such a pump station does not look daunting based on preliminary investigations.
16. What's in the works for the area east of 1-5 (in the City-owned acreage surrounding the treatment plant)? Is wastewater effluent currently applied there?	The area is used for growing crops. All but about 90 acres of that area is irrigated with effluent from White Slough.
17. When did city begin applying effluent in that area?	In the 1950's (at that time the City's WWTP was located within the City, and treated effluent was sent to the users by pipeline); the White Slough plant was built in 1966.
18. FAA regulations state that it's "illegal to do what the City is proposing (i.e., using RW to irrigate), because it attracts birds." The airport's approach pattern is from the west, about 800 feet above ground – this means that any birds pose a serious threat. According to the FAA regulations, birds prefer to land (even in fields) where "waste disposal" takes place. A 10,000 ft perimeter (inside which no "waste disposal" or ponds may be located) is needed around airport.	There might be some chlorine residual in the RW pipe. This may make the water seem less "favorable" to waterfowl. This would be a water reuse operation, rather than a waste disposal operation. We'll look into the FAA regulations to verify that any project that is developed is not in violation.
19. Same attendee from comment No. 11 uses between 30,000 and 50,000 gpm near White Slough (on his ~700 acres). He's growing olives, tomatoes, peppers, and probably others.	
20. WID "replenishment/recharge" fee, for one meeting attendee: For their 30 irrigated acres, the GW recharge fee is $80/yr.	

Action Items:

1. Look into and verify FAA regulations; determine whether conceptual alternatives would violate any regulations. Also determine if and where it is stated that land irrigated with recycled water is more attractive to fowl than land irrigated with groundwater or surface water.

CITY OF LODI - ***Recycled Water Master Plan***

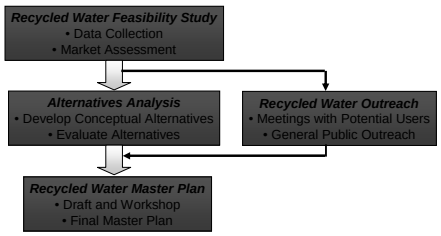
Workshop with Potential Recycled Water Users

June 11, 2007

Presenters:
Deana L. Donohue, P.E.
Andy Smith

RMC

RWMP Project Approach

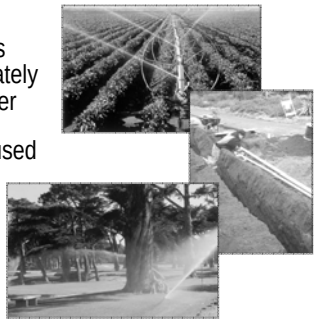


Goals and Objectives

- Understand the Quality and Benefits of Recycled Water
- Present Project Concept to Potential Users
- Answer Questions on Project Concepts and Opportunities
- Obtain Feedback and Information from Potential Users to help define the project

What is Recycled Water?

- Highly treated wastewater that is distributed separately from drinking water
- Most commonly used for irrigation and industrial applications



What are the Benefits of Recycled Water?

- Provide an additional, drought-proof, and reliable long-term water supply
- Offset use of potable water supplies by beneficially re-using available tertiary treated wastewater
- Reduce effluent discharge
- Align with State guidelines promoting recycled water

The Need for Recycled Water in Lodi

- The City of Lodi will need to bring a new water supply to its customers by 2020
- The best new supply available is Recycled Water

Potential Recycled Water Market

Agricultural Customers
Industrial Customers
Urban Customers
Commercial Customers

Water Quantity

- Quantity available
  - White Slough WPCF Supply:
    - 6,900 – 9,500 Acre Feet per Year (AFY)
  - WID Surface Water Delivery:
    - 6,000 AFY Contracted (March 1 to October 15)
    - 2,400 AF (~500 AFY) Banked

Water Quality

- Quality suitable for a variety of applications
  - Irrigation:
    - Salinity (Total Dissolved Solids - TDS)
    - Sodium (Sodium Adsorption Rate - SAR)
    - Toxicity
      - pH
      - Chloride
      - Nitrogen
      - Potassium

Water Quality

- Industrial Applications:
  - Calcium
  - Alkalinity
  - Silica
  - TDS
  - Chloride
  - Iron
  - Manganese

Operational Issues & Concerns

- Retrofitting
- Storage
- Irrigation Periods
- Water Pressure
- Filtration (prior to drip irrigation)

Conceptual Alternative 1

Conceptual Alternative 2

Conceptual Alternative 3

Goals and Objectives

- Understand the quality and benefits of recycled water
- Present Project Concept to Potential Users
- Answer Questions on Project Concepts and Opportunities
- Obtain Feedback and Information from potential Users to help define the project

Questions/Comments

Projected Recycled Water Quality for Industrial Applications

Constituents of Concern	Units	White Slough WPCF Effluent Water Quality	Predicted Future Recycled Water Quality[1]	
pH	pH units	**7.0** (range 6.2 – 8.0)	*6.9*	No expected change
Alkalinity	mg/L as $CaCO_3$	**153** (range 120 – 230)	*99*	Estimated based on mass balance
Total Suspended Solids	mg/L	**3** (range 0.1 – 22)	*3*	No expected change
Total Dissolved Solids	mg/L	**377** (range 150 – 540)	*245*	Reduction in source TDS
Ammonia	mg/L	**2** (range 0.03 – 25)	*2*	No expected change
Silica	mg/L	**69** (range 65 – 72)	*69*	No expected change
Chloride	mg/L	**64** (range 55 – 77)	*41*	Reduction in source chloride
Manganese	µg/L	**27.6** (range 11.7 – 41.6)	*27.6*	No expected change
Aluminum	µg/L	**35** (range non-detect – 40)	*28*	Reduction in Source Aluminum
Calcium	mg/L	**29** (range 22 – 34)	*19*	Reduction in source hardness
Zinc	µg/L	**33.9** (range 2.5 – 69)	*24*	reduction in source zinc
Copper	µg/L	**3** (range non-detect – 13)	*3*	No expected change
Iron	mg/L	**100** (range 100 – 200)	*94*	reduction in source iron

[1] Estimated values are italicized. For the purposes of this analysis, it was assumed that recycled water quality concentrations will change in proportion to the change in drinking water parameter concentrations resulting from blending groundwater and surface water supplies.

Meeting Minutes

City of Lodi Recycled Water Master Plan

Subject:	Large Users Workshop - Urban
Prepared By:	Andy Smith
Date/Time:	June 11, 2007 / 1:00 p.m.
Location:	Lodi
Project Number:	0140-003

Attendance:

- Lyman Chang, Chris Boyer, Richard Prima (Lodi)
- Deana Donohue, Andy Smith (RMC)
- Steve Virrey, Tim McGeorge (Lodi Parks Division)

Meeting Objectives:

- Present project concepts to potential users
- Answer questions on project concepts and opportunities
- Obtain feedback and information from users to help define the project

Questions & Comments:

Question/Comment	Answer/Response
1. Are specialized pumps required for use with RW? The Parks Division has quite a few older booster pumps.	We don't anticipate any special pump requirements, but there are certainly specialized equipment/materials (e.g., impellers, pump casings, etc.) available if necessary.
2. The Parks Division has not yet spoken with parks staff from other municipalities using RW. RW holding ponds are under construction in Manteca. Parks Division intends to discuss RW operational issues at upcoming interagency workshops/meetings.	Suggested contacts: City of Roseville (incl. golf course managers), City of Pittsburg (also incl. municipally-owned golf course), Elk Grove, El Dorado Hills
3. Would basket strainers be required for filtering RW upstream of irrigation valves?	Possibly; strainers and other retrofits will be evaluated during the evaluation of the chosen alternative. RW from White Slough would not require additional filtration/straining, but some form of straining will likely be necessary if raw WID water is drawn from the canal. Strainers could be located at the raw water intake, rather than at the points of service.
4. There was a recent article about fruit stickers getting all the way through the wastewater treatment process. Could this be a problem for Lodi (i.e., could the stickers get into the RW system and clog irrigation valves)?	Probably not. It is unlikely that fruit stickers would pass the cloth filters currently in use at White Slough.
5. What other types of retrofits/requirements might be necessary if the Parks Division accepts RW?	Title 22 includes requirements for backflow prevention devices; overspray, misting, and runoff; color coding of RW pipes; signage; and quick coupling connections. These requirements will be considered and discussed during the evaluation of alternatives.
6. Richard: The price of RW would be different than the current price for potable GW. (The difference would benefit the Parks Division).	
7. Lyman: Are there water meters at all of the parks?	Yes.
8. The peak day peaking factors for the City's parks appears high (in comparison to typical values in California).	Every park is different. Particularly for parks with frequent athletic use, irrigation schedules can be tricky, often requiring more water to be applied at one time.

Question/Comment	Answer/Response
9. The presence and/or configuration of RW booster pumps will impact the Parks Division's ability to control irrigation periods – with higher pressures, more valves can be operated simultaneously. [Pixley Park?] occupies 26 acres, and has about 65 valves. The presence of sloped sides in basin parks also affects irrigation periods – these parks need alternating cycles to avoid excessive runoff towards the toe of the slope.	
10. A number of the City's parks are on Maxicom irrigation control systems.	Can RMC obtain a list of all of the parks controlled by Maxicom?
Four or five of the City's parks are on ET-based irrigation schedules – these don't always work with athletic facilities.	We will need the irrigation system printouts for all parks in order to help size storage at White Slough and/or in the distribution system.
11. The Parks Division has been aware that RW has been in the works for some time, and is prepared to accept it.	
12. The school district has a $25,000 weather station, which it had intended to use for a different irrigation management system, still sitting in a box.	
13. What does the Parks Division's weather station measure?	Temperature, wind run, humidity, solar (?), and rainfall. A technician cleans and recalibrates the equipment annually. The Parks Division has compared data from its weather station to that of the Fire Department, and found the FD's rainfall data to be higher by 3-5 inches (for the 2006-2007 water year).
14. Richard: The CIMIS station located west of Lodi may not be a reliable source for controlling park irrigation (although the average precipitation values are probably very close).	
15. Lyman: A representative from the Lodi Academy called to inquire about recycled water and its implications on a school site.	

Action Items:

1. Tim McGeorge will provide a list of the City's parks that currently feature Maxicom irrigation systems (sent 6/12/07).
2. Contact hoped-for workshop attendees that did not attend: Jack Merrill from Mainland Nursery; Art Hand (sp?) from the school district, etc. We may need to send them the workshop materials prior to having a phone discussion.
3. The City had trouble printing the draft Market Assessment TM. RMC will provide a PDF that does not contain 11x17 pages.
4. RMC and the City will conduct a workshop debrief within the next week or so to go over the feedback from workshop attendees, and to discuss a systematic approach to paring down the list of potential users, in conjunction with the refinement of conceptual alternatives for the next phase of the project.

Appendix E City of Lodi Annual Water Quality Report for 2006

City of Lodi
Annual Water Quality Report for 2006

(published April 2007)

Keeping you, the Citizens of Lodi, informed about your drinking water.

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo ó hable con alguien que lo entienda bien. Para la ayuda en español, llama por favor (209) 333-6740.

This 18th Annual Water Quality Report summarizes testing on Lodi's water supply by State certified laboratories and provides information about the water system. This report follows the "Consumer Confidence Report" (CCR) format required by the U.S. Environmental Protection Agency and the State of California.

WHO ARE WE?

In 1910 your City of Lodi Water Utility officially began operation along with the Electric Utility, and for 96 years, the water system has been owned by the Citizens of Lodi. Ninety-six years ago there were only two wells and a few miles of water mains. In 2006 there were twenty-six wells, over 220 miles of mains, a water tower and a 1-million-gallon storage tank. Lodi delivers water to approximately 23,000 residential, commercial and industrial customers.

Water rates, system expansion projects, and significant purchases are authorized by the Lodi City Council, which serves as the water utility's official regulatory body. **Lodi City Council meetings are open to the public and are scheduled for the first and third Wednesdays of each month at 305 West Pine Street in Lodi at 7:00 p.m.** You may also communicate with the Council and City staff through the City's web site (www.lodi.gov).

YOUR DRINKING WATER SYSTEM

Twenty-six computer controlled wells, located throughout the City, provide high quality groundwater, and was our sole source of supply in 2006. The wells operate automatically on water pressure demand so that when water use increases, more wells are started. To keep up with peak water supply demands, a new well is planned for 2007. The costs of new wells are paid by development fees. However, the groundwater basin is being depleted. Lodi has contracted to use some surface water from the Mokelumne River. The City has begun studies to treat this water and use it directly, thereby reducing groundwater pumping. More information on water supply is on the City's web site.

Seven wells are fitted with emergency diesel-powered generators. (While these generators will help maintain water pressure during power outages, please refrain from using water during power outages to save capacity for essential uses, - hospitals, fire fighting, etc.)

The water delivered to your tap meets or is better than all federal and state water quality standards.

If you have any questions about this report or Lodi's water quality, please contact:

Water/Wastewater Superintendent
Frank Beeler
1331 S. Ham Lane, Lodi, CA 95242
Telephone: (209) 333-6740
E-mail: fbeeler@lodi.gov

WATER QUALITY

Lodi is fortunate in having a high quality groundwater supply. However, that supply is at risk and must be carefully managed. The following section describes some of these measures.

- PCE/TCE - The City, working with regulatory agencies and potentially responsible parties in a cooperative manner, is pursuing a resolution to a groundwater contamination problem in the north and central Lodi area. While no operating wells are out of compliance with any drinking water standards, the contamination is a serious threat. PCE (Tetrachloroethylene) and TCE (Trichloroethylene) have been detected in samples taken in soils and groundwater. Cleanup work in portions of the area has commenced and the City expects additional areas to commence cleanup work in 2007/08. The City's share of these costs has largely been determined and a series of rate adjustments has been adopted. More information on this can be found on the City's website.

- Bacteriological Quality, Chlorination - Lodi takes over 20 samples per week from throughout Lodi's water distribution system for bacterial water quality. Regulations allow for 5% of all total coliform samples in a month to be positive. In 2006 all bacteriological standards were met.

The water may be periodically chlorinated as a proactive step to help keep the water system in compliance with strict bacteriological standards; however, Lodi's water does not normally contain chlorine. The City will make an effort to inform you in local newspapers before your water is chlorinated. When necessary however, the water may be chlorinated before you can be informed.

- MTBE - MTBE (Methyl-Tert-Butyl-Ether) is a controversial additive to gasoline that has been in the news the past few years. One of the main concerns with MTBE is the threat of leaking from service stations into the groundwater. Monitoring of City wells has NOT found any detected traces of MTBE to date. The City has a program of monitoring all City wells for MTBE. Wells that are at greater risk (i.e., closer to gasoline stations) are monitored more frequently.

- DBCP - Dibromochloropropane (DBCP) was used by area farmers to kill nematodes in vineyards. DBCP was banned in California in 1977, but is still present in trace levels in some groundwater. The City of Lodi used 25 (of 26) wells to provide drinking water in 2006. The wells are rotated so over the course of time, water being delivered is a blend from these wells. Thirteen of Lodi's wells had no detectable DBCP. Six wells have filters to remove DBCP. The remaining six meet State and Federal standards, but have trace amounts of DBCP. The result is that the people of Lodi are being served water below the DBCP level deemed safe by the U.S. EPA and the State of California.

In 1996 the City settled a lawsuit against DBCP manufacturers, who have already paid the City for a large portion of Lodi's costs related to DBCP treatment. These manufacturers will continue to pay a large portion of the City's DBCP related costs for the settlement's 40-year term.

- Drinking Water Source Assessment - An assessment of the drinking water sources for the City of Lodi's water system was completed in February 2003. The sources are considered most vulnerable to the following activities: gas stations (current and historic), chemical/petroleum processing/storage, metal plating/ finishing/fabricating, plastic/synthetics producers, dry cleaners, known contaminant plumes, sewer collection systems, fleet/truck/bus terminals, machine shops, utility stations-maintenance areas, agricultural drainage, and photo processing/printing.

A copy of the completed assessment is available at the Public Works Department, City of Lodi, 1331 South Ham Lane, Lodi, CA 95242. You may request that a copy be sent to you by contacting Frank Beeler at (209) 333-6740. A copy of the complete assessment is also available at the Department of Health Services, Drinking Water Field Operations Branch, Stockton District Office, 31 E Channel Street, Room 270, Stockton, California 95202. You may also request that a copy be sent to you by contacting Joseph O. Spano, District Engineer, at (209) 948-7696

IF YOU HAVE A WATER PROBLEM

-Many times, water quality problems in the home can be traced to the hot water heater, the plastic water lines under the sink to faucets, or because sewer gases from the drain are being smelled.

-Set the hot water heater at the proper temperature, too hot can create heavier scaling problems, and not warm enough can allow bacteria to grow.

-Other times there can be occasional water quality problems associated with the aesthetic quality of your water such as sand, which may be originating from water supply mains.

-"Hard" water can be considered a quality issue depending on the actual hardness level and the use. Some industrial processes require very soft water. Lodi's groundwater is at the low end of the "moderately hard" water range and you may see white scale or spots on plumbing fixtures.

-If you have a filter or in-home treatment system; be sure it's working properly and change filters regularly. (Note, if you use a water softener, we suggest you utilize one which is regenerated by the softener company. Self-regenerating units add salt to the wastewater, which can add significantly to the City's wastewater treatment costs.)

-Low pressure can lead to water quality problems and can be caused by plugged screens in faucets or washing machine hoses, broken valves or for other reasons. If you have intermittent problems, first check pressure in other parts of your house or at an outside faucet. If that pressure is okay, check the fixture/screens at the problem area. If the problem is throughout the whole house, call the City for assistance.

If you ever experience trouble with your water, and you do not think it is a problem with your on-site plumbing, please call the Water/Wastewater Division at 368-5735 or 333-6740.

WATER CONSERVATION

In 2006, 5.313 billion gallons of groundwater were pumped to meet Lodi's water demands. This is 26% less water use per person than in 1986. As population in Lodi and California increases, water conservation becomes an important part of meeting demands for fresh water.

The commitment of the citizens of Lodi to conserving water also helps conserve the electrical energy needed to pump the water to homes and businesses. To further conserve water, electrical energy, and wastewater treatment plant capacity, the City has instituted a rebate program for water saving devices such as low-flow toilets. See details below.

Your diligent water conservation practices, as in the past, are needed in 2007. A report calculated dollar savings from water conservation to be far above the cost of the Water Conservation Program! Your water conservation efforts have also averted millions of dollars in capital costs, helping rates stay as low as possible. The millions of dollars in capital cost savings can easily be lost if water conservation is not continued.

See the summary of the Lodi Water Conservation Ordinance at:
http://www.lodi.gov/public%5Fworks/water%5Fconservation.html For information or to report a water waste, call the Water Conservation office at 333-6829.

$ Water Conservation Rebate Program $

The City of Lodi is offering rebates on the purchase and installation of water conserving devices at residential and commercial water customer premises within the City of Lodi.

Rebates of up to $44 are given for Ultra Low-Flow Toilets rated at 1.6 gallons per flush or less and must be replacing units using a higher volume of water per flush. Rebates of up to $100 are available for pressure assist PF/2 Ultra Low-Flow 1.6 gallon toilets. Additional rebates of 50% are available on Low-Flow Shower Heads, Insulated Hot Water Blankets, and Hose Bib Manual Timers for outside water hoses.

The program is funded by the Water, Wastewater and Electric Utilities. **The rebates, given in the store at the time of purchase, are only available at the following Lodi stores:**

Ace Hardware • 827 West Kettleman Lane
Orchard Super Hardware • 360 South Cherokee Lane
Ferguson Enterprises, Inc • 1435 Academy Street

Call (209) 333-6740 for more details.

THE FOLLOWING MESSAGES ARE REQUIRED BY THE U.S. EPA AND THE STATE OF CALIFORNIA. NOT ALL PORTIONS OF THESE MESSAGES NECESSARILY APPLY TO LODI'S GROUNDWATER .

• Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at (1-800-426-4791).

• Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lesson the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

• The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

• Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, that may come from sewage treatment plant, septic systems, agricultural livestock operations, and wildlife.
- Inorganic contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- Pesticides and herbicides, that may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems.
- Radioactive contaminants, that can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, US Environmental Protection Agency (USEPA) and the State California Department of Health Services (Department) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that must provide the same protection for public health.

RADON is a naturally occurring radioactive gas that you can't see, taste, or smell. It is found throughout the U.S. Radon can move up through the ground and into a home through cracks and holes in the foundation. Radon can build up to high levels in all types of homes. Radon can also get into indoor air when released from tap water from showering, washing dishes, and other household activities. Compared to radon entering the home through soil, radon entering the home through tap water will in most cases be a small source of radon in indoor air. Radon is a known human carcinogen. Breathing air-containing radon can lead to lung cancer. Drinking water containing radon may also cause increased risk of stomach cancer. If you are concerned about radon in your home, test the air in your home. Testing is inexpensive and easy. Fix your home if the level of radon in your air is 4 picocuries per liter of air (pCi/L) or higher. There are simple ways to fix a radon problem that aren't too costly. For additional information, call your State radon program or call EPA's Radon Hotline (1-800-SOS-RADON).

ARSENIC: *After a long debate, the drinking water standard for Arsenic was lowered from 50 ppb (parts per billion) to 10 ppb. The following message is required for systems that have some sources containing Arsenic below the new standard of 10 ppb, but over half (5 ppb). The average in Lodi's wells is 4.4 ppb and the highest well is 9.7 ppb.*

While your drinking water meets the current EPA standard for arsenic, it does contain low levels of arsenic. The standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The California Department of Health Services continues to research the health

effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

NITRATE: *The following message is required for systems that have some sources containing Nitrate below the standard of 45 ppm (as NO3), but over half (23 ppm) of the standard. The average of Lodi's wells is 9.2 ppm and the highest well is 36 ppm.*
Nitrate in drinking water at levels above 45 mg/L is a health risk for infants of less than six months of age. Such nitrate levels in drinking water can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin. Nitrate levels above 45 mg/L may also affect the ability of the blood to carry oxygen in other individuals, such as pregnant women and those with certain specific enzyme deficiencies. If you are caring for an infant, or you are pregnant, you should ask advice from your health care provider.

To better understand the report, please note the description of terms and abbreviations

Terms and Abbreviations Used:

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCL's are set to protect the odor, taste, and appearance of drinking water.

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

Notification Level (NL): Health-based advisory levels established by DHS for chemicals in drinking water that lack maximum contaminant levels (MCLs).

Primary Drinking Water Standard or PDWS: MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Maximum residual disinfectant level (MRDL): The level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap.

Maximum residual disinfectant level goal (MRDLG): The level of a disinfectant added for water treatment below which there is no known or expected risk to health. MRDLs are set the U.S. Environmental Protection Agency.

mg/L or ppm: Milligrams per liter, or parts per million (one ppm equals a concentration of about one cup in a 60,000 gallon swimming pool).

ug/L or ppb: Micrograms per liter, or parts per billion (one ppb equals about 4.5 drops in a 60,000 gallon swimming pool).

ppt: Parts per trillion (one ppt equals less than 1/200 of a drop in a 60,000 gallon swimming pool).

pCi/L: Picocuries per liter (a measurement of radiation).

NA: Not Applicable.

ND: Not Detected at measurable amounts for reporting purposes.

Grains/gal: Grains per gallon. A hardness measurement often used for softeners and dishwashers. (17.1 mg/L = 1 grain/gal as calcium carbonate).

umhos/cm: Micromhos per centimeter (a measurement of conductance).

< Means less than the amount shown.
> Means more than the amount shown.

City of Lodi Annual Water Quality Report for 2006

(published April 2007)

Regulated Inorganic Chemicals *2004-2006 Data	MCL	Average of Lodi Wells	Range of Individual Detections	PHG or (MCLG)	Major sources in Drinking water
Arsenic, ug/L	10	4.4	9.7-ND	0.004	Erosion of natural deposits (see message below)

Barium, mg/L	**1**	**<0.1**	**0.25-ND**	**2**	**Erosion of natural deposits**
Fluoride, mg/L	**2.0**	**0.05**	**0.37-ND**	**1**	**Erosion of natural deposits**
Nitrate as NO_3, mg/L	**45**	**9.2**	**36-ND**	**45**	**Leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits (see below)**

Bacterial Water Quality Coliform Bacteria 2006 Data	**MCL**	**Total Positive**	**Monthly High-Low Range**	**PHG or (MCLG)**	**Major sources in Drinking water**
Total Coliform, Positive	**5%/month**	**0.29 %**	**2.3 % - 0%**	**(0)**	**Naturally present in the environment**
Fecal Coliform & E. coli	**>1 /month**	**0**	**0 - 0**	**(0)**	**Human and animal fecal waste**

Radioactivity, pico Curies per Liter, 2005 Data	**MCL**	**Average of Lodi Wells**	**Range of Individual Detections**	**PHG or (MCLG)**	**Major Sources in Drinking water**
Gross Alpha, pCi/L	**15**	**2.86**	**15.9-0.16**	**(0)**	**Erosion of natural deposits**
Radium 228	**2**	**0.12**	**0.456-0**	**(0)**	**Erosion of natural deposits**
Uranium, pCi/L	**20**	**2.66**	**15.8-0**	**0.43**	**Erosion of natural deposits**

Organic Chemicals with at least one confirmed detection in an operational City Well

Regulated Organic Chemicals 2006 Data	**MCL**	**Average of Lodi Wells**	**Range of Individual Detections**	**PHG or (MCLG)**	**Major sources in Drinking water**	**Comments:**
Tetrachloroethylene (PCE), ppb	**5**	**0.06**	**2.0** - ND**	**0.06**	**Discharge from factories, dry cleaners, and auto shops (metal degreaser)**	Found in Wells #6R, 8 & 12 at levels below the MCL.
1,1-Dichloroethylene (1,1-DCE), ppb	**6**	**0.01**	**0.8**-ND**	**10**	Discharge from industrial chemical factories. Local contamination from businesses using the chemical.	**Only in Well # 2 at levels below the MCL**
Trichloroethylene (TCE), ppb	**5**	**0.08**	**2.1**-ND**	**0.8**	**Discharge from metal degreasing sites and other factories. Local ground contamination from businesses using the chemical. Breakdown product of Tetrachloroethylene (PCE).**	**Only from Wells # 2 & 18 at levels below the MCL.**
Dibromochloro-propane (DBCP), ppt	**200**	**36**	**320**-ND**	**1.7**	**Banned nematocide that may still be present in soils due to runoff/leaching from former use on vineyards.**	**See the update in the Water Quality section of this report**

Secondary Standards Aesthetic Purposes (see note) *2004-2006 Data	**Secondary MCL**	**Average of Lodi Wells**	**Range of Individual Detections**
Chloride, mg/L	**500**	**15**	**50-3.3**
Color-Units	**15**	**ND**	**ND**
Specific Conductance, MS/cm	**1600**	**345**	**810-120**

Secondary Standards Aesthetic Purposes (see note) *2004-2006 Data	**Secondary MCL**	**Average of Lodi Wells**	**Range of Individual Detections**
Sulfate, mg/L	**500**	**14**	**36-ND**
Total Dissolved Solids, mg/L	**1000**	**248**	**490-120**
Turbidity, NTU Units	**5**	**0.11**	**0.62-0.02**

Note: Aesthetic problems are only associated with taste, smell, and other problems which are not a health risk.

Lead & Copper Rule Customer Tap Monitoring 2006 Data	**AL (Action Level)**	**Average 90th Percentile**	**Range of Individual Detections**	**# Samples Exceeding AL (of 46 samples from 46 sites)**	**PHG or (MCLG)**	**Major sources in Drinking Water**
Lead, 90th %, ug/L	**15**	**<5.0**	**16-ND**	**1**	**2**	**Internal erosion of household plumbing systems; erosion of natural deposits**
Copper, 90th %, mg/L	**1.3**	**0.32**	**0.60-0.027**	**0**	**0.17**	

Unregulated Contaminants Detected 2006 Data	**Notification Level (NL)**	**Average of Lodi Wells**	**Range of Individual Detections**
Trichloropropane, ug/L	**0.005**	**0.003**	**0.089 - ND**

Other non-regulated water constituents found in your water (for your information only)

Non-regulated water constituents, *2004-06 Data	**Average of Lodi Wells**	**Range of Detections**	**Non-regulated water constituents, *2004-06 Data**	**Average of Lodi Wells**	**Range of Detections**
Total Hardness, mg/L as CaCO3	**133**	**340-40**	**Potassium, mg/L**	**6.9**	**13-2.3**
Total Hardness, grains/gal.	**7.8**	**19.9-2.3**	**Alkalinity (bicarbonate), mg/L**	**168**	**340-63**
Calcium, mg/L	**29**	**78-8.2**	**pH, in pH units**	**7.4**	**7.8-6.9**
Sodium, mg/L	**22**	**56-1.3**	**Magnesium, mg/L**	**14**	**35-4.9**

*** Regulations call for monitoring of some constituents less than once per year because the concentrations of these constituents do not change frequently. Therefore, some of our data, though representative, are more than one year old.**
**** Averages are used for compliance determination due to the variable nature of individual analyses, and due the fact that any associated theoretical risks are not acute, but theoretically only after years of exposure to levels above MCLs.**

Appendix F Agreement for Purchase of Water from the Woodbridge Irrigation District by the City of Lodi

AGREEMENT FOR PURCHASE OF WATER FROM THE WOODBRIDGE IRRIGATION DISTRICT BY THE CITY OF LODI

This Agreement is made and entered into between Woodbridge Irrigation District and the City of Lodi, adjoining entities located within the County of San Joaquin, State of California, this 13th day of May, 2003.

Background Recitals.

a. The City of Lodi obtains its municipal water supply from wells located within the City, extracting the water from the underground aquifer, which is replenished in part by flows of the Mokelumne River. Lodi desires to acquire a supplemental surface water supply to avoid being wholly dependent upon the wells and the possible impacts of eventual overdraft of the groundwater supply.

b. Woodbridge Irrigation District (District or WID) is an irrigation district that is organized and existing under Division 11 of the California Water Code (Sections 20,500 et seq). The District is located immediately west of the City of Lodi and immediately north of the City of Stockton. The District diverts water from the Mokelumne River at Woodbridge Dam, located in the NE 1/4 of the SE 1/4 of Section 34, Township 4 N, Range 6 E, MDBM, for irrigation of a net area of 19,370.3 acres within a gross area of 40,441.77 acres and located within Townships 2 N, 3 N, 4 N and 5 N, Ranges 5 E, 6 E and 7 E, MDBM.

c. The District diverts its water supply from the Mokelumne River under pre-1914 appropriative rights for the diversion of water up to 300 cubic feet per second (cfs). The District's pre-1914 rights are overlapped by the District License No. 5945 for the appropriation of 300 cfs per annum from February 1 to October 31 for irrigation use, supplemented by License No. 8214 for the diversion of an additional 114.4 cfs from May 1 to August 31 of each year and from November 1 of each year to January 31 of the succeeding year. The combined rights under the two Licenses together with the District's pre-1914 rights are limited to a maximum diversion of 414.4 cfs.

d. The District, following the East Bay Municipal Utility District's (EBMUD) building of the Pardee and Camanche Reservoirs on the Upper Mokelumne River, entered into Agreements with EBMUD in 1938 after Pardee's completion and again in 1965 after the completion of Camanche, which acknowledged the priority of some of the District rights to the EBMUD rights, and under which agreements EBMUD releases a Regulated Base Supply of water each year from Camanche Reservoir for diversion by the District at Woodbridge Dam for irrigation use.

e. The District's demand for water from the Mokelumne River under its water rights has begun to diminish by reason of the District's water conservation programs, including the conversion of field furrow and flood irrigation methods of application to water applied by drip irrigation and micro-sprinklers, which reduce the amount of applied water for crops. There has also been a reduction in the delivery of irrigation water by reason of the number of irrigated acres being reduced as a result of urbanization of District lands.

f. By reason of the anticipated reductions in water usage within the District, the District has determined that it will have surplus water in certain amounts available under its water entitlements from the Mokelumne River, and the water that would be delivered to the City by this Agreement is surplus to the current needs of the landowners and water users within the District as required by Section 22259 of the Water Code. The District's South Main Canal traverses the westerly portion of the City of Lodi, and the District could deliver water diverted from the Mokelumne River under its water rights to Lodi at a mutually agreeable location along the District Canal System.

g. The water is diverted by the District at Woodbridge Dam, with diversions being facilitated during the irrigation season by the installation of flashboards in the Dam. The flashboards are removed after the end of the irrigation season for Dam maintenance and Dam safety. When the flashboards are in place, water backs up into Lodi Lake and the City's Lodi Park Lake. The Lake is used for fishing, boating and recreational purposes by inhabitants of the City, and its presence during the summer months is an enhancement to the City's Lodi Park Lake. During the periods that the flashboards are not in the Dam, the Lake level is lowered and its utility for fishing, recreation and boating is reduced.

h. Because of its age, it is necessary for the District to replace the existing Woodbridge Diversion Dam in order to provide greater security and protection against dam failure. In doing so, and in reliance on this Agreement, the District intends, subject to any requirements of the Division of Safety of Dams, that the replacement dam structure will be designed and constructed so that water can be impounded behind the dam year round. The estimated cost for replacement of the Dam and appurtenances is approximately $20,000,000.

i. The City of Lodi desires to contract with the District for the purchase of water from the District for use within the City service area, for which the City will pay on the basis and pursuant to the conditions hereinafter set forth.

NOW, THERFORE, WOODBRIDGE IRRIGATION DISTRICT (DISTRICT) AND THE CITY OF LODI (CITY) AGREE AS FOLLOWS:

May 2003
Jan 1, 2004

1. Water to be Made Available to City, and Payment. Beginning in the calendar year which first follows the entry of a final judgment confirming the validity of this Agreement pursuant to Chapter 9 (commencing with Section 860) of Title 10 of Part 2 of the Code of Civil Procedure, and continuing through the term of this Agreement, the District shall make available to the City out of its Regulated Base Supply under its Agreement with EBMUD, 6,000 acre feet per annum under the terms and conditions herein set forth. In consideration thereof, the City will pay the District annually the sum of ONE MILLION TWO HUNDRED THOUSAND DOLLARS ($1,200,000.) Payments thereon of $300,000 quarterly are due and payable in advance beginning on the first day of each calendar quarter, commencing on the first day of the calendar year which follows said entry of a final judgment confirming the validity of this Agreement. Said payments shall be made irrespective of whether the City takes the water made available to it under this Agreement and irrespective of whether the District has water available for delivery to the City, provided that the District shall make its best efforts to provide to the City the amounts of water provided for in this Agreement.

October 2003 ?

Prior to the commencement of the first full calendar year following the entry of said final judgment, i.e., in the year in which the entry of the final judgment occurs, the City shall make quarterly payments to the District of $300,000 on the first day of each calendar quarter in that year which follows the entry of the final judgment by more than thirty days, in consideration for which one-fourth of 6,000 acre feet of water shall be made available to the City in the that initial year for each calendar quarter for which such payment is made. Any of such water which is not taken by City in that initial year shall be included as a part of the 18,000 acre feet of carryover water which the City may take at a later date as provided for in paragraph 6.a. hereof.

2 Construction of New Dam by Woodbridge. The District has secured the required permits from the Federal and State agencies and the necessary environmental clearances for the construction of a new Woodbridge Dam to replace the existing Dam together with appurtenant facilities, and the District will proceed with construction as soon as is feasible utilizing the revenues to be paid under this Agreement to finance a portion of the costs of the project.

3. Point of Delivery and Time of Delivery. The District agrees to deliver the water to the City at a point or points on the District's Canal at a mutually agreeable location or locations, to be determined at a later date. The water will be delivered during the period from March 1 through October 15. The City shall construct at its sole cost and expense the facilities needed to measure and take delivery of water from the District Canal, and the design, construction and operation thereof shall be approved by the District. The City will be responsible for all costs of operation, repair, maintenance and replacement of such facilities. The measurement facilities shall be recalibrated annually at the City's

expense as requested by the District and the District shall have a continuing right to test the accuracy of such facilities.

a. The City shall provide the District, by January 1 of each year, an estimate of the maximum amount of water anticipated to be needed by the City during each month of that year from March 1 through October 15, which scheduling will be subject to the District's approval. The District will supply such water on said approved monthly schedule pursuant to and as limited by the terms, conditions and limitations of this Agreement; provided that the City shall to the extent that its operations will permit, schedule the taking of as much of its entitlement to water from the District that year prior to July 1 as is feasible, but in any event not less than 3,000 acre feet.

b. At such times as it is possible for the District to deliver water during the remaining months of the year, or to deliver water in excess of 6,000 acre feet during the period from March 1 through October 15, then by mutual agreement of the parties, delivery of such water to the City may be made by the District. The City shall pay the District $100 per acre foot for any such additional water delivered to the City.

c. The water furnished by the District under this Agreement shall be used or furnished by the City only for domestic, municipal, industrial, irrigation and other beneficial uses.

d. The District further agrees that it will, during the term of this Agreement at the City's request, divert from the Mokelumne River at the District's Woodbridge Dam and wheel and convey through the District's canal system to the City's delivery point(s), any non-District water acquired by or available to the City, subject to the District having available capacity for that purpose and subject to the City paying a per-acre-foot charge in an amount which the District determines to be its costs for such service. The District's cost for such service in year 2003 would be $20 per acre-foot.

e. Commencing on January 1 of the seventh year following the year in which execution of this Agreement occurs, the amounts payable to the District under paragraph 1, and the amounts payable to the District under subparagraphs 2.b. and 2.d., shall be increased by two percent per year above the amounts payable during the preceding calendar year. In the event that the annual change in the Consumer Price Index (CPI-W, unadjusted U.S. average) published in December of each year by the United States Bureau of Labor Statistics, commencing in December in the year preceding such seventh year, has increased more than two (2) percent above the December Index of the prior year, the increases in the amounts payable in the ensuing year shall be in the percentage of that increase; provided that any such annual increase shall not exceed five percent (5%).

f. The payments by the City to the District under this Agreement shall be deemed to include the payment during the term of the Agreement of all District groundwater recharge fees on parcels within the City of Lodi which are also located within the boundary of the District.

4. Term of Agreement. (a) This Agreement shall be effective from the date of execution hereof, and shall remain in effect for a term of forty (40) years from said date.

(b) Upon receipt by the District of written notice and request for renewal from the City at least two years in advance of the termination of the Agreement, the District agrees to negotiate with the City for a renewal of this Agreement for an additional forty (40) year term, on terms and conditions that are reasonable and equitable and which are satisfactory to the District.

(c) The District agrees that it will not enter into any agreement during the initial term of this Agreement to provide water to others outside of the District except upon terms which provide that such supply shall be subordinate to the City's rights to be furnished water under this Agreement (except as the City may otherwise specifically agree to). The parties may contract for the delivery of additional amounts of water that may become available upon terms mutually agreeable to the parties. The City shall have a first right of refusal to purchase any water which the District agrees during the initial term of this Agreement to provide to any other purchaser, upon the same terms and conditions provided in such other proposed sale of water.

5. City Payments to be Made from City's Water System Revenues. The City shall make payments under this Agreement solely from the Revenues of, and as an operating expense of, the Lodi Municipal Water System. The City hereby pledges the Revenues to the payments required hereunder. Nothing herein shall be construed as prohibiting the City from using any other funds and revenues for purposes of satisfying any provisions of this Agreement. So long as the City is in compliance with all of its obligations hereunder, such pledge shall not prevent its application of Revenues to other operating expenses of the Lodi Municipal Water System or, subject to the payment of such operating expenses, to other lawful purposes, or impair the rights of any recipient of Revenues lawfully so applied.

"Revenues" means "all gross income and revenue received or receivable by the City from the ownership and operation of the Lodi Municipal Water System, which gross income and revenue shall be calculated in accordance with generally accepted accounting principles, including all rates, fees, and charges received by the City for water service and connection and hook-up fees and all other income and revenue howsoever derived by the City from the ownership and operation of or arising from the Lodi Municipal Water System, but excluding in all cases any proceeds or taxes and any refundable deposits made to establish credit,

federal or state grants, or advances or contributions in aid of construction".

"Lodi Municipal Water System" means "the municipal water system of the City existing on the effective date of this Agreement and all additions, betterments, extensions and improvements thereto hereafter acquired or constructed".

6. City Cooperation in District's Funding of Reconstruction of Woodbridge Dam. The City agrees to cooperate with District in connection with any financing undertaken by District in connection with the reconstruction of the Woodbridge Diversion Dam and to provide to District such certificates, statements and information as District shall reasonably require in connection with such financing, including, without limitation, information relating to the Lodi Municipal Water System and the Revenues, and to provide such information as may be reasonably required in connection with the continuing disclosure undertaking to be entered into by the City pursuant to Rule 15c2-12(b)(5) of the Securities Exchange Commission in connection with the District financing.

7. No Permanent Water Right, and Dry Year Curtailments. The District has determined that the water to be made available annually for delivery to the District pursuant to this Agreement will be surplus to the needs of the District during the term of this Agreement. The parties further agree that no permanent right to the water supplied by the District shall accrue to the City except pursuant to and as limited by the terms of this Agreement.

a. The District agrees that it will deliver up to 6,000 acre feet per annum to the City under this Agreement except to the extent that the District's Regulated Base Supply of 60,000 acre feet under its Agreements with East Bay Municipal Utility District is reduced in dry years by thirty-five (35) percent. In the event of such a reduction, the District may reduce the amount of water to be provided under this Agreement by up to fifty percent (50%). District shall on or about May 1 of each year make a preliminary estimate of whether the City's deliveries may be curtailed that year, and will provide a final estimate of any curtailment on or about July 1. In such event, the City shall only be obligated to take 50% of its estimated delivery before July 1 in that year. There shall be no reduction in the amount of the City's annual payment to the District in such years under paragraph 1.

b. Except for noncompliance with the foregoing provisions of this paragraph, the City shall have no claim for damages or breach arising from the unavailability of surplus water from the District for any cause or condition.

8. Carryover of Entitlements. Unused water may not be carried over by the City

from year to year except that the right to receive water may be "banked," as follows:

a. If during the first three years in which the water is available to the City under this Agreement, the City does not take the water or takes less than the amounts which are available, then the City may carry over and have credit for the water not taken, not to exceed a total of 18,000 acre feet, for later delivery during the initial 40-year term of this Agreement, at such times as the District has extra water available as determined solely by the District. There will be no additional charge for the delivery of such banked water.

b. If after said initial three years delivery of water to the City is curtailed under paragraph 7.a. by reason of a dry year condition or by District's maintenance or other District activities, then the City may carry over and have credit for the amount of such curtailment for later delivery at such time(s) as the District has extra water available as determined by the District. Any City credits for curtailed segments of carryover water shall expire at the end of eight (8) years from the end of the period in which the curtailment for that segment of curtailed water occurred. Such credits for the delivery of curtailed carryover water within said eight-year period may extend beyond the termination of this Agreement. There will be no additional charge for the delivery of such banked water.

c. Except as provided in subparagraph a, no credits shall accrue for water that is available to but is unused by the City.

