

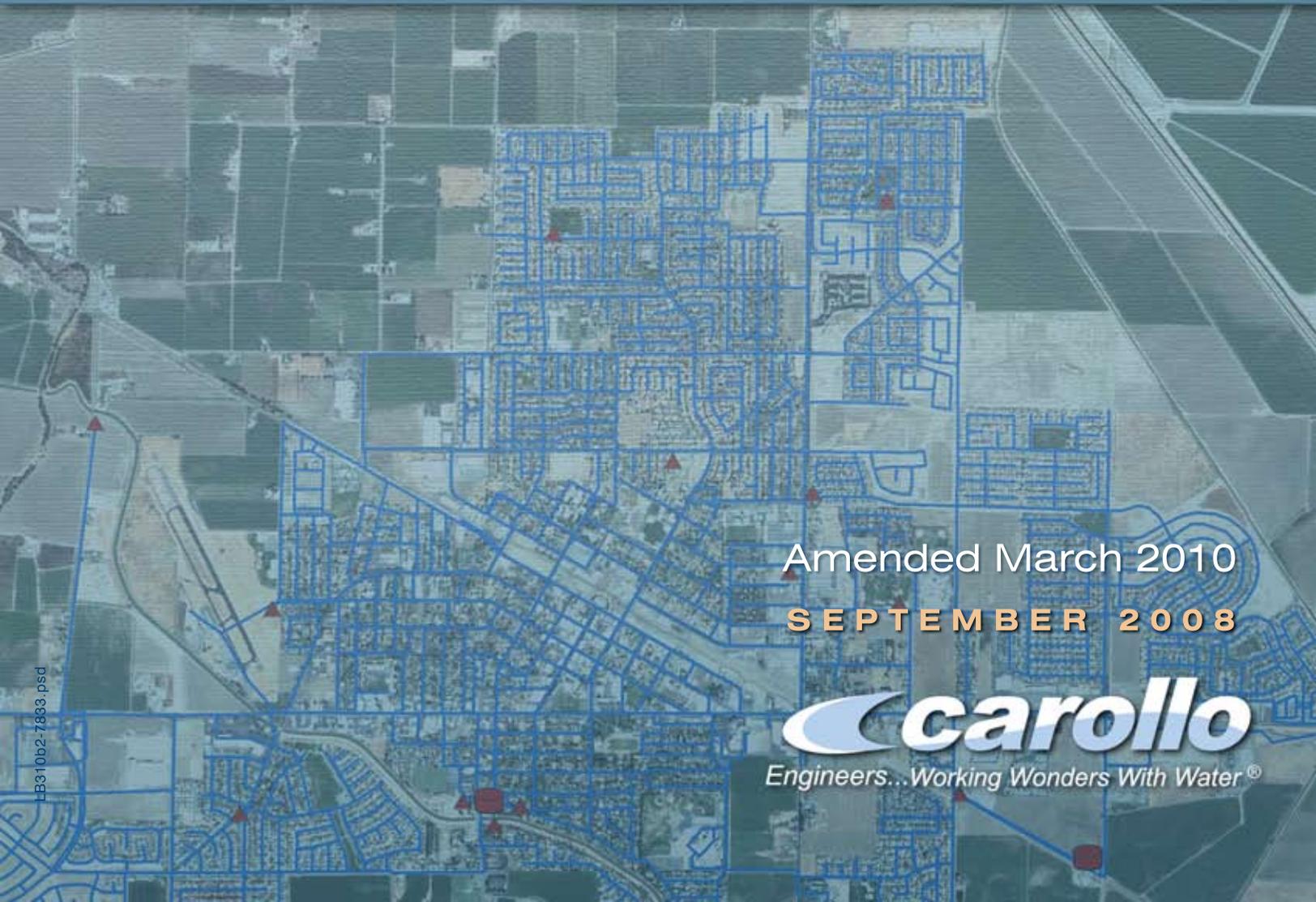
Final Report

MASTER PLAN FOR



City of
Los Banos
At the Crossroads of California

Water Distribution System



Amended March 2010

SEPTEMBER 2008

carollo
Engineers... Working Wonders With Water®

March 31, 2010
7833A03

City of Los Banos
411 Madison Avenue
Los Banos, California 93635

Attention: Mr. Mark Fachin, P.E.

Subject: City of Los Banos Final Water Distribution System Master Plan
Amended March 2010

Dear Mr. Fachin:

We are pleased to submit 10 copies of the amended final report for the City of Los Banos (City) Water Distribution System Master Plan (Master Plan). The Master Plan includes: planning assumptions, the distribution system evaluation, and recommended improvements to correct existing deficiencies and to serve future customers. This amended report incorporates the recent changes to land use assumptions and planning boundaries described in the City's 2030 General Plan Update.

Adjustments to the phasing of recommended improvements have also been included to account for the recent slowdown in development and current economic conditions. If economic, development and/or funding conditions change, then the City should revisit the phasing assumptions and consider implementing the recommended improvements at an earlier date, in particular, those that mitigate existing deficiencies.

We would like to extend our thanks to you, Mr. Gary Hutsell, Assistant Public Works Director; and other City staff whose courtesy and cooperation were valuable components in ensuring that this document will assist the City in planning infrastructure improvements to serve its customers.

Sincerely,

CAROLLO ENGINEERS, P.C.



David L. Stringfield, P.E.



Jose L. Gutierrez, P.E.

DLS:JLG:asw

Enclosures: Amended Final Water Distribution System Master Plan (10)



City of Los Banos

**WATER DISTRIBUTION SYSTEM
MASTER PLAN**

Amended March 2010
September 2008



City of Los Banos

WATER DISTRIBUTION SYSTEM MASTER PLAN

TABLE OF CONTENTS

	<u>Page No.</u>
EXECUTIVE SUMMARY	
ES.1 INTRODUCTION	ES-1
ES.2 STUDY AREA.....	ES-1
ES.3 EXISTING AND FUTURE SERVICE AREA	ES-1
ES.4 HISTORICAL AND FUTURE POPULATION.....	ES-3
ES.5 HISTORICAL AND FUTURE WATER DEMANDS	ES-3
ES.6 CAPACITY EVALUATION AND PROPOSED IMPROVEMENTS	ES-6
ES.6.1 Existing Versus Future Improvement.....	ES-6
ES.6.2 Water Supply Capacity Improvements.....	ES-13
ES.6.3 Storage Tank and Booster Pump Capacity Improvements	ES-15
ES.6.4 Pipeline Improvements	ES-16
ES.6.5 Meter Installation	ES-17
ES.7 CAPITAL PROJECT PRIORITIZATION.....	ES-17
ES.7.1 Existing System Improvement Prioritization.....	ES-18
ES.7.2 Future System Improvement Prioritization	ES-18
ES.8 CAPITAL PROJECT COSTS	ES-20
CHAPTER 1 – BACKGROUND	
1.1 INTRODUCTION	1-1
1.2 BACKGROUND	1-1
1.3 WATER SERVICE AREA.....	1-1
1.4 SCOPE AND AUTHORIZATION.....	1-4
1.5 REPORT ORGANIZATION	1-4
1.6 ACKNOWLEDGMENTS.....	1-5
1.7 ABBREVIATIONS AND DEFINITIONS	1-5
1.8 REFERENCE MATERIAL	1-6
CHAPTER 2 – STUDY AREA DESCRIPTION	
2.1 STUDY AREA.....	2-1
2.2 PLANNING PERIOD.....	2-1
2.3 CLIMATE	2-1
2.4 LAND USE.....	2-3
2.4.1 Water Distribution Service Area by Land Use.....	2-3
2.5 HISTORICAL AND FUTURE POPULATION.....	2-6
CHAPTER 3 – PLANNING CRITERIA	
3.1 WATER SUPPLY CAPACITY	3-1
3.2 FIRM SUPPLY CAPACITY	3-1
3.2.1 Standby Supply Capacity	3-1
3.2.2 Recommended Supply Capacity	3-2
3.2.3 Future Surface Water Treatment Plant	3-2
3.3 STORAGE REQUIREMENTS.....	3-2

3.3.1	Operational Storage	3-2
3.3.2	Fire Storage	3-2
3.3.3	Emergency Storage.....	3-3
3.3.4	Total Storage.....	3-3
3.4	SERVICE PRESSURES	3-4
3.5	DISTRIBUTION MAINS	3-4
3.6	FIRE FLOWS.....	3-5

CHAPTER 4 – WATER DEMAND

4.1	HISTORICAL WATER USE	4-1
4.1.1	Per Capita Consumption	4-1
4.1.2	Seasonal Demands and Peaking Factors.....	4-1
4.2	WATER DEMAND PROJECTIONS	4-4
4.2.1	Existing Water Demand Coefficients	4-4
4.2.2	Future Water Demands	4-7
4.2.3	Growth Horizon	4-9
4.2.4	Future Water Resources	4-9
4.3	PLANNING CRITERIA SUMMARY	4-10

CHAPTER 5 – EXISTING SYSTEM FACILITIES AND HYDRAULIC MODEL

5.1	WATER SERVICE AREA OVERVIEW.....	5-1
5.1.1	Distribution System	5-1
5.1.2	Pressure Zones.....	5-3
5.1.3	Supply Sources	5-3
5.1.4	Recycled Water	5-4
5.1.5	Groundwater Wells.....	5-4
5.1.6	Storage Reservoirs.....	5-4
5.1.7	Booster Pump Stations.....	5-5
5.2	DISTRIBUTION SYSTEM HYDRAULIC MODEL	5-6
5.2.1	Data Collection and Validation.....	5-6
5.2.2	Elements of the Hydraulic Model	5-6
5.3	HYDRAULIC MODEL CALIBRATION	5-7
5.3.1	Macro Calibration	5-7
5.3.2	Fire Flow Field Testing	5-8

CHAPTER 6 – CAPACITY EVALUATION AND PROPOSED IMPROVEMENTS

6.1	SUPPLY CAPACITY	6-1
6.1.1	Largest Well Out of Service.....	6-1
6.1.2	Fire Flow	6-3
6.1.3	Power Outage	6-3
6.1.4	Emergency Condition	6-3
6.1.5	Surface Water Treatment Plant	6-5
6.1.6	Supply Recommendations.....	6-6
6.2	STORAGE TANKS	6-11
6.3	BOOSTER PUMP STATIONS	6-14
6.4	PIPELINES	6-14
6.4.1	Existing System Improvements	6-14
6.4.2	Future System Improvements.....	6-15
6.4.3	Water Main Replacement	6-16
6.4.4	Well Manifold System	6-16
6.5	METER INSTALLATION.....	6-16
6.6	RECOMMENDED IMPROVEMENTS	6-17

6.6.1	Existing Versus Future Improvements	6-17
6.7	PROJECT PRIORITIZATION.....	6-21
6.7.1	Existing System Improvement Prioritization.....	6-23
6.7.2	Future System Improvement Prioritization.....	6-23

CHAPTER 7 – CAPITAL IMPROVEMENT PROJECTS

7.1	CAPITAL IMPROVEMENT PROJECT COSTS.....	7-1
7.2	COST ESTIMATING ACCURACY	7-1
7.3	CONSTRUCTION UNIT COSTS.....	7-1
7.3.1	Pipeline Unit Costs	7-1
7.3.2	Tank and Booster Pump, Well, and Treatment Plant Costs	7-2
7.3.3	Land Acquisition Costs	7-3
7.4	PROJECT COSTS AND CONTINGENCIES	7-3
7.4.1	Baseline Construction Cost	7-3
7.4.2	Estimated Construction Cost	7-3
7.4.3	Capital Improvement Cost	7-4
7.5	CAPITAL IMPROVEMENT IMPLEMENTATION	7-5
7.6	EXISTING VERSUS FUTURE USER COST SHARE	7-5

