CITY OF HESPERIA

Final Report

Wastewater Master Plan

July 2008

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75 YEARS Working Wonders

July 30, 2008
7287A.00

City of Hesperia
9700 Seventh Avenue
Hesperia, CA 92345

Attention: Mr. Scott Priester, AICP
Director of Development Services

Subject: Final Wastewater Master Plan

Dear Mr. Priester:

Enclosed is a copy of the final Wastewater Master Plan. Thank you for the opportunity to work with the City on this project. We enjoyed working with you and your staff and look forward to continuing our relationship with the City. Please feel free to contact me if you have any questions on this Plan.

Sincerely,

CAROLLO ENGINEERS, P.C.

Gary Meyerhofer, P.E.
Partner

GM:alh

REGISTERED PROFESSIONAL ENGINEER
GARY J. MEYERHOFER
GM
No. 29483
Exp. 3/31/09
CIVIL
STATE OF CALIFORNIA

Enclosures: Final Wastewater Master Plan Report

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CITY OF HESPERIA

WASTEWATER MASTER PLAN

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ES.1 INTRODUCTION

The City of Hesperia (City) lies within an area that is commonly referred to as the high desert in Southern California. It is located in the northern portion of San Bernardino County (County), California, approximately 30 miles north of the City of San Bernardino. The City encompasses an area of approximately 74 square miles. The study area for this Wastewater Master Plan (Master Plan) is shown on Figure ES.1. As shown on this figure, Planning Area No. 15 (PA-15) and PA-16 are excluded from the study area of this Master Plan.

Geographically, approximately 5 percent of the study area is currently served by sewers that ultimately flow to a regional wastewater treatment plant (WWTP) that is owned and operated by the Victor Valley Wastewater Reclamation Authority (VVWRA). The remaining area is undeveloped or served by on-site systems (septic tanks).

Through a formal selection process, Carollo Engineers (Carollo) was selected to prepare this Master Plan to aid in the planning of its wastewater infrastructure and operations. This report makes up one portion of a four-system study that includes the Urban Water Management Plan, the Recycled Water Master Plan, and the Water Master Plan, which are presented in separate reports.

ES.2 EXISTING SYSTEM FACILITIES

The City's wastewater collection system includes approximately 60 miles of gravity sewer pipe, 882 manholes, 51 cleanouts, 1 operational lift station, and 1 force main. The City's sewer system connects to VVWRA's 3-mile interceptor that runs along the northeast boundary of the City. Figure ES.2 shows the location of each of the facilities, including the six outlets to the VVWRA interceptor. Detailed information on these facilities is included in Chapter 2 of this Master Plan.

ES.3 WASTEWATER FLOW

The principal sources of wastewater in the City's sewer system include sanitary flow from residential, commercial, and industrial sources. Future wastewater flows are projected from the City's land use plans and flow monitoring results. Using the estimated customer counts and unit flows, the average dry weather wastewater flows (ADWF) are projected by land use type and planning year. Projected wastewater flows are summarized in Table ES.1. Projected flows from PA-15 and PA-16 are excluded from Table ES.1 and the hydraulic model, as this area falls outside of the study area of this Master Plant and because developers are responsible for sewers in these areas.

Table ES.1 Projected Average Dry Weather Flow
Wastewater Master Plan Update
City of Hesperia

Year	2005	2012	2017	2022	2027	2032
LDR ADWF (mgd)	0.73	1.68	2.11	2.45	2.75	2.93
HDR ADWF (mgd)	0.63	1.83	2.92	3.67	4.19	4.45
Commercial ADWF (mgd)	0.56	1.22	2.13	2.74	3.14	3.30
Industrial ADWF (mgd)	0.15	0.41	0.71	1.03	1.33	1.55
Total ADWF (mgd)[(2)(3)]	**2.06[(1)]**	**5.14**	**7.90**	**9.90**	**11.40**	**12.20**

Notes:
(1) 2.04 mgd was measured at the downstream end of the Hesperia collection system for 7 days in April 2006.
(2) Totals may not agree with the sum of the PAs due to rounding.
(3) Excluded flows from PA-15 and PA-16 (see Figure ES.1).

The peaking factor is defined as the ratio of the peak dry weather flow (PDWF) to the ADWF. The peaking factor is used to estimate peak flows based on average flows. As directed by City staff, the equation developed by the San Bernardino County Special District is used in this Master Plan. The projected peak hour flows and peaking factors for all the planning years are summarized in Table ES.2.