9. Water Quality, Temporary Interruptions, and Responsibility for the Water Beyond Point of Delivery.

a. The water being supplied to the City is raw water diverted from the Mokelumne River, and the character or quality of the water furnished hereunder may vary from time to time. District does not guarantee in any respect the character or quality of the water furnished pursuant to this Agreement, provided that the District shall not apply or use any chemicals within the Canal section used to deliver water to the City that the City determines to be deleterious to the quality of the water for the uses made by the City of such water.

b. It is agreed that there may be, in addition to shortages of water, temporary discontinuance or reduction of water to be furnished for the City as herein provided, for purposes of investigation, inspection, maintenance, repair or replacement as may be necessary of any of the facilities used by the District for furnishing water to the City. The District agrees to provide the City notice of such temporary discontinuance or reduction of water as soon as such information is available to the District.

c. The City shall hold the District harmless from and defend the District from all claims or expenses on account of damage or claim of damage of any nature whatsoever from which there is legal responsibility, including property damage, personal injury or death, arising out of or connected with the delivery, control, carriage, handling, use, or disposal or distribution of water furnished hereunder beyond the point of delivery of water into the City's system from the District's Canal.

10. Right of Termination for Unacceptable Conditions in Validation Judgment. In the event that the court in the validation action enters a judgment validating the Agreement but upon conditions or restrictions which impose upon either party costs, requirements, obligations, or limitations in their performance of the agreement or upon their operations or property interests which in that party's judgment are unacceptable or otherwise not in the best interests of that party, that party shall have the right to terminate this Agreement, and in that event neither party shall have any further liability or obligation to the other party hereunder.

11. Arrearage in Payments. No water shall be furnished to the City during any period in which the City may be in arrears in payment of charges accruing hereunder after the determination on the amount thereof as above provided. Interest on arrearage in payment shall be charged at a rate of 1-1/2% per month and compounded monthly, commencing 45 days after the due date of the payment.

12. Assignment. The provisions of this contract shall apply to and bind the successors and assigns of the respective parties hereto; but no assignment or transfer of this contract or any part thereof or interest therein by the City shall be valid unless and until approved in writing by the District; and no assignment of the obligation to provide or deliver the water shall be assignable by the District without the consent of the City.

13. Fees and Costs. Any fees, costs or expenses, including attorney fees, administrative costs, and consultant fees, incurred by the District to effect the sale of water to the City, together with CEQA and any other regulatory approval, shall be paid by District and City on a 50/50 basis. The City shall not be required to contribute to any fees or costs incurred by District relating to other issues or disputes that may arise in any of said proceedings not directly relating to City's use of District water. District shall provide to City invoices and accountings of said fees and expenses on a regular basis.

14. City Use of District Rights of Way. The District agrees to cooperate with City and to agree to the City's use of any District right of way along the District's Main Canal needed by the City for the conveyance or distribution of water it obtains from the District.

15. CEQA. The parties agree that the District will be Lead Agency for purposes of

compliance with any requirements of the California Environmental Quality Act pertaining to the execution of this Agreement by each party.

16. Entire Agreement. This Agreement contains the full and entire Agreement of the parties and there are no other conditions, either explicit or implied, nor any warranties or promises other than those contained within the written terms of this Agreement.

17. Time of the Essence. Time is of the essence in the performance of this Agreement.

18. Nonwaiver. The failure of either party to enforce or abide by a term or condition of this Agreement shall not constitute a waiver of that term or condition unless a written Agreement is prepared specifically providing for the waiver or forgiveness of that term and such Agreement is executed by each party hereto.

19. Date of Execution. The date of execution of this Agreement is the date of execution by the party last signing the Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this instrument on the 13th day of May, 2003.

WOODBRIDGE IRRIGATION DISTRICT

By _____

Attest: _____

CITY OF LODI, A MUNICIPAL CORPORATION

By _____
Susan Hitchcock, Mayor

Attest: _____
Susan J. Blackston, City Clerk

APPROVED AS TO FORM: _____
Randall A. Hays, City Attorney

4/16/03

RESOLUTION NO. 03-09-06-01
Of WOODBRIDGE IRRIGATION DISTRICT
AUTHORIZING EXECUTION OF AN AMENDMENT EXTENDING THE AGREEMENT WITH LODI FOR ADDITONAL FOUR YEARS

WHEREAS. The City of Lodi has requested that its 40-year Agreement for Purchase of Water from the District, entered into on May 13, 2003, be extended for an additional four years, and also that the City be allowed to continue to bank unused water for an additional four years beyond the existing cutoff date of May 13, 2006; and

WHEREAS, the Board of Directors of the District are agreeable to granting such extension in the form of an Amendment as finally approved by the President; and

WHEREAS, the Board of Directors also wishes to inform Lodi that the District believes strongly that the highest and best use of the water by the City would be through a new surface water treatment plant and delivery to the City's customers rather than through groundwater recharge;

BE IT RESOLVED BY THE BOARD OF DIRECTORS OF WOODBRIDGE IRRIGATION DISTRICT, as follows:

Section 1. The President and Secretary are authorized and directed to execute a First Amended Agreement with the City of Lodi, to extend the termination date of the Agreement from May 13, 2043 to September 30, 2047, and to allow the City to continue to bank unused water up to 6,000 acre-feet per annum for an additional four years from May 13, 2006 to October 15, 2010, not to exceed a total of 24,000 acre feet. The First Amended Agreement shall in form and substance as recommended by the Manager and Attorney and approved by the President.

ADOPTED the 9th day of March, 2006, by the following vote:

AYES: Directors Stokes, Shinn , Van Exel and McQueen

NOES: None

ABSENT: Luchessi

Signed: _____
William Stokes, President

Attest: _____
Anders Christensen, Secretary

Appendix G CD of City of Lodi White Slough WPCF Soil and Groundwater Investigation Existing Conditions Report

Appendix H TM No. 2: Land Application: Future Nitrogen Loading Conditions

WEST YOST
ASSOCIATES
Consulting Engineers

TECHNICAL MEMORANDUM NO. 2

DATE: June 15, 2007 Project No.: 711-04-05-02.007

TO: Richard Prima

FROM: Melanie Carr MAC Reviewed By: Kathryn Gies

SUBJECT: Technical Memorandum No. 2: Land Application: Future Nitrogen Loading Conditions

West Yost Associates (WYA), in collaboration with Dr. Mitchell Johns, an agronomist and professor of Plant and Soil Science at California State University, Chico, is preparing a Groundwater Investigation Study for the City of Lodi (City) Water Pollution Control Facility (WPCF). In September 2006, the project team submitted the Existing Conditions Report, which provided several recommendations for further evaluation of the potential impacts of the City's recycled water irrigation practices. Recently, the project team completed a historic field loadings technical memorandum (TM #1) that presented design nitrogen uptake and loading rates.

The purpose of this TM is to describe the projected future nitrogen loading conditions. These projected nitrogen loadings will be used to estimate the additional land required, if any, to accommodate future reclaimed water flows and biosolids production. Based on the information presented herein, additional land application area will be required to assimilate the projected future reclaimed water and biosolids total nitrogen loadings at agronomic rates. TM #3 will synthesize the information from the Existing Conditions Report, TM #1 and TM # 2 to provide an assessment of the recommended Land Management Best Practicable Treatment Controls for the Lodi WPCF.

As discussed in TM#1, the primary cause of historic excess nitrogen loadings to the City's field areas are as follows:

1. Elevated nitrogen concentrations in the applied irrigation water
2. Historic biosolids applications

However, issues with irrigation water and biosolids application are distinct and require two different solutions to adequately assimilate their nitrogen loads. Therefore, the requirements for addressing these two issues are discussed separately below. The specific topics discussed are as follows:

- Conclusions and Recommendations
- Recycled Water Applications

1260 Lake Boulevard, Suite 240 Davis, California 95616 Phone 530 756-5905 Fax 530 756-5991 email: mail@westyost.com

- Biosolids Applications
- Total Land Area Requirements Summary
- Existing and Future Total Loading Conditions

CONCLUSIONS AND RECOMMENDATIONS

The purpose of TM #2 is to develop and describe the future nitrogen loading conditions for the land application area. The nitrogen loadings were used to estimate the land required, if any, to accommodate future reclaimed water flows and biosolids production. Based on the information presented in TM #2, additional land application area will be required to assimilate the projected future reclaimed water and biosolids total nitrogen loadings at agronomic rates.

Irrigation water and biosolids application are evaluated separately as two distinct issues to adequately assimilate their nitrogen loads, and are described as follows:

- Recycled Water Applications
- Biosolids Loadings
- Summary of Existing and Future Conditions

Recycled Water Applications

The major sources of reclaimed water at the WPCF are expected to change in the next few years due to the following planned modifications:

- WPCF discharges are anticipated to increase to 8.5 mgd
- Improved nitrogen reductions in the WPCF municipal treatment process will result in an average effluent TN concentration of 8 mg/L
- Biosolids lagoon supernatant and DAFT subnatant flows will be removed from the land application system
- PCP cannery flows will approximately double to 216 MG per year, and will comprise the dominant total nitrogen load to the land application system
- Winery wastewater flows will approximately double to 2.5 MG per year, but will not contribute significantly to the total nitrogen load

Other minor sources that contribute to the irrigation flows are anticipated to remain relatively similar to existing conditions. These flows were not included in the analysis, as they would not appreciably change the land applied total nitrogen concentration.

Based on the results of the analysis using the 95th percentile historic nitrogen concentration of the PCP flows, a minimum of 355 acres should be planted in alfalfa each year to assimilate the nitrogen that will be applied late in the irrigation season from the PCP cannery flows. A total of 880 acres will need to be available for agronomic irrigation purposes during the remainder of the year. Therefore, a minimum of 15 acres of additional land is required to accommodate increases in reclaimed water irrigation flows.

Biosolids Loadings

Design considerations for the following facilities were used in the analysis:

- Primary Sedimentation Basins: 65 percent capture rate, 4 percent solids
- Secondary Solids Production: 80 percent volatile fraction; a range of WAS solids production was used to bracket required land application area for biosolids
- DAFT Thickening: range of 50 to 95 percent capture was used, 4.5 percent solids
- Anaerobic Digesters: 50 percent VSS reduction
- Biosolids Lagoon: 30 percent additional VSS reduction, 85 percent capture rate

A range of scenarios was evaluated for this TM #2. Scenario 2a & b, (95% DAFT Solids Recovery, 30% VSS Reduction in Lagoons, 85% Solids Capture) is recommended for design purposes. Using this scenario, approximately 475 to 510 acres of corn/wheat are required for biosolids application under current conditions, and approximately 655 to 690 acres of corn/wheat are required for 2020 buildout conditions.

A total of 865 acres is required under current conditions for both reclaimed water and biosolids land application. Future conditions require up to a total of 1,045 acres for both reclaimed water and biosolids land application. Therefore, additional land purchase will likely be required.

Additional investigation will be needed to more accurately define the required land area for reclaimed water and biosolids land application. The amount of land area required is highly dependent on several unknown factors, in particular the biosolids and cannery nitrogen concentrations. Moreover, other means of treatment could be considered that would further reduce biosolids and cannery nitrogen concentrations. These treatment alternatives will be addressed in TM #3.

Existing and Future Total Loading Conditions

Because total nitrogen has historically been regulated as the limiting constituent for land application design, total nitrogen concentrations and flows are used to size additional land area requirements for both reclaimed water and biosolids. However, after additional data collection, TDS and BOD loadings will be revisited to determine if additional area would be required to assimilate these constituents. Finally, pretreatment of cannery wastewater is being considered, which would result in reductions of TN, TDS and BOD loadings.

RECYCLED WATER APPLICATIONS

As discussed in TM #1, the primary causes of the elevated nitrogen concentrations in the applied recycled water are as follows:

- Biosolids lagoon supernatant and Dissolved Air Flotation Thickener (DAFT) subnatant flows directed to storage ponds during the winter months that are later applied to the agricultural areas during the early spring
- Pacific Coast Producers (PCP) cannery wastewater flows directed to the land application areas June through September

The total nitrogen field loadings associated with these reclaimed water components would be reduced if adequate low-nitrogen concentration water could be blended with the relatively high-nitrogen concentration flows from the biosolids supernatant, DAFT subnatant, and PCP cannery wastewater. However, additional land may be necessary to ensure that the blended flows can be applied at agronomic rates. The following section presents the anticipated flows and associated land application areas that would be needed to achieve this objective. The specific topics discussed are as follows:

- Irrigation Water Nitrogen Concentrations and Flows
- Required Irrigation Area Calculations
- Recommendations

Irrigation Water Nitrogen Concentrations and Flows

Nitrogen concentrations in reclaimed water at the WPCF are expected to change in the next few years due to the following planned modifications:

- Increased discharges from the WPCF municipal treatment process
- Improved nitrogen reductions in the WPCF municipal treatment process
- Removal of biosolids lagoon supernatant and DAFT subnatant flows from the land application system
- Increased discharges to the irrigation area from the PCP cannery
- Increased disposal of winery wastewater to the land application system

The anticipated future conditions resulting from these modifications are critical in determining the amount of land area required to assimilate the blended irrigation flows. Therefore, projected municipal effluent, supernatant and subnatant flows, PCP cannery, and winery wastewater total nitrogen concentrations and flows are described below in detail.

Other minor sources contribute to the irrigation flows associated with the City WPCF, including industrial line and onsite winter runoff, and other industrial flows. These minor flows are anticipated to remain relatively similar to existing conditions. These flows have relatively low nitrogen concentrations; therefore, the addition of these flows would slightly decrease the total applied nitrogen concentration. To be conservative, these flows were not included in the analysis, as these flows would not appreciably affect the nitrogen concentration of the applied recycled water.

Municipal Effluent

The City is in the process of constructing improvements to the WPCF municipal secondary treatment facilities to allow for improved nitrification and denitrification. The maximum permitted effluent total nitrogen concentration is slightly greater than 10 mg/L as N. However, land application is evaluated on an annual basis, and the average condition would be somewhat lower than the peak design condition. As a result, the future effluent total nitrogen concentrations are anticipated to be less than 8 mg/L. Therefore, higher nitrogen concentration flows from the PCP cannery and winery wastewater could be diluted with the municipal effluent to achieve the desired irrigation water nitrogen loading rate.

Municipal effluent monthly dry season flows are also expected to increase to the 2020 buildout flow of 8.5 mgd. Therefore, a significant amount of low-nitrogen concentration water could potentially be available for blending. Any treated effluent flow not needed for irrigation would be discharged to Dredger Cut; therefore, there is no need for additional land solely to dispose of municipal effluent flows.

Supernatant and Subnatant Flows

The City is in the process of constructing the facilities needed to direct the biosolids supernatant and DAFT subnatant flows to the aeration basins, in lieu of the existing route to storage ponds and ultimately to the land application system. The storage pond total nitrogen concentrations will measurably decrease following removal of these flows, and the major source of relatively high nitrogen concentrations early in irrigation season will be eliminated. Therefore, the supernatant and subnatant flows are not included in the future conditions analysis. Additional future municipal effluent flows will replace the irrigation water currently provided by the supernatant and subnatant flows. Subnatant flows do not necessarily need to be rerouted, as solids could be reduced through use of polymers or decreasing DAFT loading rates. However, for purposes of this analysis, it was assumed that the DAFT subnatant flows would be rerouted.

PCP Cannery

PCP cannery flows are expected to increase to approximately double existing flows. The following major assumptions were used to evaluate the potential nitrogen loadings associated with the flow increase:

- Future PCP cannery flows will be as shown in Table 1 (data provided by PCP):

Table 1. Projected PCP Cannery Flows for Future Loading Conditions

Discharge Period	Average Daily Flow, gpd	Days of Discharge	Total Gallons for Period
June 15 – July 14	900,000	30	27,000,000
July 15 – September 30	3,000,000	78	234,000,000
Total		108	261,000,000

- PCP cannery monthly flow distribution will be similar to historic patterns, as shown in he Table 2:

Table 2. Monthly PCP Lodi Cannery Flows (Million Gallons)

Month	Flow, MG
April	5.2
May	2.0
June	23.0
July	56.6
August	86.6
September	37.4
October	5.2
Total	216.0

- Future total nitrogen concentrations will be similar to historic patterns observed at the PCP's Oroville and Lodi canning facilities, as shown in Table 3:

Table 3. Total Nitrogen Concentrations from PCP's Lodi and Oroville Canning Facilities (mg/L)

Month	50th Percentile	90th Percentile	**95th Percentile**	99th Percentile
April	2.2	2.2	**2.2**	2.2
May	3.4	3.4	**3.4**	3.4
June	4.1	8.6	**12.7**	18.5
July	33.9	78.9	**85.3**	89.9
August	38.2	61.7	**64.3**	65.4
September	20.7	32.4	**45.8**	58.8
October	32.2	47.9	**48.2**	48.4

Because the required land application areas are particularly sensitive to the cannery total nitrogen concentrations, various percentiles of the total nitrogen concentration data were developed. For purposes of this analysis, the 95th percentile of the total nitrogen concentration data was used to estimate nitrogen loadings.

Winery Wastewater

Winery wastewater flows are also expected to increase to more than double existing flows. Currently, Van Ruiten Winery is permitted to discharge 3,600 gpd on a monthly basis, while Jessie's Grove winery is permitted to discharge 2,000 gpd on a monthly average. Although these winery wastewater flows are relatively small, the nitrogen concentrations can be significant, resulting in measurable nitrogen loads. Therefore, these flows are also to be considered when evaluating future nitrogen loading conditions. The following major assumptions were used to evaluate the potential nitrogen loadings associated with these flows:

- Projected future annual winery wastewater flows will be 2.5 million gallons per year, per WPCF staff.
- Winery wastewater monthly flow patterns will be similar to the Van Ruiten winery, which currently discharges approximately 1 MG per year to the City WPCF, as shown in Table 4:

Table 4. Projected Monthly Winery Wastewater Flows (Million Gallons) [a]

Month	Flow
April	0.1
May	0.1
June	0.2
July	0.3
August	0.4
September	0.2
October	0.2
Total	1.4

- Approximately 1.1 MG of the winery wastewater flows will be discharged between November and April and will be directed to the onsite storage ponds.
- Winery wastewater flows will be the greatest during bottling (which typically occurs in March) and these flows will be directed to the onsite storage ponds.
- The estimated winery wastewater total nitrogen concentration is 42 mg/L, a maximum value observed at the Woodbridge Winery.

Required Irrigation Area Calculations

The following steps were implemented to calculate the additional irrigation area requirements for the WPCF field areas:

1. Calculate the maximum allowable monthly recycled water total nitrogen concentrations.
2. Calculate the amount of municipal wastewater needed to blend with the cannery and winery flows to achieve the calculated allowable concentrations.
3. Calculate the amount of irrigation area necessary to dispose of these combined flows at agronomic rates.
4. Calculate the total volume of required municipal effluent irrigation water per month and the corresponding combined flow nitrogen concentrations.

These steps are described in detail as follows:

Maximum Allowable Total Nitrogen Concentrations

The maximum allowable monthly reclaimed water total nitrogen concentrations can be developed for both alfalfa and corn crops, and for the two different soil types within the WPCF field areas. The maximum allowable monthly reclaimed water total nitrogen concentration can be calculated by dividing the allowable nitrogen loading rates (L_n) that were presented in TM #1 by the theoretical crop irrigation demands (L_w) that were also presented in TM #1. To be conservative, the minimum of these maximum allowable total nitrogen concentrations should be used as the design basis for determining the required land application area for reclaimed water. The applicable allowable nitrogen loading rates and theoretical crop irrigation demands are presented in Table 5.

Table 5. Allowable Nitrogen Loading Rates (L_n), Crop Irrigation Demands (Lw), and Allowable Irrigation Water Nitrogen Concentration for Specific Crops and Soil Types

Month	L_n	L_w	Concentration	L_n	L_w	Concentration
	Guard			Devries		
Alfalfa						
April	39	6	30	40	6	29
May	55	8	29	58	9	27
June	68	10	31	71	11	30
July	75	10	33	78	11	32
August	73	9	36	76	10	34
September	50	7	32	53	8	30
October	30	4	31	32	5	30
Corn						
April	16	3.2	23	19	4	21
May	50	7.3	30	53	8	29
June	75	10.0	33	78	11	32
July	73	9.1	35	76	10	34
August	16	3.2	23	19	4	21
September	—	—	—	—	—	—
October	—	—	—	—	—	—

Note, however, that the monthly allowable nitrogen loading rates (L_n) presented in TM #1 were based on an assumed fraction (F) of applied nitrogen removed by nitrification and volatilization of 25 percent. While the use of this fraction was appropriate for evaluating historic loading conditions in TM #1, monthly flow-weighted F values are recommended for use when considering required land areas to assimilate peak cannery flows. Therefore, monthly flow-weighted F values were developed for use in this analysis. A nitrification and volatilization F value of 15 percent was assumed for municipal flows and an F value of 50 percent was assumed for cannery and winery wastewater flows, as recommended by the USEPA.

The calculation of the nitrification and volatilization (F) value is determined on an iterative basis, as the fraction of applied municipal flow will vary depending on the allowable uptake rates. Additionally, the fraction of applied municipal flow will also vary depending on the nitrogen concentration of the cannery wastewater. The amount of acreage required to assimilate the cannery wastewater is highly dependent upon the cannery wastewater concentration. Therefore, a range of cannery wastewater total nitrogen concentration percentiles was developed. As mentioned previously, the 95th percentile concentration is recommended for the design condition. A summary of the calculated allowable monthly uptake rates and the associated nitrification and volatilization values (F) for the four cannery wastewater design conditions discussed in the previous section is presented in Table 6.

Table 6. Variable Nitrification and Volatilization Fractions (F) and Allowable Monthly Reclaimed Water Total Nitrogen (TN) Concentrations (mg/L)

Month	Cannery Wastewater Nitrogen Concentration Percentiles							
	50th		90th		**95th** [(a)]		99th	
	F [(b)]	TN	F	TN	**F**	**TN**	F	TN
April	15.1%	23.7	15.1%	23.7	**15.1%**	**23.7**	15.1%	23.7
May	15.0%	21.0	15.0%	21.0	**15.0%**	**21.0**	15.0%	21.0
June	22.5%	28.7	19.4%	27.9	**19.0%**	**27.8**	18.8%	27.8
July	30.2%	31.9	23.5%	30.3	**23.1%**	**30.2**	22.9%	30.1
August	40.6%	34.0	29.3%	31.2	**28.7%**	**31.1**	28.4%	31.0
September	29.3%	30.0	23.0%	28.6	**22.6%**	**28.5**	22.4%	28.4
October	22.4%	29.5	20.9%	29.2	**19.0%**	**28.7**	18.1%	28.5

(a) 95th percentile recommended for use in design.
(b) Flow weighted F value is determined using a flow weighted average of the F values.

Required Municipal Wastewater Flows

The information presented above was used to determine the amount of municipal effluent flow needed to dilute cannery and winery wastewater total nitrogen concentrations to meet the most limiting total nitrogen design loadings for the WPCF field areas. As discussed, the minimum municipal effluent flows required for blending are dependant upon the monthly allowable reclaimed water total nitrogen concentration, which is dependant upon the nitrification and volatilization fraction (F), which in turn is dependant upon the fraction of total applied municipal effluent flows applied. Therefore, all four of these values were determined in an iterative process. The calculated minimum monthly municipal effluent volumes to dilute the nitrogen concentrations to acceptable values are presented in Table 7. Similar to the monthly allowable reclaimed water total nitrogen concentrations, the minimum monthly municipal wastewater irrigation volumes are also dependant on the assumed concentration of applied cannery wastewater. The 95th percentile monthly concentrations values are the recommended design basis for determining the required land application areas.

Table 7. Minimum Monthly Municipal Wastewater Irrigation Volumes Required to Control Nitrogen Loadings to Fields (Million Gallons)

Month	Cannery Wastewater Nitrogen Concentration Percentiles			
	50th	90th	**95th** [(a)]	99th
April	0	0	**0**	0
May	0	0	**0**	0
June	0	0	**0**	0
July	12	132	**149**	161
August	31	123	**133**	137
September	0	7	**31**	55
October	1	5	**5**	5

(a) 95th percentile recommended for use in design.

Required Irrigation Area

The required irrigation areas were calculated by dividing the total flow (sum of the municipal, cannery and winery flows) by the theoretical crop irrigation demands (L_w), which vary by crop. Therefore, the land area requirements are dependant upon which crops are assumed to be planted.

Perennial crops like alfalfa and an alfalfa/ryegrass mixture were recommended in TM #1 for the reclaimed water application in WPCF field areas because these crops require both irrigation water and nitrogen late in the irrigation season when other crops, like corn, have already been harvested. Therefore, irrigation water demands for alfalfa were used to calculate the total alfalfa area needed to assimilate nitrogen loading associated with cannery flows in September and October, which is after corn has historically been harvested on the City's properties.

Field crops like corn are preferred for biosolids applications at the WPCF due to the fact that the harvesting practices are relatively consistent in nature. However, it is recommended that such crops be rotated with a winter cover crop like wheat, such that uptake of mineralized organic nitrogen can occur year round. For these reasons, it was assumed that all land area not planted in alfalfa would be planted in a corn/wheat combination. The total amount of land required is based on how much land is needed to assimilate both the nitrogen concentration from the cannery wastewater, and the amount of municipal effluent required to reduce the nitrogen concentration of the cannery. The irrigation water demands for a mixture of corn and alfalfa were used to calculate the total irrigation area needed to assimilate nitrogen loading associated with applications in April through August.

A summary of the calculated required land application areas for each of the cannery wastewater concentration percentiles described above is presented in Table 8. Additional details regarding the analysis used to develop the information presented in Table 8 are provided in Appendix A.

Table 8. Required Reclaimed Water Land Application Area [a]

Crop	Cannery Wastewater Concentration Percentiles			
	50th	90th	**95th[b]**	99th
Alfalfa	195	230	**355**	475
Corn	275	610	**525**	425
Total	470	840	**880**	900
Additional Land Required[c]	0	0	**15**	35

(a) Required land area for handling reclaimed water flows only. Additional land area planted in a corn crop may be needed for biosolids applications.
(b) For purposes of this analysis, use the 95th percentile is recommended to develop conservative required land application areas
(c) Assumes that 790 acres and the planned additional 75 acre-expansion are available for reclaimed water irrigation.

The acreage of alfalfa shown in Table 8 was determined based on the minimum amount of alfalfa that would need to be grown to assimilate the cannery wastewater during September when cannery flows are relatively high and corn has been harvested. For the months of April through August, when both corn and alfalfa are being irrigated, it was assumed that the minimum amount of alfalfa needed for uptake in September would be planted and the remaining acreage would be planted in a corn crop. The most limited of these month, August, was used as the basis for the information in Table 8.

As mentioned above, maximizing the area planted in corn is recommended for assimilation of biosolids. However, the acreage of corn shown in Table 8 only represents the area needed to assimilate the reclaimed water; and therefore, may not be adequate to meet the biosolids requirements. The area required to be planted in corn to assimilate all biosolids at build-out conditions is discussed later in this TM.

Total Municipal Effluent Irrigation Requirements and Combined Flow Nitrogen Concentrations

The total land area and cropping assumptions described above were used to calculate the total volume of applied municipal effluent irrigation water, which can then be used to calculate the total nitrogen concentrations in the combined flows. A summary of these results is provided in Table 9.

Table 9. Total Monthly Municipal Wastewater Irrigation Volumes (Million Gallons) and Total Nitrogen (TN) Concentrations in Combined Irrigation Flow (mg/L)

Month	Cannery Wastewater Concentration Percentiles							
	50th		90th		**95th [a]**		99th	
	Municipal Flow	TN	Municipal Flow	TN	**Municipal Flow**	**TN**	Municipal Flow	TN
April	41.4	7.5	66.2	7.6	**81.2**	**7.7**	94.6	7.7
May	69.6	7.9	109.1	7.9	**130.7**	**7.9**	149.7	8.0
June	85.5	7.2	163.3	8.1	**179.6**	**8.6**	191.5	9.2
July	74.0	19.3	177.0	25.2	**188.1**	**25.9**	193.7	26.5
August	32.0	30.1	125.6	30.0	**135.7**	**30.0**	140.8	29.9
September	54.6	13.2	127.1	13.6	**135.0**	**16.2**	138.9	18.8
October	20.3	13.2	27.1	14.6	**41.7**	**12.6**	55.5	11.6

(a) 95th percentile recommended for use in design.

The applied nitrogen concentrations presented in Table 9 can then be compared to the allowable concentrations presented in Table 6 to assess the amount of additional nitrogen loadings that could be applied with biosolids. Biosolids applications are discussed in the next section of this TM following recycled water applications recommendations.

Recommendations

The proposed increase in PCP cannery wastewater flows will likely result in excess field total nitrogen loadings on the City's available land application area. The amount of future required land application area is highly dependent upon the cannery wastewater total nitrogen concentration. Moreover, as described in TM #1, variations in day to day operations at the cannery will likely result in the actual field loadings exceeding the theoretical design standards that are presented above. Therefore, to be conservative, the 95th percentile cannery wastewater concentration is recommended for use in determining additional land area required to accommodate the potential variations in nitrogen concentrations in PCP cannery flows.

Based on the results of the analysis using the 95th percentile, a minimum of 355 acres should be planted in alfalfa each year to assimilate the nitrogen that will be applied late in the irrigation season from the PCP cannery flows. In order to accommodate both the cannery wastewater flows and the additional municipal effluent flows needed to dilute these flows, a total of 880 acres will need to be available for agronomic irrigation purposes during the remainder of the year. Therefore, a minimum of 15 acres of additional land is required to accommodate increases in reclaimed water irrigation flows.

As discussed previously, it was determined that winery wastewater nitrogen loads are relatively insignificant. While these flows were included in the analysis, it is evident that the cannery flows are driving the need for additional land, not the winery wastewater flows.

BIOSOLIDS APPLICATIONS

Land application of biosolids has also been a factor with respect to historic excess nitrogen loading of the fields. Therefore, an assessment of anticipated future biosolids loading conditions was completed to determine the total land area needed to assimilate the biosolids loadings for the 2020 buildout condition. The following information is presented below with respect to additional irrigation area requirements for biosolids application:

- Biosolids Production
- Total Biosolids Nitrogen Loading Equation
- Biosolids Assumptions
- Required Biosolids Land Application Area

Biosolids Production

A solids balance was developed for the WPCF in the Predesign Technical Memorandum #4, Predesign of Anaerobic Digestion Facilities (TM #4), which was submitted to the City in August 2002. This analysis was updated to incorporate additional data that has been collected over the past several years.

The Pre-Design TM #4 analysis biosolids loading projections were based on the typical (or actual, if available) process performance and solids characteristics for the following facilities:

- Primary Sedimentation Basins
- Secondary Solids Production
- DAFT Thickening
- Anaerobic Digesters

However, the Pre-Design TM #4 did not address solids thickening and potential reductions of solids in the WPCF biosolids lagoons. A comparison of the Pre-Design TM #4 results to the revised analysis completed for each of these facilities is presented below to incorporate these items.

Primary Sedimentation Basins

Primary sedimentation basins typically remove approximately 65 percent of the influent suspended solids from the main plant flow stream. In 2002, when Pre-Design TM #4 was developed, the influent Total Suspended Solids (TSS) loading was approximately 16,300 lb/day. However, a review of data collected in 2005 and 2006 indicates that the influent TSS loadings have decreased to 15,700 lb/day. The annual average flow during this period was approximately 6.3 mgd. Therefore, the build-out influent TSS loadings (at 8.5 mgd) are anticipated to be approximately 21,200 lb/day.

For the Pre-Design TM #4, it was assumed that the primary sedimentation basins thicken the sludge to an average concentration of 4.5 percent prior to pumping to the digesters. Data recently provided by City staff, however, show that the percent solids range from 3.3 percent to 4.5 percent, with an average of 4 percent. Therefore, for this revised assessment a percent solids of 4 percent was assumed.

Also note that the primary sedimentation basin solids flow data collected between 2003 and 2004 yielded an average flow 8,500 gpd, which would indicate a solids concentration of 11.6 percent (assuming a 65 percent capture of influent TSS). This percentage is significantly higher than what has been measured. However, after a brief period in October 2005, the flow meter readings increased significantly, averaging approximately 34,800 gallons per day. At a 65 percent capture rate, this would correlate to the loadings measured in 2005-2006 of about 4 percent. Therefore, the data collected prior to October 2005 was not used as part of this analysis.

Finally, the Pre-Design TM #4 analysis assumed that the solids stream would contain a volatile fraction of 70 percent. However, data provided by the City indicates that the volatile fraction is typically between 80 to 85 percent volatile. Therefore, an 80 percent volatile fraction was assumed for this analysis.

Secondary Solids Production

Solids production estimates from the secondary treatment systems were developed for Pre-Design TM #4 using the BioWin® model. The model assumed full nitrification, a mean cell residence time of 9.5 days, and a MLSS concentration varying from 3,000 mg/L in the summer to 4,500 mg/L in the winter. Based on this analysis, the total estimated Waste Activated Sludge (WAS) content was 7,700 pounds per day. Denitrification would not significantly affect this value; therefore, this value was used in the updated analysis.

Data provided by the City indicates that between 2001 and 2005, the average MLSS concentration was approximately 3,500 mg/L (2000 and 2006 were periods of system upset and complete nitrification were not occurring), with an estimated solids content of 0.013 percent. The City also measures the WAS flow, and between 2002 and 2005, it was approximately 85,900 gpd. The combination of these two numbers yields the estimated WAS solids content of 9,300 pounds per day, which was also used in the updated analysis.

A range between 7,700 lb/day and 9,300 lb/day range was assumed for secondary biosolids production. Similarly, the future biosolids loading range was calculated between 10,400 lb/day and 12,500 lb /day.

The secondary solids for both analyses were assumed to contain a volatile fraction of 80 percent, which is a typical value for wastewater facilities.

DAFT Thickening

All solids removed from the secondary treatment system are first sent to the dissolved air flotation thickener (DAFT) for removal of excess water prior to the digesters. Solids capture in the DAFT was assumed to be 95 percent and the thickened solids concentration was assumed to be 4.5 percent for Pre-Design TM #4, which is a typical value for wastewater facilities.

The City also currently measures thickened WAS flows. Based on data collected between 2002 and 2005, these flows were approximately 10,000 gpd. At a solids content of 4.5%, this would only be 3,700 lbs per day. Therefore, assuming influent loadings are 7,700 lbs per day, this would equate to a capture rate of 48%, which is unusually low for these types of facilities. If the loading were 9,300 lbs per day, the capture rate would be even less.

If the actual capture rate is as low as calculated, this finding will lead to major problems once these flows are re-directed from the onsite storage ponds to the aeration basins, which is planned for the City's current expansion project. Therefore, additional efforts are needed to assess the capture of the DAFT and determine if necessary improvements are required. However, low flows (near approximately 10,000 gpd) can be difficult to measure; therefore, the issue could have resulted from the flow metering. For this reason, WYA has recently requested that the City collect TSS concentration of the subnatant flows to determine whether there is significant solids content in this flow.

For purposes of this analysis, it has been assumed that the future capture rate will fall between 50 and 95%, and both values were used to represent a range of the amount of solids that are expected.

Anaerobic Digesters

Primary and thickened waste activated sludge are combined and placed in the anaerobic digesters for stabilization and solids destruction. Digesters typically achieve a 50 percent rate of destruction of the volatile solids fraction. Therefore, this amount was used for both Pre-Design TM #4 and the revised analysis.

Biosolids Lagoon

The Pre-Design TM #4 analysis did not include additional treatment and stabilization that occurs in the biosolids lagoon, which include:

- Volatile Suspended Solids (VSS) solids reduction
- Solids Thickening in Lagoon

For a lagoon that can store biosolids for approximately one year, a VSS reduction of 42 percent is typical (USEPA Process Design Manual for Sludge Treatment and Disposal). However, the WPCF biosolids lagoon retention time is significantly less than one year. Therefore, for purposes of this evaluation, it was assumed that the biosolids lagoon provided an additional VSS reduction of 30 percent because the residence time was less than one year. Assuming the sludge lagoons perform as a gravity thickener; the design solids capture percentage for the lagoon would be 85 percent (Metcalf & Eddy, 2004).

Using the solids production estimating assumptions described above, the historical volume of solids that would have been land applied would be approximately 1,100 dry tons per year. However, as shown in Table 10, the reported historic volumes between 2002 and 2006 were approximately 605 tons per year, which is a substantially lower value. This data suggests that the existing solids capture rate in the lagoon is only approximately 49 percent.

Table 10. Reported Annual Biosolids Land Application Quantity

Year	Biosolids Application, Tons/year
2002	725
2003	690
2004	580
2005	550
2006	478
Average	605

All digested sludge is currently discharged to Sludge Lagoon No. 2. The capacity of this lagoon is not sufficient for the existing or anticipated future liquid volume of biosolids. This lagoon has an available storage volume of approximately 1.9 million gallons. At a projected production of approximately 70,000 gallons of digested sludge per day, the average storage capacity is about 27 days.

Moreover, based on discussions with City staff, there is approximately one to two feet of stored solids that cannot be removed from the bottom of the lagoon using pumping equipment. The City staff also cannot use alternative equipment to empty the lagoon because there is no other place to put the solids while the lagoon is being cleaned. Therefore, the actual holding capacity of the lagoon is even less than 1.9 million gallons. Combined with the information presented above, it can be concluded that the existing lagoon volume is not sufficient.

The solids that cannot be retained in Lagoon No. 2 are currently flowing either to the storage ponds or directly to the land application area without the oversight required under State and Federal regulations. Moreover, the City is planning to construct a lagoon supernatant return flow pump station, which would direct the flows that cannot be held within Lagoon No. 2 to the aeration basins. Because there are too many solids currently in the supernatant flow stream to introduce it into the main plant treatment train, it would not be prudent to use this return pump station until this issue resolved.

For purposes of this analysis, it has been assumed that additional biosolids storage capacity will be constructed in the future. Following the completion of this project, the capture rate in the lagoons would range from 85 to 95 percent. However, for purposes of this analysis, a theoretical lagoon capture rate of 100 percent was used. Note that these capture rates are similar to what would be expected for a dewatering facility.

Summary of Solids Production Scenarios

Using this updated information discussed above, a solids balance was developed to quantify biosolids production under different scenarios. Scenario 1 assumes a DAFT solids recovery of 50 percent, while Scenarios 2 and 3 have a 95 percent DAFT solids recovery. Scenarios 1 and 2 assume 30% VSS reduction in the Lagoons and a solids capture rate of 85 percent, while Scenario 3 assumes no VSS reduction and a Lagoon solids capture of 100 percent. The scenarios developed also represent the range of WAS production, and actual production will fall somewhere between these two values. Scenarios that include an "a" designation refer to the WAS production of existing: 7,700 lb/day, future: 10,400 lb/day), while Scenarios that include a "b" designation refer to WAS production estimate of existing: 9,300 lb/day, future: 12,500 lb/day. A summary of the various scenarios evaluated for the current and future conditions is provided as follows:

- **Scenario 1a**. WAS Flow of 7,700 (existing) and 10,400 (future) pounds per day, 50% DAFT Solids Recovery, 30% VSS Reduction in Lagoons, 85% Solids Capture in Lagoon
- **Scenario 2a**. WAS Flow of 7,700 (existing) and 10,400 (future) pounds per day, 95% DAFT Solids Recovery, 30% VSS Reduction in Lagoons, 85% Solids Capture

- **Scenario 3a**. WAS Flow of 7,700 (existing) and 10,400 (future) pounds per day, 95% DAFT Solids Recovery, No VSS Reduction Following Digesters, 100% Solids Capture in the Lagoon
- **Scenario 1b**. WAS Flow of 9,300 (existing) and 12,500 (future) pounds per day, 50% DAFT Solids Recovery, 30% VSS Reduction in Lagoons, 85% Solids Capture in Lagoon
- **Scenario 2b**. WAS Flow of 9,300 (existing) and 12,500 (future) pounds per day, 95% DAFT Solids Recovery, 30% VSS Reduction in Lagoons, 85% Solids Capture
- **Scenario 3b**. WAS Flow of 9,300 (existing) and 12,500 (future) pounds per day, 95% DAFT Solids Recovery, No VSS Reduction Following Digesters, 100% Solids Capture in the Lagoon

A summary of the biosolids loading assumptions and biosolids production is provided in Table 11. Please note that ranges of biosolids production are provided under each scenario, bracketing the ranges of WAS production discussed previously. Also note that Scenarios 3a and 3b represents a worst-case condition, and would represent the total amount of solids coming from the anaerobic digesters. Actual biosolids production is anticipated to fall in between the values shown for the three scenarios.

As shown in Table 11, a large range of biosolids production is possible. However, Scenarios 2a and 2b represents the typical "design" operating range for the WPCF facilities. Therefore, this scenario is the recommended design scenario for determining the amount of land required to assimilate biosolids at agronomic rates.

Table 11. Biosolids Loading Assumptions and Average Daily Biosolids Production

Item	Scenario 1a	Scenario 1b	**Scenario 2a**	**Scenario 2b**	Scenario 3a	Scenario 3b
DAFT Solids Recovery, percent	50	50	**95**	**95**	95	95
Solids Capture in Lagoon, percent	85	85	**85**	**85**	100	100
Current (2006) Biosolids Production, tons/year [(a)]	1,100	1,100	**1,300**	**1,400**	1,900	2,100
Future (2020) Biosolids Production, tons/year [(b)]	1,400	1,500	**1,800**	**1,900**	2,600	2,800

(a) Current loadings were based on secondary WAS solids production ranging between 7,700 and 9,300 lb/day and an influent TSS loading of 15,700 lb/day.
(b) Future loadings were based on secondary WAS solids production ranging between 10,400 and 12,500 lb/day and an influent TSS loading of 21,200 lb/day.