APPENDIX A – Land Use Descriptions

LIST OF TABLES

Table ES.1	Existing and Projected Year 2030 Population.....	ES-3
Table ES.2	Demand Summary	ES-5
Table ES.3	Demand Projections	ES-5
Table ES.4	Capital Improvement Projects (3 pages).....	ES-11
Table ES.5	Existing Versus Future User Cost Share	ES-21
Table 2.1	Study Area Land Use Designations	2-5
Table 2.2	Historical and Projected Population	2-7
Table 3.1	Pipe Roughness.....	3-5
Table 4.1	Historical Water Production and Metered Water Deliveries	4-2
Table 4.2	Daily Diurnal Water Demand Pattern.....	4-5
Table 4.3	Existing Water Demand Coefficients	4-6
Table 4.4	SOI Build-out Water Demand Projections.....	4-8
Table 4.5	Demand Summary	4-9
Table 4.6	Demand Projections	4-10
Table 4.7	Future Water Resource Demand.....	4-11
Table 4.8	Planning Criteria Summary.....	4-12
Table 5.1	Modeled Water System Pipeline Summary.....	5-3
Table 5.2	Water Supply Wells	5-5
Table 6.1	Well Supply Requirements - Largest Well Out of Service	6-2
Table 6.2	Total Supply Capacity.....	6-10
Table 6.3	Storage Capacity Requirements.....	6-12
Table 6.4	Proposed Water Distribution System Improvements (3 pages).....	6-18
Table 7.1	Pipeline Construction Unit Costs	7-2
Table 7.2	Facility Construction Unit Costs.....	7-2
Table 7.3	Capital Improvement Projects (3 pages).....	7-6
Table 7.4	Existing Versus Future User Cost Share	7-9

LIST OF FIGURES

Figure ES.1	Study Area	ES-2
Figure ES.2	Proposed Water Distribution System Improvements (3 Pages)	ES-7
Figure ES.3	Regional Improvements.....	ES-14
Figure 1.1	Location Map.....	1-2
Figure 1.2	Current Water Distribution Service Area.....	1-3
Figure 2.1	Study Area	2-2
Figure 2.2	General Plan Land Use	2-4
Figure 2.3	Historical and Projected Population	2-8
Figure 4.1	Daily Diurnal Water Demand Pattern.....	4-5
Figure 5.1	Existing Water Distribution System.....	5-2
Figure 6.1	Increase in Demand and Supply.....	6-4
Figure 6.2	Proposed Distribution System Improvements (3 pages)	6-7
Figure 6.3	Required Storage Capacity	6-13
Figure 6.4	Regional Improvements.....	6-22

WATER DISTRIBUTION SYSTEM MASTER PLAN

ES.1 INTRODUCTION

The City of Los Banos (City) is located in western Merced County (County), in the northern portion of the San Joaquin Valley. The City is located near the junction of California State Route (SR)-152 and Interstate 5. Los Banos is the second largest city in the County.

The City owns, maintains, and operates water supply wells, storage tanks, and water lines throughout the City. The City oversees over 142 miles of water lines spanning 4- to 30-inches in diameter, 13 wells, one water tower, and one above ground water storage tank. In addition to these major facilities, the City also maintains thousands of water valves and hydrants throughout the City. The City pumps, stores, and delivers water to its residential, commercial, institutional, and industrial customers within its service area.

The City currently relies on groundwater from the Delta-Mendota groundwater subbasin to provide water to its users. Surface water and recycled water sources are not currently utilized by the City. The Delta-Mendota Subbasin is bounded on the west by the Coast Ranges, and on the north by the Stanislaus/San Joaquin County line¹. The eastern boundary follows the San Joaquin River.

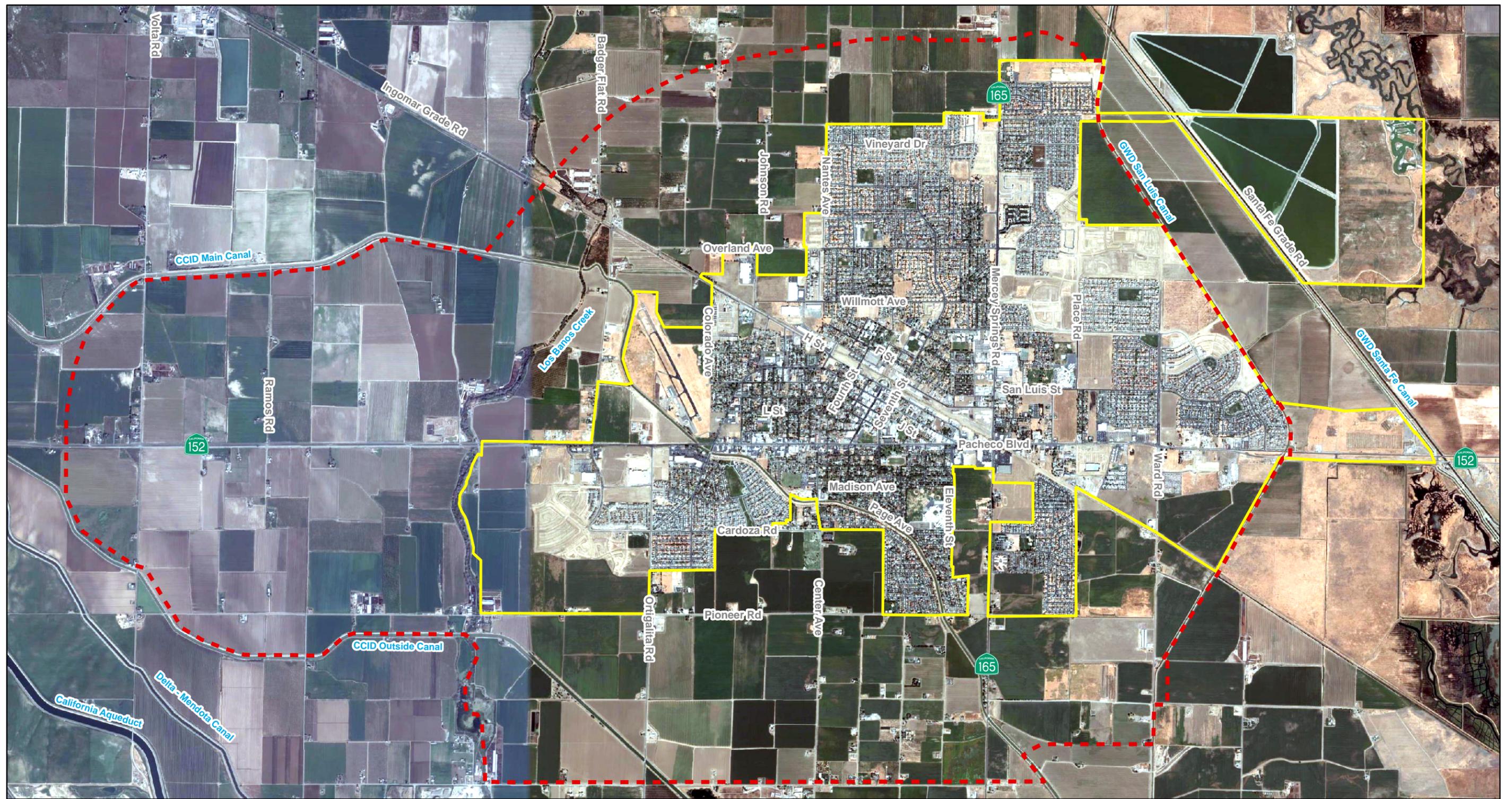
ES.2 STUDY AREA

The City's 2030 General Plan Update (2030 General Plan) sphere of influence (SOI) is the study area boundary for this water distribution system master plan (Master Plan). The Master Plan study area boundary and SOI are synonymous and will be used interchangeably throughout this report. The SOI boundary extends far beyond the current water distribution service area and is approximately 14,382 acres (22.5 square miles). The Master Plan contains a forecast of water system improvements in a large study area beyond the City limits. Figure ES.1 shows the study area boundary and the City's limits. Evaluating infrastructure needs beyond the City limits is important because: there are conceptual development plans that are beyond the City limits; and recent rapid growth in the San Joaquin Valley indicates that significant development into the study area could occur within a short planning period.

ES.3 EXISTING AND FUTURE SERVICE AREA

The land use designations (residential, commercial, etc.) used in this Master Plan are consistent with the City's 2030 General Plan. The type of land use in an area will affect the water demand, including daily variation in the demand.

¹ Delta-Mendota Subbasin Description and Information, DWR Bulletin 118 - Update 2003



Legend

- Sphere of Influence¹
- City Limits

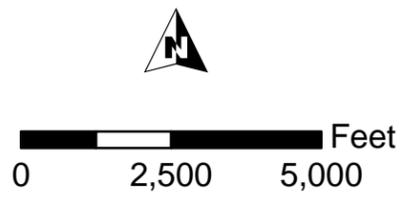


Figure ES.1
Study Area
 Water Distribution
 System Master Plan
 City of Los Banos



1. Sphere of Influence from City of Los Banos 2030 General Plan Update, Dyett & Bhatia, July 2009

The City currently provides water service to approximately 4,582 acres (includes developed and undeveloped land) or 7.2 square miles. Note that the acreage total does not include land occupied by the WWTP because the treatment plant is located outside of the SOI. The largest land use category is residential (low, medium, and high), which accounts for approximately 2,279 acres, or approximately 50 percent of the total acreage. Commercial, office/professional, and industrial make up approximately 925 acres, or 20 percent of the total. Civic/Institutional makes up approximately 181 acres, or 4 percent. Land uses like parks, streets, and open space account for 1,197 acres, or 26 percent of the total service area.

At build-out of the SOI boundary, the City will serve approximately 14,382 acres or 22.5 square miles, which is about three times the current service area. Build-out is defined as complete development of all lands. Residential will continue to represent the largest land use category in the City and will make up approximately 38 percent of the total acreage.

ES.4 HISTORICAL AND FUTURE POPULATION

The City's population began to grow quickly after World War II owing to returning veterans and highway construction. A series of irrigation and dam projects in the 1960s brought more people to the City, however, growth slowed from 1970 to 1985. In 1990, the City's population began to grow rapidly and continued through year 2007. From 1990 through the present, the population grew from approximately 14,500 to 35,200. Over the last 20 years, the City has grown at an annual rate of about 5.1 percent.

The 2030 General Plan states that the build-out population will reach approximately 90,400 people. This build-out population reflects an annual growth rate that ranges between 4.1 to 4.6 percent. Table ES.1 summarizes the existing and projected year 2030 population.

Table ES.1 Existing and Projected Year 2030 Population Water Distribution System Master Plan City of Los Banos	
Year	Population
2007	35,200
2030	90,400
Note: 1. Source of historical data: City of Los Banos 2030 General Plan Update, July 2009.	

ES.5 HISTORICAL AND FUTURE WATER DEMANDS

The per capita consumption rate is equal to the City's average day demand (ADD) divided by its population. Between 2000 and 2007, the average per capita demand ranged between

161 gallons per capita per day (gpcd) to 240 gpcd, and averaged 210 gpcd, based on metered water deliveries.

The ADD is the total annual production or total annual metered water deliveries divided by number of days in the year. In 2006, the ADD was approximately 7.3 million gallons per day (mgd), and in 2007, the ADD increased to 8.5 mgd.

The average day maximum month demand (ADMMD) is the average demand for the month with the highest demand during the year, usually occurring in the summer. In 2006, the ADMMD was approximately 12.8 mgd and occurred in July. The highest demand month typically occurs in July, August, or September.

The MDD is the greatest water demand during a 24-hour period of the year. In general, the MDD is 2.0 to 2.5 times greater than the ADD. Daily production or metered data was not available to determine the MDD, so an industry accepted peaking factor of 2.5 was used. The PHD is the highest water demand during any one-hour period of the year. A normal day typically experiences two peak demands, in the morning and then evening. In general, the PHD ranges between 2.5 and 3.5 times greater than the ADD. Hourly demands were not available for this project, so an industry accepted peaking factor of 3.5 was used.