Table ES.2 Projected Peak Hour Flow and Peaking Factors
Wastewater Master Plan Update
City of Hesperia

Year	2005	2012	2017	2022	2027	2032
Projected ADWF (mgd)	2.06	5.14	7.87	9.89	11.41	12.23
Projected PDWF (mgd)[(1)]	4.83	10.98	16.10	19.77	22.48	23.93
Estimated Peaking Factor[(2)]	2.34	2.14	2.05	2.00	1.97	1.96

Notes:
(1) Peak flows based on the San Bernardino Special County District Equation.
(2) Peaking factor is calculated using PDWF/ADWF.

ES.4 HYDRAULIC COMPUTER MODEL DEVELOPMENT

The City is currently migrating towards GIS as its future database management and mapping platform. To provide the City with a hydraulic model that is fully integrated in a GIS environment, it was recommended to use MWH Soft's InfoSewer sewer collection system modeling software for the development of the sewer model. The City's sewer model was developed into InfoSewer by converting the City's previous Microsoft® Excel-based sewer model and the City's digitized sewer system.

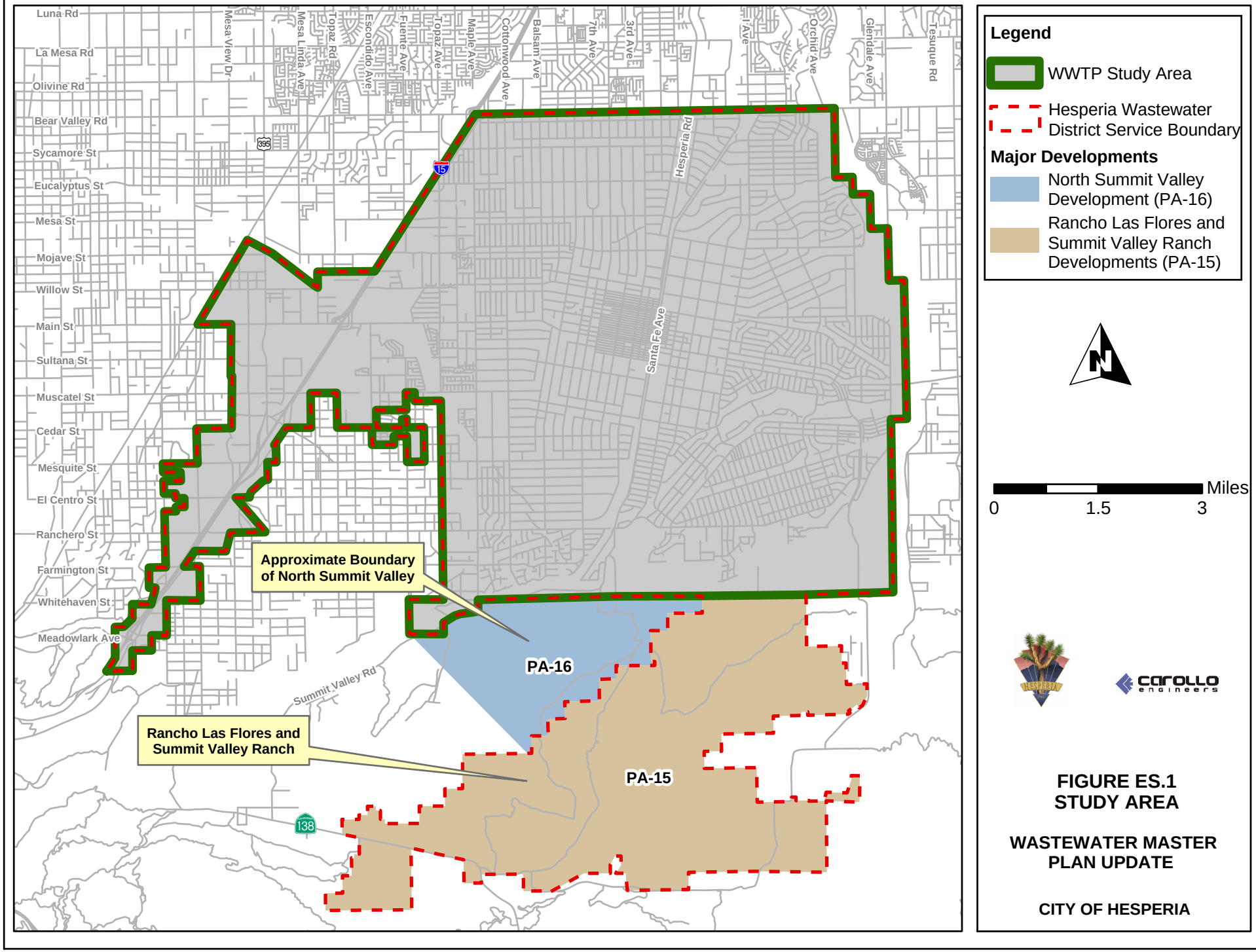
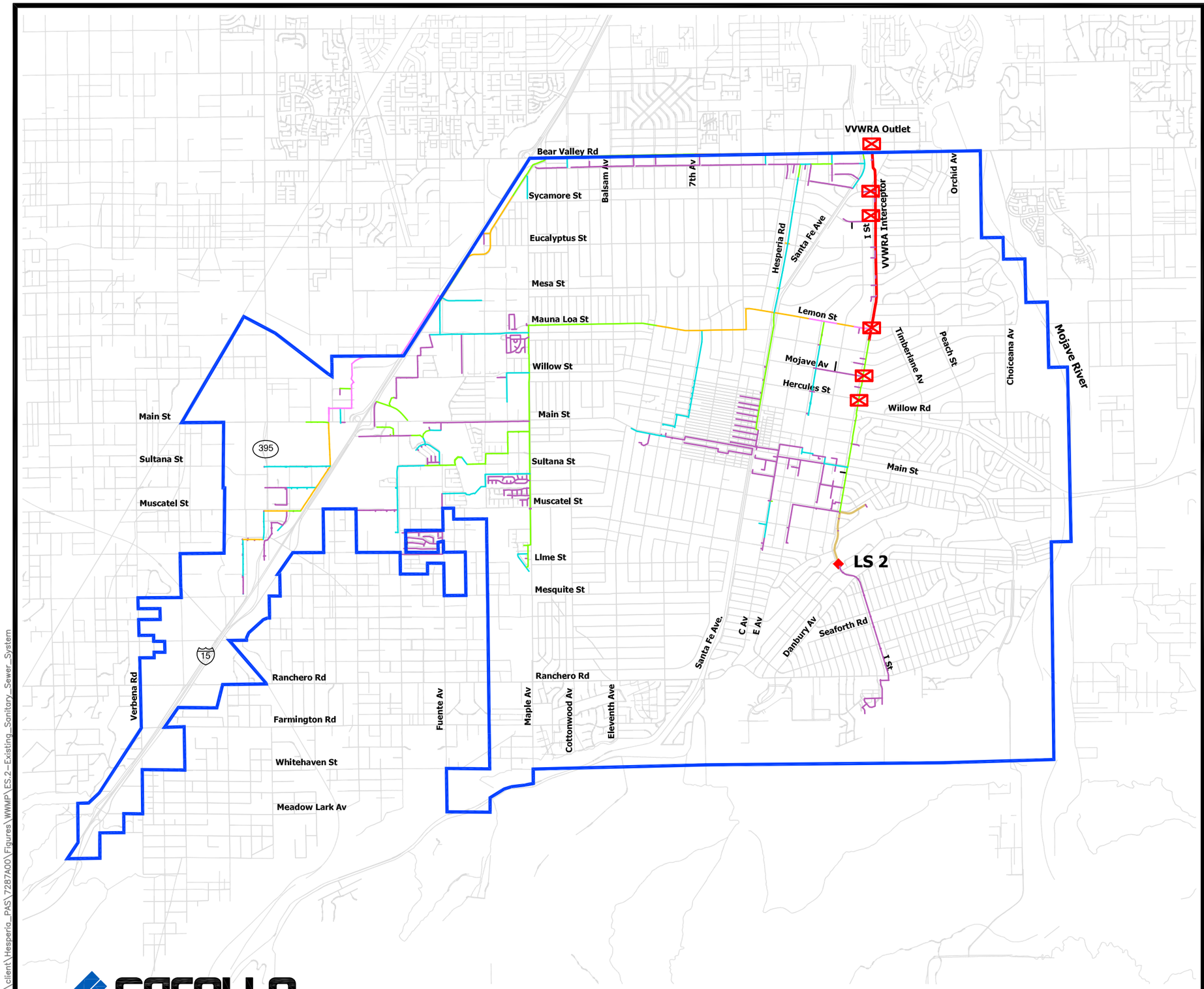