Total Biosolids Nitrogen Loading Equation

Total biosolids nitrogen loading is comprised of two sources of nitrogen, one from biosolids applied during the current year, and one from mineralized organic nitrogen that becomes available over time. In the USEPA Process Design Manual for Land Application of Sewage Sludge and Municipal Septage (1995), total nitrogen (N) loading is defined as follows:

Total N Loading = Plant Available Nitrogen (PAN) + Mineralized Organic Nitrogen (MON)

(Equation 2)

Plant Available Nitrogen (PAN) is determined using the following equation:

PAN= (Nitrate + kv*Ammonia + fn*Organic Nitrogen)

(Equation 3)

Where:

Nitrate = Applied Biosolids Nitrate Concentration on a dry weight basis

kv = volatilization fraction, 0.5 for anaerobically digested biosolids and surface spreading

Ammonia = Applied Biosolids Ammonia Concentration on a dry weight basis

fn = fraction of organic nitrogen available during the first year of application, 0.2 for anaerobically digested biosolids

Organic Nitrogen = Applied Biosolids Organic Nitrogen Concentration on a dry weight basis

Mineralized Organic Nitrogen (MON) is defined as the amount of organic nitrogen (ON) that is available during the current year that has been mineralized over the past three years. For purposes of this evaluation, the year 2006 (representing the current year loading) has been provided to clarify the varying fractions of ON that become available over time. The MON equation is computed as follows:

Mineralized Organic Nitrogen (MON) (Year 2006) = 0.2 * ON (Year 2005) + 0.1 * ON (Year 2004) + 0.05 * ON (Year 2003)

(Equation 4)

Where:

20% of the applied ON is mineralized (becomes available) during the first year following application, for anaerobically digested sludge

10% of the applied ON is mineralized during the second year following application, for anaerobically digested sludge

5% of the applied ON is mineralized during the third year following application, for anaerobically digested sludge

Biosolids Assumptions

The following assumptions were used in developing the additional land application requirements for biosolids application:

- The future biosolids nitrogen concentration would be equivalent to the historic average biosolids nitrogen concentrations from 2000-2006, as shown in Table 12:

Table 12. Historic Annual Average Nitrogen Concentrations

Constituent	Concentration, Dry Weight Basis, mg/kg
Nitrate	0
Ammonia	37,800
Organic Nitrogen	39,100

Note that the City has been measuring nitrogen concentrations of the biosolids entering Lagoon #2. Therefore, actual nitrogen concentrations may be lower than the average values represented in Table 12. However, these values were used for purposes of developing a conservative analysis.

- Biosolids nitrogen can be assimilated during the winter months when wheat (or a similar winter crop) is grown and by the remaining uptake available for a summer corn crop (determined based on theoretical irrigation water loadings discussed above), as shown in Table 13:

Table 13. Assumed Crop Nitrogen Loading Requirements

Crop	Nitrogen Loading, lb/ac
Wheat Component	171
Available Corn Component	92
Total Wheat/Corn	263

Required Biosolids Land Application Area

Depending on the biosolids design criteria, a varying range of land is required for existing and future biosolids land application. Table 14 presents the biosolids required land application area for each scenario.

Table 14. Existing and Future Biosolids Application Conditions

Item	Historical Average Conditions	Scenario 1a	Scenario 1b	**Scenario 2a [a]**	**Scenario 2b [a]**	Scenario 3a	Scenario 3b
Existing Conditions							
Design Dry Solids [b]	605	1,100	1,100	**1,300**	**1,400**	1,900	2,100
Total N Loading, Lb/year	58,300	106,100	106,100	**125,400**	**135,100**	144,700	202,600
Required Land Area of Corn, ac	220	400	400	**475**	**510**	545	765
Future Conditions							
Design Dry Solids [c]	—	1,400	1,500	**1800**	**1900**	2600	2800
Total N Loading, Lb/year	—	135,100	144,700	**173,700**	**183,300**	250,900	270,200
Required Land Area of Corn, ac	—	510	545	**655**	**690**	945	1,020

(a) Recommended design scenarios.
(b) Current loadings were based on WAS secondary solids production of 7,000-9,300 lb/day and influent TSS loading of 15,700 lb/day.
(c) Future loadings were based on secondary WAS solids production of 10,400-12,500 lb/day and influent TSS loading of 21,200 lb/day.

Note that historical average conditions are significantly less than both existing and the anticipated future conditions as well. As discussed previously, this is attributed to the loss of solids in the storage ponds. As shown in Table 14, a much larger acreage of corn is required than previously has been used for biosolids application.

TOTAL LAND AREA REQUIREMENTS SUMMARY

The total amount of land required is determined by combining land requirements for both reclaimed water and biosolids application under current and future conditions. Land area requirements for existing conditions and future conditions are provided in Table 15.

Table 15. Current and Future Land Area Requirements for Reclaimed Water and Biosolids Application [a]

Crop	Condition	Current Land Area Requirements, acres	Future Land Area Requirements, acres
Alfalfa	Required for Reclaimed Water Application (Refer to Table 8)	355	355
Corn/Wheat	Required for Reclaimed Water Application (Refer to Table 8)	525	525
	Required for Biosolids Application (Refer to Table 14)	475 – 510	655 – 690
	Area Required [b]	525	690
Total Required Land Area		880	1045
Additional Area Required [c]		15	180

(a) This is the total amount of land area required to assimilate both reclaimed water and biosolids during land application. Because the biosolids required land area is greater than the reclaimed water area required for corn, no additional corn acreage is needed to assimilate reclaimed water.
(b) Maximum of the calculated required values.
(c) Assuming that 790 acres and the planned additional 75 acre expansion are available for combined reclaimed water irrigation. Note that the City does currently own an additional 15 acre field in the proposed expansion area.

EXISTING AND FUTURE TOTAL LOADING CONDITIONS

Historically, nitrogen loadings have typically been the most regulated constituent with respect to land application of industrial flows such as cannery and winery wastewater. However, other constituents such as Total Dissolved Solids (TDS) and Biological Oxygen Demand (BOD) are also of concern and should be considered during design of land application systems. Existing and future concentration and flow conditions for the following constituents are described as follows:

- Total Nitrogen
- Biological Oxygen Demand
- Total Dissolved Solids

Total Nitrogen

A summary of the current and projected average flow conditions and projected flow weighted concentrations of the projected reclaimed water quality on an annual basis is presented in Table 16.

Table 16. Projected Maximum Reclaimed Water Total Nitrogen Flow-Weighted Average Concentration (Annual Basis)

TN Source	Historic TN Concentrations mg/L [a]	Projected Future TN Concentrations mg/L [b]	Historical Average Flow, MG per year [c]	Current Average Flow (865 acres) [d], MG per year	2020 Projected Flow (1,045 acres) [e], MG per year
Municipal Effluent to Land	23	8	763	755	1,012
PCP Cannery	78	78	115	260	260
Winery Wastewater	42	42	0.13	2.5	2.5
Industrial Line Winter Runoff	3 [f]	3	154	154	154
Onsite Winter Runoff	20 [f]	20	46	46	46
Other Industries	11 [f]	11	16	16	16
Estimated Biosolids Supernatant	1,290 [g]	—	3	0 [i]	0 [i]
DAFT Subnatant	23 [h]	—	29	0 [i]	0 [i]
Total		—	1,126	1,233	1,490
Flow Weighted Average Nitrogen Concentration, mg/L	—	—	29.0	22.7	20.1

(a) Historic TN concentrations are averages between 2002 through 2005, with the exception of PCP cannery and winery wastewater, which are maximum concentrations.
(b) Projected future concentrations are expected to remain the same, except for municipal effluent.
(c) Average of reclaimed water flows from 2002 through 2005.
(d) Includes flow requirements for 865 acres of land.
(e) Includes flow requirements for 1,045 acres of land based on recommendations discussed above.
(f) Obtained from industrial discharge data between 2002 and 2005. To be eliminated from land application in the future.
(g) Obtained from standard minerals sampling 2005-2006. To be eliminated from land application in the future.
(h) Assumed to be equal to the reclaimed water TN concentration.
(i) Supernatant and subnatant will be routed to the aeration basins. These flows will be offset by municipal effluent.

As shown in Table 16, the addition of land application area results in a reduction in the applied total nitrogen concentration due to the dilution provided by blending municipal effluent. The addition of 75 acres would reduce the average TN concentration from 29.0 to 22.7 mg/L. The addition of 255 acres would result in a TN reduction to 20.1 mg/L.

Total Dissolved Solids

Total Dissolved Solids (TDS) in the reclaimed water or biosolids can increase groundwater TDS concentrations. This should be avoided because groundwater TDS concentrations are already greater than established TDS water quality criteria. Therefore, current and future TDS loading rates associated with recycled water applications are addressed below.

The major contributor of TDS is the PCP cannery. As discussed in the City's Groundwater Investigation Existing Conditions Report, approximately half of the annual TDS load to the irrigation area originates from the PCP cannery. However, cannery wastewater has unique characteristics with respect to TDS. Dissolved solids consist of both volatile (organic) dissolved solids (VDS) and fixed (inorganic) dissolved solids (FDS). Cannery wastewater is typically comprised of a significant amount of VDS, which are labile (readily break down following land application) and therefore do not pose a threat to groundwater. Nevertheless, adequate FDS data is not available to evaluate the historic flow-weighted FDS concentrations. Therefore, the projected total dissolved solids concentration is based on TDS data.

The projected maximum flow-weighted reclaimed water TDS concentrations for the City's reclaimed water discharge are presented in Table 17. This calculation incorporates all of the flow sources discharged to the irrigation area.

Table 17. Projected Maximum Reclaimed Water Total Dissolved Solids Concentration

TDS Source	Historic TDS Concentrations mg/L [a]	Existing Average Flow, MG per year [b]	Current Average Flow (865 acres) [c], MG per year	2020 Projected Flow (1,045 acres) [d], MG per year
Municipal Effluent to Land	424	763	755	1,012
PCP Cannery	2,150 [e]	115	260	260
Winery Wastewater	2,353[f]	0.13	2.5	2.5
Industrial Line Winter Runoff	420[g]	154	154	154
Onsite Winter Runoff	420[g]	46	46	46
Other Industries	420[g]	16	16	16
Estimated Biosolids Supernatant	2,000 [g]	3	0 [i]	0 [i]
DAFT Subnatant	424 [h]	29	0 [i]	0 [i]
Total	—	1,126	1,233	1,490
Projected Maximum Flow-Weighted TDS Concentration, mg/L	—	604	791	728

(a) Historic TDS concentrations are averages between 2000 through 2006, with the exception of PCP cannery and winery wastewater.
(b) Average of reclaimed water flows from 2002 through 2005.
(c) Includes flow requirements for 865 acres of land.
(d) Includes flow requirements for 1,045 acres of land based on recommendations discussed above.
(e) Cannery concentration calibrated based on average reclaimed water TDS concentrations.
(f) Annual average from 2006.
(g) Obtained from industrial discharge data between 2002 and 2005.
(h) Assumed to be equal to the municipal TDS concentration.
(i) Supernatant and subnatant will be routed to the aeration basins. Additional flow will be provided by domestic effluent.

As shown in Table 17, even with the additional land application area, the TDS concentration will increase due to the additional cannery flows. However, as described above, a significant portion of the applied TDS will readily breakdown prior to or shortly after, land application. Based on the limited standard minerals data collected during the 2005 and 2006 canning season, between 35 and 71 percent (54 percent average) of the TDS concentration is volatile and will readily break down. During non-canning periods, the percentage is negligible. Therefore, assuming an average of 50 percent reduction of cannery TDS, the 2020 buildout TDS concentration of 728 mg/L would be approximately 540 mg/L of TDS would be land applied. Additional data will be collected to provide additional data support for this finding, and future TDS concentrations will be confirmed by PCP cannery.

Biological Oxygen Demand (BOD)

Following land application, biological oxygen demand (BOD) is removed through the soil profile through filtration, adsorption, and biological reduction and oxidation. The consideration of BOD loading is important because excess organic loading during land application can result in odorous anaerobic conditions, incomplete removal of organics in the soil profile, mobilization of iron, manganese, and other compounds, as well as increases in bicarbonate in the soil solution via carbon dioxide dissolution (CLFP, 2007).

The projected maximum reclaimed water BOD concentration is presented in Table 18. This calculation incorporates all of the flow sources that are discharged to the irrigation area.

Table 18. Projected Maximum Reclaimed Water Biological Oxygen Demand Concentration

BOD Source	Historic BOD Concentrations mg/L	Existing Average Flow, MG per year [a]	Current Average Flow (865 acres) [b], MG per year	2020 Projected Flow (1,045 acres) [c], MG per year
Municipal Effluent to Land	7 [d]	763	755	1,012
PCP Cannery	3,779 [e]	115	260	260
Winery Wastewater	3,297 [f]	0.13	2.5	2.5
Industrial Line Winter Runoff	69 [g]	154	154	154
Onsite Winter Runoff	420 [g]	46	46	46
Other Industries	69 [g]	16	16	16
Estimated Biosolids Supernatant	4,000 [h]	3	0 [j]	0 [j]
DAFT Subnatant	7 [i]	29	0 [j]	0 [j]
Total	—	1,126	1,233	1,490
Projected Maximum Flow-Weighted BOD Concentration, mg/L	—	429	833	691

(a) Average of reclaimed water flows from 2002 through 2005.
(b) Includes flow requirements for 865 acres of land.
(c) Includes flow requirements for 1,045 acres of land.
(d) Average effluent BOD between 2000 through 2006.
(e) Maximum annual average between 1999 and 2006.
(f) Annual average from 2006.
(g) 99th percentile historical industrial influent BOD concentration during the non canning season (2000-2005).
(h) Estimated value.
(i) Assumed to be equal to the municipal effluent BOD concentration.
(j) Supernatant and subnatant will be routed to the aeration basins. Additional flow will be provided by municipal effluent.

As shown in Table 18, BOD loadings are also expected to increase as a result of the increased cannery flows. Similar to the TDS concentrations, however, BOD from the cannery will be exerted prior to or shortly after land application. Additional data will be collected regarding reclaimed water BOD. Following collection of additional data, the BOD loading rates will be revisited and incorporated into design loadings. Furthermore, cannery wastewater pretreatment is being evaluated, which would result in additional BOD reduction.

The following calculations demonstrate the historic BOD field loading rates based on data collected by the City. Table 19 illustrates the historic BOD field loading.

Table 19. Historic BOD Field Loading

Year	Average Annual Industrial BOD Field Loading, lb/ acre/year[a]	Average Annual Municipal BOD Field Loading, lb/ acre/year[a]
2000	8,119	23
2001	9,112	40
2002	4,607	48
2003	3,535	52
2004	2,997	50
2005	3,496	29

(a) Annual loads were determined from BOD concentration data collected weekly and daily flow data. Note the municipal BOD load is only based on the portion directed to the storage ponds.

As shown in the above table, the vast majority of the BOD load to the City's irrigation area is from the industrial flow (primarily from the PCP cannery), which is typically discharged between July and September. These flows are blended with the treated municipal wastewater prior to being land applied. Note that BOD loads associated with the other sources of irrigation water are also expected to be very low in comparison to these industrial loads.

As shown in Table 19, the loads from the PCP cannery were substantially greater during 2000 and 2001. These two years are more representative of projected future conditions, as cannery flows during 2000 and 2001 were roughly double the current flows. Therefore, the loadings that occurred in these two years are representative of the anticipated future BOD loading rates and will be used to develop BOD design criteria. Future BOD concentrations will be confirmed by PCP cannery.

In summary, because total nitrogen has historically been regulated as the limiting constituent for land application design, total nitrogen concentrations and flows are used to size additional land area requirements for both reclaimed water and biosolids. However, after additional data collection, TDS and BOD loadings will be revisited to determine if additional area would be required to assimilate these constituents. Finally, pretreatment of cannery wastewater is currently being considered, which would result in reductions of TN, TDS and BOD loadings.

MAC:nmp

APPENDIX A

Nitrogen Contributions and Totals of Applied Reclaimed Water

Appendix A: Nitrogen Contributions and Totals of Applied Reclaimed Water

Table A-1. Flows and Concentrations for Land Application (50th Percentile Cannery Concentrations)

	Domestic Flow			Cannery Flow			Winery Wastewater			Total RW Flow, MG			
	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Total Field Area Crop Uptake [2]
Apr	41.4	8.0	2,765	5.2	2.2	96	0.1	42.0	50	46.8	7.5	2,912	10,808
May	69.6	8.0	4,645	2.0	3.4	57	0.1	42.0	22	71.7	7.9	4,724	15,580
June	85.5	8.0	5,703	23.0	4.1	797	0.2	42.0	53	108.7	7.2	6,552	27,368
July	74.0	8.0	4,936	56.6	33.9	15,975	0.3	42.0	92	130.8	19.3	21,003	35,724
Aug	32.0	8.0	2,133	86.6	38.2	27,613	0.4	42.0	125	118.9	30.1	29,871	34,662
Sept	0.7	8.0	46	37.4	20.7	6,458	0.2	42.0	62	38.2	20.6	6,566	9,885
Oct	18.3	8.0	1,219	5.2	32.2	1,403	0.2	42.0	79	23.7	13.7	2,701	5,999

(1) Note that the domestic effluent flow increases as cannery concentration increases in order to reduce the total RW concentration.
(2) Total field nitrogen uptake rate based on 195 acres of alfala and 275 acres of corn, for a total of 470 acres.

Table A-2. Flows and Concentrations for Land Application (90th Percentile Cannery Concentrations)

	Domestic Flows			Cannery Flow			Winery Wastewater			Total RW Flow, MG			
	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Total Field Area Crop Uptake [2]
Apr	66.2	8.0	4,416	5.2	2.2	96	0.1	42.0	50	71.5	7.6	4,563	16,070
May	109.1	8.0	7,278	2.0	3.4	57	0.1	42.0	22	111.1	7.9	7,356	23,288
June	163.3	8.0	10,895	23.0	8.6	1,644	0.2	42.0	53	186.5	8.1	12,592	45,538
July	177.0	8.0	11,807	56.6	78.9	37,201	0.3	42.0	92	233.8	25.2	49,101	60,595
Aug	125.6	8.0	8,380	86.6	61.7	44,596	0.4	42.0	125	212.6	30.0	53,101	57,002
Sept	7.5	8.0	503	37.4	32.4	10,109	0.2	42.0	62	45.1	28.4	10,674	11,091
Oct	22.5	8.0	1,503	5.2	47.9	2,089	0.2	42.0	79	28.0	15.7	3,671	6,989

(1) Note that the domestic effluent flow increases as cannery concentration increases in order to reduce the total RW concentration.
(2) Total field nitrogen uptake rate based on 230 acres of alfala and 610 acres of corn, for a total of 840 acres.

Table A-3. Flows and Concentrations for Land Application (95th Percentile Cannery Concentrations)

	Domestic Flows			Cannery Flow			Winery Wastewater			Total RW Flow, MG			
	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Total Field Area Crop Uptake [2]
Apr	81.2	8.0	5,419	5.2	2.2	96	0.1	42.0	50	86.6	7.7	5,565	19,959
May	130.7	8.0	8,720	2.0	3.4	57	0.1	42.0	22	132.7	7.9	8,799	28,783
June	179.6	8.0	11,983	23.0	12.7	2,436	0.2	42.0	53	202.8	8.6	14,472	49,762
July	188.1	8.0	12,550	56.6	85.3	40,238	0.3	42.0	92	244.9	25.9	52,881	63,448
Aug	135.7	8.0	9,056	86.6	64.3	46,478	0.4	42.0	125	222.7	30.0	55,658	59,686
Sept	32.0	8.0	2,138	37.4	45.8	14,262	0.2	42.0	62	69.6	28.4	16,463	17,119
Oct	37.7	8.0	2,517	5.2	48.2	2,101	0.2	42.0	79	43.2	13.0	4,698	10,787

(1) Note that the domestic effluent flow increases as cannery concentration increases in order to reduce the total RW concentration.
(2) Total field nitrogen uptake rate based on 355 acres of alfala and 525 acres of corn, for a total of 880 acres.

Table A-4. Flows and Concentrations for Land Application (99th Percentile Cannery Concentrations)

	Domestic Flows			Cannery Flow			Winery Wastewater			Total RW Flow, MG			
	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Flow[1], MG	Total Nitrogen Conc., mg/L	Load, lb/month	Total Field Area Crop Uptake [2]
Apr	94.6	8.0	6,310	5.2	2.2	96	0.1	42.0	50	99.9	7.7	6,457	23,479
May	149.7	8.0	9,990	2.0	3.4	57	0.1	42.0	22	151.8	8.0	10,069	33,742
June	191.5	8.0	12,778	23.0	18.5	3,563	0.2	42.0	53	214.7	9.2	16,393	52,911
July	193.7	8.0	12,921	56.6	89.9	42,391	0.3	42.0	92	250.5	26.5	55,405	64,859
Aug	140.8	8.0	9,394	86.6	65.4	47,264	0.4	42.0	125	227.8	29.9	56,782	61,013
Sept	55.6	8.0	3,708	37.4	58.8	18,308	0.2	42.0	62	93.1	28.4	22,078	22,906
Oct	52.3	8.0	3,491	5.2	48.4	2,111	0.2	42.0	79	57.8	11.8	5,681	14,433

(1) Note that the domestic effluent flow increases as cannery concentration increases in order to reduce the total RW concentration.
(2) Total field nitrogen uptake rate based on 475 acres of alfala and 425 acres of corn, for a total of 900 acres.

Appendix I City of Lodi Water Recycling Facilities Planning Grant Application

City of Lodi Water Recycling Facilities Planning Grant Application

For consideration in the Water Recycling Funding Program offered by
State Water Resources Control Board
Division of Financial Assistance

Prepared by:

RMC
Water and Environment

September 20, 2006

Attachment 1 – Plan of Study

City of Lodi
Recycled Water Master Plan
Planning Study Grant Application

Introduction

The City of Lodi (City) currently recycles about 35% of treated effluent in the summer months for feed crop irrigation and in pond recharge. The City is interested in preparing a Recycled Water Master Plan (RWMP) to assess the full recycled water market potential within the current City limits as well as future areas of development, and to identify cost-effective alternatives for implementation. Implementation of recycled water would provide several benefits to the City, including:

- **Offset Groundwater Pumping.** The City currently uses groundwater from the San Joaquin Valley groundwater basin for all demands. The Department of Water Resources (DWR) has declared that the groundwater basin underlying Eastern San Joaquin County is overdrafted, and groundwater levels in the County and the City are generally decreasing (DWR, Bulletin 118). Expanding the use of recycled water to serve non-potable demands would offset the use of groundwater supplies, thereby addressing some of the overdraft issues.
- **Improve Supply Reliability.** The City's water demand is projected to more than double between 2005 and 2040; therefore a reliable alternative supply source is needed. Recycled water supply serving non-potable demands for the City is considered to be very consistent even in dry years; and resistant to supply fluctuations in comparison to groundwater. The use of recycled water will reduce dependency on potable water supplies for non-potable uses, and in turn preserves potable supplies for highest uses (e.g. drinking water).
- **Utilize Tertiary Treated Wastewater.** All wastewater (except for the 2.1 mgd feed crop irrigation) is tertiary treated at the White Slough Water Pollution Control Facility (WSWPCF) to meet Title 22 standards. The 7 mgd wastewater treatment plant is sized to accommodate additional recycled water demands, and the City would benefit by finding a market for the surplus tertiary treated water.
- **Reduce Effluent Discharges.** Increased water recycling reduces the amount of effluent discharged into White Slough.

Plan of Study

The following sections present the Plan of Study, and are organized in accordance with the State's "Water Recycling Funding Program Guidelines" dated October 2004.

1. Recycled Water Service Area

The recycled water service area that will be evaluated by the RWMP includes the City of Lodi, the WSWPCF, as well as new development areas located west of the City (between the City and WSWPCF) as shown in Figure 1. Lodi's geographical area extends from the Mokelumne River on the north, Woodbridge Irrigation District's South Main Canal and Lower Sacramento Road on the west, Harney Lane on the south, and portions of Highway 99 and Central California Traction Railroad on the east. The new development area boundaries are Highway 12 to the north, Ray Road to the west, halfway between Armstrong Road and Harney Road to the south and the eastern City limit to the east.

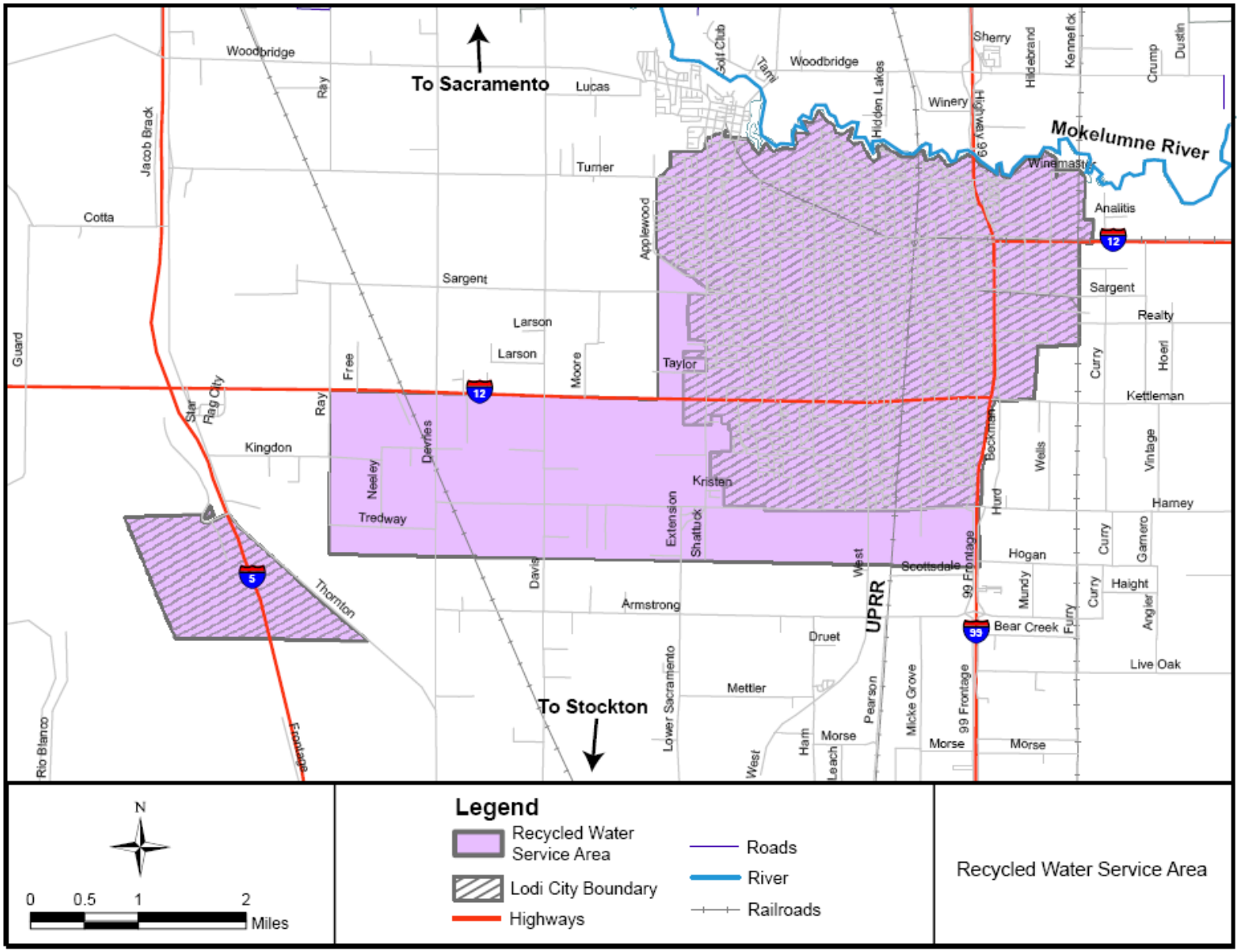


Figure 1: City of Lodi Recycled Water Service Area

2. Recycled Water Sources and Unit Process Summary at the Existing Treatment Facility

The main source of recycled water is the White Slough Water Pollution Control Facility located approximately 6 miles southwest of the City. All of the wastewater collected within the City limits undergoes tertiary treatment. The effluent produced meets Title 22 recycled water standards. Currently, the WSWPCF is permitted for a capacity of 7.0 million gallons per day (mgd), with an average daily flow in 2004-2005 being 6.4 mgd. (RMC, 2006)

Wastewater at the WSWPCF is treated by the following treatment train as seen in Figure 2.

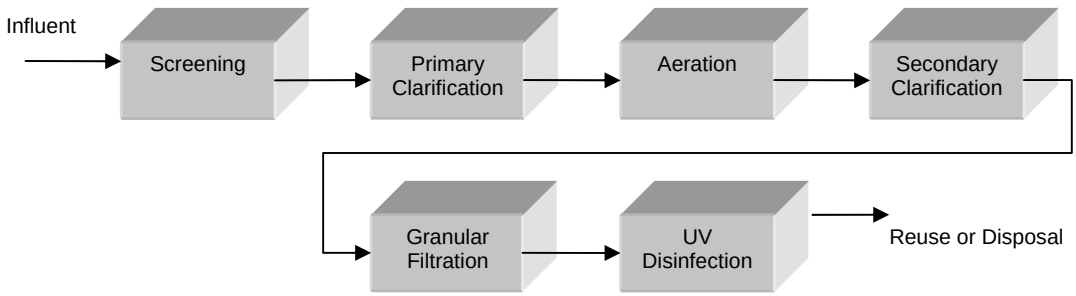


Figure 2: Existing Wastewater Treatment Flow Schematic

Primary Treatment

- Influent screening;
- Grinding;
- Grit removal;
- Primary clarification;

Secondary Treatment

- Aeration/sludge activation;
- Secondary clarification;
- WAS thickening;
- Anaerobic digestion of solids;

Tertiary Treatment

- Granular filtration;
- UV disinfection;
- Effluent flow measurement; and
- Effluent disposal or reuse.

3. Current Disposal and Reuse

An average wastewater flow of 6.4 mgd is generated at the WSWPCF. Effluent not recycled in the summer months is tertiary treated and discharged into White Slough, which is part of the San Joaquin Delta. During the winter months, all treated effluent is discharged to White Slough.

Approximately 2.09 mgd or 35% of the treated effluent from WSWPCF is recycled in the summer months by the following methods:

- The City leases 650 acres of land near WSWPCF to farmers for the cultivation and harvesting of feed and fodder crops not intended for human consumption. This land is irrigated with secondary treated wastewater from the WSWPCF.
- City has also supplied tertiary treated recycled water from WSWPCF to produce steam for a 49-megawatt natural gas-powered generator and to replenish mosquito fish-rearing ponds
- The City has provided a "will-serve" letter to supply 1 mgd of tertiary treated wastewater to the Northern California Power Agency to use at a potential power plant

4. Study Area Map

The boundaries of the planning area and the location of the WSWPCF, the source of recycled water, are illustrated in Figure 1.

5. Agency Jurisdiction

The City of Lodi Water Utility (Utility) is the sole water supplier for the City of Lodi and currently serves 62,500 people. The Utility's service area is contiguous with the City boundaries and covers approximately 12 square miles. The City owns, operates, and maintains the wastewater system that serves the City. Woodbridge Irrigation District has jurisdiction over portions of the new development area; however has no jurisdiction within the City of Lodi.

The City of Lodi has informed WID of the proposed study and is currently coordinating with WID on the proposed scope of work. The City of Lodi will continue to work with WID as the study progresses and is prepared to enter into an interagency agreement as needed for implementation of the recommended alternative(s).

6. Recycled and Potable Water Supply Alternatives

The study will identify the infrastructure needed to expand recycled water usage through the City and the need for storage facilities to accommodate peak recycled water demands. Potential uses of recycled water within the City are expected to include:

- Agricultural irrigation;
- Urban (park, and streetscape) landscape irrigation;
- Residential irrigation;
- School landscape irrigation; and
- Dual plumbed business/commercial developments.

7. Opportunities for Stakeholder Participation

Outreach activities include meetings with the largest potential recycled water users identified as part of the market assessment, to gage their potential interest in using recycled water and discuss any preliminary concerns they may have relating to water quality and supply reliability.

Outreach to the general public will include the development of a recycled water brochure that describes the proposed recycled water project, benefits of recycled water and safety of its use. A public workshop will also be held to address any questions and/or concerns that the public may have.

8. Recycled Water Master Plan Schedule

The study is scheduled to begin October 16, 2006, but the start date is contingent upon the timing of the SWRCB review and approval of this grant application. Major milestones for the Study are as follows:

- Study Start Date: October 16, 2006
- Submittal of Draft Master Plan: April 11, 2007
- Submittal of Final Master Plan: June 28, 2007

A more detailed schedule and scope of work is included in Attachment 3.

9. Potential Problems and Proposed Actions to Reduce Impact

The City does not anticipate any potential problems that would delay progress in this study.

10. Entities Conducting the Study

The City of Lodi will be conducting the study and has asked RMC Water and Environment to prepare a scope of work to complete the study that is consistent with the requirements of Appendix B of the Water Recycling Funding Program Guidelines. The scope of work is broken down into 5 major tasks: Project Coordination, Recycled Water Feasibility Study, Alternatives Development and Evaluation, Recycled Water Outreach, and the Recycled Water Master Plan. Detailed information on each of these tasks is provided in Attachment 3. A summary description of the tasks is provided below:

Task 1 – Project Coordination

- This task involves the coordination and communication between the RMC team, the City and WID throughout the duration of the project, and the Quality Assurance/ Quality Control (QA/QC) activities for project deliverables.

Task 2 – Recycled Water Feasibility Study

- This task involves the investigation of recycled water potential in the City of Lodi and proposed areas of annexation by evaluating potential markets and confirming the quantity and quality of available recycled water supplies. As part of this evaluation, water use records and water quality needs of potential users will be evaluated.

Task 3 – Alternatives Development and Evaluation

- This task involves the development and evaluation of recycled water alternatives for delivering recycled water and non-potable water to potential recycled water customers within the City of Lodi. As part of this task, these alternatives will be compared to potential potable water supply alternatives for serving these demands. The results will be presented to the City and other interested stakeholders at a Workshop/Mid-course review meeting

Task 4 – Recycled Water Outreach

- This task involves conducting various outreach activities to potential recycled water users and the general public in order to educate them on the benefits of recycled water use.

Task 5 – Recycled Water Master Plan

- This task involves the development of a Recycled Water Master Plan for the City of Lodi. The Master Plan will include discussion of the study area characteristics, (e.g. existing water supplies, demands and plans for new facilities), recycled water market assessment, recommended project facilities, planning level cost estimates and financing plan, interagency agreements and recycled water assurances, and additional outreach and environmental compliance activities related to the recommended project.
- As required by Appendix B of the Water Recycling Guidelines, the RWMP will present the results of the evaluation of both recycled water and non-recycled water alternatives. This would include the results of an evaluation of an interim alternative that would involve use of recycled

water infrastructure to convey raw Woodbridge Irrigation District supplies for irrigation use within the City until a transmission line between the WSWPCF and the City is constructed; as well as the results of a longer-term alternatives that involve supplying recycled water to the City, it's annexation area, and future development located in the General Plan's sphere of influence.

11. Proposed Budget

The total cost of preparing the Recycled Water Master Plan for the City of Lodi is $160,000. These costs are broken down as follows:

Table 1: Proposed Recycled Water Master Plan Budget

Task	RMC Costs	Subconsultant Costs	Total Costs
1.0 Project Coordination	$14,240	$0	$14,240
2.0 Recycled Water Feasibility Study	$36,540	$0	$36,540
3.0 Alternative Analysis	$34,170	$500	$34,670
4.0 Recycled Water Outreach	$30,700	$8,000	$38,700
5.0 Recycled Water Master Plan	$34,350	$1,500	$35,850
Total	**$150,000**	**$10,000**	**$160,000**

The City will cover all costs incurred prior to dispersement of the grant funds from the Water Fund.

References

California Department of Water Resources, "Bulletin 118 Update 2003," 2005.

RMC Water and Environment, City of Lodi Urban Water Management Plan, 2006.

Attachment 2 – Authorized Representative Resolution

AUTHORIZED REPRESENTATIVE RESOLUTION

BE IT RESOLVED, by the City Council that the City Manager hereby authorized and directed to sign and file, for and on behalf of the City of Lodi, a Financial Assistance Application for a loan/grant from the State Water Resources Control Board in the amount not to exceed $75,000 for the facilities planning study for the City of Lodi Recycled Water Master Plan, and

BE IT RESOLVED, that the City of Lodi hereby agrees and further does authorize the aforementioned representative or his/her designee to certify that the Agency has and will comply with all applicable state and federal statutory and regulatory requirements related to any federal state loan/grants received, and

BE IT FURTHER RESOLVED, that the City Manager or his/her designee of the City of Lodi is hereby authorized to negotiate and execute a loan/grant contract and any amendments or change orders thereto, and to certify loan/grant disbursement on behalf of the City of Lodi.

CERTIFICATION

I do hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the City Council held on May 17, 2006.

(Seal)

Susan J. Blackston
City Clerk

CITY OF LODI, CALIFORNIA FOUNDED 1869
INCORPORATED DECEMBER 6, 1906

RESOLUTION NO. 2006-91

A RESOLUTION OF THE LODI CITY COUNCIL AUTHORIZING THE CITY MANAGER TO EXECUTE GRANT APPLICATION TO THE STATE WATER RESOURCES CONTROL BOARD FOR THE FACILITIES PLANNING STUDY FOR THE CITY OF LODI RECYCLED WATER MASTER PLAN

==========

WHEREAS, as an incentive to municipalities to prepare Recycled Water Master Plans and to pursue the use of recycled water, the State Regional Water Quality Control Board (SRWQCB) is offering grants of up to $75,000 to help in the cost of preparing these plans; and

WHEREAS, while this plan is not required by the State, staff does believe that recycled water will be an important part of Lodi's future water supply and recommends that the City take advantage of this incentive program; and,

WHEREAS, the estimated cost of the plan is $150,000; and

WHEREAS, on February 1, 2006, the City Council approved a technical services task order agreement in the amount of $10,000 with RMC, Water Consultants, for preparation of the grant application, which is now complete, and staff hereby requests the necessary authorizations to submit the application.

NOW, THEREFORE, BE IT RESOLVED that the Lodi City Council does hereby authorize the City Manager to execute grant application to the State Water Resources Control Board for the Facilities Planning Study for the City of Lodi Recycled Water Master Plan in an amount not to exceed $75,000; to negotiate a grant contract and any amendments or change orders as required; and to certify that the City has and will comply with all applicable state and federal statutory and regulatory requirements related to any grants received.

Dated: May 17, 2006

==========

I hereby certify that Resolution No. 2006-91 was passed and adopted by the City Council of the City of Lodi in a regular meeting held May 17, 2006, by the following vote:

AYES: COUNCIL MEMBERS – Beckman, Hansen, Johnson, Mounce, and Mayor Hitchcock

NOES: COUNCIL MEMBERS – None

ABSENT: COUNCIL MEMBERS – None

ABSTAIN: COUNCIL MEMBERS – None

SUSAN J. BLACKSTON
City Clerk

Attachment 3 – Scope of Work

RMC
Water and Environment

Los Angeles
Sacramento
San Francisco
San Jose
Walnut Creek

August 15, 2006

Mr. Charles Swimley, Jr.
Senior Civil Engineer
Public Works Department
City of Lodi
221 West Pine Street
P.O. Box 3006
Lodi, CA 95241-1910

Subject: Task Order No. Two: Recycled Water Master Plan

Dear Mr. Swimley:

At the City of Lodi's request, RMC Water and Environment (RMC) is pleased to present this proposal to prepare a Recycled Water Master Plan for the City.

BACKGROUND

The City of Lodi recognizes several benefits for developing a Recycled Water Master Plan (RWMP) to define the recycled water market potential and identify recommended projects to deliver recycled water for non-potable uses within the City and proposed areas of annexation:

- **Improves Water Supply Reliability.** Groundwater is currently the sole source of water supply used within the City. With the groundwater basin in a state of overdraft, the City of Lodi is in need of alternative supply sources to meet future water demands, which are projected to more than double between 2005 and 2040. Use of recycled water to serve non-potable demands within this area would preserve groundwater supplies for potable uses and provide additional supply reliability for the City.

- **Reduces Wastewater Discharges.** The City of Lodi, like other wastewater dischargers in the Central Valley, is facing increasingly stringent wastewater discharge regulations. Increased use of recycled water is a key strategy for complying with these future discharge regulations and helps to position the City for ultimately achieving zero discharge.

- **Provides Interim Solution for Use of Supplemental WID Supply.** The City of Lodi currently contracts with Woodbridge Irrigation District (WID) for an annual surface water supply of 6,000 AFY which is currently unused because the City does not yet have facilities in place to develop that supply. Early construction of portions of the recycled water distribution infrastructure could provide the City of Lodi with an interim usage of the raw water supplies from WID to serve non-potable irrigation demands. These demands would ultimately be served by recycled water once construction of all of the recycled water distribution facilities is completed.

The scope of work presented below is for development of a Recycled Water Master Plan which will evaluate the potential for recycled water use within the City limits and proposed westside annexation areas

140 Geary Street
9th Floor
San Francisco, CA 94108
ph: 415.321.3400
fax: 415.321.3401
www.rmcwater.com

Innovative Solutions for Water and the Environment

SCOPE OF WORK

RMC has identified the following tasks to complete the scope of work for this project. The tasks associated with this scope of work comply with the requirements set forth in Appendix B of the Water Recycling Funding Program Guidelines.

Task 1 Project Coordination

This task involves the coordination and communications between the RMC team and the City throughout the duration of the project, and the Quality Assurance/ Quality Control (QA/QC) activities for project deliverables. An initial kickoff meeting will be held with the Project Team to confirm overall approach and schedule. RMC will also provide the City with monthly status updates for the project.

Deliverables:

1. Kick off Meeting
2. Monthly Status Reports

Assumptions:

- RMC will attend at total of four (4) coordination meetings (including the Kickoff meeting) with the City to discuss project status as needed.

Task 2 Recycled Water Feasibility Study

RMC will document the recycled water potential in the City of Lodi by evaluating potential markets and confirming the quantity and quality of available recycled water supplies. As part of this task, RMC will complete the following:

Key Assumptions. RMC will prepare a technical memorandum documenting the key assumptions that will be used in the development of the RWMP, including but not limited to: market assessment methodology, design criteria, and cost criteria. The TM will be revised based on comments from the City.

Data Collection and Review. RMC will collect and review any pertinent information for this project (e.g., previous planning reports; land use information; water use records to determine non-potable demands; recycled/raw water supply and quality data; available survey/geotechnical data; etc).

Market Assessment. RMC will build upon previous studies to conduct a detailed recycled water market assessment for the City. This assessment will involve the following tasks:

- *User Identification*. RMC will identify both urban, industrial and agricultural users within and surrounding the City of Lodi that could potentially use recycled water to meet non-potable demands. This will include identification of both existing and future recycled water users.
- *Demand Assessment*. Using water use records and evapotranspiration (E/T) data, RMC will determine the timing and quantity of non-potable demands for each of the potential recycled water users identified. This will include quantification of average annual demands, peak month demands, and peak hour demands.
- *Water Supply Assessment.* RMC will document the timing and quantity of recycled water and raw water WID supplies available to serve the non-potable demands within and around the City of Lodi, including peak month and annual supply availability.
- *Water Quality Assessment*. RMC will gather water quality data for the various water supply sources currently used in the study area, including (1) existing recycled water; (2) raw surface water (Mokelumne River) supplies; and (3) groundwater supplies. RMC will also evaluate water quality data projected for future recycled water supplies when the Lodi starts using the surface water supplies from WID.