Developing an accurate estimate of the water demand is an important step in determining the size of water distribution system facilities, for both existing conditions and future developments. The future ADD projections were developed based on the land use projections as described in the City's 2030 General Plan. The build-out water demands projections assume 100 percent development and occupancy of all land uses within the SOI. If we assume that 5 to 10 percent of all residences, commercial buildings and offices are vacant or not developed at build-out, then the build-out demand could range between 22.4 to 24.9 mgd. For the purposes of modeling and sizing infrastructure, this Master Plan assumed 100 percent development of the SOI.

A summary of the existing and future ADD is presented in Table ES.2. If the City achieves build-out of the SOI by 2030, then the water demand will increase at an annual rate of about 5.0 percent between now and build-out of the study area. In addition to the projected average demands, Table ES.2 includes annual estimates for the MDD and PHD through build-out of the SOI. Based on these projections, it is anticipated that the City's build-out ADD and MDD will approach 24.9 mgd and 62.3 mgd, respectively.

The discussion up to this point has focused on the demand projection when the SOI is fully built out. The City's 2030 General Plan states, "Although the General Plan applies a 24-year horizon, the Plan is not intended to specify or anticipate when build-out will actually occur." If we assume that the projected population is reached by 2030, then the residential land uses will be fully built out. However, a different assumption is provided for the employment related land uses. The 2030 General Plan reports that, based on historical trends, complete build-out of employment-related land should be reached around 2055.

Based on this growth rate, it is assumed that half of the employment-related land is developed by year 2030, and the remainder is developed by 2055.

Table ES.2 Demand Summary Water Distribution System Master Plan City of Los Banos			
Planning Year	Average Day Demand (mgd)	Maximum Day Demand (mgd)	Peak Hour Demand (mgd)
Existing ⁽¹⁾	7.5	18.8	26.3
SOI Build-out ⁽²⁾	24.9	62.3	87.2
Notes:			
1. Based on land use and developed acreages within the City limits, and water demands for year 2006.			
2. Based on land use and acreage from the City's 2030 General Plan and 100 percent build-out.			

Based on the timing assumptions for build-out of residential and employment-related land uses, the following demand projections can be made (Table ES.3).

Table ES.3 Demand Projections Water Distribution System Master Plan City of Los Banos	
Planning Year	Average Day Demand (mgd)
Existing ⁽¹⁾	7.5
2010	8.8
2015	10.7
2020	13.0
2025	15.7
2030	19.0
2035	20.1
2040	21.2
2045	22.4
2050	23.6
2055	24.9
Note:	
1. Based on Average Annual Water Use Estimate Technical Memorandum, August 2007, Erler & Kalinowski, Inc. and developed land in the City.	

ES.6 CAPACITY EVALUATION AND PROPOSED IMPROVEMENTS

The capacity analysis entailed identifying areas in the distribution system where pipeline capacity is insufficient to supply water at high flow rates and meet minimum pressure or maximum velocity and headloss criteria. Pipelines that lack sufficient capacity or the appropriate connectivity to distribute peak hour or fire flow demands could result in low delivery pressures. The hydraulic modeling analysis identified locations of existing and future hydraulic deficiencies resulting from these periods of high flows. This analysis also evaluated the adequacy of the City's water supply and storage capacity.

Most of the existing water distribution system has sufficient capacity to convey current peak hour or fire flow demands. However, in some locations, such as the City's downtown or in more mature neighborhoods, the distribution system could not meet minimum fire flow and pressure requirements.

The proposed improvements that will serve future users are sized for build-out conditions. As the City continues to grow beyond its current limits, it is recommended that the pipeline diameters, well and storage capacities proposed in this Master Plan be constructed so that the facilities have sufficient capacity for build-out conditions. Building a smaller interim project with the plans of upsizing in the future to account for further growth is not recommended. In this Master Plan, the proposed pipe diameter represents the ultimate diameter for build-out conditions.

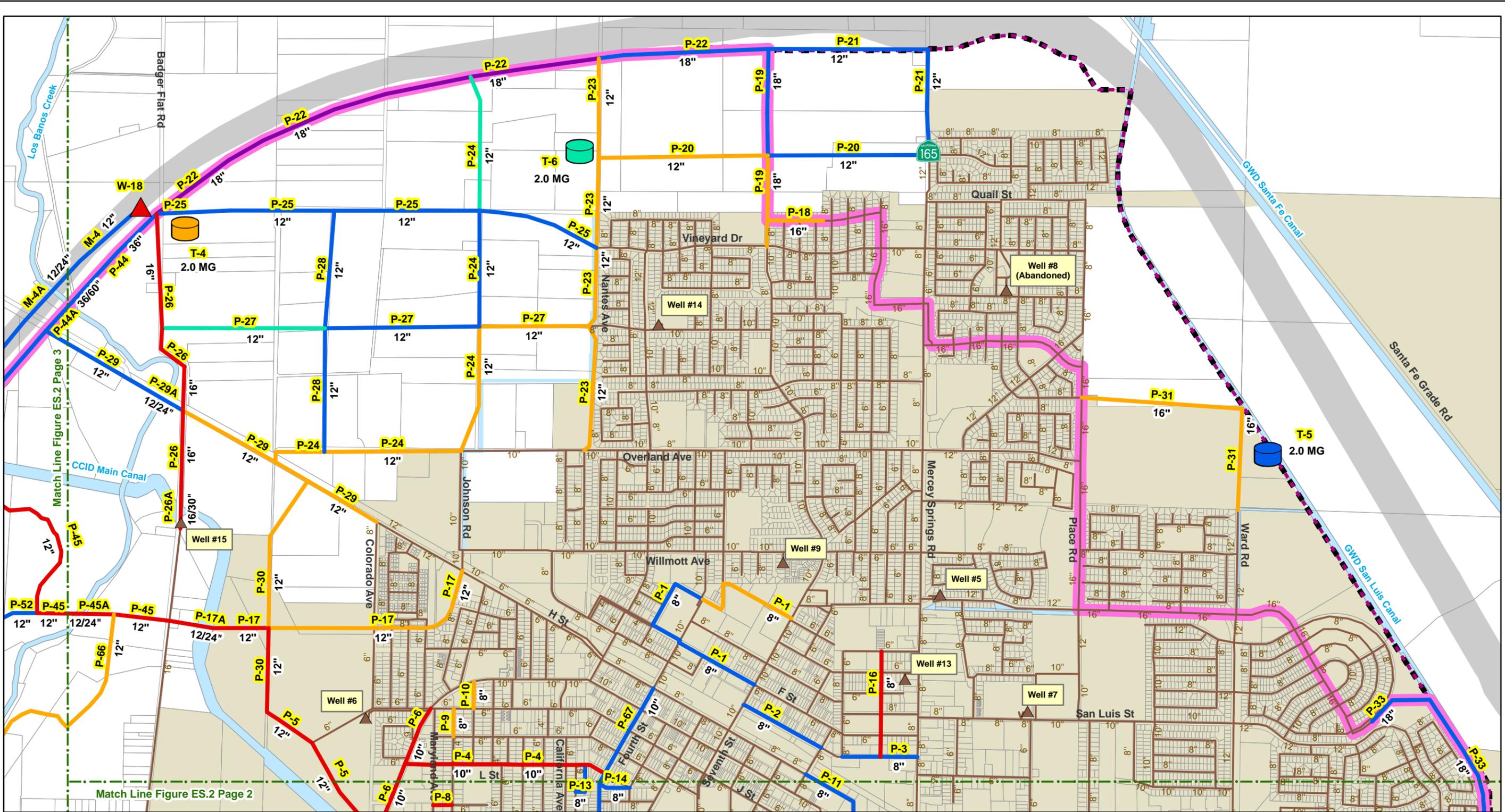
Figure ES.2 (three pages) illustrates the proposed improvements necessary to correct the existing deficiencies and to serve future users. Figure ES.2 shows the proposed improvements in different categories (colors). The different colors identify the implementation timeframe of the improvements and differentiate between near-term and long-term improvements.

Table ES.4 summarizes the improvements illustrated in Figure ES.2 with a cross-referenced number system. The figure number in the first column of Table ES.4 matches the improvement identification shown in Figure ES.2. For example "P-1" in the first row of Table ES.4 is the downtown replacement project. The table also contains a street location for the improvement, approximate size (length, diameter, volume, etc.), cost, and implementation timeframe.

ES.6.1 Existing Versus Future Improvements

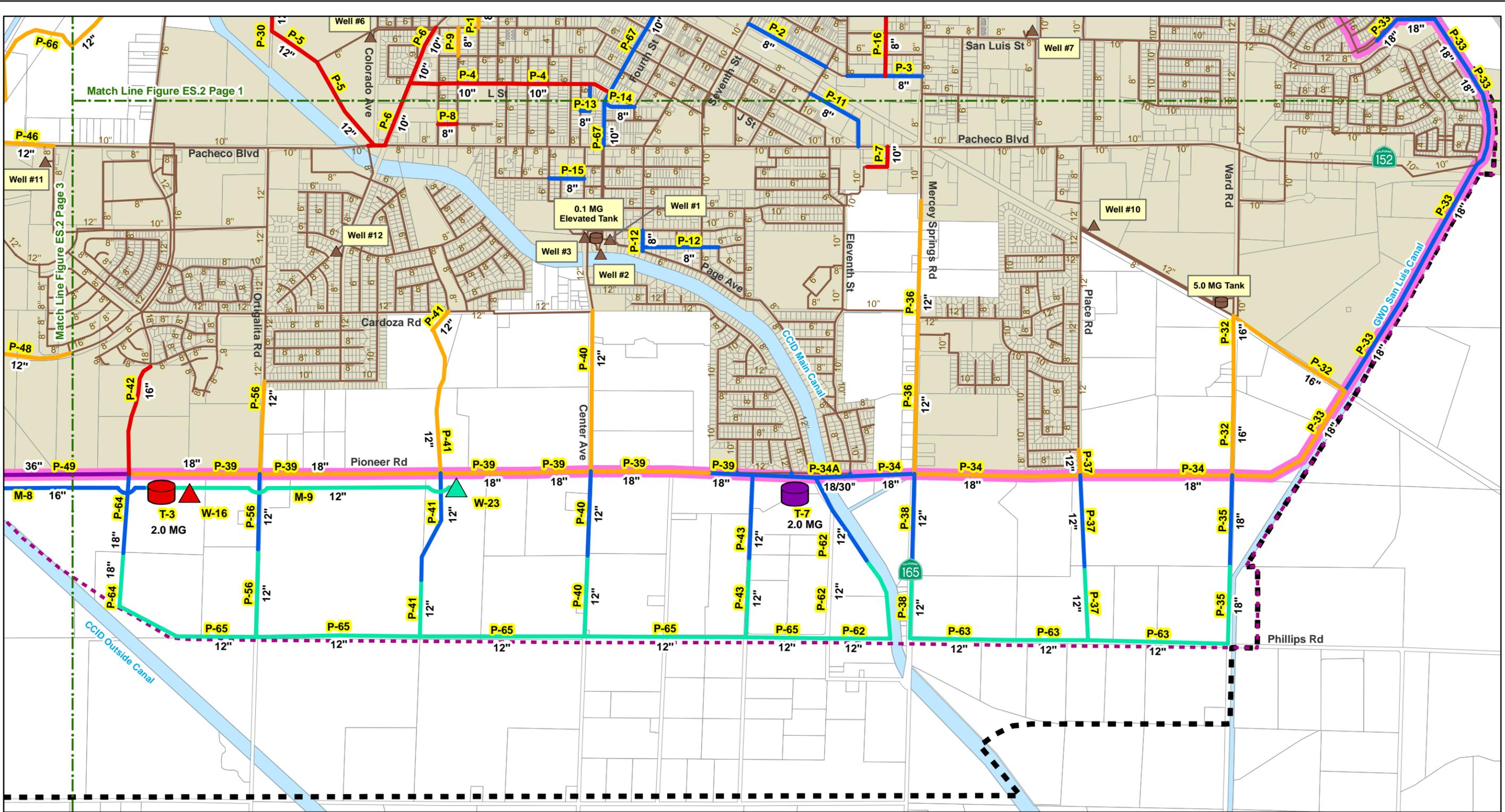
An existing deficiency is one where the existing facility's capacity is insufficient to meet the planning criteria (e.g. pipeline upgrades required to meet fire flow criteria). If a project was proposed to correct an existing deficiency, then existing users were assigned 100 percent of the project's benefit, and therefore, 100 percent of the costs.