FIGURE ES.1
STUDY AREA

WASTEWATER MASTER PLAN UPDATE

CITY OF HESPERIA



Legend

- Study Area Boundary
- 8" Gravity Sewers
- 10" Gravity Sewers
- 12" Gravity Sewers
- 15" and 16" Gravity Sewers
- 18" and 21" Gravity Sewers
- VVWRA Interceptor
- 6" Force Mains
- Streets
- Lift Station (LS)
- VVWRA Outlet

N

0 6000’ 12000’

FIGURE ES.2
EXISTING SYSTEM

WASTEWATER MASTER PLAN UPDATE

CITY OF HESPERIA

H:\client\Hesperia_PAS\7287A00\Figures\WWMP\ES.2-Existing_Sanitary_Sewer_System

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To validate the developed model, flow-monitoring data was collected for calibration. A flow-monitoring study was performed from April 24 to April 30, 2006. A total of 12 flow monitors were placed at selected locations in the Hesperia sewer system (as shown on Figure 4.1). Locations were selected to measure flow from a variety of different land uses and to isolate different parts of the City. The flow-monitoring data was compared with the modeled flow values at every flow monitor location. The model was calibrated by matching the modeled and measured flows. A detailed discussion of the model development, flow monitoring, and calibration is presented in Chapter 4.

ES.5 EXISTING AND FUTURE SYSTEM ANALYSIS

The calibrated hydraulic computer model was used to analyze the existing and future sewer systems. Several steady state scenarios were developed to evaluate system deficiencies and identify improvements that address these deficiencies. In simulations where the model results indicated that the system did not meet the minimum performance criteria, improvements were identified that addressed the deficiencies and meet the system performance criteria to the minimum acceptable level. A discussion of the detailed conveyance system analysis is presented in Chapter 5.

ES.5.1 Existing System Analysis

The existing system analysis was performed under PDWF conditions of 4.8 mgd with the existing sewer collection system infrastructure as described in Chapter 2. The model showed major deficiencies occur in the 12-inch/18-inch diameter VVWRA's Interceptor that runs along I Avenue from Lemon Street to Bear Valley Road. The recommended improvement for this deficiency is to build a separate gravity main along Santa Fe Avenue from Mesa Street to Bear Valley Road. All recommended existing system improvement projects are shown on Figure ES.3.

ES.5.2 Future System Analysis

Future system analyses were performed for planning years 2012, 2017, 2022, and 2032 to evaluate the system performance under the projected flow conditions. Model results showed that larger trunk lines have the largest deficiencies among all the deficient pipes. Parallel pipelines are proposed to alleviate these deficiencies. In addition, new gravity sewers and force mains are also recommended. The recommended future improvement projects are summarized in Tables ES.3 and are shown on Figure ES.3.