  RMC will evaluate the quality of each of these supplies in relation to the water quality needs of the potential urban, industrial and agricultural recycled water users. This will include evaluation of various

water quality parameters of interest (e.g., total dissolved solids (TDS), chloride, sodium, ammonia, nitrate, nitrite, etc) to determine suitability as an irrigation supply, especially for sensitive crops types.

Recycled Water Feasibility Workshop. RMC will hold a workshop with the City and other interested stakeholders to present the preliminary results from the recycled water market assessment and review assumptions and outstanding items.

Deliverables:

1. Draft and Final Key Assumptions TM
2. Project Feasibility Workshop

Assumptions:

- Pertinent information will be readily accessible.
- The Recycled Water Feasibility workshop will be a half-day workshop, hosted by the City of Lodi

Task 3 Alternatives Development and Evaluation

RMC will develop and evaluate recycled water alternatives for delivering recycled water and non-potable water to potential recycled water customers within the City of Lodi. This task will involve the following:

- **Development of Conceptual Alternatives.** Based on the results of the market assessment, RMC will develop conceptual alternatives, including preliminary alignments (e.g. specific pipeline routes) for the recycled water and non-potable distribution systems, pumping/storage facility locations, and potential demands served by each alternative. Potential satellite treatment opportunities will be developed as appropriate. These conceptual alternatives will include an interim alternative to use raw water WID supplies to serve non-potable demands. RMC will prepare a technical memorandum describing the Conceptual Alternatives for the City's review and feedback. As part of this task, these alternatives will be compared to potential potable water supply alternatives that can be implemented to meet demands.

- **Alternative Refinement and Evaluation.** Based on preliminary feedback on the conceptual alternatives, RMC will refine the conceptual alternatives. A hydraulic model (e.g. H2O Map) will be used to determine facility requirements and sizing (e.g., pipeline, storage, pumping) for each alternative. In addition, planning level cost estimates (including capital costs, operation and maintenance costs, and unit costs) will be developed for each alternative.

- **Alternatives Evaluation Workshop/Mid-Course Review Meeting.** RMC will present the preliminary results of the alternatives evaluation at a workshop with the City and other interested stakeholders, including representatives from the State Water Resources Control Board.

Deliverables:

1. Conceptual Alternative TM
2. Alternatives Evaluation Workshop

Assumptions:

- No more than five recycled water alternatives, including a "No Project Alternative", will be developed.
- RMC will develop a hydraulic model using H2O Map (or similar) for determination of distribution facility sizing requirements.
- The Alternatives Evaluation Workshop will be a half-day workshop.

Task 4 Recycled Water Outreach

RMC will conduct various outreach activities to potential recycled water users and the general public in order to educate them on the benefits of recycled water use. This task will involve:

- **Initial Meetings with Potential Recycled Water Users/Opinion Leaders.** RMC will meet with the largest potential recycled water users and opinion leaders (e.g., major vineyards) to describe the purpose of the project, gage their potential interest in using recycled water and discuss any preliminary concerns they may have relating to water quality and supply reliability.
- **Follow-Up Meetings with Potential Recycled Water Users.** Following development of recycled water alternatives, RMC will hold follow-up meetings with the largest potential recycled water uses to present the alternatives and discuss any concerns they may have with implementation of the project. The results of these meetings will be incorporated into the recycled water master plan.
- **General Public Outreach.** RMC will develop a recycled water brochure that describes the proposed project, the benefits of recycled water and safety of its use. RMC will also help to facilitate a public workshop to address any questions and/or concerns that the public may have.

Deliverables:

1. Large User Meetings
2. Public Outreach Materials
3. Public Workshop

Assumptions:

- There will be a total of 5 initial meetings and 5 follow-up with the largest potential recycled water users
- The budget for development of the recycled water brochure will be limited to $10,000.

Task 5 Recycled Water Master Plan

This task involves development of Recycled Water Master Plan for the City of Lodi. The RWMP will include at least two phases – an interim phase that involves use of recycled water infrastructure to convey raw WID supplies; and a long-term phase that involves serving the annexation area, and future development located in the General Plan's sphere of influence.

- **Draft RWMP.** RMC will develop a Draft RWMP that documents the results from Tasks 2 -4 and presents the recommended recycled water project. Specifically, the Draft RWMP will include:
    - A summary of study area characteristics, including information on project setting (e.g., hydrologic features, groundwater basins, population and land use); water supply characteristics and facilities; wastewater characteristics and facilities.
    - Recycled water market assessment results (potential users and demands, water quality requirements, etc).
    - Specific alignments, locations and sizes for the recycled water and non-potable system alternatives and recommended project(s)
    - Preliminary cost estimates (capital, O&M, annual) for each alternative and the recommended project(s).
    - Potential funding/financing options to implement the recommended recycled water and non-potable projects.
    - A draft implementation plan that outlines strategies for interagency agreements with Woodbridge Irrigation District, additional recycled water outreach, permitting, and environmental compliance for the recommended project(s).
    - Preliminary recycled water market assurances for the recommended project(s) and a description of the anticipated schedule for future connections.
    - Potential policy option for developers as it relates to the installation of recycled water and/or non-potable distribution piping.

- **Draft RWMP Workshop.** RMC will facilitate a workshop with City staff and other interested stakeholders to review the recommendations of the Draft RWMP and solicit comments and feedback.

- **Final RWMP.** RMC will prepare a Final RWMP that incorporates all comments received on the Draft.

Deliverables:

1. Draft Master Plan
2. Final Master Plan

Assumptions:

- The Draft Master Plan will be provided electronically.
- The Master Plan Workshop will be a half-day workshop.
- Ten (10) copies of the Final Master Plan will be printed and distributed to the City.

FEE ESTIMATE

The fee estimate and for this scope of work is attached.

SCHEDULE

The tentative schedule for this scope of work is attached.

RMC greatly appreciates this opportunity to continue providing our consulting services to the City of Lodi. If you have any questions or require further information, please do not hesitate to call me at 415.321.3414.

Very truly yours,
RMC Water and Environment

Rachael M. Wark

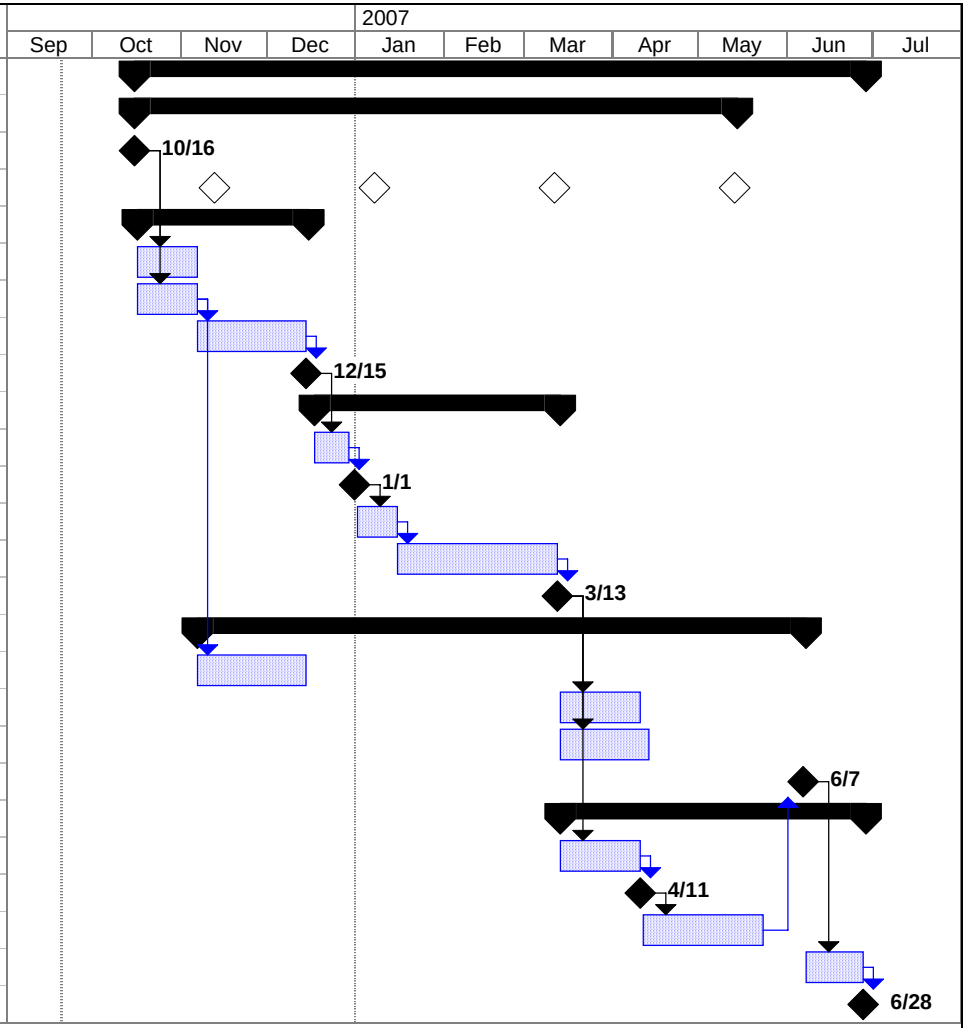
Rachael M. Wark, P.E.
Senior Project Manager

City of Lodi
Recycled Water Master Plan

Fee Estimate

Task	Description	RMC Labor Hours						RMC Labor ($)	Sub Costs	ODCs ($)	Mark-up (10%)	TOTAL COST ($)
		PIC	PM	PE 2	PE 1	Admin	*Total Hours*		Lodi Graphic Design Firm			
	2005	$205/hr	$190/hr	$145/hr	$130/hr	$100/hr						
1.0	**PROJECT COORDINATION**	**22**	**44**	**0**	**0**	**9**	***75***	**$13,800**	**$0**	**$400**	**$40**	**$14,240**
	Project Coordination	14	40			9	*63*	$11,400	$0	$400	$40	$11,840
	QA/QC	8	4				*12*	$2,400	$0		$0	$2,400
2.0	**B RECYCLED WATER FEASIBILITY STUDY**	**14**	**50**	**120**	**48**	**0**	***232***	**$36,100**	**$0**	**$400**	**$40**	**$36,540**
	Key Assumptions TM	2	6	20			*28*	$4,500	$0		$0	$4,500
	Data Collection		8	24			*32*	$5,000	$0	$200	$20	$5,220
	Market Assessment	8	24	60	40		*132*	$20,100	$0		$0	$20,100
	RW Feasibility Workshop	4	12	16	8		*40*	$6,500	$0	$200	$20	$6,720
3.0	**ALTERNATIVE ANALYSIS**	**14**	**44**	**84**	**80**	**0**	***222***	**$33,900**	**$500**	**$200**	**$70**	**$34,670**
	Development of Conceptual Alts - TM	2	8	20	12		*42*	$6,400	$500		$50	$6,950
	Alernative Refinement and Evaluation	8	24	48	60		*140*	$21,000	$0		$0	$21,000
	Alternative Evaluation Workshop	4	12	16	8		*40*	$6,500	$0	$200	$20	$6,720
4.0	**RECYCLED WATER OUTREACH**	**30**	**64**	**72**	**0**	**0**	***166***	**$28,800**	**$8,000**	**$1,000**	**$900**	**$38,700**
	Large Recycled Water User Meetings	24	40	40			*104*	$18,300	$0		$0	$18,300
	Education Materials	2	8	16			*26*	$4,300	$8,000	$500	$850	$13,650
	Public Workshop	4	16	16			*36*	$6,200	$0	$500	$50	$6,750
5.0	**RECYCLED WATER MASTER PLAN**	**14**	**44**	**100**	**56**	**0**	***214***	**$33,100**	**$1,500**	**$1,000**	**$250**	**$35,850**
	Draft Master Plan	8	24	60	32		*124*	$19,100	$1,000		$100	$20,200
	Draft Master Plan Workshop	4	8	16	8		*36*	$5,700	$0		$0	$5,700
	Final Master Plan	2	12	24	16		*54*	$8,300	$500	$1,000	$150	$9,950
SUBTOTAL												
Subtotal Hours		*94*	*246*	*376*	*184*	*9*	*909*					
Subtotal Cost								**$145,700**	**$10,000**	**$3,000**	**$1,300**	**$160,000**

ID	Task Name	Duration	Start	Finish
1	**Lodi Recycled Water Master Plan**	**184 days**	**Mon 10/16/06**	**Thu 6/28/07**
2	**Task 1 - Project Coordination**	**151 days**	**Mon 10/16/06**	**Mon 5/14/07**
3	Kickoff Mtg	1 day	Mon 10/16/06	Mon 10/16/06
4	**Coordination Meetings**	**131 days**	**Mon 11/13/06**	**Mon 5/14/07**
9	**Task 2 - RW Feasibility Study**	**44 days**	**Tue 10/17/06**	**Fri 12/15/06**
10	Key Assumptions TM	15 days	Tue 10/17/06	Mon 11/6/06
11	Data Collection	15 days	Tue 10/17/06	Mon 11/6/06
12	Market Assessment	28 days	Tue 11/7/06	Thu 12/14/06
13	RW Feasibility Workshop	1 day	Fri 12/15/06	Fri 12/15/06
14	**Task 3 - Alternative Analysis**	**62 days**	**Mon 12/18/06**	**Tue 3/13/07**
15	Develop Conceptual Alts	2 wks	Mon 12/18/06	Fri 12/29/06
16	Submit TM	1 day	Mon 1/1/07	Mon 1/1/07
17	City Review	2 wks	Tue 1/2/07	Mon 1/15/07
18	Alt Evaluation	40 days	Tue 1/16/07	Mon 3/12/07
19	Alts Evaluation Workshop	1 day	Tue 3/13/07	Tue 3/13/07
20	**Task 4 - Recycled Water Outreach**	**153 days**	**Tue 11/7/06**	**Thu 6/7/07**
21	Initial Meetings with Targeted Us	28 days	Tue 11/7/06	Thu 12/14/06
22	Follow-Up Meetings with Targete	20 days	Wed 3/14/07	Tue 4/10/07
23	Outreach Materials	23 days	Wed 3/14/07	Fri 4/13/07
24	Public Meeting	1 day	Thu 6/7/07	Thu 6/7/07
25	**Task 5 - RWMP**	**77 days**	**Wed 3/14/07**	**Thu 6/28/07**
26	Prepare Draft	20 days	Wed 3/14/07	Tue 4/10/07
27	Submit Draft	1 day	Wed 4/11/07	Wed 4/11/07
28	City/SWRCB Review	30 days	Thu 4/12/07	Wed 5/23/07
29	Prepare Final	14 days	Fri 6/8/07	Wed 6/27/07
30	Submit Final	1 day	Thu 6/28/07	Thu 6/28/07



Project: Lodi RWMP
Date: September 2006

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Appendix J Recycled Water Alternatives Evaluation Backup Information

Project: **Lodi RWMP**

Aspect: **Cost Estimate Comparison**

Estimate Type: Facilities Plan

Date: August 3, 2007
Project Number: 140-003

Prepared by: ob
Checked by:
Check Date:

Elements	Alternative A Storage Option 1	Alternative A Storage Option 2	Alternative D
Pipeline	$ 16,865,000	$ 16,865,000	$ 6,017,000
Pump Station	$ 820,000	$ 895,000	$ 580,000
Storage Facility	$ 37,353,610	$ 29,594,348	$ 19,834,418
Raw Construction Cost	$ 57,026,000	$ 49,341,000	$ 27,033,000
Contractor OH&P (10%)	$ 11,405,000	$ 9,868,000	$ 5,407,000
Change Order Allowance (5%)	$ 2,851,000	$ 2,467,000	$ 1,352,000
Subtotal Construction Cost	$ 71,282,000	$ 61,676,000	$ 33,792,000
Land and Right of Way	$ 15,046,000	$ 11,906,000	$ 7,966,000
Planning Phase Unknown Allowance (30%)	$ 21,385,000	$ 18,503,000	$ 10,138,000
Construction Cost	$ 107,713,000	$ 92,085,000	$ 51,896,000
Environmental Documentation (2%)	$ 2,154,000	$ 1,842,000	$ 1,038,000
Engineering, Administration, and Legal (10%)	$ 10,771,000	$ 9,209,000	$ 5,190,000
Construction Management (15%)	$ 16,157,000	$ 13,813,000	$ 7,784,000
Capital Cost	**$ 136,795,000**	**$ 116,949,000**	**$ 65,908,000**
O&M	$ 1,433,000	$ 1,248,000	$ 712,000
Annualized Capital Costs	$ 10,701,000	$ 9,149,000	$ 5,156,000
Annualized Costs	$ 12,134,000	$ 10,397,000	$ 5,868,000
Cost per AF	**$ 2,429**	**$ 2,081**	**$ 1,807**

Alternative A
Cost Estimate

Capital Facility

White Slough Pump Station		Storage Option 1	Storage Option 2
Pump Station Facilities		$820,000	$510,000
Seasonal Storage Ponds		$37,353,610	$29,594,348
	Total	**$38,173,610**	**$30,104,348**
WID Water Canal Pump Station			
Pump Station Facilities			$385,000
	Total	**$0**	**$385,000**
RW Main Pipeline (Open Trench)	**$/lf**		
6 in (PVC)	$47	$247,559	$247,559
8 in PVC	$73	$596,848	$596,848
12 in diameter pipe	$124	$3,274,773	$3,274,773
16 in diameter pipe	$176	$456,098	$456,098
24 in diameter pipe	$273	$12,220,042	$12,220,042
30 in diameter pipe	$337	$69,956	$69,956
	Total	**$16,865,000**	**$16,865,000**
RW Main Pipeline (Bore & Jack)	**$/lf**		
UPRR tracks crossing (200 ft)	$1,500	$300,000	$300,000
	Total	**$300,000**	**$300,000**
Appurtenances			
Appurtenances	10% of pipeline	$1,687,000	$1,687,000
	Total	**$1,687,000**	**$1,687,000**
	Raw Construction Cost	**$57,026,000**	**$49,341,000**
	Contractor OH&P (10%)	$11,405,000	$9,868,000
	Change Order Allowance (5%)	$2,851,000	$2,467,000
	Subtotal Construction Cost	**$71,282,000**	**$61,676,000**
	Land & Right of Way	$15,046,000	$11,906,000
	Construction Phase Unknown Allowance (30%)	$21,385,000	$18,503,000
	Subtotal Construction Cost	**$107,713,000**	**$92,085,000**
	Environmental Documentation (2%)	$2,154,000	$1,842,000
	Engineering, Administration, and Legal (10%)	$10,771,000	$9,209,000
	Construction Management (15%)	$16,157,000	$13,813,000
	Total Project Cost	**$136,795,000**	**$116,949,000**

O&M			
Annual Operation		$65,374	$79,178
Annual Maintenance		$1,368,000	$1,169,000
	Total	**$1,433,000**	**$1,248,000**
Present Worth O&M			
Present Worth		**$18,323,000**	**$15,956,000**

Total Present Worth Cost	**$155,118,000**	**$132,905,000**
Annualized Costs	**$12,134,000**	**$10,397,000**
Annual Unit Cost (Per AF Disposal)	**$2,429**	**$2,081**

Alternative D
Cost Estimate

Capital Facility

White Slough Pump Station		
Pump Station Facilities		$580,000
Seasonal Storage Ponds		$19,834,418
	Total	**$20,414,418**
RW Main Pipeline (Open Trench)	**$/lf**	
12 in diameter pipe	$124	$1,525,430
16 in diameter pipe	$176	$2,202,856
24 in diameter pipe	$273	$2,226,590
30 in diameter pipe	$337	$62,273
	Total	**$6,017,000**
RW Main Pipeline (Bore & Jack)	**$/lf**	
UPRR tracks crossing (200 ft)	$0	$0
	Total	**$0**
Appurtenances		
Appurtenances	10% of pipeline	$602,000
	Total	**$602,000**
	Raw Construction Cost	**$27,033,000**
	Contractor OH&P (10%)	$5,407,000
	Change Order Allowance (5%)	$1,352,000
	Subtotal Construction Cost	**$33,792,000**
	Land & Right of Way	$7,966,000
	Construction Phase Unknown Allowance (30%)	$10,138,000
	Subtotal Construction Cost	**$51,896,000**
	Environmental Documentation (2%)	$1,038,000
	Engineering, Administration, and Legal (10%)	$5,190,000
	Construction Management (15%)	$7,784,000
	Total Project Cost	**$65,908,000**

O&M		
Annual Operation		$53,432
Annual Maintenance		$659,000
	Total	**$712,000**
Present Worth O&M		
Present Worth		**$9,557,000**

Total Present Worth Cost	**$75,465,000**
Annualized Costs	**$5,868,000**
Annual Unit Cost (Per AF Disposal)	**$1,807**

Capital Facility		Alternative A Looped		Alternative D Looped
		Storage Option 1	Storage Option 2	
White Slough Pump Station				
Pump Station Facilities		$820,000	$510,000	$580,000
Seasonal Storage Ponds		$37,353,610	$29,594,348	$19,834,418
	Total	**$38,173,610**	**$30,104,348**	**$20,414,418**
WID Water Canal Pump Station				
Pump Station Facilities			$385,000	
	Total	**$0**	**$385,000**	**$0**
RW Main Pipeline (Open Trench)	**$/lf**			
6 in (PVC)	$47	$247,559	$247,559	
8 in PVC	$73	$596,848	$596,848	
12 in diameter pipe	$124	$3,274,773	$3,274,773	$1,525,430
16 in diameter pipe	$176	$456,098	$456,098	$2,202,856
24 in diameter pipe	$273	$12,220,042	$12,220,042	$2,226,590
30 in diameter pipe	$337	$69,956	$69,956	$62,273
	Total	**$16,865,000**	**$16,865,000**	**$6,017,000**
RW Main Pipeline (Bore & Jack)	**$/lf**			
UPRR tracks crossing (200 ft)	$1,500	$300,000	$300,000	$0
	Total	**$300,000**	**$300,000**	**$0**
Appurtenances				
Appurtenances	10% of pipeline	$1,687,000	$1,687,000	$602,000
	Total	**$1,687,000**	**$1,687,000**	**$602,000**
	Raw Construction Cost	**$57,026,000**	**$49,341,000**	**$27,033,000**
	Contractor OH&P (10%)	$11,405,000	$9,868,000	$5,407,000
	Change Order Allowance (5%)	$2,851,000	$2,467,000	$1,352,000
	Subtotal Construction Cost	**$71,282,000**	**$61,676,000**	**$33,792,000**
	Land & Right of Way	$15,046,000	$11,906,000	$7,966,000
	Construction Phase Unknown Allowance (30%)	$21,385,000	$18,503,000	$10,138,000
	Subtotal Construction Cost	**$107,713,000**	**$92,085,000**	**$51,896,000**
	Environmental Documentation (2%)	$2,154,000	$1,842,000	$1,038,000
	Engineering, Administration, and Legal (10%)	$10,771,000	$9,209,000	$5,190,000
	Construction Management (15%)	$16,157,000	$13,813,000	$7,784,000
	Total Project Cost	**$136,795,000**	**$116,949,000**	**$65,908,000**

O&M			
Annual Operation	$65,374	$79,178	$53,432
Annual Maintenance	$1,368,000	$1,169,000	$659,000
Total	**$1,433,000**	**$1,248,000**	**$712,000**
Present Worth O&M			
Present Worth	**$18,323,000**	**$15,956,000**	**$9,107,000**

Total Present Worth Cost	**$155,118,000**	**$132,905,000**	**$75,015,000**
Annualized Costs	**$12,134,000**	**$10,397,000**	**$5,868,000**
Annual Unit Cost (Per AF Disposal)	**$2,429**	**$2,081**	**$1,807**

Alternative D

Storage Option 1: Seasonal Storage for On- and Off-site RW Requirements

Month	No. of Days	Lodi Effluent Flow 2005 (mgd)	Lodi Effluent Flow Build Out (mgd)	Available RW (MG)	On-Site Demand (MG)	On-Site Demand (mgd)	Off-Site Demand (mgd)	Total Demand (mgd)	Total Demand (MG)	Storable RW (MG)	Cumulative Stored Volume (MG)	Stored or Withdrawn (MG)
J	31	6.2	8.5	263.5	-	-	-	-	-	263.5	-	263.5
F	28	6.2	8.5	238.0	-	-	-	-	-	238.0	91.2	238.0
M	31	6.2	8.5	263.5	-	-	-	-	-	263.5	354.7	263.5
A	30	6.2	8.5	255.0	81.2	2.7	0.3	3.0	90.6	164.4	519.1	164.1
M	31	6.2	8.5	263.5	130.7	4.2	4.6	8.8	273.6	(10.1)	509.0	(14.7)
J	30	6.2	8.5	255.0	179.6	6.0	9.3	15.3	459.0	(204.0)	305.1	(213.3)
J	31	6.2	8.5	263.5	188.1	6.1	9.9	16.0	495.8	(232.3)	72.8	(242.2)
A	31	6.2	8.5	263.5	135.7	4.4	6.5	10.8	336.3	(72.8)	(0.0)	(79.3)
S	30	6.2	8.5	255.0	135.0	4.5	3.0	7.5	223.8	31.2	-	28.3
O	31	6.2	8.5	263.5	41.7	1.3	1.0	2.3	72.0	191.5	-	190.6
N	30	6.2	8.5	255.0	-	-	-	-	-	255.0	-	255.0
D	31	6.2	8.5	263.5	-	-	-	-	-	263.5	-	263.5
TOTAL				**3,103**	**892**				**1,951**	**1,152**		

Maxium Storage Volume

519	MG
1,593	af

LODI RW DEMAND

1,059 MG

	No. of Days	% Annual Demand	Monthly Demand Volume (MG)	Monthly Demand Flow (mgd)
January	31	0.0%	-	-
February	28	0.0%	-	-
March	31	0.0%	-	-
April	30	0.9%	9.4	0.31
May	31	13.5%	142.9	4.61
June	30	26.4%	279.4	9.31
July	31	29.1%	307.7	9.93
August	31	18.9%	200.6	6.47
September	30	8.4%	88.8	2.96
October	31	2.9%	30.3	0.98
November	30	0.0%	-	-
December	31	0.0%	-	-
TOTAL		**100.0%**	**1,059.00**	

1 acre = 43 560 square foot
1 US gallon = 0.133680556 cubic foot
1 cubic foot = 7.480 519 481 gallon

Prelim. Storage requirements:	519,119,230	gallons
	69,396,152	cubic feet
	10	depth of pond, feet
	6,939,615	surface area of pond, square feet
	159.31	surface area of pond, acres

Alternative A

Storage Option 2: Seasonal Storage for On-Site RW Requirements

Month	No. of Days	Lodi Effluent Flow 2005 (mgd)	Lodi Effluent Flow Build Out (mgd)	Available RW (MG)	On-Site Demand (MG)	On-Site Demand (mgd)	Storable RW (Pre-Offsite Use) (MG)	Cumulative Stored Volume (MG)	Remaining Available RW (mgd)	Off-Site Demand (mgd)	Req'd WID/GW Input (mgd)	Total WID/GW Demand (MG)
J	31	6.2	8.5	263.5	-	-	263.5	153.5	-	-	-	-
F	28	6.2	8.5	238.0	-	-	238.0	391.5	-	-	-	-
M	31	6.2	8.5	263.5	-	-	263.5	642.5	8.5	0.4	-	-
A	30	6.2	8.5	255.0	81.2	2.7	173.8	775.9	8.5	1.3	-	-
M	31	6.2	8.5	263.5	130.7	4.2	132.8	680.1	8.5	7.4	-	-
J	30	6.2	8.5	255.0	179.6	6.0	75.4	500.5	8.5	13.2	4.7	140.2
J	31	6.2	8.5	263.5	188.1	6.1	75.4	312.4	8.5	14.0	5.5	170.7
A	31	6.2	8.5	263.5	135.7	4.4	127.8	176.7	8.5	9.7	1.2	36.4
S	30	6.2	8.5	255.0	135.0	4.5	120.0	41.7	8.5	5.1	-	-
O	31	6.2	8.5	263.5	41.7	1.3	221.8	-	8.5	2.0	-	-
N	30	6.2	8.5	255.0	-	-	255.0		8.5	0.0	-	-
D	31	6.2	8.5	263.5	-	-	263.5		-	-	-	-
TOTAL				**3,103**	**892**							**347**

Maxium Storage Volume

776	MG
2,381	af

Total WID/GW Demand

1,066	afy

LODI RW DEMAND

1,628 MG

	No. of Days	% Annual Demand	Monthly Demand Volume (MG)	Monthly Demand Flow (mgd)
January	31	0.0%	-	-
February	28	0.0%	-	-
March	31	0.8%	12.5	0.40
April	30	2.5%	40.4	1.35
May	31	14.0%	228.6	7.37
June	30	24.3%	395.2	13.17
July	31	26.7%	434.2	14.01
August	31	18.4%	299.9	9.68
September	30	9.5%	154.0	5.13
October	31	3.8%	62.1	2.00
November	30	0.1%	1.1	0.04
December	31	0.0%	-	-
TOTAL		**100.0%**	**1,628.00**	

1 acre = 43 560 square foot
1 US gallon = 0.133680556 cubic foot
1 cubic foot = 7.480 519 481 gallon

Prelim. Storage requirements:	775,894,674	gallons
	103,722,038	cubic feet
	10	depth of pond, feet
	10,372,204	surface area of pond, square feet
	238.11	surface area of pond, acres

Alternative A

Storage Option 1: Seasonal Storage for On- and Off-site RW Requirements

Month	No. of Days	Lodi Effluent Flow 2005 (mgd)	Lodi Effluent Flow Build Out (mgd)	Available RW (MG)	On-Site Demand (MG)	On-Site Demand (mgd)	Off-Site Demand (mgd)	Total Demand (mgd)	Total Demand (MG)	Storable RW (MG)	Cumulative Stored Volume (MG)	Stored or Withdrawn (MG)
J	31	6.2	8.5	263.5	-	-	-	-	-	263.5	358.2	263.5
F	28	6.2	8.5	238.0	-	-	-	-	-	238.0	596.2	238.0
M	31	6.2	8.5	263.5	-	-	0.4	0.4	12.5	251.0	847.2	250.6
A	30	6.2	8.5	255.0	81.2	2.7	1.3	4.1	121.6	133.4	980.6	132.0
M	31	6.2	8.5	263.5	130.7	4.2	7.4	11.6	359.3	(95.8)	884.8	(103.2)
J	30	6.2	8.5	255.0	179.6	6.0	13.2	19.2	574.8	(319.8)	565.0	(333.0)
J	31	6.2	8.5	263.5	188.1	6.1	14.0	20.1	622.3	(358.8)	206.2	(372.8)
A	31	6.2	8.5	263.5	135.7	4.4	9.7	14.1	435.6	(172.1)	34.0	(181.8)
S	30	6.2	8.5	255.0	135.0	4.5	5.1	9.6	289.0	(34.0)	(0.0)	(39.2)
O	31	6.2	8.5	263.5	41.7	1.3	2.0	3.3	103.8	159.7	-	157.7
N	30	6.2	8.5	255.0	-	-	0.0	0.0	1.1	253.9	-	253.9
D	31	6.2	8.5	263.5	-	-	-	-	-	263.5	94.7	263.5
TOTAL				**3,103**	**892**				**2,520**	**583**		

Maxium Storage Volume

981	MG
3,009	af

LODI RW DEMAND

1,628 MG

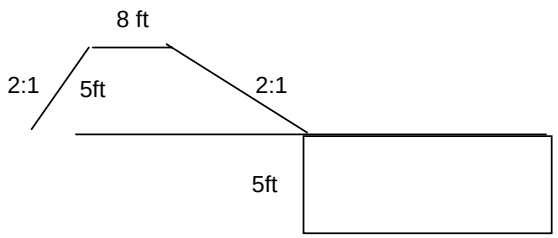
	No. of Days	% Annual Demand	Monthly Demand Volume (MG)	Monthly Demand Flow (mgd)
January	31	0.0%	-	-
February	28	0.0%	-	-
March	31	0.8%	12.5	0.40
April	30	2.5%	40.4	1.35
May	31	14.0%	228.6	7.37
June	30	24.3%	395.2	13.17
July	31	26.7%	434.2	14.01
August	31	18.4%	299.9	9.68
September	30	9.5%	154.0	5.13
October	31	3.8%	62.1	2.00
November	30	0.1%	1.1	0.04
December	31	0.0%	-	-
TOTAL		**100.0%**	**1,628.00**	

1 acre = 43 560 square foot
1 US gallon = 0.133680556 cubic foot
1 cubic foot = 7.480 519 481 gallon

Prelim. Storage requirements:	980,577,425	gallons
	131,084,143	cubic feet
	10	depth of pond, feet
	13,108,414	surface area of pond, square feet
	300.93	surface area of pond, acres

Alt A - Storage Option 1

Reservoir Volume		3,009	afy		
Depth		10	ft		
area		300.9	acre		
		13,108,415	sf		
perimeter		14,482	ft		
perimeter area		144,822	sf		
Excavation		65,542,073	cf	unit cost	
	cost	$7,282,453	$	3	$/CY
Berm	x-section	90	sf	unit cost	
	volume	1,303,400	cf	13	$/CY
	Cost	$627,563	$		
				unit cost	
Liner	cost	$19,879,855	$	1.5	$/sf
Land Cost		301	acre	unit cost	
	cost	$15,046,390		50,000	$/acre
Offhaul		64,238,674	cf	unit	
	cost	$9,516,841		4	$/CY
Total Costs		**$52,400,000**			



Alt A - Storage Option 2

Reservoir Volume		2,381	afy		
Depth		10	ft		
area		238.1	acre		
		10,372,204	sf		
perimeter		12,882	ft		
perimeter area		128,824	sf		
Excavation		51,861,020	cf		
	cost	$5,762,336	$		
Berm	x-section	90	sf		
	volume	1,159,413	cf		
	Cost	$558,236	$		
Liner	cost	$15,751,541	$		
Land Cost		238	acre		
	cost	$11,905,652			
Offhaul		50,701,607	cf		
	cost	$7,511,349			
Total Costs		**$41,500,000**			

Alt D - Storage Option 1

Reservoir Volume		1,593	afy		
Depth		10	ft		
area		159.3	acre		
		6,939,615	sf		
perimeter		10,537	ft		
perimeter area		105,373	sf		
Excavation		34,698,077	cf		
	cost	$3,855,342	$		
Berm	x-section	90	sf		
	volume	948,353	cf		
	Cost	$456,615	$		
Liner	cost	$10,567,482	$		
Land Cost		159	acre		
	cost	$7,965,582			
Offhaul		33,749,723	cf		
	cost	$4,999,959			
Total Costs		**$27,800,000**			

Appendix K City of Lodi and WID Water Service Rates

Post-It® Fax Note 7671	Date 8/13/07	# of pages ▶ 1
To ANDY SMITH	From LYMAN CHANG	
Co./Dept. RMC	Co. CITY OF LODI	
Phone #	Phone #	
Fax # 916 273 1501	Fax #	

City of Lodi

Public Works Department

Water

Add applicable Development Impact Mitigation Fees - See Page 5

Reference: LMC §13.04.050
(Installations requiring jacking or special construction per T&M estimate)
* If the same address is simultaneously installing both new water and wastewater services, charge 80% of these listed costs.

Service Installation

Service Only w/o meter - 1"	$ 2,400.00 *
1½"	$ 3,200.00 *
2"	$ 3,400.00 *
3" & over	per T&M estimate
Upgrade of existing service w/line replacement	
In street or alley w/o meter	80% of above
In easement w/o meter	66⅔% of above
Upgrade of existing service w/o line replacement	
In street or alley w/o meter	66⅔% of above
In easement w/o meter	50% of above
Complete Service with meter - 1"	$ 2,635.00
1½"	$ 3,645.00
2"	$ 4,000.00
3" & over	per T&M estimate
Meter install only - ¾"	$ 345.00 **
1"	$ 375.00 **
1½"	$ 585.00 **
2"	$ 740.00 **
Turbo, Compound, or 3" & over	per estimate
"TouchRead" or ERT Install only	$ 230.00
Disconnect/Abandon service:	
2" & under	$ 900.00
over 2"	per T&M estimate

For service installed with downsized meter, charge will be adjusted.
(Example: 2" service w/1½" meter: $3,400 + $585 - $140 = $3,845)

Credit may be allowed for meter removed if less than 5 years old.

** Cost includes $140 to set meter plus Admin.

Typical Circumstances and Costs in Street or Alley	
New 1" service with ¾" meter	$ 2,605
Upgrade 1" service line & box with ¾" meter	$ 2,125
Upgrade 1" box with ¾" meter	$ 1,803
Install ¾" meter in existing suitable service	$ 345

Bacterial Sampling Fee $ 45.00 per sample

Service Charges (2) (Water rates below effective 7/1/07 - 6/30/08) Reference: Resolution No. 2007-113

	Total	Base	I.S.R (3)	PCE/TCE	
Residential Flat Rate (per month):					
Single Family Unit (one bedroom)	$ 26.95	$ 14.42	$ 5.24	$ 7.29	
(two bedrooms)	$ 32.37	$ 17.31	$ 6.30	$ 8.76	
(three bedrooms)	$ 38.79	$ 20.75	$ 7.54	$ 10.50	
(four bedrooms)	$ 46.61	$ 24.93	$ 9.07	$ 12.61	
(five bedrooms)	$ 55.91	$ 29.90	$ 10.88	$ 15.13	
(six bedrooms)	$ 67.09	$ 35.88	$ 13.05	$ 18.16	
(seven bedrooms)	$ 80.49	$ 43.05	$ 15.66	$ 21.78	
Multiple Family Unit (one bedroom)	$ 23.13	$ 12.37	$ 4.50	$ 6.26	
(two bedrooms)	$ 27.74	$ 14.83	$ 5.40	$ 7.51	
(three bedrooms)	$ 33.29	$ 17.80	$ 6.48	$ 9.01	+ 20% for ea. add'l. bedroom

Commercial/Industrial Flat Rate — Existing accounts only. New accounts are metered.

Metered Rate	Total	Base	I.S.R (3)	PCE/TCE	
Commodity Charge (1)	$ 0.760	$ 0.517	$ 0.243	-	per 100 cu. ft. (approx. $1.016 per 1,000 gal.)
(1) plus monthly meter charge:	$ 24.69	$ 15.13	-	$ 9.56	5/8" meter
	$ 27.13	$ 16.63	-	$ 10.50	¾" meter
	$ 40.70	$ 24.94	-	$ 15.76	1" meter
	$ 54.26	$ 33.25	-	$ 21.01	1½" meter
	$ 67.84	$ 41.57	-	$ 26.27	2" meter
	$ 94.98	$ 58.21	-	$ 36.77	3" meter
	$ 122.11	$ 74.83	-	$ 47.28	4" meter
	$ 176.39	$ 108.09	-	$ 68.30	6" meter
	$ 230.62	$ 141.37	-	$ 89.25	8" meter
	$ 284.89	$ 174.64	-	$ 110.25	10" meter

Construction Water Charges:

Water	$ 0.760	Ref. PWD Policy W-7 per 100 cu. ft. (approx. $1.016 per 1,000 gal.)
6" Meter Deposit	$ 5,000.00	
Meter Rental (per day)	$ 1.00	first 45 days
	$ 2.50	during days 46 through 60
	$ 5.00	during days 61 through 90
	$ 10.00	days over 90

day count begins when meter is picked up at MSC
day count ends when meter is returned to MSC

(2) Outside of City Rates are 1.5 X the listed rates.
(3) ISR = Infrastructure Replacement Charge

$/acre

2008 RATES

Crop Type	WID Base Rate	Outside Land Use Rate
Alfalfa	55.38	67.08
Clover/Pasture	61.52	74.44
Beans	32.30	39.08
Orchard	47.68	57.70
Peppers/Beets/Carrots	47.68	57.70
Tomato	43.06	52.12
Corn	43.06	52.12
Annuals	43.06	52.12
Vineyard	36.92	44.66
Rice/Pond	116.90	141.44
Cereal 1st	15.38	18.62
Cereal Additional	7.70	9.32
Asparagus	30.76	37.22
Minimum Rate	55.00	66.56
Metered Rate *	15.98	19.34
Drip Irrigation Metered	10.00	12.10

* Rate 1 AF/A Minimum,
Meter Required by Landowner

Beaver Slough Off Season Rate - (10-% of Base Rate)
Irrigators in the Beaver Slough area who irrigate with the District water after the end of the season shall pay an additional charge equal to ten percent of the Beaver Slough base rate.

Construction Water - $2.50/1,000 gallons & $100.00 Non-Refundable Application fee.

2008 Irrigation Season Schedule Defined: Beginning May 1, 2008 or, thereof, and ending October 31, 2008 or sooner if the Mokelumne River supply runs out.

Appendix L Lease Information for Existing Recycled Water Customers

L E A S E
FOR
AGRICULTURAL LAND
at
White Slough Water Pollution Control Facility

THIS LEASE, made and entered into this _____ day of _____, 2008, by and between the CITY OF LODI, a municipal corporation, hereinafter called Lessor, and LIMA RANCH hereinafter called Lessee.

W I T N E S S E T H :

1. PROPERTIES: That for and in consideration of the rents to be paid, and the covenants to be faithfully kept and performed by said Lessee, said Lessee does hereby lease, hire, and take from said Lessor, those certain properties described as follows:

   Those certain properties described in Exhibit A attached hereto, and by this reference made a part hereof. Property to be leased totals 218 acres ±.

2. EXTENSION: Although the current lease does not expire until December 31, 2008, it is a condition of this extension that Lessee agrees to apply the requirements of this lease extension in the final year of the current lease.

3. TERM: The term of this Lease shall be for a period of five (5) years, commencing January 1, 2008, and terminating at midnight on December 31, 2013. In order that the tenants have adequate time to plan their farming operations, bids for the lease of this property after December 31, 2013, will be called for approximately one year before that date.

4. RENT: In consideration of said Lease, Lessee agrees to pay to Lessor as rent for the demised premises based on the gross value of crops produced on the properties. The amount paid by Lessee shall be 20% of gross receipts for crops grown, including any deferred payments, credits, stock, or other compensation including crop insurance payments. If a crop is successfully produced but not sold, the value will be determined by similar sales by other tenants or market rates for the crops.

   Fallowed acreage shall be assessed a flat fee of $100.00 per acre in lieu of gross percentage. Planted acreage left unattended shall also be assessed a flat fee of $100.00 per acre.

   Lessee shall maintain adequate records of crop yields and gross receipts, and make such records available to Lessor for purposes of verification.

   For the purposes of this lease gross receipts shall mean the total revenue of any sort received by Lessee at sale of crop. No reduction of gross will be allowed for any cost incurred by Lessee due to planting, growing, harvesting, or hauling of crop. Any additional cost incurred by Lessee for services by others in conjunction with the above crop production practices will also not reduce gross receipts.