A majority of the proposed improvements are required to serve future users. Continued growth will trigger the construction of new facilities to support this growth.



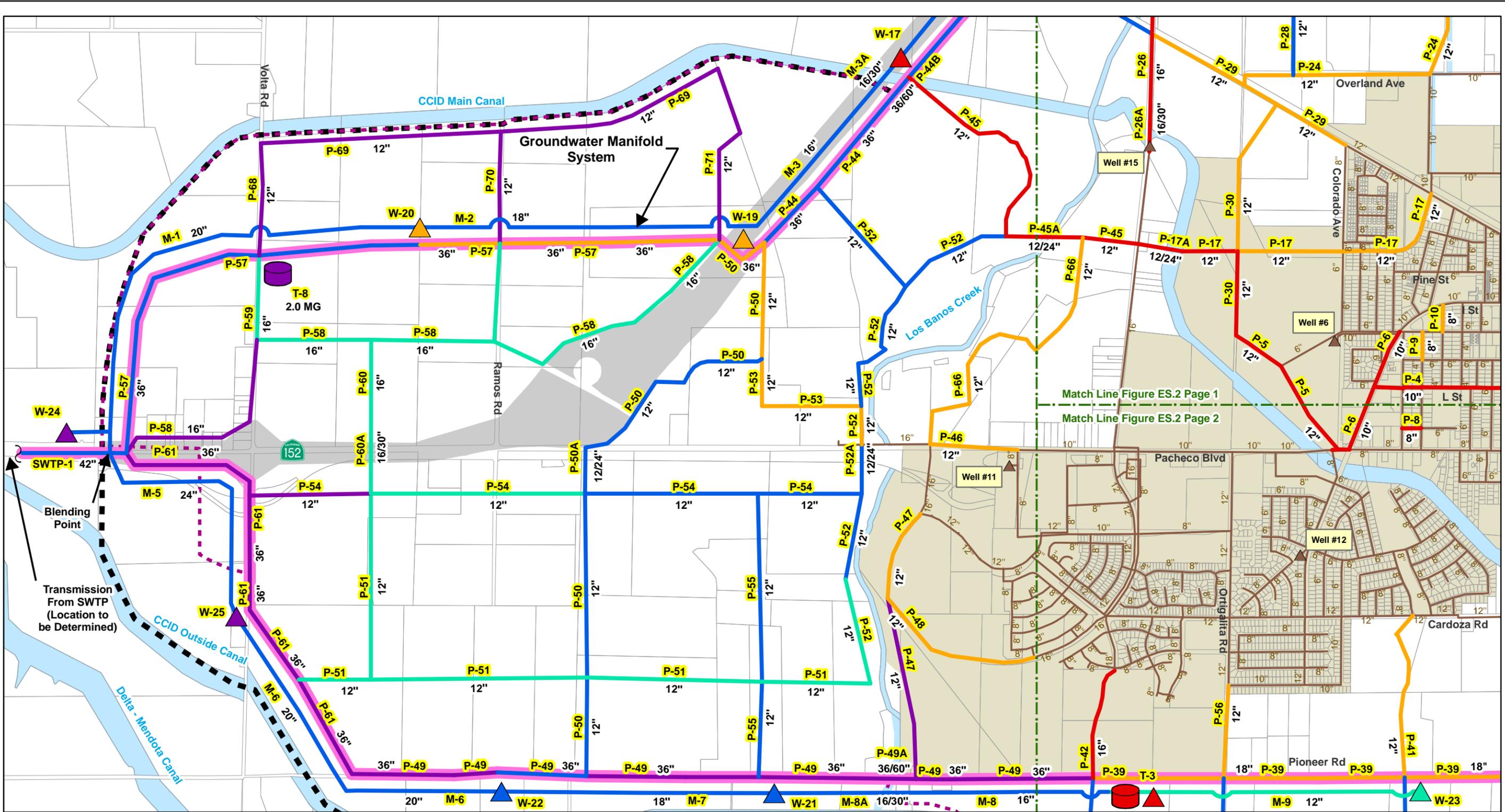
Legend		Future Distribution Facilities		Pipelines		Other Features	
	Groundwater Well		Phase 1 (2010 - 2015)		Phase 3 (2021 - 2025)		Parcels
	Storage Tank		Phase 2 (2016 - 2020)		Phase 4 (2026 - 2030)		Waterways/Canals
	Pipelines		Phase 3 (2021 - 2025)		Phase 5 (2031 +)		SR 152 Bypass Corridor
			Storage Tank and Booster Pump		Transmission Main Backbone		City Limits
			Groundwater Well		Urban Growth Boundary		Sphere of Influence
			Phase 1 (2010 - 2015)		0 700 1,400 Feet		
			Phase 2 (2016 - 2020)		Phase 1 (2010 - 2015)		
			Phase 3 (2021 - 2025)		Phase 2 (2016 - 2020)		
			Phase 4 (2026 - 2030)		Phase 3 (2021 - 2025)		
			Phase 5 (2031 +)		Phase 4 (2026 - 2030)		
					Phase 5 (2031 +)		
					Transmission Main Backbone		
					Urban Growth Boundary		
					Sphere of Influence		
					0 700 1,400 Feet		
					Phase 1 (2010 - 2015)		
					Phase 2 (2016 - 2020)		
					Phase 3 (2021 - 2025)		
					Phase 4 (2026 - 2030)		
					Phase 5 (2031 +)		
					Transmission Main Backbone		
					Urban Growth Boundary		
					Sphere of Influence		

Figure ES.2
Proposed Distribution
System Improvements (1 of 3)
 Water Distribution
 System Master Plan
 City of Los Banos



Legend		Future Distribution Facilities		Pipelines		Other	
	Groundwater Well		Phase 4 (2026 - 2030)		Phase 3 (2021 - 2025)		Parcels
	Storage Tank		Phase 5 (2031 +)		Phase 4 (2026 - 2030)		SR 152 Bypass Corridor
	Pipelines	Storage Tank and Booster Pump			Phase 5 (2031 +)		Transmission Main Backbone
	Phase 1 (2010 - 2015)		Phase 2 (2016 - 2020)		0 700 1,400 Feet		Urban Growth Boundary
	Phase 2 (2016 - 2020)		Phase 3 (2021 - 2025)		P-5 CIP ID		Sphere of Influence
	Phase 3 (2021 - 2025)				12" CIP Diameter		
					8" Existing Diameter		

**Figure ES.2
Proposed Distribution
System Improvements (2 of 3)**
Water Distribution
System Master Plan
City of Los Banos



Legend		Future Distribution Facilities		Pipelines		Other Features	
Existing Water Distribution Facilities		Groundwater Well		Phase 3 (2021 - 2025)		Phase 4 (2026 - 2030)	
▲ Groundwater Well	▲ Phase 1 (2010 - 2015)	▲ Phase 2 (2016 - 2020)	▲ Phase 3 (2021 - 2025)	— Phase 1 (2010 - 2015)	— Phase 2 (2016 - 2020)	— Phase 3 (2021 - 2025)	— Phase 4 (2026 - 2030)
● Storage Tank	▲ Phase 2 (2016 - 2020)	▲ Phase 3 (2021 - 2025)	▲ Phase 4 (2026 - 2030)	— Phase 4 (2026 - 2030)	— Phase 5 (2031 +)	— Phase 5 (2031 +)	— Transmission Main Backbone
— Pipelines	▲ Phase 3 (2021 - 2025)	▲ Phase 4 (2026 - 2030)	▲ Phase 5 (2031 +)	— Phase 5 (2031 +)	— Urban Growth Boundary	— Parcels	— Waterways/Canals
						— SR 152 Bypass Corridor	— City Limits
						— Sphere of Influence	

Scale

0 700 1,400 Feet

Match Lines

Match Line Figure ES.2 Page 1

Match Line Figure ES.2 Page 2

Figure ES.2
Proposed Distribution System Improvements (3 of 3)
 Water Distribution System Master Plan
 City of Los Banos