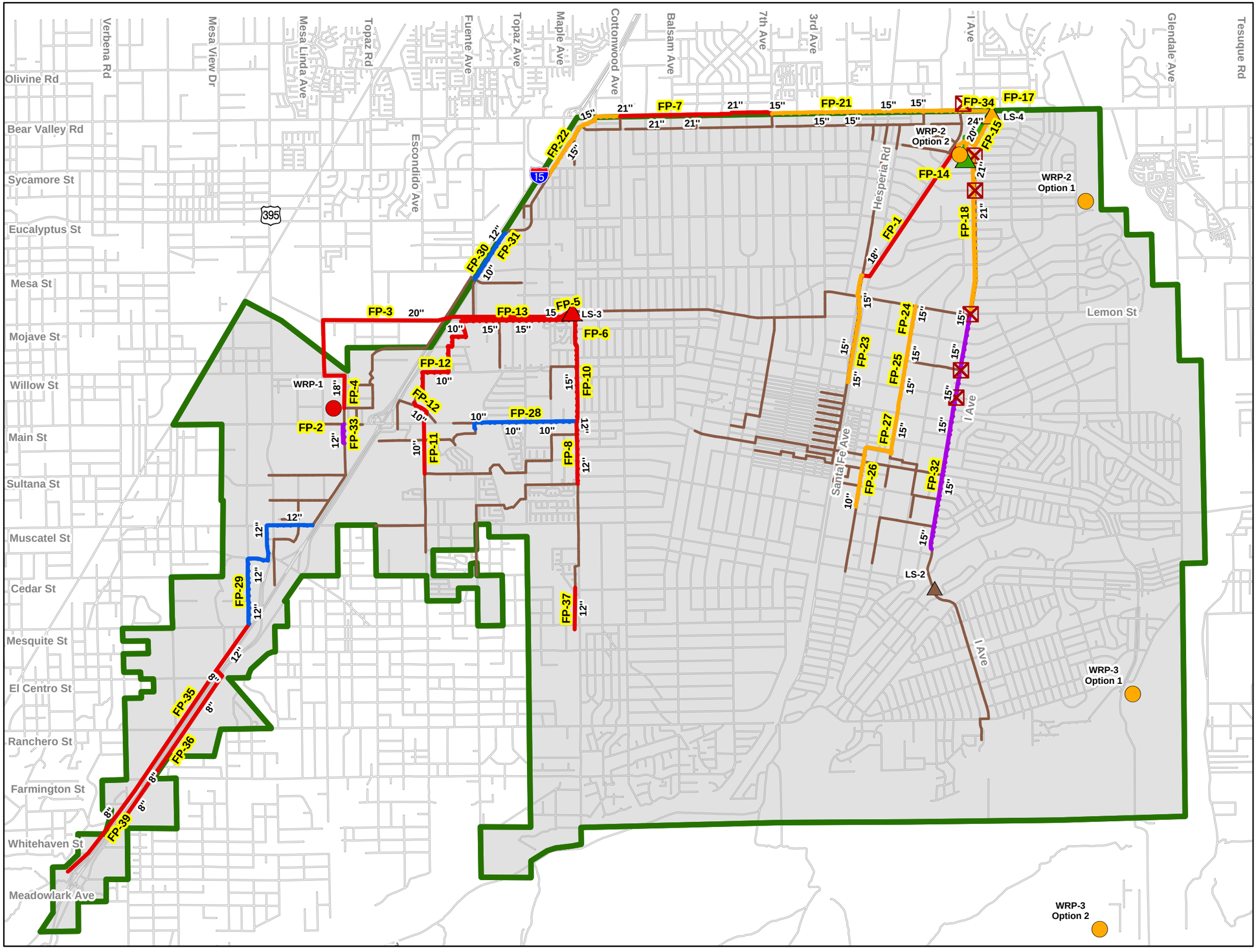
Table ES.3 Future Systems Recommendations Summary
Wastewater Master Plan Update
City of Hesperia

Project Type	Quantity	Unit
Gravity Mains		
8"	6	miles

Table ES.3 Future Systems Recommendations Summary (Continued) Wastewater Master Plan Update City of Hesperia		
Project Type	**Quantity**	**Unit**
10”	4	miles
12”	4	miles
15”	8	miles
18”	4	miles
21”	2	miles
24”	0.3	miles
30”	0.2	miles
Force Mains		
20” (to WRP-1)	3	miles
20” (to WRP-2)	1	miles
6” (Solids)	1	miles
Lift Stations		
To WRP-1 (liquid)	300	hp
To WRP-2 (liquid)	400	hp
From WRP-2 (solids)	100	hp
Treatment Plants		
WRP-1	7.4	mgd
WRP-2	8.5	mgd
WRP-3	4.7	mgd

ES.6 WASTEWATER TREATEMENT FACILITIES

The City is planning to construct three wastewater reclamation treatment plants (WRPs) to treat all the City’s future wastewater flows and create a supply source for its planned recycled water system. Figure ES.4 shows the proposed locations and the tributary areas of these three WRPs. Based on the projected flow data and the sizing criteria discussed in Chapter 6, Wastewater Reclamation Plant No. 1 (WRP-1) is estimated to require a capacity of about 7.4 mgd and WRP-2 is estimated to require a capacity of approximately 8.5 mgd. The capacity of WRP-3 is estimated to be approximately 4.7 mgd. Three basins are proposed for each treatment plant to allow operational flexibility and phased construction. In addition, a separate treatment plant will be considered for the first phase of the RLF development. The sizing of this plant is outside the scope of this project.