   Methods of verification may include any or all of the following; weigh tickets, sale receipts, and/or a contract for sale between Lessee and Broker. Lessee shall supply copies of weigh scale certification to verify accuracy of weight results. Lessor will be free to contact weigh facilities or purchasing agents from time to time as needed to verify quantities and sale amounts.

   Rental payments shall be made on or before June 1st of each year for the prior winter rotation crop and on or before December 1st of each year for the summer crops and shall be directed to the Public Works Department, 221 West Pine Street, P. O. Box 3006, Lodi, California, 95241-1910, for processing and shall be paid without prior notice or demand.

5. SECURITY: Tenant shall post security of $35,000 to secure its obligations under this agreement. The deposit shall be fully refundable upon Tenant's full satisfaction of the obligations hereunder. In the event Tenant defaults on any of its obligations, Landlord shall be entitled to deduct from the deposit for the full amount of its losses resulting from the default. The security may be in the form of a letter of credit, cash deposit, deed of trust or other form of security in such form and on such terms as is approved by the Lodi City Attorney's Office.

6. USE: The properties shall be used solely for the purpose of growing, cultivating, fertilizing, irrigating, and harvesting of agricultural crops while ensuring best farm practices, consistent with the terms of this lease, are maintained. During the term of this Lease it is understood and agreed by the parties hereto that Lessee shall be required to accept industrial wastewater, treated domestic effluent, and biosolids from City's White Slough Water Pollution Control Facility. Lessor will make available all excess domestic effluent, at no cost to the Lessee. It is further understood and agreed by Lessee, that Lessee must comply with all present and future laws, ordinances, rules, and regulations promulgated by any governmental authority of competent jurisdiction regulating the type of crops that can be grown on the properties during the lease term and any extension thereof. Lessee accepts the properties with the full understanding that the California Department of Health Services regulations (Title 22, Division 4), copy attached as Exhibit B, will limit Lessee to growing only fodder, fiber, or seed crops once industrial wastewater, treated domestic effluent, and biosolids are applied on the properties. Further, Lessee shall be permitted to use the properties for agricultural activities consistent with the terms of this Lease and as permitted by all governmental authorities, including but not limited to, the California Department of Health Services. Further, Lessee agrees to manage the irrigation of the properties with industrial wastewater, treated domestic effluent, and biosolids from the White Slough Facility in such a manner that it will not allow the discharge of any runoff to White Slough, other waters of the Delta, or adjacent private or public property, and meet all regulations imposed by all governmental authorities having proper jurisdiction, including but not limited to, the Central Valley Regional Water Quality Control Board. Lessee shall use and occupy said premises in a quiet, lawful, and orderly manner. Lessor and Lessee further agree that they shall permit no hunting, fishing, or public access to any part of the properties, including Lessee.

7. ACREAGE REQUIREMENTS AND FERTILIZER USE: Because the primary goal for the leased land is disposal of industrial wastewater, treated domestic effluent, and biosolids, in a manner that meets or exceeds regulatory requirements, it is necessary to define practices which will maximize this goal. To achieve the stated goal on a yearly basis it will henceforth be a requirement of the lease that 350 acres be planted to feed corn. To further maximize this effort a second crop of wheat or oats shall be planted after harvest of the corn. Because there are multiple leased parcels, the portion allotted to each Lessee may be increased or decreased by mutual agreement by tenants to maintain a minimum 350 acres of corn between the Lessees. To manage our goal it will be necessary for Lessee to submit an annual crop plan for each planting cycle along with the necessary harvesting and planting sheets. The plan will include crop type and acreage for each crop. It will also be necessary for Lessee to keep City staff apprised of irrigation and harvesting schedules. To better accomplish this notification, lessor shall install kiosks at several locations that lessee shall use to identify irrigation start and stop times, and harvest schedules for selected fields. Additionally, because loading rates for biosolids are determined by agronomic uptake of nitrogen for the crop, it will be necessary to better coordinate the field loading by ensuring the fields where biosolids are applied are loaded as equally and simultaneously as possible. The City will notify ahead of application days so that the irrigation system is available for this purpose. It will continue to be necessary to prohibit the application of any natural or chemical fertilizers or any other chemical without written approval of the Lessor. Lessor shall employ the services of a licensed agronomist to help City staff and lessee better manage farming practices to meet the desired goals of both parties.

8. AVAILABILITY OF LESSEE: Because of the type of operation of the White Slough Water Pollution Control Facility, it is imperative that Lessee or a representative be readily available in case plant personnel must change any plant operation. That representative must be able to understand and speak English. Lessee shall be responsible for keeping the City Public Works Department advised of a current telephone number and contact person(s) who can be reached 7 days a week, 24 hours a day.

9. REMEDIES ON DEFAULT: Should Lessee fail to pay any part of the rents herein specified at the times or in the manner provided, or fail to comply with or perform any other of the terms and provisions of the Lease on the part of Lessee to be performed or compiled with, then and in that event, Lessor may exercise any and all remedies provided by law or equity by reason of such default, including the right at Lessor's option, of terminating the Lease. In any of such events, Lessor shall be entitled to the immediate possession of said leased premises, and at their option, may enter into and upon said premises without notice to Lessee and exclude Lessee and all persons and all property therefrom, and by process of law or otherwise take and resume possession of said premises. Each and all of Lessor's remedies shall be construed as cumulative and none of them as exclusive of the other or as exclusive of any remedy provided by law or equity.

10. RELATIONSHIP OF PARTIES: It is understood and agreed that the relationship between the parties is that of landlord and tenant and not as a party or agent of Lessor. Lessee, or its subtenant, shall carry Worker's Compensation Insurance and observe all laws and regulations applicable to employers. A copy of Worker's Compensation insurance shall be on file in the Public Works Department.

11. DITCH, ROAD, AND PROPERTY MAINTENANCE: Lessee shall maintain and pay all costs of maintaining the irrigation lines, ditches, perimeter fences, and all access roads located on the properties. The perimeter fencing required by the State regulatory agencies will be maintained with material supplied by the City. All ditches and banks shall be kept free from weeds and other obstructions and have sufficient capacity to care for a reasonable head of water. In cases where ditches are not in proper condition to receive water, Lessor shall order the ditches cleaned and failure to do so will be sufficient cause for denial of water. Lessee shall further be responsible, at its sole cost and expense, for maintaining and repairing all improvements located on the properties, including but not limited to, wells, canals, drainage ditches, fences, and other improvements of any nature whatsoever located on the demised premises. Lessee will ensure no damage occurs to ground water monitoring wells located in or near farmed properties by tenant or their agents.

12. DELIVERY OF WATER: When the water supply and the capacity of the ditch is such that a rotation basis of delivery is necessary, a system of rotation may be utilized at the discretion of Lessor and may be changed in any section at the discretion of the Lessor. Lessor shall have full authority to stop water delivery if needed for plant operation or on account of any violation of the rules and regulations.

13. WASTE OF WATER: Any Lessee over irrigating or wasting water on roads, vacant lands or land previously irrigated, either willfully or carelessly or on account of defective or unclean ditches, poor equipment, or unleveled land to an unreasonable depth, will be refused the use of water until such conditions are remedied to the satisfaction of Lessor.

14. FLOOD RISK: Tenant acknowledges that he is fully acquainted with the demised premises, all facilities affecting the demised premises, and the possibility that the leased premises could be flooded from many causes including, without limitation, the following:

A. Levee overtopping and levee failure due to natural causes such as winds, tides, barometric pressure changes, rainfall or its runoff, earthquakes, levee settlement, and rodents.

B. Levee overtopping and levee failure due to man-related causes including negligence of Lessor, any reclamation district or improper levee maintenance, flood fighting and/or patrol, dredging, water releases, obstruction of water flows, and water diversions.

C. Failure of the drainage system due to natural or man-related causes including negligence of Lessor, any reclamation district, and other governmental agency.

D. Failure to construct, repair, maintain, or operate levees, drainage, or irrigation facilities, or other facilities, whether due to limited funding or otherwise.

E. Some localized flooding may occur as a result of Lessee being required to accept industrial wastewater, treated domestic effluent, and biosolids.

Tenant hereby expressly assumes the risk of damage arising out of the above and hereby waives the right (including the right on the part of any insurer through subrogation) to make any claim pertaining to the same as against the State of California, the United States, all reclamation districts, the counties, all other agencies of government, and Lessor and their officers, agents, and employees.

15. ASSIGNMENT AND SUBLETTING: Lessee shall not assign, encumber, convey, or otherwise hypothecate this Lease, in whole or any part, without first obtaining the written consent of Lessor. Lessee shall be permitted to sublet the properties to a responsible person, firm, or corporation, but any such subletting or use by another person, firm, or corporation shall in no way release Lessee from the obligation, conditions, and terms of this Lease. Lessor shall furnish in writing to Lessor the name of any subtenant, and any sublease entered into by Lessee shall incorporate the terms, provisions, and conditions of this Lease.

16. ENTRY BY LESSOR: Lessor shall have the right at all reasonable times during the term of this Lease to enter said leased premises for the purpose of examining or inspecting the same.

17. REPAIRS: Lessee shall be solely responsible for all repairs to the properties. Lessee shall notify Lessor, in writing, of any alterations or additions to the leased premises and major alterations or any alteration that would interfere with Lessor's wastewater discharges on the leased premises shall be first approved by Lessor before the same is made. All alterations, additions, or improvements made in, to, or on the demised premises shall, immediately upon the installation thereof, become and be the property of the Lessor and shall remain upon and be surrendered with the premises.

    Lessee shall be responsible to Lessor for all damages caused by willful neglect or careless acts and upon his failure to repair such damage after notification by Lesser, such repairs shall be made at his expense by Lessor.

18. ENFORCEMENT OF RULES: Refusal to comply with the rules and regulations, and the requirements hereof or the interference with the discharge of the duties of Lessor shall be sufficient cause for shutting off the water. Water will not again be furnished until full compliance with all requirements of the rules and regulations or contract agreement.

19. SURRENDER THE PREMISES: Lessee shall, at the termination of the term hereby created, or upon the earlier termination hereof for any reason, or upon the extension of the term herein set forth, quit and surrender said premises in good order, condition, and repair reasonable wear and tear and act of God or fire excepted.

20. FEES: Lessee shall pay all personal taxes, licenses fees, or other fees or taxes, levied by any governmental agency which may be imposed upon the business of Lessee or its subtenant which are attributable to Lessees use of the premises.

    If any of the above charges are assessed against the real property, and because of said assessment, the Lessor pays the same, which Lessor will have the right to do regardless of the validity of any such levy, the Lessee upon demand will repay to the Lessor all taxes and other assessments so levied against the Lessor which are due by the Lessee.

    Lessor shall pay all real estate taxes and fees for special district assessments of the real property.

21. UTILITIES: Lessee agrees to pay, during the term hereof, all utilities of any nature whatsoever used upon said leased premises except for the run-off collection system located on the property. In the event Lessee creates excessive runoff by over irrigation, Lessee may be required to pay the cost of runoff collection.

22. WASTE: Lessee shall not maintain or commit, nor suffer to be maintained or committed, any nuisance or waste in or about said leased premises, nor do or permit anything to be done in or about said premises, nor keep anything therein, which will in any way conflict with any law, ordinance, rule, or regulation affecting the occupancy and use of said premises, which have been or may hereafter be enacted or promulgated by any public authority.

23. MECHANIC'S LIEN: Lessee agrees to keep said premises free from all liens and claims of mechanics, laborers, material suppliers, and others for work done, and material furnished, and Lessee shall not create or suffer to be created any lien or encumbrance on said premises.

24. PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE: Lessee agrees to indemnify and hold harmless Lessor from and against all claims of whatever nature arising from any act, omission, or negligence of Lessee or Lessee's contractors, licensees, agents, servants, or employees, or arising from any accident, injury, or damage whatsoever caused any person, or to the property of any person, occurring during the term thereof, in or about the demised premises where such accident, damage, or injury, including death, or is claimed to have resulted, from any act or omission on the part of Lessee or Lessee's agents or employees. This indemnity and hold harmless agreement shall include indemnity against all costs and expenses, including attorney's fees incurred in or in connection with any such claim or proceeding brought thereon and the defense thereof. Lessee agrees to maintain in full force during the term hereof a policy of public liability insurance under which the Lessee is named as insured, and containing an additional named insured endorsement naming City of Lodi, its Elected and Appointed Boards, Commissions, Officers, Agents and Employees as additional insured, and under which the insurer agrees to indemnify and hold Lessee and Lessor harmless from and against all costs, expenses, and liability arising out of, or based upon, any and all property damage, or damages for personal injuries, including death, sustained in accidents occurring in or about the demised premises, where such accident, damage, or injury, including death, results, or is claimed to have resulted, from any act or omission on the part of Lessee, or Lessee's agents or employees. The minimum limits of such insurance shall be $1,000,000.00 (One Million Dollars) per occurrence. In addition to the additional named insured endorsement on Lessee's policy of insurance, said insurance policy shall be endorsed to include the following language:

    > "Such insurance as is afforded by the endorsement for additional insureds shall apply as primary insurance. Any other insurance maintained by the City of Lodi and Appointed Boards, Commissions, Officers, Agents, Employees, and Volunteers shall be excess only and not contributing with the coinsurance afforded by this endorsement."

A duplicate or certificate of said public liability and property damage insurance policy containing the above-stated required endorsements shall be delivered to Lessor within ten (10) days after the issuance and each renewal of said policy. This paragraph, and all other provisions of this Lease, shall apply and be construed as applying to any subtenant of Lessee.

25. BANKRUPTCY, RECEIVERSHIP, AND INSOLVENCY: If Lessee should make a general assignment for the benefit of creditors, or file a voluntary petition in bankruptcy, or be adjudicated bankrupt or insolvent, or permit a receiver to be appointed to take possession of a substantial portion of its assets or of this leasehold, and such bankruptcy, insolvency, or receivership proceeding shall not be dismissed within ninety (90) days, then Lessor may, without notice or demand, terminate this Lease and forthwith reenter and repossess the properties, and remove all persons therefrom, and under no circumstances shall this Lease be assignable or transferable by operation of law.

26. EMINENT DOMAIN: If the whole or any portion of the premises hereby leased shall be taken by any public authority under the power of eminent domain, whether by negotiation or otherwise, then the term of this Lease shall cease as of the date possession is taken by such authority as to that portion taken, and the rental thereafter due or payable shall be reduced for the portion taken at the rental rate per acre then in effect. All damages awarded for such taking under the power of eminent domain, whether for the whole or a part of the leased premises, shall be the property of Lessor. Provided, however, that Lessor shall not be entitled to any award made to Lessee for loss of business, business leasehold improvements, and crops.

27. ATTORNEY'S FEES: In each suit brought for the recovery of any rent due hereunder, or for the recovery of the possession of said demised premises, or for the breach, or to restrain the breach, of any of the terms, conditions, or covenants of this Lease, the prevailing party shall be entitled to a reasonable sum as and for attorney's fees therein, the amount of which shall be determined by the court in such suit and added to and become a part of the judgment therein.

28. WAIVER: Failure of Lessor to insist upon performance of any of the terms or conditions of this Lease in any one or more instances shall in no event be construed as a waiver or a relinquishment of its right to future performance thereof, and Lessee's obligations to such future performance shall continue in full force and effect. The receipt by Lessor of rent, with the knowledge of the breach of any agreement or condition hereof, shall not be determined to be a waiver of any such breach.

29. ACCEPTANCE OF LEASEHOLD ESTATE: Lessee has examined the leased premises, knows the conditions thereof, and accepts possession thereof in their condition.

30. TERMINATION OF LEASE:

    A. By Lessee. Lessee shall be permitted to terminate this Lease at its option in the event governmental laws, rules, or regulations, including, but not limited to, those promulgated by the California Regional Water Quality Control Board or the California Department of Health Services, prohibit the growing of any crop on the properties. In the event Lessee terminates this Lease as provided above, crop payments shall be due for crops harvested prior to the date of termination.

    Lessee shall also be permitted to terminate this Lease for any reason whatsoever if written notice is given to Lessor six (6) months prior to the end of any individual year covered under this lease. Lessee shall be responsible for all crop payments due for the entire calendar year in which such notice is given.

B. By Lessor. Lessor may terminate this lease if it determines, in its sole discretion, that the demised premises are necessary for any City function or any other purpose approved by the City Council. In such cases, the Lessor shall give to the Lessee six (6) months written notice thereof, and crop payments shall be due for crops harvested prior to date of termination.

31. ACCESS: Lessee shall be permitted reasonable access over adjacent City property owned by Lessor for ingress and egress purposes.

32. CONTRACT: This written agreement constitutes the entire contract between the Lessee and Lessor, and no representation or agreement, unless expressed herein, shall be binding on the Lessor or Lessee.

33. BINDING ON HEIRS: This Lease shall include and inure to and bind the heirs, executors, administrators, successors, and assigns of the respective parties hereto, but nothing in this paragraph contained shall be construed to modify or impair in any manner any of the provisions and restrictions of this Lease relating to the assignment of this Lease, or of any interest therein, or to the subletting or underletting of said leased premises or any part thereof.

IN WITNESS WHEREOF, Lessor and Lessee have executed this Lease on the date and year first above written.

CITY OF LODI, a municipal corporation
Hereinabove called "Lessor"

By_____
BLAIR KING, City Manager

Hereinabove called "Lessee"

By_____
LIMA RANCH

_____
RANDY JOHL
City Clerk

Approved as to Form:

_____
D. STEPHEN SCHWABAUER
City Attorney

L E A S E
FOR
AGRICULTURAL LAND
at
White Slough Water Pollution Control Facility

THIS LEASE, made and entered into this _____ day of _____, 2008, by and between the CITY OF LODI, a municipal corporation, hereinafter called Lessor, and KIRSCHENMEN FARMS hereinafter called Lessee.

W I T N E S S E T H :

1. PROPERTIES: That for and in consideration of the rents to be paid, and the covenants to be faithfully kept and performed by said Lessee, said Lessee does hereby lease, hire, and take from said Lessor, those certain properties described as follows:

   Those certain properties described in Exhibit A attached hereto, and by this reference made a part hereof. Property to be leased totals 659 acres ±.

2. EXTENSION: Although the current lease does not expire until December 31, 2008, it is a condition of this extension that Lessee agrees to apply the requirements of this lease extension in the final year of the current lease.

3. TERM: The term of this Lease shall be for a period of five (5) years, commencing January 1, 2008, and terminating at midnight on December 31, 2013. In order that the tenants have adequate time to plan their farming operations, bids for the lease of this property after December 31, 2013, will be called for approximately one year before that date.

4. RENT: In consideration of said Lease, Lessee agrees to pay to Lessor as rent for the demised premises based on the gross value of crops produced on the properties. The amount paid by Lessee shall be 20% of gross receipts for crops grown, including any deferred payments, credits, stock, or other compensation including crop insurance payments. If a crop is successfully produced but not sold, the value will be determined by similar sales by other tenants or market rates for the crops.

   Fallowed acreage shall be assessed a flat fee of $100.00 per acre in lieu of gross percentage. Planted acreage left unattended shall also be assessed a flat fee of $100.00 per acre.

   Lessee shall maintain adequate records of crop yields and gross receipts, and make such records available to Lessor for purposes of verification.

   For the purposes of this lease gross receipts shall mean the total revenue of any sort received by Lessee at sale of crop. No reduction of gross will be allowed for any cost incurred by Lessee due to planting, growing, harvesting, or hauling of crop. Any additional cost incurred by Lessee for services by others in conjunction with the above crop production practices will also not reduce gross receipts.

   Methods of verification may include any or all of the following; weigh tickets, sale receipts, and/or a contract for sale between Lessee and Broker. Lessee shall supply copies of weigh scale certification to verify accuracy of weight results. Lessor will be free to contact weigh facilities or purchasing agents from time to time as needed to verify quantities and sale amounts.

   Rental payments shall be made on or before June 1st of each year for the prior winter rotation crop and on or before December 1st of each year for the summer crops and shall be directed to the Public Works Department, 221 West Pine Street, P. O. Box 3006, Lodi, California, 95241-1910, for processing and shall be paid without prior notice or demand.

5. SECURITY: Tenant shall post security of $75,000 to secure its obligations under this agreement. The deposit shall be fully refundable upon Tenant's full satisfaction of the obligations hereunder. In the event Tenant defaults on any of its obligations, Landlord shall be entitled to deduct from the deposit for the full amount of its losses resulting from the default. The security may be in the form of a letter of credit, cash deposit, deed of trust or other form of security in such form and on such terms as is approved by the Lodi City Attorney's Office.

6. USE: The properties shall be used solely for the purpose of growing, cultivating, fertilizing, irrigating, and harvesting of agricultural crops while ensuring best farm practices, consistent with the terms of this lease, are maintained. During the term of this Lease it is understood and agreed by the parties hereto that Lessee shall be required to accept industrial wastewater, treated domestic effluent, and biosolids from City's White Slough Water Pollution Control Facility. Lessor will make available all excess domestic effluent, at no cost to the Lessee. It is further understood and agreed by Lessee, that Lessee must comply with all present and future laws, ordinances, rules, and regulations promulgated by any governmental authority of competent jurisdiction regulating the type of crops that can be grown on the properties during the lease term and any extension thereof. Lessee accepts the properties with the full understanding that the California Department of Health Services regulations (Title 22, Division 4), copy attached as Exhibit B, will limit Lessee to growing only fodder, fiber, or seed crops once industrial wastewater, treated domestic effluent, and biosolids are applied on the properties. Further, Lessee shall be permitted to use the properties for agricultural activities consistent with the terms of this Lease and as permitted by all governmental authorities, including but not limited to, the California Department of Health Services. Further, Lessee agrees to manage the irrigation of the properties with industrial wastewater, treated domestic effluent, and biosolids from the White Slough Facility in such a manner that it will not allow the discharge of any runoff to White Slough, other waters of the Delta, or adjacent private or public property, and meet all regulations imposed by all governmental authorities having proper jurisdiction, including but not limited to, the Central Valley Regional Water Quality Control Board. Lessee shall use and occupy said premises in a quiet, lawful, and orderly manner. Lessor and Lessee further agree that they shall permit no hunting, fishing, or public access to any part of the properties, including Lessee.

7. ACREAGE REQUIREMENTS AND FERTILIZER USE: Because the primary goal for the leased land is disposal of industrial wastewater, treated domestic effluent, and biosolids, in a manner that meets or exceeds regulatory requirements, it is necessary to define practices which will maximize this goal. To achieve the stated goal on a yearly basis it will henceforth be a requirement of the lease that 350 acres be planted to feed corn. To further maximize this effort a second crop of wheat or oats shall be planted after harvest of the corn. Because there are multiple leased parcels, the portion allotted to each Lessee may be increased or decreased by mutual agreement by tenants to maintain a minimum 350 acres of corn between the Lessees. To manage our goal it will be necessary for Lessee to submit an annual crop plan for each planting cycle along with the necessary harvesting and planting sheets. The plan will include crop type and acreage for each crop. It will also be necessary for Lessee to keep City staff apprised of irrigation and harvesting schedules. To better accomplish this notification, lessor shall install kiosks at several locations that lessee shall use to identify irrigation start and stop times, and harvest schedules for selected fields. Additionally, because loading rates for biosolids are determined by agronomic uptake of nitrogen for the crop, it will be necessary to better coordinate the field loading by ensuring the fields where biosolids are applied are loaded as equally and simultaneously as possible. The City will notify ahead of application days so that the irrigation system is available for this purpose. It will continue to be necessary to prohibit the application of any natural or chemical fertilizers or any other chemical without written approval of the Lessor. Lessor shall employ the services of a licensed agronomist to help City staff and lessee better manage farming practices to meet the desired goals of both parties.

8. AVAILABILITY OF LESSEE: Because of the type of operation of the White Slough Water Pollution Control Facility, it is imperative that Lessee or a representative be readily available in case plant personnel must change any plant operation. That representative must be able to understand and speak English. Lessee shall be responsible for keeping the City Public Works Department advised of a current telephone number and contact person(s) who can be reached 7 days a week, 24 hours a day.

9. REMEDIES ON DEFAULT: Should Lessee fail to pay any part of the rents herein specified at the times or in the manner provided, or fail to comply with or perform any other of the terms and provisions of the Lease on the part of Lessee to be performed or compiled with, then and in that event, Lessor may exercise any and all remedies provided by law or equity by reason of such default, including the right at Lessor's option, of terminating the Lease. In any of such events, Lessor shall be entitled to the immediate possession of said leased premises, and at their option, may enter into and upon said premises without notice to Lessee and exclude Lessee and all persons and all property therefrom, and by process of law or otherwise take and resume possession of said premises. Each and all of Lessor's remedies shall be construed as cumulative and none of them as exclusive of the other or as exclusive of any remedy provided by law or equity.

10. RELATIONSHIP OF PARTIES: It is understood and agreed that the relationship between the parties is that of landlord and tenant and not as a party or agent of Lessor. Lessee, or its subtenant, shall carry Worker's Compensation Insurance and observe all laws and regulations applicable to employers. A copy of Worker's Compensation insurance shall be on file in the Public Works Department.

11. DITCH, ROAD, AND PROPERTY MAINTENANCE: Lessee shall maintain and pay all costs of maintaining the irrigation lines, ditches, perimeter fences, and all access roads located on the properties. The perimeter fencing required by the State regulatory agencies will be maintained with material supplied by the City. All ditches and banks shall be kept free from weeds and other obstructions and have sufficient capacity to care for a reasonable head of water. In cases where ditches are not in proper condition to receive water, Lessor shall order the ditches cleaned and failure to do so will be sufficient cause for denial of water. Lessee shall further be responsible, at its sole cost and expense, for maintaining and repairing all improvements located on the properties, including but not limited to, wells, canals, drainage ditches, fences, and other improvements of any nature whatsoever located on the demised premises. Lessee will ensure no damage occurs to ground water monitoring wells located in or near farmed properties by tenant or their agents.

12. DELIVERY OF WATER: When the water supply and the capacity of the ditch is such that a rotation basis of delivery is necessary, a system of rotation may be utilized at the discretion of Lessor and may be changed in any section at the discretion of the Lessor. Lessor shall have full authority to stop water delivery if needed for plant operation or on account of any violation of the rules and regulations.

13. WASTE OF WATER: Any Lessee over irrigating or wasting water on roads, vacant lands or land previously irrigated, either willfully or carelessly or on account of defective or unclean ditches, poor equipment, or unleveled land to an unreasonable depth, will be refused the use of water until such conditions are remedied to the satisfaction of Lessor.

14. FLOOD RISK: Tenant acknowledges that he is fully acquainted with the demised premises, all facilities affecting the demised premises, and the possibility that the leased premises could be flooded from many causes including, without limitation, the following:

A. Levee overtopping and levee failure due to natural causes such as winds, tides, barometric pressure changes, rainfall or its runoff, earthquakes, levee settlement, and rodents.

B. Levee overtopping and levee failure due to man-related causes including negligence of Lessor, any reclamation district or improper levee maintenance, flood fighting and/or patrol, dredging, water releases, obstruction of water flows, and water diversions.

C. Failure of the drainage system due to natural or man-related causes including negligence of Lessor, any reclamation district, and other governmental agency.

D. Failure to construct, repair, maintain, or operate levees, drainage, or irrigation facilities, or other facilities, whether due to limited funding or otherwise.

E. Some localized flooding may occur as a result of Lessee being required to accept industrial wastewater, treated domestic effluent, and biosolids.

Tenant hereby expressly assumes the risk of damage arising out of the above and hereby waives the right (including the right on the part of any insurer through subrogation) to make any claim pertaining to the same as against the State of California, the United States, all reclamation districts, the counties, all other agencies of government, and Lessor and their officers, agents, and employees.

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19. SURRENDER THE PREMISES: Lessee shall, at the termination of the term hereby created, or upon the earlier termination hereof for any reason, or upon the extension of the term herein set forth, quit and surrender said premises in good order, condition, and repair reasonable wear and tear and act of God or fire excepted.

20. FEES: Lessee shall pay all personal taxes, licenses fees, or other fees or taxes, levied by any governmental agency which may be imposed upon the business of Lessee or its subtenant which are attributable to Lessees use of the premises.

    If any of the above charges are assessed against the real property, and because of said assessment, the Lessor pays the same, which Lessor will have the right to do regardless of the validity of any such levy, the Lessee upon demand will repay to the Lessor all taxes and other assessments so levied against the Lessor which are due by the Lessee.

    Lessor shall pay all real estate taxes and fees for special district assessments of the real property.

21. UTILITIES: Lessee agrees to pay, during the term hereof, all utilities of any nature whatsoever used upon said leased premises except for the run-off collection system located on the property. In the event Lessee creates excessive runoff by over irrigation, Lessee may be required to pay the cost of runoff collection.

22. WASTE: Lessee shall not maintain or commit, nor suffer to be maintained or committed, any nuisance or waste in or about said leased premises, nor do or permit anything to be done in or about said premises, nor keep anything therein, which will in any way conflict with any law, ordinance, rule, or regulation affecting the occupancy and use of said premises, which have been or may hereafter be enacted or promulgated by any public authority.

23. MECHANIC'S LIEN: Lessee agrees to keep said premises free from all liens and claims of mechanics, laborers, material suppliers, and others for work done, and material furnished, and Lessee shall not create or suffer to be created any lien or encumbrance on said premises.

24. PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE: Lessee agrees to indemnify and hold harmless Lessor from and against all claims of whatever nature arising from any act, omission, or negligence of Lessee or Lessee's contractors, licensees, agents, servants, or employees, or arising from any accident, injury, or damage whatsoever caused any person, or to the property of any person, occurring during the term thereof, in or about the demised premises where such accident, damage, or injury, including death, or is claimed to have resulted, from any act or omission on the part of Lessee or Lessee's agents or employees. This indemnity and hold harmless agreement shall include indemnity against all costs and expenses, including attorney's fees incurred in or in connection with any such claim or proceeding brought thereon and the defense thereof. Lessee agrees to maintain in full force during the term hereof a policy of public liability insurance under which the Lessee is named as insured, and containing an additional named insured endorsement naming City of Lodi, its Elected and Appointed Boards, Commissions, Officers, Agents and Employees as additional insured, and under which the insurer agrees to indemnify and hold Lessee and Lessor harmless from and against all costs, expenses, and liability arising out of, or based upon, any and all property damage, or damages for personal injuries, including death, sustained in accidents occurring in or about the demised premises, where such accident, damage, or injury, including death, results, or is claimed to have resulted, from any act or omission on the part of Lessee, or Lessee's agents or employees. The minimum limits of such insurance shall be $1,000,000.00 (One Million Dollars) per occurrence. In addition to the additional named insured endorsement on Lessee's policy of insurance, said insurance policy shall be endorsed to include the following language:

    > "Such insurance as is afforded by the endorsement for additional insureds shall apply as primary insurance. Any other insurance maintained by the City of Lodi and Appointed Boards, Commissions, Officers, Agents, Employees, and Volunteers shall be excess only and not contributing with the coinsurance afforded by this endorsement."

A duplicate or certificate of said public liability and property damage insurance policy containing the above-stated required endorsements shall be delivered to Lessor within ten (10) days after the issuance and each renewal of said policy. This paragraph, and all other provisions of this Lease, shall apply and be construed as applying to any subtenant of Lessee.

25. BANKRUPTCY, RECEIVERSHIP, AND INSOLVENCY: If Lessee should make a general assignment for the benefit of creditors, or file a voluntary petition in bankruptcy, or be adjudicated bankrupt or insolvent, or permit a receiver to be appointed to take possession of a substantial portion of its assets or of this leasehold, and such bankruptcy, insolvency, or receivership proceeding shall not be dismissed within ninety (90) days, then Lessor may, without notice or demand, terminate this Lease and forthwith reenter and repossess the properties, and remove all persons therefrom, and under no circumstances shall this Lease be assignable or transferable by operation of law.

26. EMINENT DOMAIN: If the whole or any portion of the premises hereby leased shall be taken by any public authority under the power of eminent domain, whether by negotiation or otherwise, then the term of this Lease shall cease as of the date possession is taken by such authority as to that portion taken, and the rental thereafter due or payable shall be reduced for the portion taken at the rental rate per acre then in effect. All damages awarded for such taking under the power of eminent domain, whether for the whole or a part of the leased premises, shall be the property of Lessor. Provided, however, that Lessor shall not be entitled to any award made to Lessee for loss of business, business leasehold improvements, and crops.

27. ATTORNEY'S FEES: In each suit brought for the recovery of any rent due hereunder, or for the recovery of the possession of said demised premises, or for the breach, or to restrain the breach, of any of the terms, conditions, or covenants of this Lease, the prevailing party shall be entitled to a reasonable sum as and for attorney's fees therein, the amount of which shall be determined by the court in such suit and added to and become a part of the judgment therein.

28. WAIVER: Failure of Lessor to insist upon performance of any of the terms or conditions of this Lease in any one or more instances shall in no event be construed as a waiver or a relinquishment of its right to future performance thereof, and Lessee's obligations to such future performance shall continue in full force and effect. The receipt by Lessor of rent, with the knowledge of the breach of any agreement or condition hereof, shall not be determined to be a waiver of any such breach.

29. ACCEPTANCE OF LEASEHOLD ESTATE: Lessee has examined the leased premises, knows the conditions thereof, and accepts possession thereof in their condition.

30. TERMINATION OF LEASE:

    A. By Lessee. Lessee shall be permitted to terminate this Lease at its option in the event governmental laws, rules, or regulations, including, but not limited to, those promulgated by the California Regional Water Quality Control Board or the California Department of Health Services, prohibit the growing of any crop on the properties. In the event Lessee terminates this Lease as provided above, crop payments shall be due for crops harvested prior to the date of termination.

    Lessee shall also be permitted to terminate this Lease for any reason whatsoever if written notice is given to Lessor six (6) months prior to the end of any individual year covered under this lease. Lessee shall be responsible for all crop payments due for the entire calendar year in which such notice is given.

B. By Lessor. Lessor may terminate this lease if it determines, in its sole discretion, that the demised premises are necessary for any City function or any other purpose approved by the City Council. In such cases, the Lessor shall give to the Lessee six (6) months written notice thereof, and crop payments shall be due for crops harvested prior to date of termination.

31. ACCESS: Lessee shall be permitted reasonable access over adjacent City property owned by Lessor for ingress and egress purposes.

32. CONTRACT: This written agreement constitutes the entire contract between the Lessee and Lessor, and no representation or agreement, unless expressed herein, shall be binding on the Lessor or Lessee.

33. BINDING ON HEIRS: This Lease shall include and inure to and bind the heirs, executors, administrators, successors, and assigns of the respective parties hereto, but nothing in this paragraph contained shall be construed to modify or impair in any manner any of the provisions and restrictions of this Lease relating to the assignment of this Lease, or of any interest therein, or to the subletting or underletting of said leased premises or any part thereof.

IN WITNESS WHEREOF, Lessor and Lessee have executed this Lease on the date and year first above written.

CITY OF LODI, a municipal corporation
Hereinabove called "Lessor"

By_____
BLAIR KING, City Manager

Hereinabove called "Lessee"

By_____
KIRSCHENMEN FARMS

_____
RANDY JOHL
City Clerk

Approved as to Form:

_____
D. STEPHEN SCHWABAUER
City Attorney

RECEIVED
MAY 2 2008
CITY OF LODI
PUBLIC WORKS DEPARTMENT

RECEIVED
FEB 24 1993
CITY OF LODI
PUBLIC WORKS DEPARTMENT

RECEIVED
FEB 26 1993
CITY OF LODI
MUNICIPAL SERVICE CENTER

GROUND LEASE

by and between

THE CITY OF LODI

(Landlord)

and

NORTHERN CALIFORNIA POWER AGENCY

(Tenant)

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GROUND LEASE

THIS LEASE, entered into this 17TH day of FEBRUARY, 1993, by and between the CITY OF LODI, a municipal corporation ("Landlord"), and NORTHERN CALIFORNIA POWER AGENCY ("Tenant").

1. Premises. Landlord leases to Tenant and Tenant leases from Landlord that real property in the City of Lodi, County of San Joaquin, California, described in Exhibit A attached hereto and made a part hereof. The premises leased to Tenant are referred to in this Lease as the "Leased Premises" or the "Premises."

2. Use. Tenant shall have the use of the Leased premises for the purpose of the construction, operation and maintenance of a gas turbine power generation plant and incidental ancillary uses (the "Project"), and for any other lawful purpose.

3. Term; Extension. The term of this Lease shall commence on January 1, 1993 ("Commencement Date"), and shall terminate, unless earlier terminated in accordance with the provisions of this Lease, on a date fifty (50) years from the Commencement Date. Tenant's right to exclusive possession shall commence on the Commencement Date. Tenant shall have the right to extend the term of this Lease on all the terms and conditions set forth herein for an additional period of fifty (50) years, to be exercised by written notice to Landlord during the last year of the initial term of this Lease.

4. Rent.

(A) Monthly Rent. Rent payments will begin on a monthly basis on the Commencement Date. Tenant shall pay to Landlord rent on or

keep Landlord apprised of the volume and nature of truck traffic upon the demised premises.

(B) Landlord shall not be obligated to make any changes, alterations, additions or repairs in, on or about the Leased Premises or any part hereof or any improvements installed thereon. Tenant waives all provisions of law that may impose a duty of repair on Landlord.

(C) Tenant shall indemnify and save harmless Landlord against all actions, claims and damages by reason of (1) Tenant's failure to perform the terms of this paragraph, or (2) Tenant's nonobservance or nonperformance of any law, ordinance or regulation applicable to the Leased Premises, and any liability or duty to repair imposed by the laws of California.

(D) Tenant agrees to construct a perimeter fence around the Leased Premises according to the attached specification.

7. Mechanic's Liens.

(A) Covenant Against Liens and Claims. Tenant shall not allow or permit to be enforced against the Leased Premises or any part thereof, any mechanic's, materialmen's, contractor's or subcontractor's liens arising from any claim growing out of work of any construction, repair, restoration, operation, replacement or improvement, or any other claim or demand no matter how the same may arise. Tenant shall pay or cause to be paid all of said liens, claims or demands before any lawsuit is brought to enforce them against the Leased Premises. Tenant agrees to indemnify and hold the Landlord and the Leased Premises free and harmless from all liability for any and all such liens, claims and demands, together with reasonable attorneys' fees and all costs and expenses incurred by Landlord in connection therewith.

paid. Any default in such repayment by Tenant shall constitute a breach of the covenants and conditions of this Lease.

8. Insurance and Indemnity.

(A) Landlord's Nonliability. Landlord shall not be liable for any loss, damage or injury of any kind to any person or property arising from any use of the Leased Premises, or any part thereof, or caused by any defect in any building, structure or other improvement thereon or in any equipment or other facility therein, or caused by or arising from any act or omission of Tenant or any of its agents, employees, licensees or invitees, or by or from any accident on the Leased Premises or any fire or other casualty thereon, or occasioned by the failure of Tenant to maintain the Leased Premises and all improvements thereto in a safe condition, or arising from any other cause except where caused by the negligence of Landlord, its agents or employees.

(B) Indemnification of Landlord. Notwithstanding anything to the contrary contained in this Lease, and irrespective of any insurance carried by Tenant for the benefit of Landlord under the terms of this Lease, Tenant agrees to protect, indemnity and hold the Landlord and the Leased Premises harmless from any and all damages and liabilities at any time occasioned by or arising out of (1) any act, activity or omission of Tenant, or of anyone holding under Tenant, or (2) the occupancy or use of the Leased Premises or any part thereof, by or under Tenant, or (3) any state or condition of the Leased Premises or any part thereof.

(C) Liability Insurance. Tenant shall procure and maintain at all times during the term of this Lease, at its sole cost and expense, a policy or policies of commercial public liability insurance by the terms of which

election, upon ten (10) days advance written notice, to procure and maintain such insurance. The premiums paid by Landlord shall be treated as added rent due from Tenant with interest at the Bank of America prime rate, to be paid within thirty (30) days of demand. Landlord shall give prompt notice of the payments of such premiums, stating the amounts paid and the names of the insurer or insurers.

(F) Waiver of Subrogation. The parties hereby release each other, and their respective representatives, from any claims for damage to any person or to the Premises and the improvements which may be located upon the Premises and to the fixtures, personal property, tenant's improvements and alterations of tenant in or on the Premises and the improvements which may be located upon the Premises that are caused by or result from risks insured against under any insurance policies carried by the parties hereto and in force at the time of any such damage. Each party hereto shall cause each insurance policy obtained by it to provide that the insurance company waives all right of recovery by way of subrogation against either party in connection with any damage covered by any policy, provided obtaining such a waiver in each such policy is then available at a reasonable charge. Neither party hereto shall be liable to the other for any damage caused by fire or any of the risks insured against under any insurance policy required by this Lease.

9. Landlord's Covenants.

(A) Water Supply. Landlord shall make available to Tenant a minimum of 550,000 gallons per day of reclaimed water from the White Slough Treatment Plant.

(C) Failure to maintain the Leased Premises or cause the same to be maintained as provided for in this Lease;

(D) Abandonment of the Leased Premises after completion of construction for a continuous period of one hundred twenty (120) days; or

(E) Failure to perform or breach of any other covenant, condition or restriction provided for in this Lease.

13. Remedies in Event of Default. Upon any default of Tenant, and in the event the said default is due to the failure of Tenant to make the payment of any installment of rent or other sum when due, and in the event Tenant shall fail to remedy such default within ten (10) days after written notice to do so, or upon any other default by Tenant, and in the event that Tenant shall fail to remedy such other default within thirty (30) days after written notice from Landlord so to do specifying the nature of such default, or if such default cannot be cured within thirty (30) days, Tenant has not commenced corrective action and prosecuted the same to completion with due diligence, or in the event that the default is of such a nature that it cannot be cured by any action of Tenant, then and in any of these events, in addition to any other remedy Landlord may have by operation of law, Landlord shall have the right but not the obligation without any further demand or notice to reenter the Leased Premises and eject all persons from the Leased Premises, using due process of law, and immediately terminate Tenant's right to possession of the Premises, and repossess the same by summary proceedings or other appropriate action, and Landlord shall thereupon be entitled to receive from Tenant all damages allowed by law.

of this Lease. Any improvements remaining on the Premises after expiration or sooner termination of the Lease shall become the property of Landlord.

16. Miscellaneous.

(A) Attorneys' Fees. In the event any action is brought by Landlord to recover any rent due and unpaid hereunder or to recover possession of the Leased Premises, or in the event any action is brought by Landlord or Tenant against the other to enforce or for the breach of any of the terms, covenants or conditions contained in this Lease, the prevailing party shall be entitled to recover reasonable attorneys' fees to be fixed by the Court, together with costs of suit therein incurred.

(B) Waiver. No waiver of any breach of any of the terms, covenants, agreements, restrictions or conditions of this Lease shall be construed as a waiver of any succeeding breach of the same or other covenants, agreements, restrictions and conditions hereof. No delay or omission of Landlord to exercise any right or remedy shall be construed as a waiver of any such right or remedy or of any default by Tenant under this Lease. The various rights and remedies reserved to Landlord herein including those not specifically described in this Lease shall be cumulative and, except as otherwise provided by California statutory law in force at the time of execution of this Lease, Landlord may pursue any or all of such rights and remedies whether at the same time or otherwise.