Table ES.4 Capital Improvement Projects																								
Water Distribution System Master Plan																								
City of Los Banos																								
Figure No.	Type of Improvement	Description/ Street	Description / Limits	Project Length/Size and Cost					Capital Improvement Cost ^{(2),(3)} (\$)	Capital Improvement Phasing					Future Users Benefit (%)	Improvement Reimbursement Category								
				Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)			Phase 1 2010-2015 (\$)	Phase 2 2016-2020 (\$)	Phase 3 2021-2025 (\$)	Phase 4 2026-2030 (\$)	Phase 5 2031+ (\$)		Existing Improvements (\$)	Future Improvements Developer (\$)	Regional (\$)						
Existing System Improvements																								
Pipelines																								
P-1	Pipe	C Street, D Street, 3rd Street, F Street	7th Street, North Street, C Street, E Street, F Street in downtown.	4,6	8	Replace	9,200	\$	1,275,000		\$	637,500	\$	637,500			0%	\$	1,275,000	\$	-	\$	-	
P-2	Pipe	G Street	7th Street to 10th Street	6	8	Replace	1,450	\$	201,000			\$	201,000				0%	\$	201,000	\$	-	\$	-	
P-3	Pipe	G Street	Mercy Springs Road to San Juan Avenue	6	8	Replace	700	\$	97,000			\$	97,000				0%	\$	97,000	\$	-	\$	-	
P-4	Pipe	L Street	4th Street to I Street	4,6	10	New/Replace	3,300	\$	571,000	\$	571,000						0%	\$	571,000	\$	-	\$	-	
P-5	Pipe	Within Municipal Airport	Colorado Avenue and Pacheco Blvd to end of Airport	6	12	Replace	2,300	\$	477,000	\$	477,000						0%	\$	477,000	\$	-	\$	-	
P-6	Pipe	I Street	Colorado Avenue and Pacheco Blvd to J Street	6,8	10	Replace	2,300	\$	398,000	\$	398,000						0%	\$	398,000	\$	-	\$	-	
P-7	Pipe	13th Street	Pacheco Blvd and 13th Street to existing 10-inch diameter pipe	-	10	New	650	\$	112,000	\$	112,000						0%	\$	112,000	\$	-	\$	-	
P-8	Pipe	M Street	Maryland Avenue to Iowa Avenue	-	8	New	300	\$	42,000	\$	42,000						0%	\$	42,000	\$	-	\$	-	
P-9	Pipe	Iowa Street	K Street to J Street	4	8	Replace	450	\$	62,000		\$	62,000					0%	\$	62,000	\$	-	\$	-	
P-10	Pipe	Idaho Street	J Street to I Street	4	8	Replace	450	\$	62,000		\$	62,000					0%	\$	62,000	\$	-	\$	-	
P-11	Pipe	H Street	10th Street to Pacheco Blvd	6	8	Replace	1,300	\$	179,000			\$	179,000				0%	\$	179,000	\$	-	\$	-	
P-12	Pipe	Monroe Avenue, Sixth Street	Monroe Circle to 6th Street, Paige Avenue to Madison Avenue	4	8	Replace	1,600	\$	222,000			\$	222,000				0%	\$	222,000	\$	-	\$	-	
P-13	Pipe	Center Lane	L Street to connection in alleyway near California Avenue	4	8	Replace	600	\$	83,000			\$	83,000				0%	\$	83,000	\$	-	\$	-	
P-14	Pipe	Alleyway n/o M Street	4th Street to Fifth Street	4	8	Replace	500	\$	69,000			\$	69,000				0%	\$	69,000	\$	-	\$	-	
P-15	Pipe	Adams Avenue	Nevada Avenue to Center Avenue	4	8	Replace	600	\$	83,000			\$	83,000				0%	\$	83,000	\$	-	\$	-	
P-16	Pipe	Santa Rita Avenue	G Street to Romero Street	-	8	New	1,700	\$	236,000	\$	236,000						0%	\$	236,000	\$	-	\$	-	
P-67	Pipe	4th Street	Pacheco Blvd to H Street	10	10	Replace	2,700	\$	468,000			\$	468,000				0%	\$	468,000	\$	-	\$	-	
	Pipe	Various Locations	Water main replacement program. Average size is 10-inch diameter.	10	10	Replace	25,000	\$	4,329,000		\$	1,083,000	\$	1,082,000	\$	1,082,000	\$	1,082,000	\$	4,329,000	\$	-	\$	-
Groundwater Wells																								
W-16	Supply Well ⁽⁴⁾	Pioneer Road	Near Ortigalita Road	-	1,400 gpm	New		\$	1,560,000	\$	1,560,000						0%	\$	1,560,000	\$	-	\$	-	
	Land Acquisition				0.25 acres	New		\$	60,000	\$	60,000						0%	\$	60,000	\$	-	\$	-	
	Supply Well	Various Locations	Replace or rehabilitate existing wells. Assume one well every 15 years.	various	1,400 gpm	Replace/Rehab		\$	3,120,000		\$	1,560,000			\$	1,560,000	0%	\$	3,120,000	\$	-	\$	-	
Water Meters																								
	Water Meters	Various Locations			3/4" and 1"	New	100	\$	250,000		\$	125,000	\$	125,000			0%	\$	250,000	\$	-	\$	-	
Existing Improvements Subtotal									\$	13,956,000	\$	3,456,000	\$	3,529,500	\$	3,246,500	\$	1,082,000	\$	2,642,000	\$	13,956,000	\$	-
Future System Improvements																								
Pipelines																								
P-17	Pipe	sw/o Johnson Road	H Street to connection to 16-inch diameter pipe in Badger Flat Road	-	12	New	5,400	\$	1,122,000	\$	337,000	\$	785,000				100%	\$	-	\$	1,122,000	\$	-	
P-17A	Casing ⁽¹⁾	sw/o Johnson Road	Crossing CCID Main Canal	-	12/24	New	400	\$	557,000	\$	557,000						100%	\$	-	\$	557,000	\$	-	
P-18	Pipe	Chenin Blanc	Stonewood Drive to intersection of Chenin Blank Court	8	18	Replace	1,150	\$	326,000		\$	326,000					100%	\$	-	\$	-	\$	326,000	
P-19	Pipe	Stonewood Drive	Vinewood Drive to future HWY 152 alignment	-	18	New	4,550	\$	1,289,000		\$	773,000	\$	516,000			100%	\$	-	\$	-	\$	1,289,000	
P-20	Pipe	Probable Extension of St Francis Drive	Mercy Springs Rd to Nantes Avenue	-	12	New	5,400	\$	1,122,000		\$	561,000	\$	561,000			100%	\$	-	\$	1,122,000	\$	-	
P-21	Pipe	Mercy Springs Road	St Francis Drive to future HWY 152 alignment, then west to future tank	-	12	New	4,300	\$	894,000			\$	894,000				100%	\$	-	\$	894,000	\$	-	
P-22	Pipe	Future HWY 152 Alignment	Probable extension of Stonewood Drive to Badger Flat Road	-	18	New	10,500	\$	8,616,000			\$	2,154,000	\$	6,462,000		100%	\$	-	\$	-	\$	8,616,000	
P-23	Pipe	Nantes Avenue	Overland Avenue to future HWY 152 Alignment	-	12	New	6,500	\$	1,351,000		\$	1,351,000					100%	\$	-	\$	1,351,000	\$	-	
P-24	Pipe	Johnson Road	H Street to Overland Avenue, then north to future HWY 152 Alignment	-	12	New	9,350	\$	1,942,000		\$	1,068,000	\$	388,000	\$	486,000		100%	\$	-	\$	1,942,000	\$	-
P-25	Pipe	Capri Avenue	Nantes Avenue to future tank along future HWY 152 alignment	-	12	New	7,300	\$	1,516,000			\$	1,516,000				100%	\$	-	\$	1,516,000	\$	-	
P-26	Pipe	Badger Flat Road	Well 15 to future HWY 152 alignment	-	16	New	5,300	\$	1,468,000	\$	1,468,000						100%	\$	-	\$	-	\$	1,468,000	
P-26A	Casing ⁽¹⁾	Badger Flat Road	Crossing CCID Main Canal	-	16/30	New	400	\$	696,000	\$	696,000						100%	\$	-	\$	-	\$	696,000	
P-27	Pipe	n/o Overland Avenue	Nantes Avenue to Badger Flat Road	-	12	New	6,950	\$	1,445,000		\$	361,250	\$	505,750	\$	578,000		100%	\$	-	\$	1,445,000	\$	-
P-28	Pipe	St Lucia Avenue	Overland Avenue to Capri Avenue	-	12	New	3,900	\$	810,000			\$	810,000				100%	\$	-	\$	810,000	\$	-	
P-29	Pipe	H Street	Colorado Avenue to future HWY 152 alignment	-	12	New	6,850	\$	1,423,000		\$	853,800	\$	569,200			100%	\$	-	\$	1,423,000	\$	-	
P-29A	Casing ⁽¹⁾	H Street	Crossing Los Banos Creek	-	12/24	New	200	\$	278,000			\$	278,000				100%	\$	-	\$	278,000	\$	-	
P-30	Pipe	w/o Colorado Avenue	H Street to existing system within airport	-	12	New	4,200	\$	872,000	\$	349,000	\$	523,000				100%	\$	-	\$	872,000	\$	-	
P-31	Pipe	Ward Road	Ward Road to Place Road	-	12	New	4,250	\$	883,000			\$	883,000				100%	\$	-	\$	883,000	\$	-	
P-32	Pipe	Ward Road and Railroad ROW	From 5.0 MG Reservoir to Pioneer Road and San Luis Canal	-	16	New	4,800	\$	1,329,000		\$	1,329,000					100%	\$	-	\$	1,329,000	\$	-	
P-33	Pipe	Along San Luis Canal	Existing 16-inch pipe in Creekside Circle and along San Luis Canal	-	18	New	10,550	\$	2,989,000		\$	747,000	\$	2,242,000			100%	\$	-	\$	-	\$	2,989,000	
P-34	Pipe	Pioneer Road	Ward Avenue to Holland Avenue	-	18	New	6,800	\$	1,927,000		\$	1,445,000	\$	482,000			100%	\$	-	\$	-	\$	1,927,000	
P-34A	Casing ⁽¹⁾	Pioneer Road	Crossing CCID Main Canal	-	18/30	New	400	\$	696,000			\$	696,000				100%	\$	-	\$	-	\$	696,000	
P-35	Pipe	Ward Avenue	Pioneer Road to Phillips Road	-	18	New	2,700	\$	764,000			\$	382,000	\$	382,000		100%	\$	-	\$	764,000	\$	-	
P-36	Pipe	Mercy Springs Avenue	Cardoza Road to Pioneer Road	-	12	New	4,450	\$	3,652,000		\$	3,652,000					100%	\$	-	\$	3,652,000	\$	-	
P-37	Pipe	Place Road	Pioneer Road to Phillips Road	-	12	New	3,100	\$	644,000		\$	64,000	\$	290,000	\$	290,000		100%	\$	-	\$	644,000	\$	-
P-38	Pipe	Mercy Springs Avenue	Pioneer Road to Phillips Road	-	12	New	2,700	\$	562,000			\$	281,000	\$	281,000		100%	\$	-	\$	562,000	\$	-	
P-39	Pipe	Pioneer Road	West of Ortigalita Road to CCID Main Canal	-	18	New	11,200	\$	3,173,000		\$	2,856,000	\$	317,000			100%	\$	-	\$	-	\$	3,173,000	
P-40	Pipe	Center Avenue	Cardoza Road to Phillips Road	-	12	New	5,300	\$	1,101,000		\$	441,000	\$	330,000			100%	\$	-	\$	1,101,000	\$	-	
P-41	Pipe	Between Ortigalita and Center	Cardoza Road to Phillips Road	-	12	New	5,500	\$	1,142,000		\$	456,000	\$	343,000	\$	343,000		100%	\$	-	\$	1,142,000	\$	-