Legend

- Existing Lift Station
- Existing Collection System

Proposed Lift Station

Year

- 2007
- 2012
- Proposed Solids Pump Station

Proposed Water Reclamation Plant (WRP)

Year

- WRP 1 (2012)
- WRP 2/WRP 3 (2017)
- VVWRA Outlet

Proposed Collection System Improvements

Phase (Year)

- 2007 - 2012
- 2013 - 2017
- 2018 - 2022
- 2023 - 2032
- Proposed Solids Pipeline
- Wastewater District Boundary
- Roadways

Text:

- FP-10 CIP Project No.
- 12" Proposed Diameter

N

0 5,000 10,000 Feet

FIGURE ES.3
WASTEWATER SYSTEM CIP

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CITY OF HESPERIA

Per discussion with the City staff, the City prefers the treatment of liquid only at WRP-1 and WRP-2 and not the solids. The solids from WRP-1 would be discharged into the gravity sewer system that would convey the solids to WRP-2, where it would be treated again. Solids from WRP-2 will be pumped via a 4,000-linear foot designated solids pipeline from WRP-2 to the existing VVWRA outlet along Bear Valley Road. At this planning stage, it is assumed that WRP-3 will have on-site solids handling facilities. Table ES.4 shows the phasing of the treatment facilities. The phasing of WRP-3 is outside the scope of this project.

Table ES.4 Wastewater Treatment Facilities Phasing
Wastewater Master Plan Update
City of Hesperia

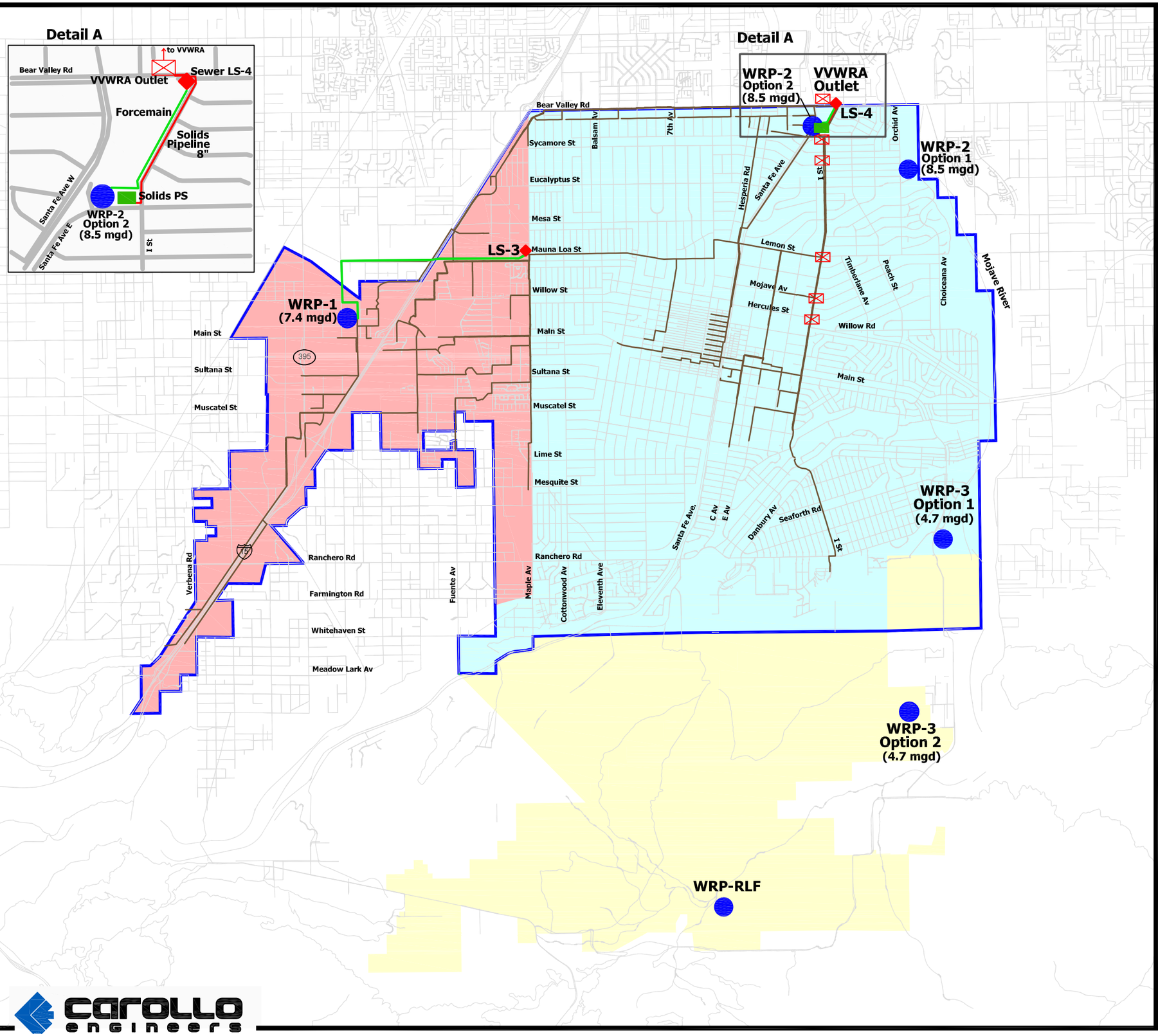
Description	2012	2017	2022	2032
WRP-1				
ADWF (mgd)	2.3	3.8	4.8	5.7
PDWF (mgd)	5.6	8.9	11.0	12.8
Capacity (mgd)	5.0	5.0	7.4	7.4
Solids Flow (mgd)	0.1	0.1	0.1	0.2
WRP-2				
ADWF (mgd)		4.1	5.1	6.5
PDWF (mgd)		9.8	12.0	15.0
Capacity (mgd)		5.6	8.5	8.5
Solids Flow (mgd)		0.1	0.1	0.2