(C) Holding Over. If Tenant shall hold over the Leased Premises after the expiration of the term hereof with the consent of Landlord, either express or implied, such holding over shall be construed to be only a tenancy from month to month, subject to all the covenants, conditions and

agreed that Landlord does not in any way nor for any purpose become a partner of Tenant or a joint venturer with Tenant in the conduct of Tenant's business or otherwise, except as provided by the Phase 2 and Phase 3 combustion turbine project number 2 agreements.

(H) Time of the Essence. Time is expressly declared to be of the essence of this Lease.

(I) Memorandum of Lease. This Lease shall not be recorded, but the parties agree to execute and deliver a Memorandum of this Lease in recordable form, which Memorandum shall be recorded.

(J) Quitclaim. At the expiration or earlier termination of this Lease, Tenant shall execute, acknowledge and deliver to Landlord within five (5) days after written demand from Landlord to Tenant any quitclaim deed or other document required by any reputable title company to remove the cloud of this Lease from the real property subject to this Lease.

(K) Number and Gender. Whenever the singular number is used in this Lease and when required by the context, the same shall include the plural, and the masculine gender shall include the feminine and neuter genders, and the word "person" shall include corporation, firm or association. If there is more than one Tenant, the obligations imposed under this Lease upon Tenant shall be joint and several.

(L) Headings and Titles. The marginal headings or titles to the paragraphs of this Lease are not a part of this Lease and shall have no effect upon the construction or interpretation of any part of this Lease.

(M) Entire Agreement. This Lease contains the entire agreement of the parties hereto with respect to the matters covered hereby,

not expressly contained herein shall in no way bind either Tenant or Landlord. Landlord and Tenant waive any right or rescission and all claims for damages by reason of any statement, representations, warranty, promise and agreement, if any, not contained in this Lease.

(P) Quiet Enjoyment. This Lease is subject and junior only to all existing easements, covenants, conditions and restrictions and other matters and encumbrances of record as of the date of this Lease. As long as Tenant is not in default of any provision of this Lease, Tenant shall have quiet enjoyment of the premises.

(Q) Termination. Tenant may terminate this Lease at any time upon six (6) months advance notice.

17. Payments and Notices. Any notice to be given or other document to be delivered by either party to the other party may be given by personal delivery or may be deposited in the United States mail in the State of California, duly registered or certified, with postage prepaid, and addressed to the party for whom intended as follows:

To Landlord:	Thomas A. Peterson City Manager 221 West Pine Street Lodi, CA 95240
To Tenant:	Northern California Power Agency Attn: Assistant General Manager 180 Cirby Way Roseville, CA 95678

Jack Sovern

Eitl :om time to time by written notice to the other part ddress which shall be substituted for the one specified above. It any notice or other document is sent by registered or

19. Abandonment and Closure of Injection Wells. Upon termination of this lease, Tenant, at its sole expense, shall provide for the abandonment and closure of any and all injection wells utilized on site by Tenant. Such abandonment shall be done in compliance with all applicable state and federal laws and regulations and under the direction of the California Department of Oil and Gas.

This Ground Lease has been executed on the date first set forth, to become effective as provided for in paragraph 3 hereof.

LANDLORD:

CITY OF LODI, a municipal corporation

By Thos. A. Peterson
THOMAS A. PETERSON
Its City Manager
Date: 2/22/93

TENANT:

NORTHERN CALIFORNIA POWER AGENCY

By James W Whalen
Its Assist Gen Mgr
Date: January 29, 1993

ATTEST:

Jennifer M Perrin
JENNIFER M. PERRIN
City Clerk

Approved As To Form:

Bobby W McNatt
BOBBY W. McNATT
City Attorney

DESCRIPTION FOR LAND LEASE PURPOSES

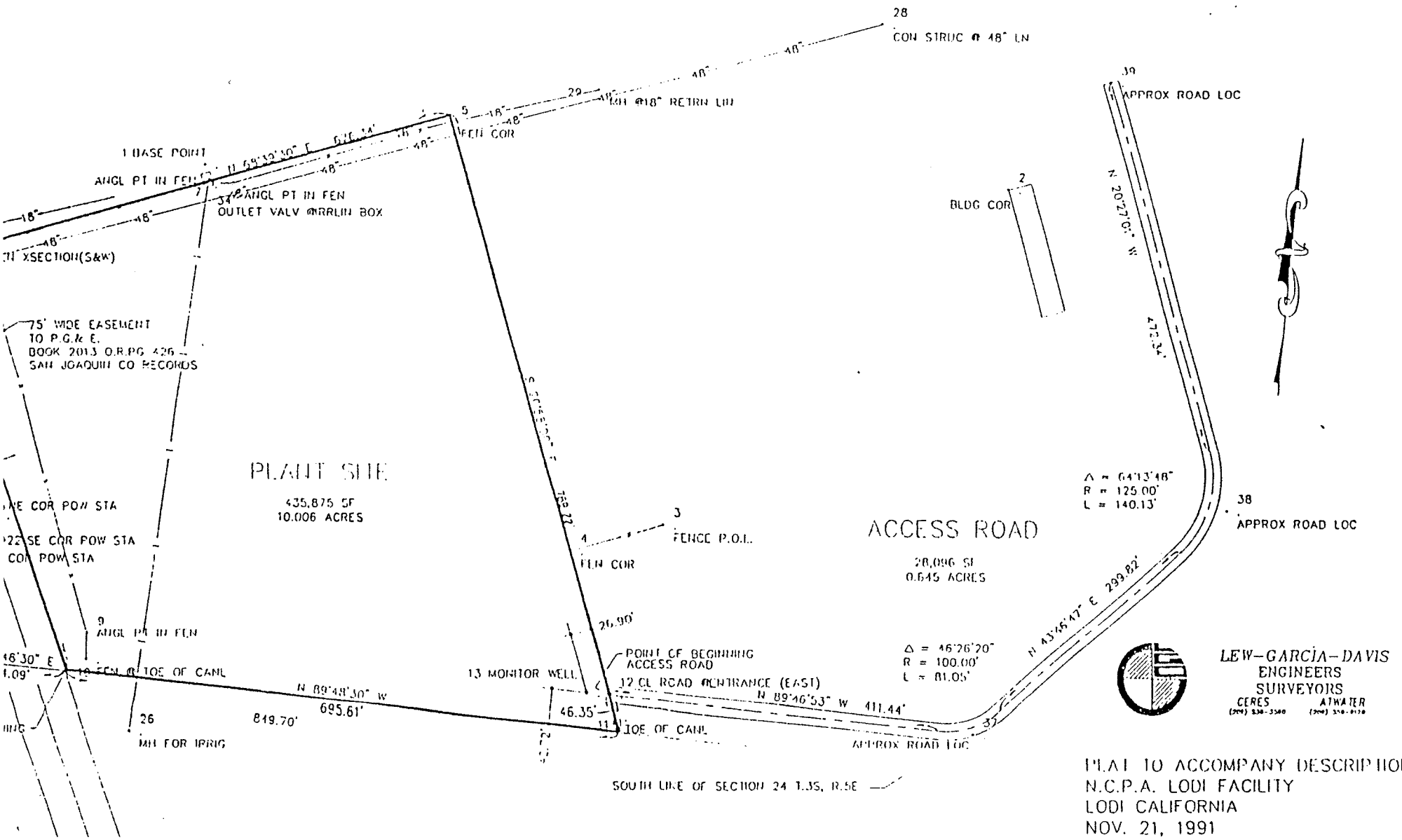
A portion of the southeast quarter of Section 23 and the southwest quarter of Section 24, Township 3 North, Range 5 East, Mount Diablo Base and Meridian, being more particularly described as follows:

> COMMENCING at the southwest corner of said Section 24; thence South 89°48'30" East along the south line of said Section 24, a distance of 154.09 feet, more or less, to a point on the east line of that strip of land granted as an easement to the Pacific Gas and Electric Company described in Deed dated September, 6, 1957, in Book 2013 of Official Records at Page 426, San Joaquin County Records and the POINT OF BEGINNING of this description; thence North 23°56' West along said east line, a distance of 533.43 feet; thence North 68°39'30" East, parallel with and 20.00 feet south of the center of the south levee of the White Slough Water Pollution Control Plant Skimming Ponds, a distance of 676.34 feet; thence South 20°58" East, a distance of 788.22 feet to the south line of said Section 24; thence North 89°48'30" West along said south line, a distance of 695.61 feet, more or less, to the point of beginning.

Contains 10.0 acres, more or less.

Also, the centerline of a 20.00 foot wide easement being more particularly described as follows:

> COMMENCING at the southwest corner of said Section 24; thence South 89°48'30" East along the south line of said section, a distance of 849.70 feet; thence North 20°58" West, a distance of 46.35 feet to a point on the center of a dirt access road and the POINT OF BEGINNING of this description, said point bears North 89°10'11" East, a distance of 28.66 feet from a monitoring well located in the southeast corner of above described land; thence South 89°46'53" East, a distance of 411.14 feet; thence along the arc of a curve concave to the north having a radius of 100.00 feet through a central angle of 46°26'20", a distance of 81.05 feet; thence



PLAT TO ACCOMPANY DESCRIPTION
N.C.P.A. LODI FACILITY
LODI CALIFORNIA
NOV. 21, 1991

room should be immediately adjacent to the boiler with a glass window (6 ft wide x 3 ft high). The operator should be able to view the unit simply by looking up from the control board. The Owner will require space for five 36 inch wide control panels at Ceres and *three* 36 inch wide control panels *(1-SCADA panel, 1-C/R panel, and 1- spare)* at Lodi. Phone system should include yard public address capability; Electrical Room (30 ft x 40 ft minimum dimensions) which will contain electrical switchgear, motor control centers, etc.; and the Turbine Area (Ceres Only) to house the turbine enclosure and the generator. All offices, lunch room, testing lab, electrical room, and tech shop shall be finished with vinyl floors, painted gypsum board walls and suspended acoustical ceilings. The restrooms and locker facilities shall be finished with ceramic floor tile, ceramic wall tile, and water resistant gypsum board ceilings. The lab countertop shall be black slate or stainless steel. All room finishes shall be in accordance with AIA standards and subject to approval by the Owner. All other areas not requiring finished surfaces shall have acoustical metal liner panel covering the insulation and building support steel. Acoustical insulation shall be used to prevent noise transmission to other areas.

3. Warehouse (30 ft x 60 ft minimum dimensions) for spare parts for the facility shall be included.

All pre-engineered buildings proposed shall be Star or Varco Pruden.

3.8.7 Site Fencing

The entire site shall be fenced with a eight foot high fence complete with extension arms with three rows of two-strand barbed wire projecting at an angle of approximately 45 deg extending outward. The fencing material shall be vinyl coated No. 9 gage good quality steel wire. The fabric shall have a uniform diamond mesh approximately 2 in between the parallel sides. Top and bottom selvages shall have a twisted and barbed finish.

The Contractor shall provide at the main entrance a motor-operated gate. The Contractor shall also provide an intercom system from the main gate to the control room and allow for remote operation of the main gate from the control room.

Fence posts, gates, and accessories, such as barbed and tension wire, ties, bands, clips, stretcher bars, post tops, post braces, and gate hinges, latches, stops, and keepers shall be in

Final Signed Copy
Feb. 11 '14

GROUND LEASE

by and between

THE CITY OF LODI

(Owner)

and

SAN JOAQUIN COUNTY MOSQUITO
AND VECTOR CONTROL DISTRICT

(Tenant)

GROUND LEASE

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GROUND LEASE

THIS LEASE, entered into this first day of Febrauary, 1994, by and between the CITY OF LODI, a municipal corporation ("Owner"), and SAN JOAQUIN COUNTY MOSQUITO and VECTOR CONTROL DISTRICT ("Tenant").

1. Premises. Owner leases to Tenant and Tenant leases from Owner that real property in the City of Lodi, County of San Joaquin, California, described in Exhibit A attached hereto and made a part hereof. The premises leased to Tenant are referred to in this Lease as the "Leased Premises" (approximately 12 ± acres).

2. Use. Tenant shall have the use of the Leased premises for the purpose of the developing, construction, operation and maintenance of ponds for the purpose of rearing mosquito fish and incidental ancillary uses and for any other lawful purpose.

3. Term; Extension. The term of this Lease shall commence on February 1, 1994 ("Commencement Date"), and shall terminate, unless earlier terminated in accordance with the provision of this Lease, on a date twenty (20) years from the Commencement Date. Tenant's right to exclusive possession shall commence on the Commencement Date. Tenant shall have the right to extend the term of this lease on all the terms and conditions set forth herein for an additional period of twenty (20) years, to be exercised by written notice to Owner during the last year of the initial term of this Lease.

4. Rent.

(A) Annual Rent. During the term of this lease, Tenant shall pay annual rent in the amount of $ 2,700.00, in advance, on or before the anniversary of Commencement Date of each year for the following twelve (12) month period. Additionally, Tenant shall furnish weed and mosquito abatement services throughout the City's 1,040 acre site (ponds and ditches).

(B) Rental Adjustments. The rent shall not be adjusted for the first five (5) years of the term. The rent may be adjusted on the Commencement Date of the sixth (6th) year and each fifth (5th) year thereafter. Following an adjustment, the rent will remain fixed for five (5) years. Future rent shall be based on what the owner receives on the adjacent 218 acre agricultural lease. Tenant and Owner shall act in good faith and cooperate with one another in establishing any adjustment.

(C) Payments. All rent paid shall be in lawful money of the United States of America and shall be paid without deduction or offset, prior notice or demand, and at such place or places as may be designated from time to time by Owner.

5. Utilities. During the term of this Lease, Tenant agrees to pay all charges and expenses in connection with utility services and to protect Owner and the Leased Premises from all such charges and expenses.

6. Repairs and Maintenance.

(A) At all times during the term of this Lease, Tenant shall, at its cost and expense, maintain the Leased Premises and all improvements thereon in good order and repair and safe condition, including but not limited to, fences and roadways predominantly used by Tenant. Tenant shall keep Owner apprised of the volume and nature of truck traffic and official activities upon the premises.

(B) Owner shall not be obligated to make any changes, alterations, additions or repairs in, on or about the Leased Premises or any part hereof or any improvements installed thereon. Tenant waives all provisions of law that may impose a duty of repair on Owner.

(C) Tenant shall indemnify and save harmless Owner against all actions, claims and damages by reason of (1) Tenant's failure to perform the terms of this paragraph, or (2) Tenant's nonobservance or nonperformance of any law, ordinance or regulation aplicable to this leased premises, and any liability or duty to repair imposed by the laws of California, except that tenant shall be under no obligation under the lease for conditions or problems of or on the premises which existed prior to the commencement of this lease.

(D) Tenant agrees to construct a perimeter fence around the Leased Premises according to the specification shown on Exhibit "B" agreed or equal.

7. Mechanic's Liens.

(A) Covenant Against Liens and Claims. Tenant shall not allow or permit to be enforced against the Leased Premises or any part thereof, any mechanic's, materialmen's, contractor's or subcontractor's liens arising from any claim growing out of work of any construction, repair, restoration, operation, replacement or improvement, or any other claim or demand no matter how the same may arise. Tenant shall pay or cause to be paid all of said liens, claims or demands before any lawsuit is brought to enforce them against the Leased Premises. Tenant agrees to indemnify and hold the Owner and the Leased Premises free and harmless from all liability for any and all such liens, claims and demands, together with reasonable attorneys' fees and all costs and expenses incurred by Owner in connection therewith.

(B) Tenant's Right to Contest Liens. Notwithstanding anything to the contrary set forth above, if Tenant shall in good faith contest the validity of any such lien, claim or demand, then Tenant shall, at its expense, defend itself and Owner against the same and shall pay and satisfy any adverse judgment that may be rendered thereon before the enforcement thereof against Owner or the Leased Premises.

(C) Owner Paying Claims. In the event Tenant shall fail to pay and discharge or cause to be paid and discharged, when due and payable, any tax, assessment or other charge upon or in connection with the Leased Premises, or any lien or claim for labor or material employed or used or any claim for damages arising out of the construction, repair, restoration, replacement, maintenance and use of the Leased Premises and any improvements thereon, or any judgment on any contested lien or claim, or any insurance premium or expense in connection with the Leased Premises and improvements, or any other claim, charge or demand which Tenant has agreed to pay or cause to be paid under the terms of this Lease, and if Tenant, after ten (10) business days' written notice from Owner to do so shall fail to pay and discharge the same, or in the event Tenant contests such tax, assessment, claim or charge then Owner may, at his option, pay any such tax, assessment, insurance expenses, lien, claim, charge or demand, or settle or discharge any action therefor, or judgment thereon, and all costs, expenses and other sums incurred or paid by Owner in connection with any of the foregoing shall be paid by Tenant to Owner upon demand, together with interest thereon at Bank of America's prime rate from the date incurred or paid. Any default in such repayment by Tenant shall constitute a breach of the covenants and conditions of this Lease.

8. Insurance and Indemnity.

(A) Owner's Nonliability. Owner shall not be liable for any loss, damage or injury of any kind to any person or property arising from any use of the Leased Premises, or any part thereof, or caused by any defect in any building, structure or other improvement thereon or in any equipment or other facility therein, or caused by or arising from any act or omission of Tenant or any of its agents, employees, licensees or invitees, or by or from any accident on the Leased Premises or any fire or other casualty thereon, or occasioned by the failure of Tenant to maintain the Leased Premises and all improvements thereto in a safe condition, or arising from any other cause except where caused by the negligence of Owner, its agents or employees.

(B) Indemnification of Owner. Notwithstanding anything to the contrary contained in this Lease, and irrespective of any insurance carried by Tenant for the benefit of Owner under the terms of this Lease, Tenant agrees to protect, indemnity and hold the Owner and the Leased Premises harmless from any and all damages and liabilities at any time occasioned by or arising out of (1) any act, activity or omission of Tenant, or of anyone holding under Tenant, or (2) the occupancy or use of the Leased Premises or any part thereof, by or under Tenant, or (3) any state or condition of the

leased premises or any part thereof except that tenant shall be under no obligation to Owner for any state or condition of the leased premises which was in existence prior to the commencement of this lease.

(C) Liability Insurance. Tenant shall procure and maintain at all times during the term of this Lease, at its sole cost and expense, a policy or policies of commercial public liability insurance by the terms of which Owner and Tenant are named as insured and are indemnified against liability for damage or injury to property or person, including death, of any person entering upon or using the Leased Premises or any improvements thereon or any part thereof, with a combined single limit for bodily injury and property damage in an amount of not less than ONE MILLION DOLLARS ($1,000,000). Such public liability insurance policy or policies shall be stated to be primary and noncontributing with any insurance which may be carried by Owner and shall contain a provision that the Owner, although named as an insured shall nevertheless be entitled to recover under that policy for any loss, injury or damage to the Owner, its agents and employees or the property of such persons by reason of the negligence of Tenant. Tenant may at its option self-insure upon the foregoing terms.

(D) Certificate of Insurance. All policies of insurance procured and maintained by Tenant hereunder shall be issued by companies having not less than Best's A: Class X rating and shall be issued in the name of the Owner and Tenant for the mutual and joint benefit and protection of the parties. Executed copies of all insurance policies or a certificate thereof shall contain a provision that not less than thirty(30)days' written notice shall be given to Owner prior to the cancellation, reduction of coverage, expiration or any material change in any such policy. If Tenants elect to provide coverage through a Joint Powers Entity, Tenant shall provide proof satisfactory to the Owner of the financial stability of the Joint Powers Entity.

(E) Failure to Provide Insurance. If Tenant fails or refuses to procure or to maintain insurance as required by this Lease or fails or refuses to furnish Owner with required proof that the insurance has been procured and is in force and paid for, Owner shall have the right at Owner's election, upon ten (10) days advance written notice, to procure and maintain such insurance. The premiums paid by Owner shall be treated as added rent due from Tenant with interest at Bank of America prime rate, to be paid within thirty (30) days of demand. Owner shall give prompt notice of the payments of such premiums, stating the amounts paid and the names of the insurer or insurers.

(F) Waiver of Subrogation. The parties hereby release each other, and their respective representatives, from any claims for damage to any person or to the Premises and the improvements which may be located upon the Premises and to the fixtures, personal property, tenant's improvements and alterations of tenant in or on the Premises and the improvements which may be located upon the Premises that are caused by or result from risks insured against under any insurance policies carried by the parties hereto and in force at the time of any such damage. Each party hereto shall cause each insurance policy obtained by it to provide that the insurance company waives all right of recovery by way of subrogation against either party in connection with any

damage covered by any policy, provided obtaining such a waiver in each such policy is then available at a reasonable charge. Neither party hereto shall be liable to the other for any damage caused by fire or any of the risks insured against under any insurance policy required by this Lease.

9. Owner's Covenants.

(A) Water Supply. Owner shall make available to Tenant an adequate supply of unchlorinated secondary wastewater effluent or other suitable water(s) from the White Slough Water Pollution Control Facility for the purpose of rearing mosquito fish.

(B) Discharge of Domestic Wastewater. Owner shall upon payment by Tenant of applicable connection fees, accept Tenant's domestic wastewater (employee restroom waste) from the project into the White Slough Water Pollution Control Facility, if Tenant is desirous of this service.

10. Repair and Restoration. If during the term of this Lease any building or improvement on the Leased Premises or any part thereof shall be damaged or destroyed by fire or other casualty, Tenant may, at its sole cost and expense, repair or restore the same or may elect not to repair or restore. If Tenant elects not to repair or restore, this Lease shall terminate. Tenant waives the provisions of Civil Code Sections 1932(2) and 1933(4) with respect to any destruction of the Premises. Any monies received by Owner as compensation for damage or loss to improvements installed by Tenant on the Premises shall be paid to Tenant and are hereby assigned to Tenant.

11. Assignment and Subletting. Tenant may not encumber, assign, sublease or otherwise transfer this Lease, or any right or interest hereunder, or in or to any of the improvements constructed or installed on the Leased Premises, in whole or in part, without the prior written consent of Owner. Such consent shall not be withheld unreasonably.

12. Default. The occurrence of any one or more of the following events shall constitute a default under this Lease by Tenant:

(A) Failure to pay an installment of rent or other sum;

(B) Failure to pay any insurance premium, lien, claim, demand, judgment or other charge provided for in this Lease to be paid or caused to be paid by tenant at the time and in the manner as provided in this Lease;

(C) Failure to maintain the Leased Premises or cause the same to be maintained as provided for in this Lease;

(D) Abandonment of the Leased Premises after completion of construction for a continuous period of one hundred twenty (120) days; or

(E) Failure to perform or breach of any other covenant, condition or restriction provided for in this Lease.

13. Remedies in Event of Default. Upon any default of Tenant, and in the event the said default is due to the failure of Tenant to make the payment of any installment of rent or other sum when due, and in the event Tenant shall fail to remedy such default within ten (10) days after written notice to do so, or upon any other default by Tenant, and in the event that Tenant shall fail to remedy such other default within thirty (30) days after written notice from Tenant so to do specifying the nature of such default, or if such default cannot be cured within thirty (30) days, Tenant has not commenced corrective action and prosecuted the same to completion with due diligence, or in the event that the default is of such a nature that it cannot be cured by any action of Tenant, then and in any of these events, in addition to any other remedy Owner may have by operation of law, Owner shall have the right but not the obligation without any further demand or notice to reenter the Leased Premises and eject all persons from the Leased Premises, using due process of law, and immediately terminate Tenant's right to possession of the Premises, and repossess the same by summary proceedings or other appropriate action, and Owner shall thereupon be entitled to receive from Tenant all damages allowed by law.

14. Estoppel Certificates. Owner and Tenant shall, respectively, at any time and from time to time upon not less than ten (10) days' prior written request by the other, deliver to the requesting party an executed and acknowledged statement in writing certifying:

(A) That this Lease is unmodified and in full force and effect (or if there has been any modification(s) thereof that the same is in full force and effect as modified, and stating the nature of the modification or modification);

(B) That to its knowledge the requesting party is not in default under this Lease (or if any such default exists, the specific nature and extent thereof);

(C) The date to which rent and other charges have been paid in advance, if any; and

(D) Such other information pertaining to this Lease as may reasonably be requested.

Each certificate delivered pursuant to this paragraph may be relied on by any prospective purchaser or transferee of the Leased Premises or of Owner's or Tenant's interest hereunder or by any fee mortgagee of the Leased Premises or of Owner's or Tenant's interest hereunder or by any assignee of any such mortgagee.

15. Ownership of Improvements. Title to any buildings, improvements or fixtures which may be placed on the Premises by Tenant shall remain in Tenant. Owner agrees to subordinate all rights, if any, which Owner may have in any of such improvements to the rights of Tenant. Tenant may remove the improvements at any time during the term of this Lease. Any improvements remaining on the Premises after expiration or sooner termination of the Lease shall become the property of Owner.

16. Miscellaneous.

(A) Attorneys' Fees. In the event any action is brought by Owner to recover any rent due and unpaid hereunder or to recover possession of the Leased Premises, or in the event any action is brought by Owner or Tenant against the other to enforce or for the breach of any of the terms, covenants or conditions contained in this Lease, the prevailing party shall be entitled to recover reasonable attorneys' fees to be fixed by the Court, together with costs of suit therein incurred.

(B) Waiver. No waiver of any breach of any of the terms, covenants, agreements, restrictions or conditions of this Lease shall be construed as a waiver of any succeeding breach of the same or other covenants, agreements, restrictions and conditions hereof. No delay or omission of Owner to exercise any right or remedy shall be construed as a waiver of any such right or remedy or of any default by Tenant under this Lease. The various rights and remedies reserved to Owner herein including those not specifically described in this Lease shall be cumulative and, except as otherwise provided by California statutory law in force at the time of execution of this Lease, Owner may pursue any or all of such rights and remedies whether at the same time or otherwise.

(C) Holding Over. If Tenant shall hold over the Leased Premises after the expiration of the term hereof with the consent of Owner, either express or implied, such holding over shall be construed to be only a tenancy from month to month, subject to all the covenants, conditions and obligations hereof, and Tenant hereby agrees to pay to Owner one-twelfth the annual rental as provided in this Lease; provided, however, that nothing herein contained shall be construed to give Tenant any rights to so hold over and to continue in possession of the Leased Premises after the expiration of the term hereof.

(D) Surrender at End of Term. Upon the end of the term of this Lease, as provided herein, or any extension thereof, or sooner termination of this Lease, Tenant shall surrender the Leased Premises, together with all improvements as hereinabove provided. Upon surrender of the Premises, Tenant shall, if directed by the Public Works Director, remove at its own expense any and all equipment remaining thereon.

(E) Lease Binding Upon Successors and Assigns. Subject to the limitations on assignment and subleasing, each of the terms, covenants and conditions of this lease shall extend to and be binding on and inure to the benefit of not only Owner and Tenant, but each of their successors and assigns. Whenever in this Lease reference is made to either Owner or Tenant, the reference shall be deemed to include, wherever applicable, the successors and assigns and such parties the same as if in every case expressed.

(F) Inspection. Owner reserves the right for Owner and Owner's agents and representatives to enter upon the Leased Premises at any reasonable time for the purpose of attending to Owner's interest hereunder, and to inspect the Leased Premises.

(G) Relationship of Parties. The relationship of parties hereto is that of Owner and Tenant, and it is expressly understood and agreed that Owner does not in any way nor for any purpose become a partner or agent of Tenant or a joint venturer with Tenant in the conduct of Tenant's business or otherwise.

(H) Time of the Essence. Time is expressly declared to be of the essence of this Lease.

(I) Memorandum of Lease. This Lease shall not be recorded, but the parties agree to execute and deliver a Memorandum of this Lease in recordable form, which Memorandum shall be recorded.

(J) Quitclaim. At the expiration or earlier termination of this Lease, Tenant shall execute, acknowledge and deliver to Owner within five (5) days after written demand from Owner to Tenant any quitclaim deed or other document required by any reputable title company to remove the cloud of this Lease from the real property subject to this Lease.

(K) Number and Gender. Whenever the singular number is used in this Lease and when required by the context, the same shall include the plural, and the masculine gender shall include the feminine and neuter genders, and the word "person" shall include corporation, firm or association. If there is more than one Tenant, the obligations imposed under this Lease upon Tenant shall be joint and several.

(L) Headings and Titles. The marginal headings or titles to the paragraphs of this Lease are not a part of this Lease and shall have no effect upon the construction or interpretation of any part of this Lease.

(M) Entire Agreement. This Lease contains the entire agreement of the parties hereto with respect to the matters covered hereby, and no other previous agreement, statement or promise made by any party hereto which is not contained herein shall be binding or valid.

(N) Force Majeure. Except as to the payment of rent, neither of the parties hereto shall be chargeable with, liable for, or responsible to, the other for anything or in any amount for any delay caused by fire, earthquake, explosion, flood, hurricane, the elements, acts of God, or the public enemy, action or interference of governmental authorities or agents, war, invasion, insurrection, rebellion, riots, strikes, or lockouts or any other cause whether similar or dissimilar to the foregoing, which is beyond the control of such parties and any delay due to said causes or any of them shall not be deemed a breach of or default in the performances of this Lease.

(O) Disclaimer of Representation. Except as otherwise specifically provided herein, Owner has made no representations or warranties to the Tenant concerning the Leased Premises, the present use thereof or the suitability for Tenant's intended use of the property. The foregoing disclaimer includes, without limitation, topography, climate, air, water, water rights, utilities, present and future zoning, soil, subsoil, drainage, access to public roads, proposed routes of roads, or extension thereof, or effect of any state or federal environmental protection laws or regulations. Tenant represents and warrants to Owner that he and his representatives have made or will make their own independent inspection and investigation of the Leased Premises and Tenant, in entering into this Lease, is relying solely on such inspection and investigation. No patent or latent physical condition of Leased Premises, whether or not known or discovered, shall affect the rights of either party hereto. Any agreement, warranties or representations not expressly contained herein shall in no way bind either Tenant or Owner. Owner and Tenant waive any right or rescission and all claims for damages by reason of any statement, representations, warranty, promise and agreement, if any, not contained in this Lease.

(P) Quiet Enjoyment. This Lease is subject and junior only to all existing easements, covenants, conditions and restrictions and other matters and encumbrances of record as if the date of this Lease. As long as Tenant is not in default of any provision of this Lease, Tenant shall be entitled to quiet enjoyment of the premises.

(Q) Termination. Tenant may terminate this Lease at any time upon six (6) months advance notice.

17. Payments and Notices. Any notice to be given or other document to be delivered by either party to the other party may be given by personal delivery or may be deposited in the United States mail in the State of California, duly registered or certified, with postage prepaid, and addressed to the party for whom intended as follows:

To Owner:	City of Lodi Attn: City Manager P.O. Box 3006 Lodi, CA 95241-1910 cc: Public Works Director
To Tenant:	San Joaquin County Mosquito and Vector Control District Attn: Manager 7759 South Airport Way Stockton, CA 95206-3918

Either party hereto may from time to time by written notice to the other party designate a different address which shall be substituted for the one specified above. If any notice or other document is sent by registered or certified mail, as provided above, the same shall be deemed served or delivered seventy-two (72) hours after the mailing thereof.

18. Right of First Refusal. Owner shall not at any time during the term of this lease sell or convey or agree to sell or convey all or any portion of the Leased Premises without first having complied with the requirements of this Paragraph. Owner shall desire to sell or convey all or any portion or portions of the Leased Premises, Owner shall obtain from a third party a bona fide arms' length offer (the "Offer") and Owner shall submit a written copy of the Offer to Tenant and shall give Tenant forty-five (45) days within which to elect to meet the Offer. If Tenant elects to meet the Offer, Tenant shall give Owner written notice thereof and closing shall be held within forty-five (45) days thereafter, whereupon Owner shall convey to Tenant all or any portion of the Leased Premises which are the subject of the Offer. At closing, Owner shall deliver to Tenant a grant deed, sufficient to convey to Tenant fee simple title to the Leased Premises free and clear of all liens, restrictions and encumbrances. Owner shall pay all transfer taxes in connection with such conveyance This right of first refusal shall continue as to any and all portions of the Leased Premises. In the event Tenant shall elect not to meet any Offer, Owner may thereafter sell the portion or portions of the Leased Premises which are subject of the Offer only to the party who made the Offer and only strictly in accordance with the terms thereof. To prevent Owner from defeating the rights of Tenant hereunder, Owner agrees that Owner will at no time accept an offer to purchase all or any portion of the Leased Premises together with any other property of Owner in contravention of Tenant's right to purchase the Leased Premises.

19. Abandonment and Closure of Rearing Ponds. Upon termination of this lease, Tenant, at its sole expense, shall provide for the abandonment and closure of any and all rearing ponds utilized on site by Tenant to conform to adjacent surrounding ground. Such abandonment shall be done in compliance with all applicable state and federal laws and regulations.

This Ground Lease has been executed on the date first set forth, to become effective as provided for in paragraph 3 hereof.

OWNER:

CITY OF LODI, a municipal corporation

By Thos. A. Peterson
THOMAS A. PETERSON

Title: City Manager

Date: January 19, 1994

TENANT:

SAN JOAQUIN COUNTY MOSQUITO and VECTOR CONTROL DISTRICT

By: John R Stroh
JOHN R STROH

Title: MANAGER

Date: 2/23/94

ATTEST:

Jennifer M. Perrin
JENNIFER M. PERRIN
City Clerk

Approved As To Form:

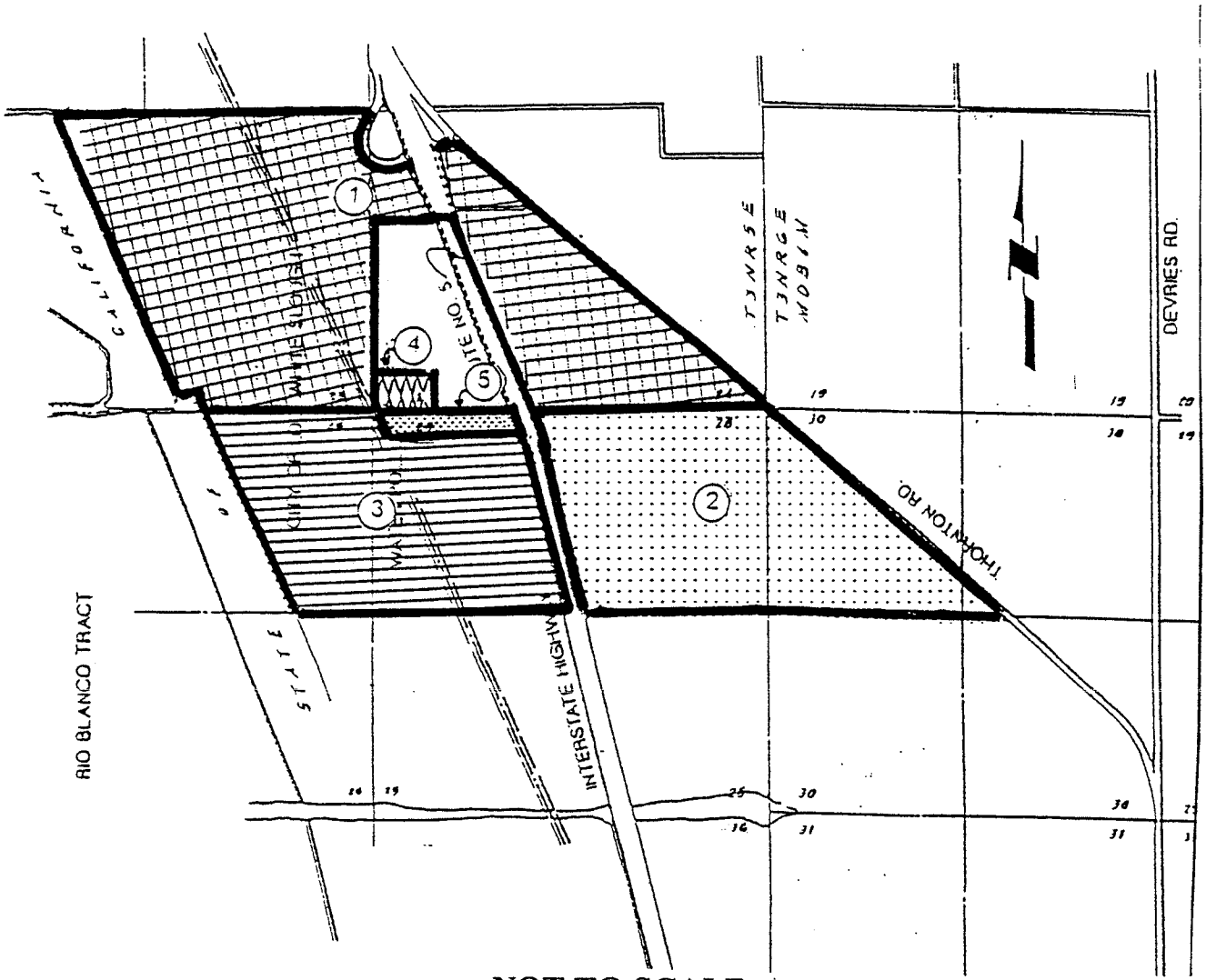
BW McNatt
BOBBY W. McNATT
City Attorney

CITY OF LODI

PUBLIC WORKS DEPARTMENT

EXHIBIT A

WHITE SLOUGH WATER POLLUTION CONTROL FACILITY LAND LEASES



NOT TO SCALE

LEGEND

- (1) 389-acre parcel leased by Bechthold-Kirschenman Farms
- (2) 270-acre parcel leased by Bechthold-Kirschenman Farms
- (3) 218-acre parcel leased by Lima Ranch
- (4) 10-acre parcel leased by Northern California Power Agency
- (5) 12-acre parcel to be leased by San Joaquin County Mosquito & Vector Control District

EXHIBIT B

Site Fencing

The entire site shall be fenced with an eight (8) foot high fence complete with extension arms with three rows of two-strand barbed wire projecting at an angle of approximately 45 degree extending outward. The fencing material shall be vinyl coated No. 9 gage good quality steel wire. The fabric shall have a uniform diamond mesh approximately two (2) in between the parallel sides. Top and bottom salvages shall have a twisted and barbed finish.

Fence posts, gates, and accessories, such as barbed and tension wire, ties, bands, clips, stretcher bars, post tops, post braces, and gate hinges, latches, stops, and keepers shall be in accordance with Industrial Steel Specifications for Fence-Posts, Gates, and Accessories of the Chain Link Fence Manufacturers Institute except as follows:

- Intermediate posts shall be Type I or Type II round pipe.
- Posts shall have holes suitable for the through passage of a top fence rail.
- Bottom reinforcing wire shall be No. 7 gage galvanized steel wire.
- Double gates shall have eccentric double locking type latches which engage strikes securely bolted to the gate frames at both top and bottom, and also engage a heavy malleable iron nonfreezing gate stop anchored in a concrete footing at the center of the double gate opening. Latches shall be readily locked with a padlock.
- Hinges for swing gates shall allow gates to swing back parallel to the fence.

Appendix P - Energy Intensity Tables

Urban Water Supplier: *City of Lodi*

Water Delivery Product

Retail Potable Deliveries

Voluntary Energy Intensity - Total Utility Approach			
Enter Start Date for Reporting Period	7/1/2014	Urban Water Supplier Operational Control	
End Date	6/30/2015		
		Sum of All Water Management Processes	Non-Consequential Hydropower
	Total Utility	Hydropower	Net Utility
Volume of Water Entering Process (AF)	*14,374*	*0*	*14,374*
Energy Consumed (kWh)	*4,808,040*	*0*	*4,808,040*
Energy Intensity (kWh/AF)	*334.5*	*0.0*	*334.5*

Quantity of Self-Generated Renewable Energy

0 kWh

Data Quality *(Estimate, Metered Data, Combination of Estimates and Metered Data)*

Metered Data

Data Quality Narrative:

The volume of water entering process is metered and includes the volume of raw water (from the Mokelumne River) going into the surface water treatment plant and the groundwater well production. The energy consumed is likewise metered and includes energy for the surface water treatment plant, groundwater well pumping, and raw water extraction.

Narrative:

The volume of water entering the process includes all water pumped from groundwater wells and purchased water extracted from the Mokelumne River for treatment at the surface water treatment plant. The energy consumed includes energy to treat surface water at the surface water treatment plant, energy to extract raw water from the Mokelumne River, and energy to pump water from City groundwater wells. There is no additional energy used for distribution within the system or in deliveries to customers.

Urban Water Supplier: *City of Lodi*

Voluntary Energy Intensity - Wastewater & Recycled Water					
Enter Start Date for Reporting Period	7/1/2014	Urban Water Supplier Operational Control			
End Date	6/30/2015	Water Management Process			
		Collection / Conveyance	Treatment	Discharge / Distribution	Total
Volume of Wastewater Entering Process (AF)		5,717	5,214	1,201	5,214
Wastewater Energy Consumed (kWh)		0	5,631,933	0	5,631,933
Wastewater Energy Intensity (kWh/AF)		0.0	1080.2	0.0	1080.2
Volume of Recycled Water Entering Process (AF)		n/a	n/a	4,901	4,901
Recycled Water Energy Consumed (kWh)		n/a	n/a	0	0
Recycled Water Energy Intensity (kWh/AF)		0.0	0.0	0.0	0.0

Quantity of Self-Generated Renewable Energy related to recycled water and wastewater operations

0 kWh

Data Quality *(Estimate, Metered Data, Combination of Estimates and Metered Data)*

Metered Data

Data Quality Narrative:

The volume of wastewater entering the process is metered and includes the amount collected and conveyed (5,717 AF), which is not measured at the collection points; instead, it is measured as inflows to wastewater treatment plant located about 6 miles from the City. The amount of wastewater treated (5,214 AF) only includes sewer inflows from non-industrial customers (industrial wastewater is not treated and adds to recycled water available). The wastewater treatment plant uses 4 meters to measure the energy consumption for collection/conveyance and treatment (5,631,933 kWh). Discharge (1,201 AF) is by gravity flow and consumes no energy.

Recycled water, which is made up of industrial wastewater and water treated (to various levels) in the wastewater treatment plant, is already accounted for in the wastewater energy intensity. The only energy consumption that is solely dedicated to recycled water is for the pumps used to transport water to the fields in the area of the wastewater treatment plant, but that energy is impossible to separate from other wastewater treatment plant energy consumption. The collection and conveyance of recycled water is entirely gravity fed and therefore requires no energy.