Table ES.4 Capital Improvement Projects																		
Water Distribution System Master Plan																		
City of Los Banos																		
Figure No.	Type of Improvement	Description/ Street	Description / Limits	Project Length/Size and Cost				Capital Improvement Cost ^{(2),(3)} (\$)	Capital Improvement Phasing					Future Users Benefit (%)	Improvement Reimbursement Category			
				Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)		Phase 1 2010-2015 (\$)	Phase 2 2016-2020 (\$)	Phase 3 2021-2025 (\$)	Phase 4 2026-2030 (\$)	Phase 5 2031+ (\$)		Existing Improvements (\$)	Future Improvements Developer (\$)	Regional (\$)	
P-42	Pipe	Future area	Pioneer Road to existing system	-	16	New	1,850	\$ 513,000	\$ 513,000						100%	\$ -	\$ -	\$ 513,000
P-43	Pipe	Plow Camp Road	Pioneer Road to Phillips Road	-	12	New	2,650	\$ 551,000			\$ 275,500	\$ 275,500			100%	\$ -	\$ 551,000	\$ -
P-44	Pipe	Future HWY 152 Alignment	Badger Flat Road to future area	-	36	New	8,850	\$ 5,015,000			\$ 5,015,000				100%	\$ -	\$ -	\$ 5,015,000
P-44A	Casing ⁽¹⁾	Future HWY 152 Alignment	Crossing CCID Main Canal	-	36/60	New	400	\$ 1,392,000			\$ 1,392,000				100%	\$ -	\$ -	\$ 1,392,000
P-44B	Casing ⁽¹⁾	Future HWY 152 Alignment	Crossing CCID Main Canal	-	36/60	New	400	\$ 1,392,000			\$ 1,392,000				100%	\$ -	\$ -	\$ 1,392,000
P-45	Pipe	Future area	CCID Main Canal to Badger Flat Road	-	12	New	6,000	\$ 1,246,000	\$ 1,246,000						100%	\$ -	\$ 1,246,000	\$ -
P-45A	Casing ⁽¹⁾	Los Banos Creek	Crossing Los Banos Creek	-	12/24	New	200	\$ 278,000	\$ 278,000						100%	\$ -	\$ 278,000	\$ -
P-46	Pipe	Pacheco Blvd	West of Badger Flat Road	-	12	New	1,450	\$ 301,000		\$ 301,000					100%	\$ -	\$ 301,000	\$ -
P-47	Pipe	Future area	Pioneer Road to Stonecreek Blvd	-	12	New	4,500	\$ 934,000		\$ 327,000				\$ 607,000	100%	\$ -	\$ 934,000	\$ -
P-48	Pipe	Future area	Cardoza Road	-	12	New	2,800	\$ 582,000		\$ 582,000					100%	\$ -	\$ 582,000	\$ -
P-49	Pipe	Pioneer Road	CCID Outside Canal to east of Los Banos Creek	-	36	New	12,050	\$ 6,828,000			\$ 1,024,200			\$ 5,803,800	100%	\$ -	\$ -	\$ 6,828,000
P-49A	Casing ⁽¹⁾	Pioneer Road	Crossing Los Banos Creek	-	36/60	New	200	\$ 696,000					\$ 696,000		100%	\$ -	\$ -	\$ 696,000
P-50	Pipe	Canyon Road	Pioneer Road to future HWY 152 alignment	-	12	New	11,450	\$ 2,379,000		\$ 476,000	\$ 1,903,000				100%	\$ -	\$ 2,379,000	\$ -
P-50A	Casing ⁽¹⁾	Pacheco Blvd	HWY 152 Crossing	-	12/24	New	400	\$ 557,000		\$ 557,000					100%	\$ -	\$ 557,000	\$ -
P-51	Pipe	Future area	Los Banos Creek to study area boundary	-	12	New	12,350	\$ 2,566,000				\$ 2,566,000			100%	\$ -	\$ 2,566,000	\$ -
P-52	Pipe	Future area	Parallel to Los Banos Creek	-	12	New	11,000	\$ 2,285,000		\$ 229,000	\$ 1,714,000		\$ 342,000		100%	\$ -	\$ 2,285,000	\$ -
P-52A	Casing ⁽¹⁾	Near Los Banos Creek	HWY 152 Crossing	-	12/24	New	300	\$ 418,000		\$ 418,000					100%	\$ -	\$ 418,000	\$ -
P-53	Pipe	Future area	Near Los Banos Creek	-	12	New	4,250	\$ 883,000		\$ 883,000					100%	\$ -	\$ 883,000	\$ -
P-54	Pipe	Parallel to HWY 152	Los Banos Creek to Volta Road	-	12	New	10,000	\$ 2,078,000			\$ 831,000	\$ 623,000	\$ 624,000		100%	\$ -	\$ 2,078,000	\$ -
P-55	Pipe	Future area	Pioneer Road to s/o Pacheco Blvd	-	12	New	4,600	\$ 956,000			\$ 956,000				100%	\$ -	\$ 956,000	\$ -
P-56	Pipe	Ortigalita Road	Sandra Street to Phillips Road	-	12	New	4,150	\$ 863,000		\$ 287,000	\$ 288,000	\$ 288,000			100%	\$ -	\$ 863,000	\$ -
P-57	Pipe	Future area	HWY 152 to future HWY 152 alignment	-	36	New	12,200	\$ 6,912,000		\$ 3,456,000	\$ 3,456,000				100%	\$ -	\$ -	\$ 6,912,000
P-58	Pipe	Future area	North of HWY 152	-	16	New	11,900	\$ 3,296,000				\$ 2,307,000	\$ 989,000		100%	\$ -	\$ 3,296,000	\$ -
P-59	Pipe	Volta Road	Future area to future storage tank	-	16	New	1,350	\$ 374,000				\$ 374,000			100%	\$ -	\$ 374,000	\$ -
P-60	Pipe	Between Volta and Ramos	Crosses HWY 152	-	16	New	2,500	\$ 693,000				\$ 693,000			100%	\$ -	\$ 693,000	\$ -
P-60A	Casing ⁽¹⁾	e/o Volta Road	HWY 152 Crossing	-	16/30	New	400	\$ 696,000				\$ 696,000			100%	\$ -	\$ 696,000	\$ -
P-61	Pipe	Study Area Boundary, Volta Road	Parallel to Outside Canal to HWY 152 alignment	-	36	New	7,450	\$ 4,221,000					\$ 4,221,000		100%	\$ -	\$ -	\$ 4,221,000
P-62	Pipe	Along CCID Main Canal, Middle Road	Pioneer Road to Holland Avenue	-	12	New	3,950	\$ 821,000			\$ 328,000	\$ 493,000			100%	\$ -	\$ 821,000	\$ -
P-63	Pipe	Phillips Road	Mercey Springs Avenue to Place Road	-	12	New	4,000	\$ 831,000				\$ 831,000			100%	\$ -	\$ 831,000	\$ -
P-64	Pipe	Study Area Boundary	Future area parallel to r/o Phillips Road	-	18	New	2,200	\$ 624,000			\$ 312,000	\$ 312,000			100%	\$ -	\$ 624,000	\$ -
P-65	Pipe	Probable extension of Middle Road	Holland Avenue to Ortigalita Road, then continues west to Madera Road	-	12	New	13,000	\$ 2,700,000				\$ 2,700,000			100%	\$ -	\$ 2,700,000	\$ -
P-66	Pipe	Future area	HWY 152 to Los Banos Creek	-	12	New	5,300	\$ 1,101,000		\$ 1,101,000					100%	\$ -	\$ 1,101,000	\$ -
P-68	Pipe	Volta Road	Future area to study area boundary	-	12	New	2,000	\$ 415,000					\$ 415,000		100%	\$ -	\$ 415,000	\$ -
P-69	Pipe	Study Area Boundary	Volta Road to CCID Main Canal	-	12	New	7,650	\$ 1,590,000					\$ 1,590,000		100%	\$ -	\$ 1,590,000	\$ -
P-70	Pipe	Ramos Road	Future area to study area boundary	-	12	New	3,650	\$ 758,000				\$ 341,000	\$ 417,000		100%	\$ -	\$ 758,000	\$ -
P-71	Pipe	Future area	Future HWY 152 alignment to study area boundary	-	12	New	3,200	\$ 665,000					\$ 665,000		100%	\$ -	\$ 665,000	\$ -
Storage Tanks and Booster Pumps																		
T-3	Storage Tank	Pioneer Road	e/o Ortigalita Road	-	2 MG	New		\$ 4,212,000	\$ 4,212,000						100%	\$ -	\$ -	\$ 4,212,000
	Land Acquisition			-	2 acres	New		\$ 480,000	\$ 480,000						100%	\$ -	\$ -	\$ 480,000
T-4	Storage Tank	Future HWY 152 Alignment	Near intersection with Badger Flat Road	-	2 MG	New		\$ 4,212,000		\$ 4,212,000					100%	\$ -	\$ -	\$ 4,212,000
	Land Acquisition			-	2 acres	New		\$ 480,000		\$ 480,000					100%	\$ -	\$ -	\$ 480,000
T-5	Storage Tank	Place Road	Near intersection with Wimbledon Court	-	2 MG	New		\$ 4,212,000			\$ 4,212,000				100%	\$ -	\$ -	\$ 4,212,000
	Land Acquisition			-	2 acres	New		\$ 480,000			\$ 480,000				100%	\$ -	\$ -	\$ 480,000
T-6	Storage Tank	Future HWY 152 Alignment	w/o Mercey Springs Avenue	-	2 MG	New		\$ 4,212,000				\$ 4,212,000			100%	\$ -	\$ -	\$ 4,212,000
	Land Acquisition			-	2 acres	New		\$ 480,000				\$ 480,000			100%	\$ -	\$ -	\$ 480,000
T-7	Storage Tank	Pioneer Road	Near intersection with Holland Avenue	-	2 MG	New		\$ 4,212,000					\$ 4,212,000		100%	\$ -	\$ -	\$ 4,212,000
	Land Acquisition			-	2 acres	New		\$ 480,000					\$ 480,000		100%	\$ -	\$ -	\$ 480,000
T-8	Storage Tank	Future HWY 152 Alignment	Near intersection with Volta Road	-	2 MG	New		\$ 4,212,000					\$ 4,212,000		100%	\$ -	\$ -	\$ 4,212,000
	Land Acquisition			-	2 acres	New		\$ 480,000					\$ 480,000		100%	\$ -	\$ -	\$ 480,000
Groundwater Wells																		
W-17	Supply Well ⁽⁴⁾	Future HWY 152 Alignment	Near CCID Main Canal	-	1,400 gpm	New		\$ 1,560,000	\$ 1,560,000						100%	\$ -	\$ -	\$ 1,560,000
	Land Acquisition			-	0.25 acres	New		\$ 60,000	\$ 60,000						100%	\$ -	\$ -	\$ 60,000
W-18	Supply Well ⁽⁴⁾	Future HWY 152 Alignment	Near intersection with Badger Flat Road	-	1,400 gpm	New		\$ 1,560,000	\$ 1,560,000						100%	\$ -	\$ -	\$ 1,560,000
	Land Acquisition			-	0.25 acres	New		\$ 60,000	\$ 60,000						100%	\$ -	\$ -	\$ 60,000
W-19	Supply Well ⁽⁴⁾	Future HWY 152 Alignment	Near CCID Canal and Ramos Road	-	1,400 gpm	New		\$ 1,560,000		\$ 1,560,000					100%	\$ -	\$ -	\$ 1,560,000
	Land Acquisition			-	0.25 acres	New		\$ 60,000		\$ 60,000					100%	\$ -	\$ -	\$ 60,000
W-20	Supply Well ⁽⁴⁾	s/o Pacheco Blvd	Near HWY 152 and Canyon Road	-	1,400 gpm	New		\$ 1,560,000		\$ 1,560,000					100%	\$ -	\$ -	\$ 1,560,000