Narrative:

The volume of wastewater collected and conveyed (5,717 AF) includes both industrial and other (non-industrial or mainly residential and commercial) wastewater treatment plant inflows. The industrial wastewater is not treated, so only the non-industrial wastewater is counted for the volume of wastewater treated (5,214 AF). The discharge and distribution volume includes only the wastewater ultimately discharged into Dredger Cut. The wastewater energy consumed (5,631,933 kWh) includes the energy for all wastewater treatment processes (collection/conveyance and treatment). The metering at the wastewater treatment plant (4 meters) make it such that is is not possible to separate out the energy uses individually. Distribution and discharge is by gravity flow and therefore consumes no energy.

The volume of recycled water collected/conveyed and treated is too intertwined with wastewater flows to separate. The volume in the discharge and distribution column indicates the amount of recycled water supplied for various uses in the area of the wastewater treatment plant. The energy associated with collecting recycled water was either already accounted for in wastewater collection and conveyance or was zero (i.e., gravity flow means zero energy used to collect tailwater in collection manholes from fields receiving recycled water around the wastewater treatment plant). Similarly, the energy for treatment of the recycled water was already accounted for in the energy intensity of the wastewater. There are pumps used to transport recycled water from the wastewater treatment plant to nearby agricultural fields, but the energy consumption for those pumps is impossible to separate from the other wastewater treatment plant energy consumption.

Appendix Q - Emergency Response Plan Excerpt

CITY OF LODI

PUBLIC WORKS DEPARTMENT

WATER SYSTEMS DIVISION

E M E R G E N C Y

R E S P O N S E

P L A N

Set No. ____

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PURPOSE

The mission of the City of Lodi Water Systems Division is to provide:

- Public Safety
- Water at appropriate quantities and pressures
- Water that meets Federal, State and Local drinking water standards
- Public confidence that the above criteria are met consistently and reliably, currently and in the future

During an emergency, the City of Lodi Water Systems Division must insure that our mission is met and/or restored as quickly as possible following Standardized Emergency Management System (SEMS) Guidelines.

This Emergency Response Plan (ERP) describes the emergency response procedures, available resources, and primary emergency task assignments for the Water Systems Division should an emergency occur. The emergencies addressed in this document include; flood, fire, terrorist threat, civil disturbance, malicious mischief, severe weather, earthquake, and nuclear accident. This ERP is unique to the Water Systems Division, and is intended to be used in both accordance and in conjunction with the existing City of Lodi Emergency Plan (December 1999) This ERP has been designed and organized in accordance with the statewide SEMS. As required, emergency actions taken pursuant to this plan will be conducted using the principles of SEMS, of the California Office of Emergency Services (California Government Code, Section 8607).

This plan is also intended to be used with the Water Systems Division Emergency Call-Out Directory (Attachment A) and the Federal, State, and Local Agency Assistance Directory (Attachment B) as a guide for directing division responses to emergencies.

RESPONSIBILITIES

Public Works Director (PWD)

The PWD is responsible for the management of all field actions which directly apply to returning the Water Systems Utilities to normal operation. The PWD activates various elements of the action plan and coordinates its execution. The PWD directs subordinate unit operational plans, requests and releases resources, makes expedient alterations to the action plan as required, and reports to the City Emergency Operations Center (EOC).

A. Obtain briefing from the EOC
B. Develop Water Systems Action Plan
C. Brief and assign Water Systems personnel according to the plan
D. Supervise Water Systems emergency operations
E. Determine need and request additional resources
F. Initiate recommendations for release of resources
G. Assemble and disassemble Water Systems crews
H. Report information about special activities, events, and occurrences to the EOC

At the direction of the City Manager, the Water/Wastewater Superintendent and/or Assistant Water/Wastewater Superintendent may take on all, part or alternate these duties with the Public Works Director in his absence.

Water/Wastewater Superintendent - Assistant Water/Wastewater Superintendent (AWWS)

The AWWS is responsible for assisting the PWD in the management of all field actions which directly apply to returning the operations of Water Systems Utilities to normal. The AWWS activates various elements of the action plan as directed by the PWD and coordinates its execution. The AWWS assists the PWD in developing and directing subordinate unit operational plans, requests and releases resources, assists in making expedient alterations to the action plan as required, and helps reporting such to the EOC.

A. Obtain briefing from the EOC
B. Develop Water Systems Action Plan
C. Brief and assign Water Systems personnel according to the action plan
D. Supervise Water Systems emergency operations
E. Determine need and request additional resources
F. Initiate recommendations for release of resources
G. Assemble and disassemble Water Systems crews
H. Report information about special activities, events, and occurrences to the EOC

The Water/Wastewater Supervisors may assume any responsibilities of the Water/Wastewater Superintendent - Assistant Water/Wastewater Superintendent in his absence.

Water/Wastewater Supervisors (WWS)

The Supervisors report to the PWD or the AWWS and are the top level of field operations. They are responsible for the implementation of the assigned portion of the action plan, assignment of manpower and other resources within their section, and reporting on progress of field operations and status of resources within their section.

A. Implement Action Plan
B. Provide action plan to subordinate employees
C. Identify critical elements assigned to section
D. Review section requirements with subordinates and assign tasks
E. Coordinate activities within adjacent sections
F. Determine need for assistance on assigned tasks
G. Submit situation and resource status information to PWD or AWWS
H. Resolve logistic problems within section
I. Suggest needed changes in the action plan to superiors

Water Systems Employees

The employees are responsible for performing assigned tasks as required. They also report work in progress, resource status, and other important information to the WWS.

A. Implement assigned tasks
B. Review assignments and tasks with subordinates
C. Monitor work progress and suggest changes to superiors
D. Coordinate activities with adjacent employees
E. Submit situation and resource status information to WWS

The remainder of other City personnel may be assigned WWS or Water System Employee tasks as designated at the time of the incident by the PWD and/or AWWS.

REPORTING LOCATIONS

PWD and AWWS report to the Emergency Operations Center (EOC) established by the City Manager.

All crewmembers report to control points, unless directed otherwise:

Water

Primary:	Municipal Service Center 1331 South Ham Lane
Secondary:	City Hall 221 West Pine Street

In the event of major flooding due to a dike or dam break, the above control points may be inaccessible and alternate locations will be established.

EMERGENCY CALL LIST

Refer to City of Lodi Water Systems Division Emergency Call Out Directory (Attachment A) and the Federal, State, and Local Agency Assistance Directory (Attachment B) as a guide for directing division responses to emergencies. The employees on the Call Out Directory are contacted by the City's Utility Control Center.

Appendix R - 2015 Consumer Confidence Report

ANNUAL WATER QUALITY REPORT FOR 2015

PUBLISHED APRIL 2016

SPECIAL POINTS OF INTEREST:

- This Report can also be found on the City's web site at www.lodi.gov, go to: City Departments; Public Works; Water; 2015 Water Quality Report.
- **Este informe contiene información muy importante sobre su agua potable. Tradúzcalo ó hable con alguien que lo entienda bien. Para la ayuda en español, llama por favor (209) 333-6706**
- This report follows the "Consumer Confidence Report" (CCR) format required by the U.S. Environmental Protection Agency and the State of California.

THE WATER DELIVERED TO YOUR TAP MEETS OR EXCEEDS ALL FEDERAL AND STATE REGULATIONS

Your Drinking Water System

In 2015, the Lodi surface water treatment plant provided approximately 40 percent of Lodi's drinking water. Twenty-eight computer controlled wells, located throughout the City, provided high quality groundwater. The wells operate automatically on water pressure demand so that when water use increases, more wells are started. Additionally, seven wells are equipped with Granular Activated Carbon (GAC) filtration units to ensure high quality water. More information on water supply is on the City's web site.

Seven wells are fitted with emergency diesel-powered generators. (*While these generators will help maintain water pressure during power outages, please refrain from using water during power outages to save capacity for essential uses, - hospitals, fire fighting, etc.*)

Drought - Water Savings 2015

In 2015, Lodi citizens reduced their water consumption and saved approximately **1.3 Billion Gallons** compared to water consumption in 2013. *This is equal to saving 5 Olympic-sized Swimming Pools of water **EACH** day!*

While we are still in a drought, please continue to conserve water.

Please see the City website for more information about the drought and current restrictions. http://www.lodi.gov/public_works/water_conservation.html

Water Quality Problems?

As your water provider, we want to ensure you have the best quality water possible. If you think you have a water quality issue, please let us know. Below are some suggestions for checking issues at home.

Many times, water quality problems in the home can be traced to the hot water heater, the plastic water lines under the sink to faucets, or because sewer gases from the drain are being smelled.

Set the hot water heater at the proper temperature, too hot can create heavier scaling problems, and not warm enough can allow bacteria to grow.

Other times there can be occasional water quality problems associated with the aesthetic quality of your water such as sand, which may be originating from water supply mains.

"Hard" water can be considered a quality issue depending on the actual hardness level and the use. Some industrial processes require very soft water. Lodi's groundwater is at the low end of the "hard" water range and you may see white scale or spots on plumbing fixtures.

If you have a filter or in-home treatment system; be sure it's working properly and change filters regularly.
(Note, if you use a water softener, we suggest you utilize one which is regenerated by the softener company. Self-regenerating units add salt to the wastewater, which can add significantly to the City's wastewater treatment costs.)

Low pressure can lead to water quality problems and can be caused by plugged screens in faucets or washing machine hoses, broken valves or for other reasons. If you have intermittent problems, first check pressure in other parts of your house or at an outside faucet. If that pressure is okay, check the fixture/screens at the problem area.

If you are experiencing trouble with your water and you do not think it is a problem with your on-site plumbing, please call the Municipal Utilities Department at (209) 368-5735 or (209) 333-6740 during normal business hours.

Water Conservation & You!

DROUGHT

Although there has been more rain this year , we are still in a Drought and Stage 3 restrictions are still in effect. These restrictions include the following:

* Watering restricted to twice weekly and **NO watering** is allowed on Mondays, Thursdays, or Fridays.
* **NO watering** is allowed during or within 48 hours of a measureable rain.

Please see the City's website for a full list of restrictions.

WHAT CAN I DO?

YOU are the key to Water Conservation. By being mindful of where and how water is used in and around your home, you can make a difference during this drought.

* Use a broom to clean driveways, sidewalks and patios.
* Check for leaks indoors and outdoors. Look and listen for faucet drips, running toilets, or leaking sprinkler heads. If you can hear water running and all fixtures are off, you may have a leak.
* Make sure your sprinklers are only watering your lawn and not the sidewalk or driveway.
* If water runs into the gutter during or after watering your lawn, cut your watering time in half and water twice an hour apart.

REDUCE POTENTIAL POLLUTION

DO NOT blow or place leaves, grass, or any other landscaping material into the street (except for a City scheduled leaf pickup.) Green-cycle or add to green waste cart. Read pesticides and herbicide labels carefully. More is NOT better. Follow label directions and do not apply pesticides when rain is in the forecast. Pick up animal waste from landscape areas.

QUESTIONS?

If you have any questions about what you can do, or to schedule a home water audit, please contact us at (209) 333-6829 or Conservation@lodi.gov

Lodi City Council meetings are open to the public and are scheduled for the first and third Wednesdays of each month, at Carnegie Forum 305 West Pine Street at 7:00 p.m.

You may also communicate with the Council and City staff through the City's web site: www.lodi.gov

Who are we?

In 1910 your City of Lodi Water Utility officially began operation along with the Electric Utility, and for more than 100 years, the water system has been owned by the Citizens of Lodi.

One hundred years ago there were only two wells and a few miles of water mains. In 2015 there were twenty-eight wells, over 220 miles of mains, a water tower, a 1-million-gallon storage tank and 10-Million Gallon a Day Water Treatment Plant with 3-million gallon storage.

Water rates, system expansion projects, and significant purchases are authorized by the Lodi City Council, which serves as the water utility's official regulatory body.

How Safe is My Water?

Lodi takes over 20 samples per week from throughout Lodi's water distribution system for bacterial water quality testing. In 2015, all total coliform samples in the distribution system were negative and all bacteriological standards were met.

The water receives low level chlorination as a proactive step to help keep the water system in compliance with strict bacteriological standards.

DRINKING WATER ASSESSMENT

An assessment of the drinking water sources for the City of Lodi's distribution system was completed in February 2003 and water treatment plant in August 2011. The sources are considered most vulnerable to the following activities: gas stations (current and historic), chemical/petroleum processing/ storage, metal plating/ finishing/fabricating, plastic/synthetics producers, dry cleaners, known contaminant plumes, sewer collection systems, fleet/truck/bus terminals, machine shops, utility stations-maintenance areas, agricultural drainage, and photo processing/ printing.

A copy of the completed assessment is available at the Public Works Department, City of Lodi, 2001 W Turner Road, Lodi, CA 95242. You may request that a copy be sent to you by contacting Andrew Richle at (209) 333-6878. A copy of the complete assessment is also available at the State Water Resource Control Board, Division of Water Resources, Stockton District Office at *(209) 948-7696*

MICRO-FILTRATION FIBERS AT THE SURFACE WATER TREATMENT PLANT

Kid's Corner

Watershed Word Search

T	U	G	G	L	Y	O	V	I	V	K	I	S	V	K	I	S	H	O	I	D	H	I	O	Y	J	O	I	D	L	K
E	T	R	A	W	S	K	B	L	M	O	K	E	L	U	M	N	E	P	C	R	L	U	M	N	E	P	T	S	F	K
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A	I	R	A	T	N	D	J	G	X	S	L	O	R	M	W	L	T	X	L	T	U	G	K	U	L	A	T	L	I	B
V	T	T	E	E	U	D	A	H	Y	S	T	O	R	M	W	A	T	E	R	E	T	R	A	P	T	I	T	I	K	E
W	A	T	E	R	X	F	A	T	C	N	T	N	G	Y	P	K	V	K	I	S	H	T	T	D	S	D	R	I	K	Q
T	T	F	Y	T	Z	I	T	T	E	N	W	P	O	Y	A	E	I	O	N	G	Z	Y	I	A	U	D	L	G	O	L
E	I	C	L	L	R	T	N	M	E	V	A	P	O	R	A	T	I	O	N	G	L	I	D	U	R	U	Z	Z	J	N
R	O	T	X	F	T	S	N	M	P	N	T	P	U	T	T	Y	O	A	P	Q	Y	Q	F	P	F	H	G	A	Q	Z
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Y	G	I	V	I	P	P	I	Z	R	X	H	Q	W	L	Z	H	U	I	L	U	P	B	P	L	W	V	A	U	Z	C
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N	K	O	P	T	H	L	U	M	N	E	P	T	K	Z	I	T	O	T	L	C	J	Z	G	A	R	Q	V	K	E	G

CHLORINATION
CONSERVATION
DROUGHT
ENVIRONMENT
EVAPORATION
FLOW
GROUNDWATER
HYDROLOGY
LODI LAKE
MANDATE
MOKELUMNE
PRECIPITATION
QUALITY
RAIN
RIVER
RUNOFF
SEDIMENT
STORMWATER
SURFACE WATER
TREATMENT
TRIBUTARY
WASTEWATER
WATER
WATERSHED

1. What percentage of Lodi water was surface water in 2015?
2. City Council meetings are held the 1st and 3rd _____ of each month.
3. How many gallons are in one hundred cubic feet (1 CCF)?
4. How much does one gallon of water weigh?
5. What year did Lodi's water utility officially begin operation?
6. How many gallons are in an Olympic sized pool?

Answer Key on Page 6

See a water emergency?
Call: (209) 368-5735

City of Lodi Annual Water Quality Report for 2015

Inorganic Contaminant *2013-2015 Data	MCL	PHG Or (MCLG)	Average	Range	Violation	Major sources in Drinking water
Aluminum, ppm	1	0.6	0.01	0.04-ND	No	Erosion of natural deposits; residue from some surface water treatment processes
Arsenic, ppb	10	0.004	4.1	8.9-ND	No	Erosion of natural deposits; runoff from orchards; glass and electronics production wastes.
Barium, ppm	1	2	0.1	0.24-0.02	No	Discharges of oil drilling wastes and from metal refineries; erosion of natural deposits.
Chromium, ppb	50	100	2.5	11-ND	No	Discharge from steel and pulp mills and chrome plating; erosion of natural deposits.
Hexavalent Chromium, ppb	10	0.02	1.9	5.1-ND	No	Discharge from electroplating factories, leather tanneries, wood preservation, chemical synthesis,
Fluoride, ppm	2	1	0.1	0.2-ND	No	Erosion of natural deposits; wa-ter additive that promotes strong teeth; discharge from fertilizer and
Nickel, ppb	100	12	0.4	2.1-ND	No	Erosion of natural deposits; discharge from metal factories.
Nitrate as N, ppm	10	10	3	8-ND	No	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
Bacteriological Contaminant 2015 Data	**MCL**	**PHG Or (MCLG)**	**Total Positive**	**Range**	**Violation**	**Major sources in Drinking water**
Total Coliform, Positive	5%/month	0	0%	0%	No	Naturally present in the environment
Fecal Coliform & E. coli	>1 /month	0	0	0	No	Human and animal fecal waste
Radiological Contaminant 2015 Data	**MCL**	**PHG Or (MCLG)**	**Average**	**Range**	**Violation**	**Major sources in Drinking water**
Gross Alpha, pCi/L	15	0	5.7	9.29-0.88	No	Erosion of natural deposits
Uranium, pCi/L	20	0.43	4.14	10.0-1.41	No	Erosion of natural deposits
Organic Contaminant 2015 Data	**MCL**	**PHG Or (MCLG)**	**Average**	**Range**	**Violation**	**Major sources in Drinking water**
Tetrachloroethylene (PCE), ppb	5	0.06	0.1	1.7** - ND	No	Discharge from factories, dry cleaners, and auto shops (metal degreaser)
Dibromochloro-propane (DBCP), ppt	200	1.7	67	160**-ND	No	Banned nematocide that may still be present in soils due to runoff/leaching from former use on vineyards.

Secondary Standards Aesthetic Purposes (see note) *2013-2015 Data	Secondary MCL	Average	Range	Secondary Standards Aesthetic Purposes (see note) *2013-2015 Data	Secondary MCL	Average	Range
Chloride, ppm	500	13.5	42-2.0	Sulfate, ppm	500	14.8	34-ND
Color-Units	15	1	5-ND	Total Dissolved Solids, ppm	1000	263	510-57
Specific Conductance, umhos/cm	1600	357	730-83	Turbidity, NTU Units	5	0.21	3.5-ND
Odor---Threshold, Units	3	1.1	2.0-1.0	Manganese, ppb	50	1	11.1-ND

Note: Secondary Standards are aesthetic and only associated with taste, color, and other problems which are not a health risk.

Lead & Copper Rule Customer Tap Monitoring 2015 Data	MCL	PHG Or (MCLG)	Average	Range	Violation	Major sources in Drinking water
Lead, 90th %, ppb	AL = 15.0	0.2	1	38 sites sampled; 0 sites over action level.	No	Internal erosion of household plumbing systems; erosion of natural deposits
Copper, 90th %, ppm	AL = 1.3	0.3	0.3	38 sites sampled; 0 sites over action level.	No	

Other non-regulated water constituents found in your water (for your information only)					
Constituents, *2013-15 Data	Average	Range	Constituents, *2013-15 Data	Average	Range
Total Hardness, ppm as CaCO3	130	330-17	Potassium, ppm	5.3	10-1.7
Total Hardness, grains/gal.	7.6	19.3-1.0	Alkalinity (bicarbonate), ppm	169	350-34
Calcium, ppm	16.9	73-1.0	pH, in pH units	7.9	8.2-7.3
Sodium, ppm	21.2	41-2.1	Magnesium, ppm	14	35-1.4

* Regulations call for monitoring of some constituents less than once per year because the concentrations of these constituents do not change frequently. Therefore, some of our data, though representative, are more than one year old.

** Averages are used for compliance determination due to the variable nature of individual analyses, and due the fact that any associated theoretical risks are not acute, but theoretically only after years of exposure to levels above MCLs.

Disinfection Byproducts, Disinfection Residuals, and Disinfection Byproduct Precursors						
Regulated Contaminant 2015 Data	MCL	PHG Or (MCLG)	Average	Range	Violation	Major sources in Drinking water
Chlorine, ppm	4	4	0.5	2.2-0.1	No	Drinking water disinfectant added for treatment.
Control of DBP precursors (TOC), ppm	TT	N/A	1.4	1.8-1.3	No	Various natural and manmade sources.
TTHM (Total Trihalomethanes), ppb	80	N/A	28	46-ND	No	Byproduct of drinking water disinfection.
HAA5 (Haloacetic Acids), ppb	60	N/A	13	18-ND	No	Byproduct of drinking water disinfection.

Sampling Results Showing Treatment of Surface Water Sources							
Contaminant	MCL	PHG	Level Found	Range	Sample Date	Violation	Typical Source
Turbidity	TT = 0.5 NTU	N/A	0.04	N/A	2015	No	Soil runoff
	TT = 95% of samples ≤ 0.1 NTU		100%	N/A			

Terms and Abbreviations Used

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

Notification Level (NL): Health-based advisory levels established by DHS for chemicals in drinking water that lack maximum contaminant levels (MCLs).

Primary Drinking Water Standard or PDWS: MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

mg/L or ppm: Milligrams per liter, or parts per million (one ppm equals a concentration of about one cup in a 60,000 gallon swimming pool).

µg/L or ppb: Micrograms per liter, or parts per billion (one ppb equals about 4.5 drops in a 60,000 gallon swimming pool).

ppt: Parts per trillion (one ppt equals less than 1/200 of a drop in a 60,000 gallon swimming pool).

pCi/L: Picocuries per liter (a measurement of radiation).

NA: Not Applicable.

ND: Not Detected at measurable amounts for reporting purposes.

Grains/gal: Grains per gallon. A hardness measurement often used for softeners and dishwashers. (17.1 mg/L = 1 grain/gal as calcium carbonate).

umhos/cm: Micromhos per centimeter (a measurement of conductance).

< Means less than the amount shown.

> Means more than the amount shown.

Water Quality

Lodi is fortunate in having a high quality groundwater supply. However, that supply is at risk and must be carefully managed. The following section describes some of these measures.

PCE/TCE

The City, working with regulatory agencies and potentially responsible parties in a cooperative manner, is pursuing a resolution to a groundwater contamination problem in the north and central Lodi area. While no operating wells are out of compliance with any drinking water standards, the contamination is a serious threat.

PCE (Tetrachloroethylene) and TCE (Trichloroethylene) have been detected in samples taken in soils and groundwater. The City's consultants have developed a computer model of the groundwater, which will enable the City to optimize the number, size and location of wells to accomplish the cleanup in an efficient manner. The City's share of these costs has largely been determined and funding secured through insurance company settlements has been set aside to pay for this work. More information on this can be found on the City's website.

DBCP

Dibromochloropropane (DBCP) was used by area farmers to kill nematodes in vineyards. DBCP was banned in California in 1977, but is still present in trace levels in some groundwater. The City of Lodi used 26 (of 28) wells to provide drinking water in 2015. The wells are rotated so over the course of time, water being delivered is a blend from these wells. Thirteen of Lodi's wells have no detectable DBCP. Seven wells have filters to remove DBCP. All wells used in 2015 met State and Federal standards. The result is that the people of Lodi are being served water below the DBCP level deemed safe by the U.S. EPA and the State of California.

In 1996 the City settled a lawsuit against DBCP manufacturers, who have already paid the City for a large portion of Lodi's costs related to DBCP treatment. These manufacturers will continue to pay a large portion of the City's DBCP related costs for the settlement's 40-year term.

CRYPTOSPORIDIUM

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes Cryptosporidium, the most commonly-used filtration methods cannot guarantee 100 percent removal. Our monitoring indicates the presence of these organisms in our source water. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of Cryptosporidium may cause cryptosporidiosis, an abdominal infection.

Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people, infants and small children, and the elderly are at greater risk of developing life threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Granular Activated Carbon (GAC) Filtration Units

Water Service Data:

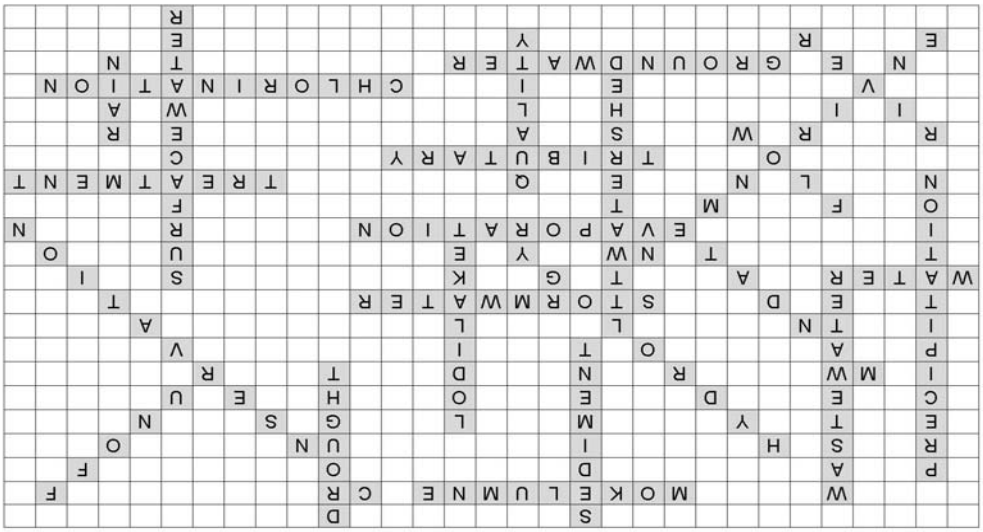
Population:	63,719
Water Accounts:	25,222
Accounts Metered:	13,842.

2015 Water Produced:

Wells:	2,271 Million Gallons
SWTF:	1,619 Million Gallons
Total:	3,891 Million Gallons

2015 Water Use *(Gallons per Capita per Day)

108 GPCD *Residential*
167 GPCD Total



Answers:

1. 40%
2. Wednesday
3. 748 gallons
4. 8.34 Lbs
5. 1910
6. 660,430 gallons

What Contaminants May Be in My Water?

THE FOLLOWING MESSAGES ARE REQUIRED BY THE U.S. EPA AND THE STATE OF CALIFORNIA. NOT ALL PORTIONS OF THESE MESSAGES NECESSARILY APPLY TO LODI'S WATER SUPPLY

- Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at (1-800-426-4791).
- Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/ Centers for Disease Control (CDC) guidelines on appropriate means to lesson the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).
- The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, that may come from sewage treatment plant, septic systems, agricultural livestock operations, and wildlife.
- Inorganic contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- Pesticides and herbicides, that may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems.
- Radioactive contaminants, that can be naturally occurring or be the result of oil and gas production and mining activities.
- In order to ensure that tap water is safe to drink, US Environmental Protection Agency (USEPA) and the State California Department of Health Services (Department) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that must provide the same protection for public health.
- If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City of Lodi is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Other Contaminants

RADON is a naturally occurring radioactive gas that you can't see, taste, or smell. It is found throughout the U.S. Radon can move up through the ground and into a home through cracks and holes in the foundation. Radon can build up to high levels in all types of homes. Radon can also get into indoor air when released from tap water from showering, washing dishes, and other household activities. Compared to radon entering the home through soil, radon entering the home through tap water will in most cases be a small source of radon in indoor air. Radon is a known human carcinogen. Breathing air-containing radon can lead to lung cancer. Drinking water containing radon may also cause increased risk of stomach cancer. If you are concerned about radon in your home, test the air in your home. Testing is inexpensive and easy. Fix your home if the level of radon in your air is 4 picocuries per liter of air (pCi/L) or higher. There are simple ways to fix a radon problem that aren't too costly. For additional information, call your State radon program (1-800-745-7236), the EPA Safe Drinking Water Act Hotline (1-800-426-4791), or the National Safe Council Radon Hotline (1-800-SOS-RADON).

ARSENIC: While your drinking water meets the federal and state standard for arsenic, it does contain low levels of arsenic. The arsenic standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The U.S. Environmental Protection Agency continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

NITRATE: The following message is required for systems that have some sources containing Nitrate below the standard of 10 ppm (as N), but over half (5 ppm) of the standard. The average of Lodi's water is 3 ppm and the highest analysis is 8 ppm.

Nitrate in drinking water at levels above 10 mg/L is a health risk for infants of less than six months of age. Such nitrate levels in drinking water can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin. Nitrate levels above 10 mg/L may also affect the ability of the blood to carry oxygen in other individuals, such as pregnant women and those with certain specific enzyme deficiencies. If you are caring for an infant, or you are pregnant, you should ask advice from your health care provider.

City of Lodi
P.O. Box 3006
Lodi, CA 95242

FOR MORE INFORMATION

If you have any questions about this report or Lodi's water quality, please contact:

City of Lodi
Brian Longpre
Laboratory Services Supervisor
Telephone: (209) 333-6749
E-mail: blongpre@lodi.gov

- ✓*Low Flow Toilet*
- ✓*WaterSense Certified Toilet*
- ✓*Low Flow Shower Heads*
- ✓*EPA WaterSense Certified Showerhead - ≤ 2.0 gpm*
- ✓*Rain Barrel*
- ✓*Energy Star Certified High Efficiency Clothes Washer (HEW) with water factor of ≤4.0*
- ✓*Replacement Automatic Sprinkler Timers*
- ✓*Hose Bib Manual Timers*

Water Conservation Rebates

The City of Lodi offers rebates on the purchase and installation of water conserving devices at residential and commercial water utility customers within the City of Lodi. Since June 2015, additional rebates are available.

Rebates must be submitted within **120 days of purchase** to be eligible. The program is funded by the Water and Wastewater Utilities. Please contact the Water Conservation Program at (209) 333-6829 or at Conservation@lodi.gov for information and additional requirements of the rebate program.

Appendix S - Water Conservation Ordinance

Article III. - Water Conservation

13.08.220 - Waste.

The waste of water is prohibited and any waste shall make the person subject to the provisions of this article.

(Ord. No. 1917, § 2, 11-18-2015)

13.08.230 - Defined.

"Waste of water" includes but is not limited to any of the following acts or omissions, whether willful or negligent:

A. Failure to repair or correct a controllable leak or discharge of water, excessive overspray, and/or low head fixture leakage that results in the flow of water to an impervious surface;
B. The watering of lawns, flower beds, landscaping, ornamental plants or gardens on days or at times other than those allowed in Section 13.08.240 of this article;
C. Washing of sidewalks, driveways, parking areas, tennis courts, patios, streets or other exterior paved areas or buildings except when required to remove any spillage of substances that may be a danger to public health or safety;
D. Washing with water any motor vehicles, trailers or movable equipment other than with a bucket and rinsing the vehicle or equipment by use of a hose for not more than three minutes;
E. Use of a hose without a positive shut off nozzle;
F. The excess watering of any area so that water flows into a gutter or any drainage area;
G. The unnecessary running of water in any residential, commercial or industrial establishment onto the floor, pavement, ground or into any drain or drainage area, with any equipment or in any way;
H. Watering of lawns or landscapes during or within forty-eight hours following a measurable rain;
I. Operation of a water fountain or other decorative water feature that does not use recirculated water.

(Ord. No. 1917, § 2, 11-18-2015)

13.08.240 - Watering days/hours.

A. Days. The watering of lawns, flower beds, landscaping, ornamental plants or gardens throughout the year shall be allowed as follows:
    1. Premises having odd numbered street addresses on Wednesday, Friday and Sunday;
    2. Premises having even numbered street addresses on Tuesday, Thursday, and Saturday;
    3. No watering will be allowed on Mondays.
B. Hours. Watering of lawns, flower beds, landscaping, ornamental plants or gardens shall not be allowed at any hour between the hours of ten a.m. and six p.m.
C. City owned parks, due to their size and use patterns, are exempt only from the provisions of Sections 13.08.240(A) and 13.08.240(B) of this code.
D.

Upon city declaration of a local water shortage or a state of emergency declared by the governor concerning California's water supplies, the public works director or designee may impose revised and/or additional water conservation measures on residential, commercial, and industrial water users. No person shall use, or cause to be used, city water in violation of such limitations. Violations of revised and/or additional conservation measures imposed under this section are punishable as a misdemeanor.

(Ord. No. 1917, § 2, 11-18-2015)

13.08.250 - Enforcement procedures.

A. Whenever the city becomes aware of a waste of water, the city shall notify the person at the premises where the waste of water occurred by delivering an information sheet. The information sheet shall describe the waste of water in order that it be corrected, cured or abated immediately or within seventy-two hours. In addition, the information sheet may be given to any other person known to the city who is responsible for that waste of water or the correction thereof and may be delivered to the premises every time a waste of water occurs. Additionally, a written notice stating the date(s), time(s) and type(s) of water waste shall be delivered to the person who regularly receives the utility bill for the premises where the wasting occurred.

B. In the event of a second waste of water within a consecutive twelve-month period, the city will send a written notice assessing a surcharge in an amount determined from time to time by city council resolution, and the surcharge shall be added to the next monthly utility bill for the property on which the waste of water occurred.

C. In the event of a third waste of water within twelve months of any previous waste of water, a written notice will be mailed assessing a surcharge in an amount determined from time to time by city council resolution and the surcharge shall be added to the next monthly utility bill for the property on which the waste of water occurred.

D. In the event of a fourth waste of water within twelve months of any previous waste of water, a written notice will be mailed assessing a surcharge in an amount determined from time to time by city council resolution, and the surcharge shall be added to the next monthly utility bill for the property on which the waste of water occurred.

E. In the event of a fifth waste of water within twelve months of any previous waste of water, a written notice will be mailed assessing a surcharge in an amount determined from time to time by city council resolution, and the surcharge shall be added to the next monthly utility bill for the property on which the waste of water occurred. If the property is not already metered, the city may also require the owner or user to pay for the cost of installation of a water meter service as a prerequisite to continuing water service. The city may also install a flow restriction device on the water service and require the owner or user to pay for the costs of installation and/or removal.

F. In the event of any subsequent waste of water within twelve months of any previous waste of water, the city may disconnect a customer's water service for willful violations of restrictions in this chapter, in addition to assessing a surcharge in an amount to be determined from time to time by city council resolution. The property owner or user will be required to pay all outstanding utility charges, fees, penalties and surcharges, in addition to a reconnection charge in an amount to be determined from time to time by city council resolution, prior to reconnection of water services.

(Ord. No. 1917, § 2, 11-18-2015)

13.08.260 - Strict application.

If the public works director or designee determines the strict application of any of the provisions of this article may cause undue hardship or public health and safety risk, or if other special circumstances exist, the strict application of this article may be waived. Requests for relief under this article must be received by the city at least twenty-four hours prior to special circumstances. Special circumstances would include, but not be limited to: newly planted areas, newly seeded areas, washing down after cement work and pressure washing a building before painting. The decision of the public works director may be appealed to the city council as described in Section 13.08.270 of this article.

(Ord. No. 1917, § 2, 11-18-2015)

13.08.270 - Appeals.

If the ruling made by the public works director or designee is unsatisfactory to the person requesting consideration, the person may, file an appeal directed to the city manager or designee, whose decision may, upon request be subject to final review by the city council. The public works director or designee's decision, action or determination shall remain in effect during such period of reconsideration except that any surcharges assessed under this article will be stayed until the city council has made its decision. Decisions of the city council are final.

(Ord. No. 1917, § 2, 11-18-2015)

13.08.280 - Violation—Infraction.

In addition to the administrative enforcement procedures and surcharges set forth in this article, each violation of this article may be punishable as an infraction.

(Ord. No. 1917, § 2, 11-18-2015)

13.08.290 - Emergency water conservation—Purpose.

The purpose of emergency water conservation is to assist meeting water pressure and/or supply demands when the water system cannot or may not be adequate and the failure to meet such demands may result in harm to the water system and/or jeopardize the health and safety of the public. In addition, emergency water conservation serves to protect water supplies during drought conditions. The public works director or designee shall determine the degree of emergency and determine what additional restrictions of water use or other appropriate actions must be taken to protect the water system, supply demands, and the citizens of Lodi.

(Ord. No. 1917, § 2, 11-18-2015)

Appendix T - Water Waste Information Sheet

NEW STAGE 3 RESTRICTIONS

EFFECTIVE MAY 2015

Public Works Department
Water Conservation Office
(209) 333-6829
Conservation@lodi.gov

INFORMATION SHEET

Requirements of the City of Lodi Water Conservation Stage 3 Restrictions

****

Ordinance Requirements - Water Waste includes but is not limited to:

1. Allowing a controllable leak of water to go unrepaired, for more than 72 hours. (Broken Sprinkler etc.)
2. Watering lawns, flower beds, landscaping, ornamental plants or gardens except on watering days as follows: **Odd**-numbered addresses on Wednesday and Sunday; **Even**-numbered addresses on Tuesday and Saturday. **(Watering is not allowed on Monday, Thursday and Friday)**
3. Watering lawns, flower beds, landscaping, ornamental plants and gardens between **10 a.m. and 6 p.m. (Watering between those hours is not allowed)**
4. Washing down sidewalks, driveways, parking areas, tennis courts, patios, other paved areas or buildings.
5. Washing any motor vehicle, trailer, boat, moveable equipment except with a bucket. A hose shall be used for rinsing only and not for more than three (3) minutes.
6. Use of a hose without a positive shut off nozzle. **(NO OPEN HOSES)**
7. Allowing excess water to flow into a gutter or any drainage area for longer than three (3) minutes.
8. Overwatering lawns/landscapes, especially from November 1 through February 28, and during or within 48 hours immediately after a rain.

****

Water Wasting Rates and Enforcement -

Education and cooperation is our first goal, but the following enforcement procedures and charges will be followed for water wasting.

1st **Waste Water** -City will leave an information sheet describing the waste so that it may be corrected.

2nd **Water Waste ***-City will give written notice requiring corrective action. * Within 12 months of a 1st waste of water.

3rd **Water Waste ***-City will give written notice, and a $35 charge will be added to the next utility bill. * Within 12 months of a 2nd water waste.

4th **Water Waste ***- City will give written notice, and a $75 charge will be added to the next utility bill * within 12 months of a 3rd water waste.

5th **and Subsequent Water Waste ***- City will give written notice, and a $150 charge will be added to the next bill **AND** the City may require a water meter and/or flow restrictor to be installed at the waster's expense.* within 12 months of the previous water waste.

****

Water saving tips and other Water Conservation Program information:

1. **Before washing down paved areas for public health or safety** (see #4 above) or for any special circumstances call the Water Conservation Office at 333-6829 for prior approval.
2. If you need **extra watering due to fertilizer application or for new turf/seeding**, please **first notify the Water Conservation Office** at 333-6829.
3. For lawns with a **run-off problem**, apply water for a short period of time and then allow enough time for it to soak in before turning the water back on, for example; 5 minutes on, 20 minutes off, 5 minutes on. This will increase the amount of water being absorbed and decrease the amount of water running into the gutters. Consult landscapers/gardeners/nurseries for improving your lawns water absorbing capacity and for other ideas.
4. During and following rain it is NOT necessary to water lawns and landscaping, and normally from November 1 through February 28, one watering per week or less is more than enough.
5. Regularly replace your back-up batteries back in your automatic sprinkler controls to prevent excess watering due to power failures or interruptions.

****

If you have any questions, need to discuss any violations, would like further information concerning water conservation, or to report water waste, please call the Water Conservation office at (209) 333-6829.

This is Not a Citation. However, if you have received any previous notice within the last 12 months, a written notice may follow.

MSC - 216 **See reverse for full Water Conservation Ordinance** **(Revised 6/15)**

NOTE: Watering days during stage III crisis are more restrictive.

WATER CONSERVATION ORDINANCE

Lodi Municipal, Chapter 13.08, Article III

*** STAGE III CRISIS REQUIREMENTS (ON FRONT) ARE MORE RESTRICTIVE**

Waste (Section 13.08.220)

The water waste is prohibited and any waste will make the person subject to the provisions of this article.

Defined. (Section 13.08.230)

Waste of water" includes but is not limited to the following:

A. Failure to repair a controllable leak of water;

B. The watering of lawns, flowerbeds, landscaping, ornamental plants or gardens on days or at times other than those allowed in Section 13.08.240 of this article;

C. Washing of sidewalks, driveways, parking areas, tennis courts, patios, streets or other exterior paved areas or buildings except when required to remove any spillage of substances that may be a danger to public health or safety;

D. Washing with water any motor vehicles, trailers or moveable equipment other than with a bucket and rinsing the vehicle or equipment by use of a hose for not more than three minutes;

E. Use of a hose without a positive shutoff nozzle;

F. The excess watering of any area so that the water flows into a gutter or any drainage area for a period exceeding three minutes;

G. The unnecessary running of water in any residential, commercial or industrial establishment onto the floor, pavement, ground or into any drain or drainage area, with any equipment or in any way for more than three minutes;

H. Overwatering of lawns or landscapes from November 1 through February 28, or during or immediately following a rain.

Watering days/hours. (Section 13.08.240)

A. Days: The watering of lawns, flowerbeds, landscaping, ornamental plants or gardens throughout the year shall be allowed as follows:

1. Premises having odd numbered street addresses on Wednesday, Friday and Sunday.
2. Premises having even numbered street addresses on Tuesday, Thursday and Saturday.

B. Hours: Watering of lawns, flower beds, landscaping, ornamental plants or gardens shall be allowed at any hour except that between May 1 and September 30 (inclusive) of each year watering between the hours of 10 a.m. and 6 p.m. is prohibited.

Enforcement Procedures. (Section 13.08.250)

A. Whenever the City becomes aware of a waste of water, the City shall notify the person at the premises where the waster of water occurred by delivering an Information Sheet. The Information Sheet shall describe the waste of water in order that it be corrected, cured or abated immediately or within such specified time as the City believes is reasonable under the circumstances. In addition, the Information Sheet may be given to any other person known to the City who is responsible for that waste of water or the correction thereof and may be delivered to the premises every time a waste of water occurs.

B. In the event of a second waste of water within a 12 month period, the City will send a written notice stating the date(s), time(s) and type(s) of water waste to the person who regularly receives the utility bill for the premises where the wasting occurred.

C. In the event of a third waste of water within 12 months of any previous waste of water, a written notice will be mailed assessing a thirty-five dollar charge to be added to the next monthly utility bill.

D. In the event of a fourth waste of water within 12 months of any previous waste of water, a written notice will be mailed assessing a seventy-five dollar charge to be added to the next monthly utility bill.

E. In the event of a fifth or any subsequent waste of water within 12 months of any previous waste of water, a written notice will be mailed assessing a one hundred and fifty dollar charge to be added to the next monthly utility bill.

The City may also require the owner or user to pay for the cost of installation of a water meter service as a prerequisite to continuing service. The City may also install a flow restriction device on the water service and require the owner or use to pay for the costs of installation and/or removal.

Strict Application (Section 13.08.260)

If the Public Works Director or a designated representative determines the strict application of any of the provisions of this article may cause undue hardship or public health or safety to suffer, or if other special circumstances exist, the strict application may be waived. Special circumstances would include, but not be limited to: newly planted areas, newly seeded areas, washing down after cement work and pressure washing a building before painting. The decision of the Public Works Director may be appealed to the City Council as described in 13.08.265 of this article.

Appeals (Section 13.08.270)

If the ruling made by the Public Works Director is unsatisfactory to the person requesting reconsideration, the person may, within twenty days after notification of the City's action, file a written appeal to the City Council. The written appeal shall be heard by the City Council within twenty days from the date of filing. The City will make a filing ruling on the appeal within twenty days of the hearing. The Public Works Director's decision, action or determination shall remain in effect during such period of reconsideration except that any changes assessed under this article will be stayed until the City Council has made its decision.

Violation-Infraction (Section 13.08.280)

In addition to the enforcement procedures and surcharges set forth in this article, any person who wastes water, as defined in this article, may also be charged with an infraction.

Emergency water conservation-Purpose (Section 13.08.290)

The purpose of emergency water conservation is to assist meeting water pressure and/or supply demands when the water system cannot or may not be adequate and the failure to meet such demands may result in harm to the water system and/or jeopardize the health and safety of the public. The Public Works Director or a designated representative shall determine the degree of emergency and determine what additional restrictions of water use or other appropriate actions must be taken to protect the water system and the citizens of Lodi.

Appendix U - Public Outreach and Rebate Programs

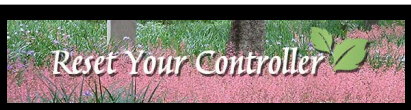
River-Friendly Landscaping is...

an environmentally friendly way of gardening. River-Friendly Landscaping practices are designed to conserve water, reduce yard waste, and prevent pollution of our air and local rivers.

Benefits

Benefits to you:

- Saves money by reducing water, fertilizer, and pesticide use
- Requires less maintenance such as mowing and trimming
- Reduces yard waste



UC Master Gardener Blog

saveourwater.com

Lower Mokelumne River Watershed User's Guide

Water Saving Tips:

Apply as little fertilizer as possible.

If you use fertilizer make sure it stays on the landscape, and carefully water it in so there is NO runoff.

San Joaquin Master Gardener's drought/water conservation resources.

Stormwater Pollution prevention ideas.

Take Our Survey

Partners honored for making a difference. Learn more...

To learn more about gardening in the San Joaquin Valley, go to the University of California Master Gardeners' website

Lodi Lawn and Gardening Watering Guide

Rebates

Storm Drain Detectives - Monitoring the Mokelumne River - Check Out Our Data (Data since 2000 available!)

Attracts wonderful birds and butterflies to your garden

Benefits to the community and the environment:

- Saves landfill space
- Reduces air pollution by reducing the amount of yard waste that is transported to the landfill
- Improves water quality by reducing pollution

Examples

Check out the following for examples of River-Friendly Landscaping:

- EcoLandscape California
- Water-Wise Gardening in the Gold Country Region
- Water Smart Gardening Websites

Be Green - in San Joaquin

Water Use Classifications of Landscape Species (WUCOLS) provides a guide to estimating irrigation water needs of landscape plantings in each of 6 distinct California climate regions. WUCOLS was developed by the University of California Cooperative Extension in cooperation with landscape professionals and funded by the California Department of Water Resources. Try their plant database search tool.

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The City's Public Works Department would like to invite Lodi Citizens to join us for:

"Water Conservation & You"

Cottage Room • Hutchins Street Square

5:00 pm on March 16th

The Staff Will Present:

- Learn about how to tell if you have a leak
- Learn about runoff from sprinklers and how it affects the health of Lodi Lake and Mokelumne River.

If You Have Questions?
Please Contact Us At:

Surface Water Treatment Plant
2001 W. Turner Rd. • 209-333-6829

CITY OF LODI
CALIFORNIA

City's Public Works Department would like to invite you and Lodi Citizens to join us for:

"Water Conservation & You"

Cottage Room
Hutchins Street Square
6:00 pm on March 18th

The Staff Will Present:

- An Overview of Lodi's Water System.
- Learn about Water Conservation and How You Can make a difference.

If You Have Questions? Please Contact Us At:

Municipal Service Center

1331 South Ham Lane, Lodi, CA 95242

209-333-6800

CITY OF LODI CALIFORNIA

WINTER IS HERE!

WHEN THE WEATHER TURNS RAINY AND COLD, REMEMBER YOU STILL NEED TO CONSERVE WATER!

Water Conservation Tips

Below are some tips on how you can conserve during the winter months:

- Remember to turn off sprinkler system during and immediately after day of rain!
- Water with the weather – As the days grow colder and shorter and the winter rains arrive, your landscape requires very little or no water.
- Most plants are dormant, even if they're still green.
  Our seasonal rains provide all the water they need. Remember, over watering causes more problems than under watering. Only water during extended dry spells.
- Aerate your soil/ lawn to improve its ability to hold water from the rain.
- Install a rain collection system – You can capture rain water from downspouts around your home and use it to water indoor and outdoor plants.

For questions or to report water waste, contact: Water Conservation Office at 209-333-6829

WASTEWATER CHARGES

Winter Water Use Affects Next Year's Charges

Did you have a water meter installed last year and are currently being billed for you water usage? If so, please read below.

If you started paying for your water based on metered usage beginning in January 2014, things are going to change. Beginning July 2015, your wastewater bill will no longer be a flat rate and will be based on your metered water use in the winter months. (Typically December, January, and February).

CHECK YOUR USAGE

- You may request a Water Meter Usage report from the Finance Department by calling 209-333-6719.
- If your meter was installed in **2013**, you may view your water meter usage on the following website:

http://www.lodi.gov/Water/Watercompare.asp

Enter your Account Number and Customer Number, without any preceding zeroes (e.g., if your account number is 0001234-5, please enter only 1234).

Easy Ways to Reduce Water Use

Indoors – Year Round Savings

- Find and fix all leaks, especially toilet leaks, replace their flappers.
- Install water-saving devices like low-flow showerheads and faucet aerators.
- Consider buying a frontloading clothes washer to save water and energy.
- Consider buying a High Efficiency Toilet (HET), which uses 1.28 gallons or less per flush.
- Take advantage of Lodi's rebates on new High Efficiency Toilets, shower heads, etc.
- Take shorter showers, cut your shower to 4 minutes to save around 2,700 gallons per year.
- Don't leave the water running when brushing your teeth, washing your hands, shaving, or doing the dishes.
- Run dishwashers and clothes washers with full loads only, or adjust the water level to match the size of the load.
- Use the garbage disposal only if you must.
- Use the wastebasket, not the toilet to dispose of trash.

Outdoors – Watering & Gardening

- Attach a nozzle with a shutoff valve to the end of your hose.
- Apply water only as fast as the soil can absorb it. If you notice runoff, divide the watering time into two cycles to allow the water time to soak in.
- Consider installing drip irrigation to apply water slowly and directly to the roots of the plants.
- Water your garden in the morning to give the water time to soak into the ground before wind and the heat of the sun cause it to evaporate.
- Water to the depth of the plant roots (about 6 inches for lawns, 9 inches for ground cover, 12 inches for shrubs, and 18-24 inches for trees).

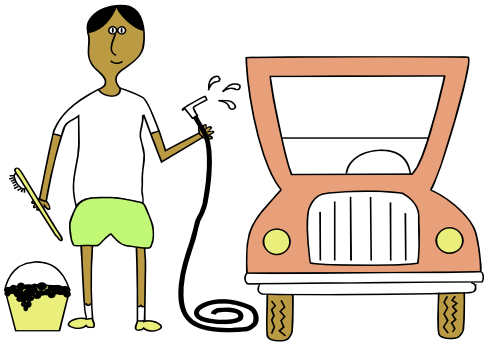
City of Lodi
1331 S. Ham Lane, Lodi CA 95242
209-333-6740

http://www.lodi.gov/public_works/water_conservation.html

- Use a soil probe (or dig down in the plant's root area using a trowel) to determine if you are watering properly.
- Water your garden only when it needs it. It is time to water the lawn when it doesn't spring back when walked on.
- Aim your sprinklers to water your garden, not the sidewalk or other paved areas and check your sprinkler system for problems regularly.
- Adjust your watering schedule with the weather and the season. If you have an automatic system, remember to turn it off in the winter.
- Plant water-conserving plants.
- Group thirsty plants together, away from un-thirsty ones and adjust your watering schedule as your garden matures. Newly planted landscapes need water more frequently than mature ones.
- Improve your soil by incorporating organic matter. This aerates your soil, and improves its ability to hold water.
- Prevent weeds from stealing water from your garden by pulling them promptly and applying mulch regularly.
- Mow grasses higher, between 3 to 4 inches, to reduce water loss.
- Fertilize less often, only in the spring and fall. Fertilizing encourages rapid plant growth and thirsty plants. California native plants don't need fertilizing.
- Aerate the lawn by punching holes in the soil. This improves the movement of water into the root area and reduces wasteful runoff.

Outdoors – Other Activities

- Use a broom, not a hose, to clean driveways and sidewalks.
- Cover pools and spas, and cut water loss by 90%.
- Don't let the hose run while you wash your car; use a bucket and nozzle with a shut off valve on your outside hose.

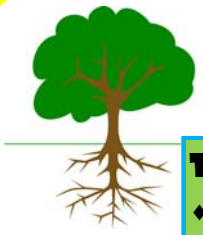


For questions or to report water waste, contact:
Water Conservation
209.333.6829
E-mail:
Conservation@lodi.gov

YOU CAN STILL CONSERVE WATER DURING THE HEAT!

- ***Don't let your trees die, just because you are not watering your lawn.*** Make sure you water the outer edges of the tree canopy branches, instead of the trunk to water the roots sufficiently. Apply mulch around the base instead of rocks which absorb heat.
- ***Regularly replace your back-up batteries*** in your automatic sprinkler controls to prevent excess watering due to power failures. Check for broken or leaking sprinkler heads.
- ***If you notice water run off into your gutters,*** cut back your watering time by 50%, if it needs more then gradually increase minutes on timer. Adjust sprinkler heads so they water your lawn and not the sidewalk.
- ***Consider new landscaping,*** use drought tolerant or water wise native plants.
- ***To avoid evaporation from the summer heat,*** water before 10 a.m. and after 6 p.m.

Please visit our website for more water saving tips and Water Conservation Rebate information: www.lodi.gov



Para preguntas o para reportar el desperdicio de agua, comuníquese con: Conservación Del Agua
209.333.6829
E-mail:
Conservation@lodi.gov

TODAVÍA PUEDE CONSERVAR AGUA DURANTE EL CALOR!

- ***No deje que sus árboles mueran,*** sólo porque no está regando el césped. Asegúrese de que riegue abajo de los bordos exteriores de las ramas del los árboles, en lugar del tronco para regar las raíces suficientemente. Aplicar abono alrededor de la base, en lugar de piedras que absorben calor.
- ***Regularmente reemplaze sus baterías*** de respaldo en sistema de irrigación para evitar el exceso de riego, debido a fallas de energía. Compruebe si hay aspersores rotos o con fugas.
- ***Si nota que la agua corra en el desagüe***, reduzca su tiempo de riego por 50%, si necesita más agua, puede aumentar gradualmente minutos. Ajuste las cabezas de los aspersores para que rieguen su césped y no las banquetas.
- ***Considere la posibilidad de un nuevo paisaje,*** utilice plantas nativas y tolerantes a la sequía.
- ***Para evitar la evaporación del calor de verano***, rigue antes de las 10 am y después de las 6 pm.

Favor de visitar el sitio web para obtener más consejos de ahorro de agua y de información sobre el Rembolso de Conservación Agua: www.lodi.gov

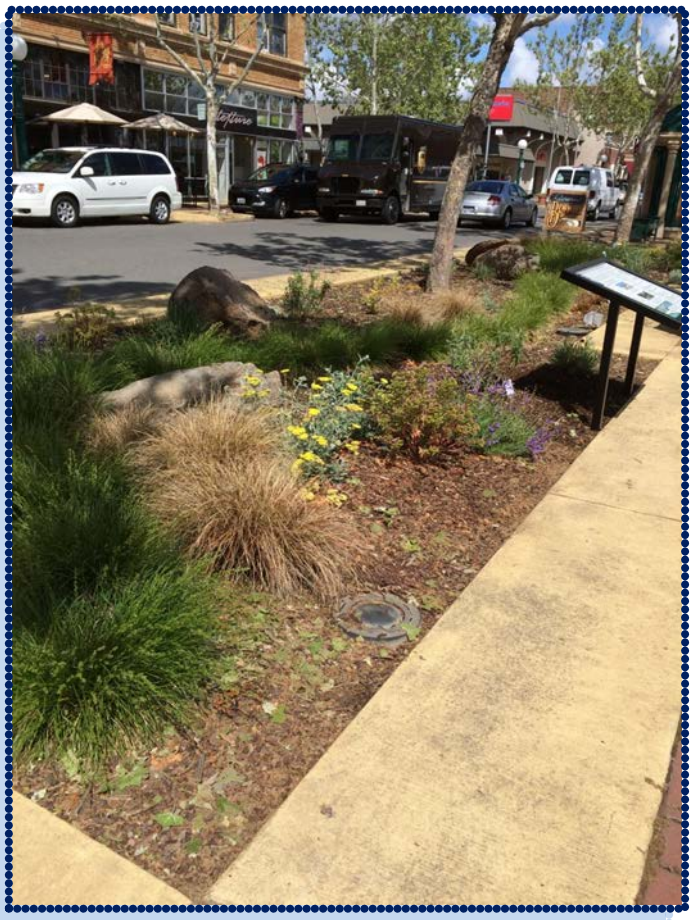
Press Release

To: The Lodi News Sentinel; The Record
From: City of Lodi- Public Works
Date: April 13, 2015

DEDICATION DAY!

City of Lodi's River-Friendly Demonstration Garden and Art in Public Places Great Blue Heron Bench

Saturday April 25, 2015
1:00PM
Corner of Oak and School Streets, Lodi



What:	In honor of 2015 Earth Day, the City of Lodi is hosting the dedication of the River-Friendly Demonstration Garden and Art in Public Places Great Blue Heron Bench in Lodi's downtown.
When:	Saturday April 25, 2015- 1:00PM
Where:	At the corner of Oak and School Streets.
Who Sponsored?	City of Lodi-Public Works

Background:

The River-Friendly Demonstration Garden and Art in Public Places, Great Blue Heron Bench, will be dedicated on Saturday, April 25, 2015, beginning at 1:00 PM. The dedication will take place at the corner of Oak and School Streets, Lodi. Starbucks Ham Lane store will provide Teavana "iced black tea" as a refreshment.

UCCE Master Gardeners will host an information table for residents to learn more about gardening using drought tolerant plants, as well as ways to sustain a conventional garden during a drought.

The River-Friendly Demo Garden was designed, installed in spring, 2014, and is currently tended by the University of California Cooperative Extension San Joaquin County Master Gardener volunteers. The bench was completed in late June, 2014. Signage at the site was donated by the Kirsten Family and the UCCE Master Gardeners and will help the public learn more about following more sustainable landscape techniques.

The Seven River-Friendly Principles are a method by which you can create and maintain a healthy, beautiful, and vibrant landscape. The principles include protection of water and air quality; conservation of energy and water; emphasize plant choices based on local climate conditions; helps nurture the soil; creates and protects wildlife habitat; and finally, sends less landscape to the landfill. With the 2013 State Water Resources Control Board National Pollution Discharge Elimination System (NPDES) Storm water general permit requirements, excessive residential landscape runoff has been targeted as a source of water pollution. Additionally, Integrated Pest Management (IPM) is the healthier alternative to the use of pesticides that may potentially affect our water quality.

CC: Steve Schwabauer- City Manager
Jennifer M. Ferraiolo - City Clerk
Jeff Hood- Director of Parks, Recreation and Cultural Services; Communications Specialist
Wally Sandelin- Public Works Director
Kat Garcia- Compliance Engineer
Jennifer Winn-Hutchins Street Square- Recreation Manager
Sabrina Willis-Bartlam- Hutchins Street Square- Program Coordinator

#####

Water Conservation Rebate Program

Rebate Application

Buyer's Name:_____ Account Name:_____

Mailing Address: _____ Address Installed:_____

_____ _____

Phone: _____ Purchase Date: _____

Water Service Account Number: _____ (Rebates for Water Service Customers Only)

Please **attach your sales receipt,** and complete the application information to receive a rebate for the purchase of any water conservation items. *Qualifying purchase receipt(s) must be dated within 120 days of rebate application submittal.* Rebates are subject to annual program funding and will be paid on a first come, first served basis. Commercial rebates limited to a maximum of 10 items.

Mail To: City of Lodi Public Works Department
Water Conservation Rebate Program
2001 W Turner Road, Lodi, Ca. 95242

Rebate Item	**Quantity**	**Make/ Model**	**Amount Paid***	**Age****
Ultra Low Flow Toilets - 1.6 gallons per flush (gpf) minimum ($44 rebate ea.)	_____	_____	$ _____	_____
EPA **WaterSense** Certified High-Efficiency Toilet - 1.28 gpf (or) Pressure Assisted PF/2 Ultra Low Flow Toilet (50% off cost up to $100 ea.)	_____	_____	$ _____	_____
Low Flow Shower Heads – 2.5 gpm (50% off cost up to $25 ea.)	_____	_____	$ _____	_____
EPA **WaterSense** Certified Showerhead - ≤ 2.0 gpm (50% off cost up to $100 ea.)	_____	_____	$ _____	_____
Rain Barrel (50% off cost up to $100 ea.)	_____	_____	$ _____	_____
Energy Star Certified High Efficiency Clothes Washer (HEW) with water factor of ≤ 4.0 (Per EnergyStar.gov) ($100 ea)	_____	_____	$ _____	_____
Replacement Automatic Sprinkler Timer (50% off cost up to $100 ea.)	_____	_____	$ _____	_____
Hose Bib Manual Timers for outside water hose (50% off cost up to $50 ea.)	_____	_____	$ _____	_____
Insulated Hot Water Blankets (50% off cost up to $25 ea.)	_____	_____	$ _____	_____

*Do not include tax in amount paid
**Please note approximate age of items being replaced.

I Certify *that the information as shown above is true, complete, and correct to the best of my knowledge and belief and are made in good faith. I understand and agree false statements and/or omissions of material fact will cause forfeiture of requested rebate. I also certify that the above-noted items will be* ***housed and utilized*** *by a City of Lodi water utility customer.*

Buyer's Signature: _____ **Date Signed:** _____

Rev 6/3/15

Appendix V - Public Notices

City of Lodi

lodi.gov | Residents | Businesses | Government | Visitors

Today is: 04/15/2016

Search Lodi.gov:

- City Council
- City Services
- City Departments
- Job Opportunities
- Storm Water
- Economic Development
- General Plan
- City Maps
- Media Information
- Meeting Agendas

City Council Meeting Webcasts

View Council Meetings

E-services

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ADA, Title VI & Related Statutes Compliance

Lodi City Hall
221 W. Pine Street
(209) 333-6800

Select Language

What's new

2015 Urban Water Management Plan Available for Public Review

Access the Report Here

Recreation Division offices move Dec. 4 to City Hall Annex

Learn more here

Utility scammers actively contacting Lodi customers

Lodi will not call residents/businesses threatening shutoff

Annual Water Quality Report for 2014

The report is now available for review and includes important information about Lodi's water quallity, supply and conservation efforts. Access the Report Here

July 2015-June 2016 schedule of City office hours

Monday-Thursday, 7:30-5:30; closed every other Friday

Government

For Public Review

FY 2015/16 Final Budget
FY 2015/16 Budget In Brief
FY 2014/15 Impact Mitigation Fee Report
FY 2014/15 Comprehensive Annual Financial Report

City Council

Meeting Agendas | Meeting Webcasts
Meeting Archives | History

City Resources

Boards & Commissions | Job Opportunities
Emergency | Municipal Code

For Residents ~

Application forms | Recreation & Leisure
Elections | Transportation
Adopt a pet

For Business ~

Bids & RFPs | Business License info
Doing Business | Economic Development

For Visitors ~

Lodi-at-a-glance | Events
Visit Lodi

Lodi profile

View the video!

(Safari users download here)

Water meters

Water Conservation

STAGE 3 WATER RESTRICTIONS

Watershed Friendly Landscaping

Rebate Form

Ordinance

Contact Us: 209-333-6829 or Conservation@lodi.gov

Learn more about the City's Water Meter Project

Customer Service

Pay your City of Lodi utility bill online

Sign up for service

Have a comment, complaint or concern? Let us know by using "Talk to Lodi"

Code enforcement question/complaint? Report it here

Street closures

Learn about planned street closures for road work, special events

News releases

Press Releases

City of Lodi
310 W. Elm Street, PO Box 3006
Lodi, CA 95241

Hours: M-Th 7:30 AM - 5:30 PM *F 8:00 AM - 5:00 PM	
***See www.lodi.gov for full schedule.**	
Delinquent bill/Account Balance, call:	**(209) 333-6717**
Need service connection/disconnection:	**(209) 333-6719**
Have a question about your bill?	**(209) 333-6719**
Central Valley Waste (refuse question):	**(209) 333-5600**
To report an outage, call:	**(209) 368-5735**

Account Number [redacted]
Res: [redacted]

Total Due Mar 19, 2016 $146.44
Billing Date Feb 22, 2016
Service from Jan 19 to Feb 17, 2016
Your meter was read on Feb 17, 2016

Pay your bill online:
www.lodi.gov

[redacted]
LODI CA 95240

Summary of Account

Previous Balance	165.14	
Payments/Adjustments thru Feb 17, 2016	-165.14	
Late Charges	0.00	
Balance Forward		$0.00
Current Month:		
Electric	37.92	
Water	45.89	
Wastewater	45.36	
Solid Waste	17.27	
Current Month Total: **Pay on or before: Mar 19, 2016**		146.44
Account Balance		$146.44

Please refer to attached detail pages for information about each utility charge

Keep this portion for your records. Please see reverse for important information.

[redacted]
Lodi, CA

[redacted]
Account Number [redacted]
Total Due Mar 19, 2016
$146.44
Enter payment amount
*See Message on Last Page

To report Graffiti call 333-5570

Account Number: [redacted]
Customer [redacted]
Premise: [redacted]
[redacted]
[redacted]
Lodi, CA

City of Lodi

310 W. Elm Street, PO Box 3006
Lodi, CA 95241

Charge Detail by Utility

Electric

Meter Number	Rate Type	No of Days	New Meter Read	Last Meter Read	Mult	Usage
[redacted]	EA	29	23328	23041	1	287

Usage Charge 287 KWH x $0.14910	$42.79
ECA - Feb 287 KWH x $0.01850-	($5.31)
CA Solar Surchrg 287 KWH x $0.00125	$0.36
Taxes: State Energy Tax	$0.08
	$37.92

Bill Month	Usage	Days	Per Day
Feb 16	287	29	10
Jan 16	342	30	11
Feb 15	290	30	10

Water

Water 3 Bdrm House 1 x $045.89000	$45.89
	$45.89

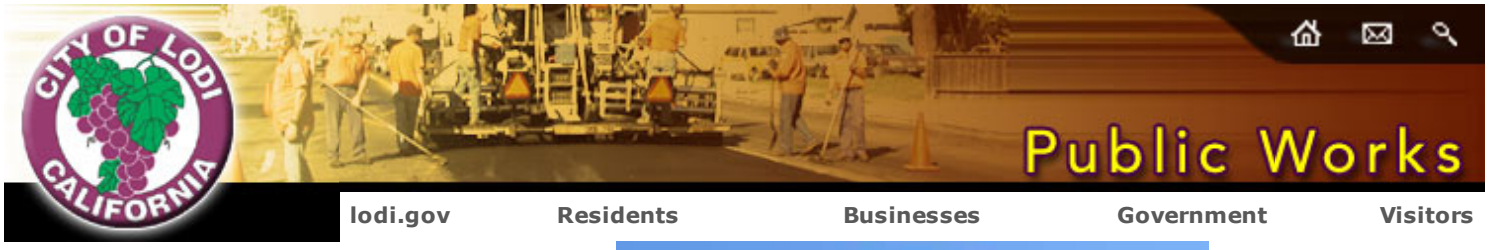
Wastewater

Customer Charge: Wastewater	$45.36
	$45.36

Solid Waste

Solid Waste 1 x $017.27000	$17.27
	$17.27

The City of Lodi is currently preparing the 2015 Urban Water Management Plan Update (UWMP). Required to be updated every five years per State law, the UWMP is prepared to evaluate and ensure the efficient use of available current and future water supplies. For more information, please contact Kathryn Garcia P.E., Compliance Engineer, at 209-333-6800 Ext. 2091 or kgarcia@lodi.gov



2015 Urban Water Management Plan Update

The City of Lodi has prepared the draft 2015 Urban Water Management Plan. The City is required to update its Urban Water Management Plan (UWMP) every five years per State law. The UWMP is prepared to ensure the efficient use of available water supplies, describe and evaluate the existing water system and historical and projected water use, evaluate current and projected water supply reliability, describe and evaluate demand management measures, and provide water shortage contingency plans as required by State law. By preparing the 2015 UWMP, the City continues its commitment to intelligent planning and management of its water supplies.

The Lodi City Council will hold a public hearing to consider adoption of its 2015 Urban Water Management Plan (UWMP) at its regular meeting on Wednesday, June 1st at 7:00 p.m.

The 2015 UWMP also includes information on the City's progress towards the 20 percent by 2020 conservation requirement of the Water Conservation Bill of 2009 (SB X7-7). A summary of the UWMP, including the City's progress towards achieving the 2020 conservation targets, will be presented at the public hearing.

The draft 2015 UWMP is available for public review and written comments will be accepted through May 25, 2016. Please send written comments to Kathryn Garcia at kgarcia@lodi.gov or Public Works Department, 2001 W. Turner Road. Lodi, California, 95242 by May 25, 2016. Comments can also be provided at the public hearing. Written statements may also be filed with the City Clerk, City Hall, 221 West Pine Street, 2nd Floor, Lodi, 95240, at any time prior to the public review period end date, and oral statements may be made at the public hearing on June 1, 2016.

The Draft 2015 Urban Water Management Plan (UWMP) is available through the link below. A hard copy will also available for review at the City Clerk's office, located at 221 W. Pine Street, Lodi, CA.

2015 Draft Urban Water Management Plan (pdf file)

2010 Urban Water Management Plan (pdf file)

2005 Urban Water Management Plan (pdf file)

Where does the City of Lodi's water supply come from?

26 computer controlled wells, located throughout the City, provide high quality groundwater, our sole source of supply in 2005. The wells operate automatically so that when water use increases, more wells come on line. However, the groundwater basin is being depleted. The City has purchased rights to some surface water from the Mokelumne River. Currently, the City is studying the most effective use of this surface water. The water delivered to your tap meets or is better than all federal and state water quality standards.

For more information on Water Quality please click on the link below:

2015 Water Quality Report (published May 2016)

Public Health Goal Report

Water Meter Retrofit Program

The City of Lodi has begun installing water meters on all unmetered properties in its service area. This is in accordance with California Assembly Bill 2572, which requires the installation and use of water meters throughout the State. To date, nearly 3,000 residential water meters have been installed as part of the City's Water Meter Retrofit Program. This is in addition to the existing 1,100 commercial and industrial meters.

To learn more about the City of Lodi's water meter program, click here.

AB 2572 was signed into law by Governor Schwarzenegger in September 2004 to reduce water-waste and encourage conservation. Studies by the California Public Utilities Commission have shown that communities with metered water systems use 7 to 20 percent less water than non-metered areas. All residential and many commercial customers are currently charged a flat-rate fee for water, which is billed monthly, based on the number of bedrooms being served, regardless of how much water they use. For example, a single person living in a four bedroom home is being charged more than a family of four living in a three bedroom home. A metered system discourages waste and rewards conservation by accurately measuring water usage and billing each household and business based on their actual water consumption. Customers are probably already familiar with this type of "usage billing" for other utility services like electricity, gas and telephone.

The City of Lodi provides very high quality water to more than 63,000 people. By working to conserve this critical resource, our residents can continue to count on a reliable supply of high quality drinking water for generations to come.

Contact Us | Accessibility Policy | Disclaimer | Privacy Policy

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PROOF OF PUBLICATION

(2015.5 C.C.C.P.)

STATE OF CALIFORNIA

County of San Joaquin

I am a citizen of the United States and a resident of the County aforesaid: I am over the age of eighteen years and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the Lodi News-Sentinel, a newspaper of general circulation, printed and published daily except Sundays, Mondays and holidays, in the City of Lodi, California, County of San Joaquin and which newspaper had been adjudicated a newspaper of general circulation by the Superior Court, Department 3, of the County of San Joaquin, State of California, under the date of May 26th, 1953. Case Number 65990; that the notice of which the annexed is a printed copy (set in type not smaller than non-pareil) has been published in each regular and entire issue of said newspaper and not in any supplement thereto on the following dates to-wit:

May 7th,

all in the year 2016

I certify (or declare) under the penalty of perjury that the foregoing is true and correct.

Dated at Lodi, California, United Sates of America this 7th, day of May 2016.

Signature

This space is for the County Clerk's Filing Stamp

Proof of Publication

Public Hearing to Consider Resolution Adopting 2015 Urban Water Management Plan (UWMP) Update

NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that on Wednesday, June 1, 2016, at the hour of 7:00 p.m., or as soon thereafter as the matter may be heard, the City Council will conduct a public hearing at the Carnegie Forum, 305 West Pine Street, Lodi, to receive comments and consider the following matter:

a) Resolution adopting 2015 Urban Water Management Plan (UWMP) update.

California state law requires each urban water supplier to prepare and adopt a UWMP plan every five years. The UWMP documents the City's plans to ensure adequate water supplies to meet existing and future demands for water under a range of water supply conditions, including water shortages. The 2015 UWMP also includes information on the City's progress towards the 20 percent by 2020 conservation requirement of the Water Conservation Bill of 2009 (SB X7-7). A summary of the UWMP, including the City's progress towards achieving the 2020 conservation targets, will be presented at the public hearing.

The Draft 2015 UWMP is available for public review and comment through May 25, 2016. The Draft 2015 UWMP is available at the City's website: http://www.lodi.gov/public_works/water.html. A hard copy is also available for review at the City Clerk's office, located at 221 West Pine Street, Lodi, CA.

The City welcomes your input on the draft plan. Please send written comments to Kathryn Garcia at kgarcia@lodi.gov or Public Works Department, 2001 West Turner Road, Lodi, 95242 by May 16, 2016. Written statements may also be filed with the City Clerk, City Hall, 221 West Pine Street, 2nd Floor, Lodi, 95240, at any time prior to the hearing scheduled herein, and oral statements may be made at said hearing.

If you challenge the subject matter in court, you may be limited to raising only those issues you or someone else raised at the public hearing described in this notice or in written correspondence delivered to the City Clerk, 221 West Pine Street, at or prior to the close of the public hearing.

By Order of the Lodi City Council:

Jennifer M. Ferraiolo, City Clerk

Dated: May 4, 2016

Approved as to form:

Janice M. Magdich, City Attorney
May 7, 2016 - 160910

160910

~~21719~~ 21717546

LODI CITY COUNCIL

Carnegie Forum
305 West Pine Street, Lodi

TM

AGENDA – REGULAR MEETING

Date: June 1, 2016
Time: 7:00 p.m.

For information regarding this Agenda please contact:
Jennifer M. Ferraiolo
City Clerk
Telephone: (209) 333-6702

6:55 p.m. Invocation/Call to Civic Responsibility. Invocations/Calls may be offered by any of the various religious and non-religious organizations within and around the City of Lodi. These are voluntary offerings of private citizens, to and for the benefit of the Council. The views or beliefs expressed by the Speaker have not been previously reviewed or approved by the Council, and the Council does not endorse the beliefs or views of any speaker.

C-1 Call to Order / Roll Call – N/A

C-2 Announcement of Closed Session – N/A

C-3 Adjourn to Closed Session – N/A

NOTE: THE FOLLOWING ITEMS WILL COMMENCE NO SOONER THAN 7:00 P.M.

C-4 Return to Open Session / Disclosure of Action – N/A

A. Call to Order / Roll Call

B. Presentations

B-1 Proclamation for 2016 National Dump the Pump Day (PW)

C. Consent Calendar (Reading; Comments by the Public; Council Action)

C-1 Receive Register of Claims in the Amount of $2,809,652.10 (FIN)

C-2 Approve Minutes (CLK)
a) May 10 and May 17, 2016 (Shirtsleeve Sessions)
b) May 18, 2016 (Regular Meeting)

C-3 Report of Sale of Surplus Equipment (PW)

C-4 Approve Specifications and Authorize Advertisement for Bids for 2016-2018 Tree Maintenance Project (PW)

C-5 Approve Specifications and Authorize Advertisement for Bids for 2016 Cherokee Lane Accessibility Improvement Project (PW)

Res. C-6 Adopt Resolution Awarding Bid for Purchase of One Oil Handling Trailer, Model No. I0S2OX-2, from Intertech Filtration System, of Bixby, Oklahoma ($70,802.64) (EU)

Res. C-7 Adopt Resolution Awarding Contract for Alley Improvement Project – Phase 5 to A. M. Stephens Construction Company, Inc., of Lodi ($129,787) (PW)

C-8 Accept Improvements Under Contract for Animal Shelter Interior Improvements (PW)

C-9 Accept Improvements Under Contract for 2016 Pavement Crack Sealing (PW)

C-10 Accept Improvements Under Contract for Shady Acres Pump Station Trash Handling Project (PW)

Res. C-11 Adopt Resolution Authorizing City Manager to Execute Amendment No. 1 to Professional Services Agreement with Garland/DBS, Inc., of Cleveland, Ohio, for Hutchins Street Square Roof Repair Project Phase 2 ($1,738) (PW)

Res. C-12 Adopt Resolution Authorizing City Manager to Execute Amendment No. 4 to Professional Services Agreement with Stantec Consulting Services, Inc., of Rancho Cordova, for Groundwater Sampling, Reporting, and On-Call Out-of-Scope Services and Appropriating Funds ($20,495) (PW)

Res. C-13 Adopt Resolution Awarding Three-Year Professional Services Agreement for Electronic Content Management System, Software Support, and Implementation Services Using Laserfiche Software to Complete Paperless Solutions, of Anaheim ($30,114 / Annual Maintenance of $4,560), Authorizing the City Clerk to Execute Two One-Year Extensions, and Appropriating Funds ($30,114) (CLK)

Res. C-14 Adopt Resolution Approving Activity Guide Printing Agreement with Casey Printing, Inc., of King City, for Fiscal Year 2016/17 ($21,700.89) and Authorizing Staff to Execute Two One-Year Extensions (PRCS)

Res. C-15 Adopt Resolution Authorizing City Manager to Accept Grant Administered by the Department of Alcoholic Beverage Control ($42,186) (PD)

Res. C-16 Adopt Resolution Approving Encroachment Permit Application from Just Dawgs, LLC, to Operate Hot Dog Cart in the Post Office Plaza Located at the Southeast Corner of School Street and Oak Street (PW)

Res. C-17 Adopt Resolution Amending Traffic Resolution No. 97-148 by Approving a Multi-Way Stop Control at Pleasant Avenue and Walnut Street and No-Parking Zones on Lodi Avenue Between Lower Sacramento Road and the Westerly City Limits (PW)

C-18 Set Public Hearing for June 15, 2016, to Consider Adopting Resolution Approving Amendment No. 3 of the 2015/16 Community Development Block Grant Annual Action Plan (CD)

C-19 Set Public Hearing for June 15, 2016 to Consider 1) Introducing Ordinance Repealing and Re-Enacting Lodi Municipal Code Chapter 17.34 – Signs – in Its Entirety; 2) Introducing Ordinance Repealing Lodi Municipal Code Chapter 9.19 – Political Sign Regulations – in Its Entirety; and 3) Introducing Ordinance Repealing and Re-Enacting Lodi Municipal Code Section 10.44.040, "Parking for Certain Purposes Prohibited – Display of 'For Sale' Signs on Vehicles, Vessels or Trailers – Restrictions," in Its Entirety (CA)

D. Comments by the Public on Non-Agenda Items

THE TIME ALLOWED PER NON-AGENDA ITEM FOR COMMENTS MADE BY THE PUBLIC IS LIMITED TO FIVE MINUTES.

Public comment may only be made on matters within the Lodi City Council's jurisdiction (Government Code Section 54954.3, Lodi City Council Protocol Manual Section 6.3l). The Council cannot take action or deliberate on items that are not on this agenda unless there is an emergency and the need to take action on that emergency arose after this agenda was posted (Government Code Section 54954.2(b)(2)). All other items may only be referred for review to staff or placement on a future Council agenda.

E. Comments by the City Council Members on Non-Agenda Items

F. Comments by the City Manager on Non-Agenda Items

G. Public Hearings

G-1 Continue Public Hearing to June 15, 2016, to Consider Adopting Resolution Setting Pre-Approved Engineering News Record Adjustment Index for Wastewater Rates for Residential, Commercial, and Industrial Customers (PW)

Res. G-2 Public Hearing to Consider Adopting Resolution Adopting 2015 Urban Water Management Plan Update (PW)

H. Communications – None

I. Regular Calendar

Res. I-1 Adopt Resolution Approving the City of Lodi Financial Plan and Budget for the Fiscal Year Beginning July 1, 2016 and Ending June 30, 2017 and Approving the Fiscal Year 2016/17 Appropriation Spending Limit (CM)

J. Ordinances

Ord. (Adopt) J-1 Ordinance No. 1920 Entitled, "An Ordinance of the Lodi City Council Amending Lodi Municipal Code Chapter 17.40 – Permit Approval or Disapproval – by Repealing and Re-Enacting Section 17.40.020 (B) Applicability Table 4-2 for Site Plan and Architectural Approval " (CLK)

Ord. (Adopt) J-2 Ordinance No. 1921 Entitled, "An Ordinance of the Lodi City Council Amending Lodi Municipal Code Chapter 1.08 – General Penalty – by Repealing and Re-Enacting Section 1.08.010 (A), 'General Penalty'" (CLK)

K. Adjournment

Pursuant to Section 54954.2(a) of the Government Code of the State of California, this agenda was posted at least 72 hours in advance of the scheduled meeting at a public place freely accessible to the public 24 hours a day.

_____
Jennifer M. Ferraiolo
City Clerk

All staff reports or other written documentation relating to each item of business referred to on the agenda are on file in the Office of the City Clerk, located at 221 W. Pine Street, Lodi, and are available for public inspection. If requested, the agenda shall be made available in appropriate alternative formats to persons with a disability, as required by Section 202 of the Americans with Disabilities Act of 1990 (42 U.S.C. Sec. 12132), and the federal rules and regulations adopted in implementation thereof. To make a request for disability-related modification or accommodation contact the City Clerk's Office as soon as possible and at least 72 hours prior to the meeting date. Language interpreter requests must be received at least 72 hours in advance of the meeting to help ensure availability. Contact Jennifer M. Ferraiolo at (209) 333-6702. Solicitudes de interpretación de idiomas deben ser recibidas por lo menos con 72 horas de anticipación a la reunión para ayudar a asegurar la disponibilidad. Llame a Jennifer M. Ferraiolo (209) 333-6702.

Meetings of the Lodi City Council are telecast on SJTV, Channel 26. The City of Lodi provides live and archived webcasts of regular City Council meetings. The webcasts can be found on the City's website at www.lodi.gov by clicking the meeting webcasts link.

AGENDA ITEM **G-02**

CITY OF LODI
COUNCIL COMMUNICATION

TM

AGENDA TITLE: Public Hearing to Consider Adopting Resolution Adopting 2015 Urban Water Management Plan Update

MEETING DATE: June 1, 2016

PREPARED BY: Public Works Director

RECOMMENDED ACTION: Public Hearing to consider adopting resolution adopting 2015 Urban Water Management Plan Update.

BACKGROUND INFORMATION: On August 19, 2015, City Council approved an agreement with RMC Water and Environment, of Walnut Creek, to prepare the 2015 Urban Water Management Plan (UWMP) update. State law requires the UWMP be updated by all water suppliers every five years. The City Council adopted the current UWMP on August 3, 2011.

The UWMP documents the City's plan to ensure adequate water supplies will meet existing and future water demands under a range of water supply conditions, including water shortages. The 2015 UWMP also includes information on the City's progress towards the 20 percent by 2020 conservation requirement of the Water Conservation Bill of 2009 (SB X7-7).

A summary of the 2015 UWMP, including the City's progress towards achieving the 2020 conservation targets, will be presented by RMC Water and Environment at the public hearing. The due date for submitting the adopted 2015 UWMP update to the State Department of Water Resources is July 1, 2016. The draft 2015 UWMP was made available to the public on April 11, 2016.

FISCAL IMPACT: By maintaining an updated Urban Water Management Plan, in accordance with State requirements, the City of Lodi remains eligible for various grant funding sources.

FUNDING AVAILABLE: Not applicable.

_____
Charles E. Swimley, Jr.
Public Works Director

Prepared by Kathryn E. Garcia, Compliance Engineer
CES/KG/trb

cc: Lance Roberts, Utilities Manager

APPROVED: _____
Stephen Schwabauer, City Manager

Appendix W - 2015 UWMP Adoption Resolution

RESOLUTION NO. 2016-90

A RESOLUTION OF THE LODI CITY COUNCIL
ADOPTING THE CITY'S 2015 URBAN WATER
MANAGEMENT PLAN UPDATE

==========

WHEREAS, on August 19, 2015, the City Council approved an agreement with RMC Water and Environment, of Walnut Creek, to prepare the 2015 Urban Water Management Plan update; and

WHEREAS, State law requires the Urban Water Management Plan (UWMP) be updated by all water suppliers every five years; and

WHEREAS, the UWMP Guidebook for preparing the update was released by the State in March 2016, and the due date for submittal of the adopted 2015 UWMP update is July 1, 2016; and

WHEREAS, the Lodi City Council adopted the current UWMP on August 3, 2011, documenting the City's plans to ensure adequate water supplies to meet existing and future demands for water under a range of water supply conditions, including water shortages; and

WHEREAS, the 2015 UWMP also includes information on the City's progress towards the 20 percent by 2020 conservation requirement of the Water Conservation Bill of 2009 (SB XY-7); and

WHEREAS, a summary of the UWMP, including the City's progress towards achieving the 2020 conservation targets, was presented at the public hearing held June 1, 2016.

NOW, THEREFORE, BE IT RESOLVED that the Lodi City Council does hereby adopt the City of Lodi's 2015 Urban Water Management Plan Update on file in the Public Works Department.

Dated: June 1, 2016

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I hereby certify that Resolution No. 2016-90 was passed and adopted by the City Council of the City of Lodi in a regular meeting held June 1, 2016, by the following vote:

AYES: COUNCIL MEMBERS – Johnson, Kuehne, Mounce, and Nakanishi

NOES: COUNCIL MEMBERS – None

ABSENT: COUNCIL MEMBERS – Mayor Chandler

ABSTAIN: COUNCIL MEMBERS – None

Jennifer M. Ferraiolo

JENNIFER M. FERRAIOLO
City Clerk