Table ES.4 Capital Improvement Projects																	
Water Distribution System Master Plan																	
City of Los Banos																	
Figure No.	Type of Improvement	Description/ Street	Description / Limits	Project Length/Size and Cost				Capital Improvement Cost ^{(2),(3)} (\$)	Capital Improvement Phasing					Future Users Benefit (%)	Improvement Reimbursement Category		
				Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)		Phase 1 2010-2015 (\$)	Phase 2 2016-2020 (\$)	Phase 3 2021-2025 (\$)	Phase 4 2026-2030 (\$)	Phase 5 2031+ (\$)		Existing Improvements (\$)	Future Improvements Developer (\$)	Regional (\$)
	Land Acquisition				0.25 acres	New		\$ 60,000		\$ 60,000				100%	\$ -	\$ -	\$ 60,000
W-21	Supply Well ⁽⁴⁾	Pioneer Road	Near Canyon Road and Los Banos Creek	-	1,400 gpm	New		\$ 1,560,000			\$ 1,560,000			100%	\$ -	\$ -	\$ 1,560,000
	Land Acquisition				0.25 acres	New		\$ 60,000			\$ 60,000			100%	\$ -	\$ -	\$ 60,000
W-22	Supply Well ⁽⁴⁾	Pioneer Road	Near Canyon Road	-	1,400 gpm	New		\$ 1,560,000			\$ 1,560,000			100%	\$ -	\$ -	\$ 1,560,000
	Land Acquisition				0.25 acres	New		\$ 60,000			\$ 60,000			100%	\$ -	\$ -	\$ 60,000
W-23	Supply Well ⁽⁴⁾	Pioneer Road	Near intersection with Holland Avenue	-	1,400 gpm	New		\$ 1,560,000			\$ 1,560,000			100%	\$ -	\$ -	\$ 1,560,000
	Land Acquisition				0.25 acres	New		\$ 60,000			\$ 60,000			100%	\$ -	\$ -	\$ 60,000
W-24	Supply Well ⁽⁴⁾	n/o Future HWY 152 Alignment	Near intersection with Volta Road	-	1,400 gpm	New		\$ 1,560,000				\$ 1,560,000		100%	\$ -	\$ -	\$ 1,560,000
	Land Acquisition				0.25 acres	New		\$ 60,000				\$ 60,000		100%	\$ -	\$ -	\$ 60,000
W-25	Supply Well ⁽⁴⁾	w/o Volta Road	Near future connection to SWTP	-	1,400 gpm	New		\$ 1,560,000				\$ 1,560,000		100%	\$ -	\$ -	\$ 1,560,000
	Land Acquisition				0.25 acres	New		\$ 60,000				\$ 60,000		100%	\$ -	\$ -	\$ 60,000
Well Manifold System																	
M-1	Pipe	Future Area	Along west side of study area boundary to future groundwater well	-	20	New	8,190	\$ 2,579,000			\$ 2,579,000			70%	\$ 773,700	\$ -	\$ 1,805,300
M-2	Pipe	Future Area	Future groundwater well to future HWY 152 alignment	-	18	New	4,880	\$ 1,382,000			\$ 1,382,000			70%	\$ 414,600	\$ -	\$ 967,400
M-3	Pipe	Future HWY 152 Alignment	Badger Flat Road to future area	-	16	New	4,520	\$ 1,253,000			\$ 1,253,000			70%	\$ 375,900	\$ -	\$ 877,100
M-3A	Casing ⁽¹⁾	CCID Main Canal Crossing		-	16/30	New	400	\$ 696,000			\$ 696,000			70%	\$ 208,800	\$ -	\$ 487,200
M-4	Pipe	Future HWY 152 Alignment	Badger Flat Road to future area	-	12	New	5,260	\$ 1,094,000			\$ 1,094,000			70%	\$ 328,200	\$ -	\$ 765,800
M-4A	Casing ⁽¹⁾	Los Banos Creek Crossing		-	12/24	New	400	\$ 557,000			\$ 557,000			70%	\$ 167,100	\$ -	\$ 389,900
M-5	Pipe	Study Area Boundary	Parallel to Outside Canal	-	24	New	4,460	\$ 1,685,000			\$ 1,685,000			70%	\$ 505,500	\$ -	\$ 1,179,500
M-6	Pipe	Study Area Boundary	Parallel to Outside Canal and Pioneer Road	-	20	New	5,510	\$ 1,735,000			\$ 1,735,000			70%	\$ 520,500	\$ -	\$ 1,214,500
M-7	Pipe	Pioneer Road		-	18	New	4,260	\$ 1,207,000			\$ 1,207,000			70%	\$ 362,100	\$ -	\$ 844,900
M-8	Pipe	Pioneer Road		-	16	New	5,450	\$ 1,510,000			\$ 1,510,000			70%	\$ 453,000	\$ -	\$ 1,057,000
M-8A	Casing ⁽¹⁾	Los Banos Creek Crossing		-	16/30	New	400	\$ 696,000			\$ 696,000			70%	\$ 208,800	\$ -	\$ 487,200
M-9	Pipe	Pioneer Road	West of Ortigalita Road	-	12	New	5,080	\$ 1,056,000			\$ 1,056,000			70%	\$ 316,800	\$ -	\$ 739,200
Surface Water Treatment Plant																	
SWTP	SWTP	Pacheco Blvd	West of the City limits	-	20 MGD	New		\$ 140,400,000		\$ 7,020,000	\$ 133,380,000			70%	\$ 42,120,000	\$ -	\$ 98,280,000
	Land Acquisition				10 acres	New		\$ 2,400,000			\$ 2,400,000			70%	\$ 720,000	\$ -	\$ 1,680,000
SWTP	SWTP Expansion	Pacheco Blvd	West of the City limits	-	2 MGD	New		\$ 14,040,000				\$ 14,040,000		70%	\$ 4,212,000	\$ -	\$ 9,828,000
SWTP	SWTP Expansion	Pacheco Blvd	West of the City limits	-	4 MGD	New		\$ 28,080,000				\$ 28,080,000		70%	\$ 8,424,000	\$ -	\$ 19,656,000
SWTP-1	Transmission Line	Pacheco Blvd	CA Aqueduct to future transmission main	-	42	New	11,000	\$ 7,271,000		\$ 364,000	\$ 6,907,000			70%	\$ 2,181,000	\$ -	\$ 5,090,000
SWTP-2	Casing ⁽¹⁾	Pacheco Blvd	Crossing CCID Outside Canal	-	42/72	New	350	\$ 1,462,000		\$ 73,000	\$ 1,389,000			70%	\$ 439,000	\$ -	\$ 1,023,000
SWTP-3	Casing ⁽¹⁾	Pacheco Blvd	Crossing Delta Mendota Canal	-	42/72	New	400	\$ 1,671,000		\$ 84,000	\$ 1,587,000			70%	\$ 501,000	\$ -	\$ 1,170,000
SWTP-4	Casing ⁽¹⁾	Pacheco Blvd	Crossing California Aqueduct	-	42/72	New	500	\$ 2,087,000		\$ 104,000	\$ 1,983,000			70%	\$ 626,000	\$ -	\$ 1,461,000
SWTP-5	Casing ⁽¹⁾	Pacheco Blvd	Crossing HWY 152	-	42/72	New	400	\$ 1,671,000		\$ 84,000	\$ 1,587,000			70%	\$ 501,000	\$ -	\$ 1,170,000
								Future Improvements Subtotal	\$ 360,263,000	\$ 13,376,000	\$ 42,753,050	\$ 204,000,650	\$ 22,899,500	\$ 77,233,800	\$ 64,359,000	\$ 54,850,000	\$ 241,054,000
								CIP Total (Existing and Future)	\$ 374,219,000	\$ 16,832,000	\$ 46,282,550	\$ 207,247,150	\$ 23,981,500	\$ 79,875,800	\$ 78,315,000	\$ 54,850,000	\$ 241,054,000
Notes:																	
1. Proposed casings size and carrier pipe size.																	
2. Baseline Construction Cost plus 20% to account for unforeseen events and unknown conditions.																	
3. Estimated Construction Cost plus 30% to cover other costs including Engineering, Construction Management, and Program Implementation.																	
4. Final location of future groundwater wells and storage tanks to be determined.																	
5. Land acquisition costs were included for the storage tank/booster pumps, wells, and surface water treatment plant, but were not included for the pipelines, since these will be located in public right of way.																	
6. Costs are based on the Engineering News Record Construction Cost Index 20-city average of 8592.																	

Future users were assigned 100 percent of the future project's benefit and 100 percent of the costs.

Most projects were assigned 100 percent to either existing or future users. The two exceptions were the 20 mgd surface water treatment plant (SWTP) scheduled to go on-line in year 2025 and the groundwater manifold piping system. The split was based on the existing ADD (7.56 mgd) divided by projected build-out ADD (24.9 mgd). Existing users will account for 30 percent of the SWTP benefits, and future users represent 70 percent of the benefits. More information on the breakdown in cost split between existing and future users and whether a proposed improvement is intended to correct an existing deficiency, to serve a future user, or both is provided in Chapters 6 and 7.

The future improvements were broken down further based on their funding source. Future improvements will be funded by developers or through development impact fees. All projects fall into one of the three following categories:

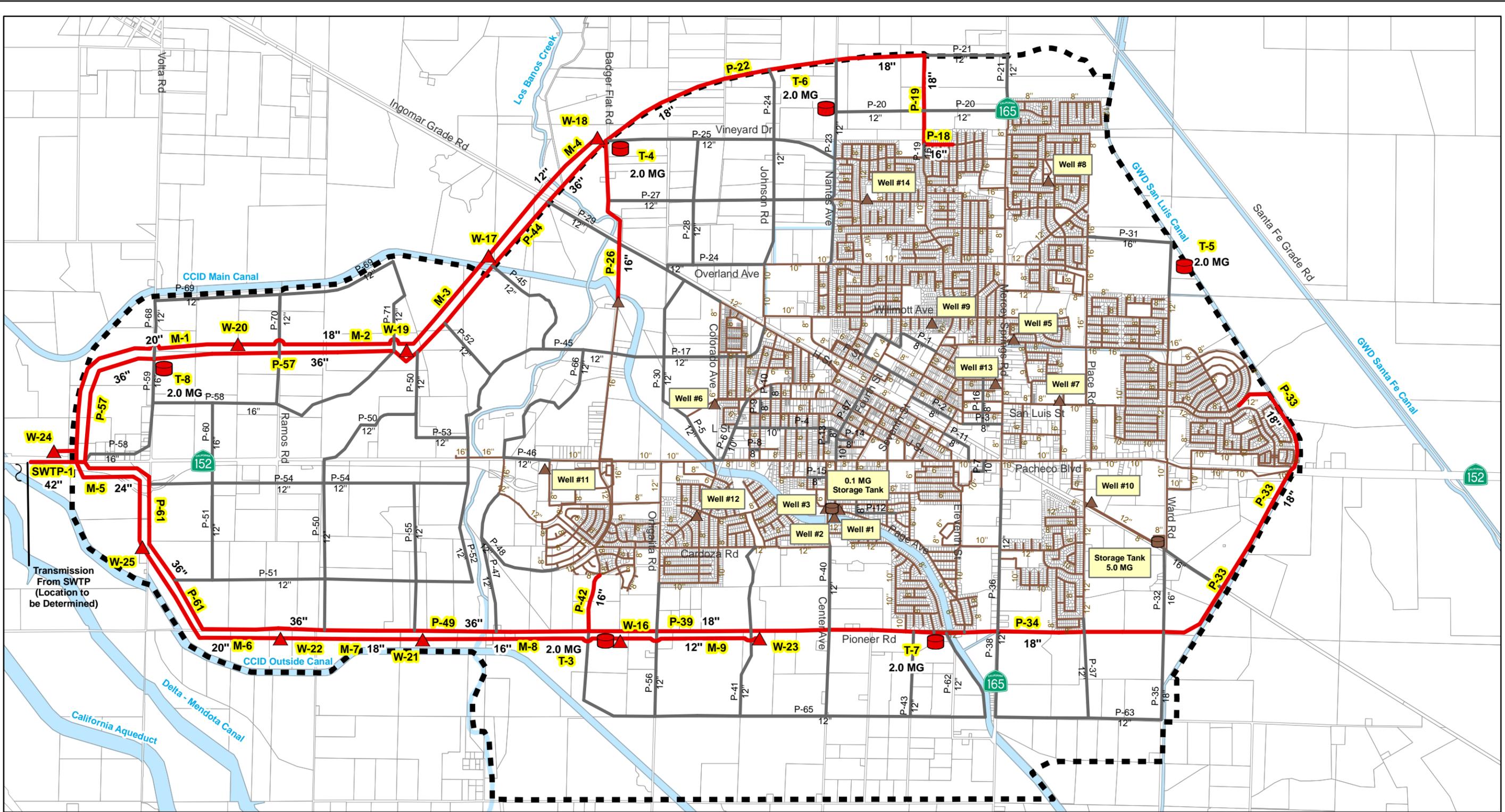
- Existing Improvements: Existing improvements correct existing deficiencies or rehabilitate/replace existing facilities that have reached their useful life. These projects are funded through user rates.
- Developer Improvements: Future improvements that serve new users. These improvements will be developer funded and/or may be part of a reimbursement agreement between developers.
- Regional Improvements: Future improvements that serve new users. These improvements will be funded through water development impact fees collected by the City.

The majority of future improvements are Developer Improvements, but water transmission mains, groundwater manifold pipe system, storage tanks, wells, and the treatment plant were designated Regional Improvements. The Regional Improvements are shown in Figure ES.3

ES.6.2 Water Supply Capacity Improvements

A significant drop in development between 2007 and 2010 allowed for deferment of the water supply improvements. Even though the maximum day demand projections appear to exceed the firm capacity, in reality the near term drop in development kept water demand levels relatively constant through 2009. If demands start to increase rapidly, then the City should review the supply projections.

This Master Plan contains recommendations for new groundwater wells to meet future demands. Three new 2.0 mgd capacity wells are required by 2015. Seven new wells are required through the year 2025, at which time the 20 mgd SWTP will be on-line. Following the installation of the SWTP, which will be sized to meet ADD, a new well will not be necessary until year 2030. The SWTP will likely have sufficient capacity to meet all the



Legend		Future Distribution Facilities		Developer Improvements		Parcels	
Existing Water Distribution Facilities		Regional Improvements		— Pipeline		Waterways/Canals	
▲ Groundwater Well	▲ Groundwater Well	NC-2 Regional CIP ID	▲ Storage Tank	S2-7 CIP ID	■ Sphere of Influence	12" CIP Diameter	8" Existing Diameter
● Storage Tank	● Storage Tank		— Pipeline				
— Pipelines	— Pipeline						

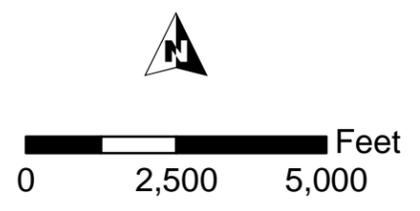


Figure ES.3
Regional Improvements
 Water Distribution
 System Master Plan
 City of Los Banos

City's demands for six months of the year. The other six months, the City will need to supplement the treatment plant supply with well water.

Possible well locations are shown in Figure ES.2. The locations shown are conceptual, but the goal was to space the new wells approximately one mile apart, to locate them along the transmission main backbone that will circle the entire City, and to locate them within the higher quality groundwater on the west side of the study area. The different color illustrations for the wells in the figure signify the timeframe that the wells should be installed.

The City will also conduct intermittent rehabilitation or replacement of existing wells to modernize aging infrastructure or to abandon wells with poor water quality. This Master Plan assumed that two wells would be rehabilitated or replaced over the next 20 years.

ES.6.3 Storage Tank and Booster Pump Capacity Improvements

A significant drop in development between 2007 and 2010 allowed for deferment of water storage improvements. Even though the storage projections appear to exceed the required storage capacity, in reality the near term drop in new development kept water demand levels relatively constant through 2009. If demands start to increase rapidly, then the City should revise the storage projections.

The required storage from 2008 through build-out of the SOI is calculated and presented in Section 6 of this Master Plan. The required storage for 2010 is projected to equal approximately 6.1 MG, which is 1,000,000 gallons greater than the current available storage. In order to meet this deficiency, the City should begin planning and designing a new storage tank.

This Master Plan assumed that future storage tanks would be 2 MG in capacity. The first 2.0 MG storage tank should be on-line in 2012. Subsequent 2.0 MG storage tanks are installed every five to eight years through year 2035. The last tank is installed in year 2049. In total, six storage tanks (2.0 MG each) will be installed to meet future storage requirements.

The proposed tank locations are distributed throughout the system and are shown in Figure ES.2. The locations shown are conceptual, but the goal was to locate them along the transmission main backbone that will circle the City. In some locations, tanks are placed adjacent to proposed wells. Each storage tank will require the installation of a pump station. Hence, six new booster pump stations are recommended in this Master Plan. Although the booster pumps are not shown on Figure ES.2, the reader should assume their presence.

ES.6.4 Pipeline Improvements

This Master Plan is proposing about 73 miles of new pipelines to serve future users and approximately 16 miles of existing pipeline replacement to correct existing deficiencies or to restore aging water mains.

ES.6.4.1 Existing System Improvements

It is recommended that the City replace some of the small diameter pipelines in the downtown area and in some of the more mature neighborhoods. These small diameter pipes are unable to deliver water at high rates and meet the fire flow pressure requirements. There are also new pipelines that are recommended for the existing system to improve connectivity and to replace the last remaining cast iron pipe in the distribution system. Figure ES.2 illustrates the existing system improvements necessary to meet the fire flow criteria and to improve connectivity. The pipeline replacement projects intended to improve fire flow pressure requirements are identified as high priority projects. These projects are illustrated as red pipelines in Figure ES.2 and are labeled as Phase 1 projects, which suggest that they would be the first projects implemented for the water system.

In addition to the pipeline improvements recommended to mitigate capacity deficiencies, the City should implement a water main replacement program. The water main replacement program will remove older pipes that may be corroded or encrusted with mineral deposits, and replace them with new pipes. This program will improve distribution of water and could improve water quality by removing corroded pipes. The City should consider an asset management program to assess the condition of pipes and establish a schedule for replacing the deteriorated pipes in the system.

ES.6.4.2 Future System Improvements

All future system pipeline improvements will serve undeveloped areas. Most of the proposed pipelines fall in the 12- to 18-inch diameter range. However, building the backbone transmission main around the City is a primary goal of this Master Plan. As the City builds more production wells on the west side of the City, the transmission main backbone will provide the facilities necessary to pump water from higher quality groundwater aquifers on the west, to the customers on the eastside of town. When the City's SWTP goes on-line in 2025, the transmission main loop should be developed enough to deliver water to all points of the City. This backbone was generally sized to be 16-inch diameter and larger to provide flexibility for the potential future SWTP and/or extraction wells on the west side of the City.

ES.6.4.3 Well Manifold System

When the future SWTP is on-line, the City's preference would be to blend the groundwater with the treated surface water prior to distribution. Blending would be achieved by installing a manifold piping system connected to new wells on the west side of the study area. The

manifold system would pipe water west and connect to the treated SWTP pipeline bringing water from the California Aqueduct. The manifold system would consist of a northern reach connecting wells on the northern perimeter of the study area, and a southern reach for the wells along the southern perimeter.

Blending treated surface water with groundwater would achieve uniform water quality throughout the distribution system. When the SWTP comes on-line, it will have sufficient capacity to serve the City's demands for most of the year. During the summer when water use increases, the wells will be needed to meet maximum day and peak hour demands. Some of the City's wells have hardness concentrations that exceed 400 mg/L as CaCO₃ and total dissolved solids (TDS) concentrations that exceed 700 mg/L on average. Blending the two water sources will avoid residents living close to wells from receiving mostly groundwater with higher hardness and TDS concentrations during the summer. Blending treated surface water with groundwater will decrease the hardness and TDS concentrations of the mixed supply and ensure that residents receive a more uniform water quality throughout the year.

ES.6.5 Meter Installation

There are approximately 100 un-metered water users in the City. The City plans to install meters on each of these customers. According to City staff, the meters are likely 3/4-inch or 1-inch service connections. The locations of these un-metered services are not shown on the figures.

ES.7 CAPITAL PROJECT PRIORITIZATION

The capital improvements for the City's water distribution system were prioritized based on the following factors:

- Addressing the most capacity deficient pipelines under fire flow demand conditions.
- Increasing supply (groundwater and surface water) capacity to serve existing and future users
- Increasing storage capacity to serve future users
- Building the distribution and transmission pipelines necessary to serve future users

Higher priority projects were listed within the Phase 1 (2010-15) and Phase 2 (2016-20) implementation timeframes in Table ES.4. Lower priority projects were listed in Phase 3 (2021-25) through Phase 5 (2030+).

The existing system improvements were proposed primarily to provide sufficient water pressure in the downtown area during a fire. The fire flow demand criteria recommended by the City's Fire Department resulted in more improvements necessary to meet the flow and pressure requirements.

Future development will require the construction of new pipelines, wells, and storage tanks to serve new users. Proposed improvements within areas identified for early development were assigned a higher priority. Areas within an approved tentative map tract received the highest priority. The actual implementation of the improvements serving future users depends on the pace of development. The priorities presented below are estimates based on available information provided by the City. Changes in the City's planning assumptions or growth projections could increase or decrease the priority of each improvement.

ES.7.1 Existing System Improvement Prioritization

The existing system improvements required to meet fire flow and water supply criteria were assigned a high priority. Due to economic conditions and the slow down in development between 2007 and 2010, the probability and practicality of building all these improvements in the next five years is low. For this reason, the improvements were distributed amongst the first three phases according to priority and the level of benefit provided to the existing system. Water supply improvements and pipelines that provided the greatest benefit (e.g. greater fire flow pressure, improved connectivity, enhanced distribution) to existing users were ranked with the highest priority and are grouped into Phase 1 (P-4 through P-8, P-16, and W-16). The remaining improvements were distributed between Phases 2 and 3 (P-1, P-2, P-3, P-9 through P-15, and P-67). P-67 will replace the last cast iron pipeline in the distribution system. Figure ES.2 illustrates the location of these improvements and the phasing by color code.

The water main replacement program would be an on-going project that would be implemented in Phases 2 through 5. The water well replacement or rehabilitation project assumes a project once every 15 years. It was assumed that the water meter installation program would begin in year 2010 and continue until completed.

ES.7.2 Future System Improvement Prioritization

The implementation of distribution system improvements that serve future growth will depend on the City's pace of development and selection of areas to be served with urban infrastructure. The City provided guidance on future development and phasing of infrastructure to serve future users. Based on this input, the projects were grouped into the following timeframes:

- Years 2010 through 2015
- Years 2016 through 2020
- Years 2021 through 2025
- Years 2026 through 2030
- Beyond 2031

ES.7.2.1 Phase 1 and 2 Projects (2010-2020)

The high priority future system improvements are those required to serve anticipated growth from 2010 through 2020. The majority of these improvements are distribution pipelines, but they also include wells and storage tanks. Wells 17 through 20 (four new wells total) are necessary to meet projected MDD through year 2020. Two new 2.0 MG storage tanks with booster pumps will be needed by 2015 to meet operational and fire storage requirements.

As shown in Table ES.4 and illustrated in Figure ES.2, there are several pipeline improvements that fall into the Phase 1 and 2 categories and are considered high priority distribution pipeline improvements. The highest priority pipeline projects that serve new users include P-17, P-30, P-32, P-42, and P-45. Improvements P-17 and P-30 link the existing 16-inch diameter pipeline in Badger Flat Road to the existing 6-inch diameter pipeline within the airport property (note that the 6-inch diameter pipeline is scheduled for replacement and upsize to a 12-inch diameter). Improvement P-42 extends a new 16-inch diameter pipeline from the Stonecreek and Cardoza Road area down to Pioneer Road where new Well No. 16 is shown.

There are a number of Phase 2 pipeline improvements that extend out to proposed tank and well sites, or serve areas that could be developed by year 2020. Some general areas with a near term development potential include the proposed industrial park around Ward Road, land between Cardoza and Pioneer Road, commercial areas around Highway 152 on the west side of the City, and vacant land around Nantes and Overland Avenues. As shown in Figure ES.2, pipelines illustrated as Phase 2 improvements serve these areas.

ES.7.2.2 Phase 3 through 5 Projects (2021 and beyond)

The lower priority future system improvements are those required to serve anticipated growth from 2021 and beyond. Wells 21 and 22 are necessary between years 2021 and 2023 to meet projected MDD. As discussed previously, when the SWTP comes on-line in year 2025, the last two wells are not required until after year 2050. Four new 2.0 MG storage tanks with booster pumps will be needed from year 2022 through build-out of the study area.

The pipeline improvements in Phase 3 extend farther out towards the boundary of the study area. This is also the phase that a significant amount of the northern loop of the transmission main backbone around the City would be completed. The northern loop placement follows the proposed Highway 152 bypass alignment. This segment of the transmission main is critical because if the SWTP comes on-line by year 2025, this pipeline would serve as the primary transmission of potable water from the west to the east. Pipeline improvements P-57, P-44, P-25, P-29, and P-52 should be completed by the end of Phase 3 to serve the future SWTP.

ES.7.2.3 Surface Water Treatment Plant Prioritization

The SWTP is the single largest project that the City will construct through build-out of the study area. This Master Plan assumed that the treatment plant would be on-line by year 2025. Projects of this size and importance typically require years to plan, design, permit, and construct. The SWTP includes an additional level of complexity in that water supply contracts need to be secured from the State Water Project. Although work on securing the water supply contracts could start in the next few years, this Master Plan assumed that the majority of work to plan, permit, design, and construct would occur between 2021 and 2025, but some work would be conducted prior to year 2021.

ES.8 CAPITAL PROJECT COSTS

A summary of the capital project costs and the implementation timeframe is presented in Table ES.4. The future improvements are broken down further into Regional or Developer Improvements. The difference between these two is the funding source. The Regional Improvements were illustrated in Figure ES.3 and include the surface water treatment plant, the transmission main around the City, the groundwater manifold piping system, wells, and tanks. The breakdown in existing and future user share by phase for existing and future users is presented in Table ES.5.

Table ES.5 Existing Versus Future User Cost Share Water Distribution System Master Plan City of Los Banos						
Reimbursement Category	Implementation Phase					Total (\$, mill.)
	2010-15 (\$, mill.)	2016-20 (\$, mill.)	2021-25 (\$, mill.)	2026-30 (\$, mill.)	2031 + (\$, mill.)	
Existing Improvements ⁽²⁾	3.46	5.85	52.33	1.40	15.28	78.32
Future Developer Improvements ⁽³⁾	2.77	17.49	13.76	15.53	5.31	54.85
Future Regional Improvements ⁽⁴⁾	10.61	22.95	141.16	7.05	59.29	241.05
Total	16.83	46.28	207.25	23.98	79.88	374.22
Notes: 1. All costs are in November 2009 dollars. ENR CCI 20 City average = 8592 2. Projects are funded through user rates. 3. Projects are developer funded and/or may be part of a development reimbursement agreement. 4. Projects funded through water development impact fees collected by the City.						