Notes:
(1) It is assumed that WRP-1 will be online by planning year 2012, while WRP-2 is phased to be completed by planning year 2017.

ES.7 RECOMMENDATIONS AND CAPTIAL IMPROVEMENT PROGRAM

The recommended capital improvement projects for the City are summarized by project type and planning year. Improvement projects are categorized into three different project types:

1. Existing Collection System Improvements:
   Improvements such as gravity mains and force mains that are proposed to resolve existing system deficiencies.
2. Future Collection System Improvements:
   Improvements such as gravity mains, force mains, and lift stations that are proposed to resolve system deficiencies in the future planning years.
3. Future System Treatment Improvements:
   Improvements such as proposed WRPs and solid handling facilities.



Legend

- Tributary Area WRP-1
- Tributary Area WRP-2
- Tributary Area WRP-3
- Study Area Boundary
- Streets
- Wastewater Reclamation Plant (WRP)
- Solids Pipeline
- Solids Pump Station
- Lift Station (LS)
- VVWRA Outlet
- Proposed and Existing Pipelines
- Forcemain

N

0' 6,000' 12,000'

FIGURE ES.4
PROPOSED TREATMENT FACILITIES LOCATIONS

WASTEWATER MASTER PLAN UPDATE

City of Hesperia

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Figure ES.3 shows all the capital improvement projects and detail CIP estimates are discussed in Chapter 7. Tables ES.5 and ES.6 summarizes the improvements identified in this Master Plan. As shown in these tables, the total wastewater system CIP for year 2032 is estimated at nearly $400 million, with the majority of capital cost related to treatment facilities (80 percent). It should be noted that this CIP is limited to the study area shown in Figure ES.1 and does not include new small diameter gravity pipelines that feed into the City's trunk sewer system, as these pipelines are assumed to be paid for by developers.

Appendix C shows a list of Capacity, Management, Operation, and Maintenance (CMOM) requirements that are required for the sewer project.

Table ES.5 Phasing of Wastewater System CIP
Wastewater Master Plan Update
City of Hesperia

Improvement Type	Near Term ($ M)	2007-2012 ($ M)	2013-2017 ($ M)	2018-2022 ($ M)	2023-2032 ($ M)	Total ($ M)
Existing Collection System Improvements[(1)]	$3.2	$0.0	$0.0	$0.0	$0.0	$3.2
Future Collection System Improvements	$0.0	$24.8	$19.2[(2)]	$5.3	$3.8	$53.0
Future System Treatment Improvements	$0.0	$112.3	$130.6	$48.6	$50.6	$342.0
Total Per Planning Period	**$3.2**	**$137.1**	**$149.8**	**$53.9**	**$54.4**	**$398.2**

Notes:
(1) Improvement cost is for VVWRA interceptor deficiencies.
(2) Approximately $2.8 million of the improvement cost is for VVWRA interceptor deficiencies.

Table ES.6 CIP by Project Type
Wastewater Master Plan Update
City of Hesperia

Project Type	Cost ($ M)
Force Main	$4.8
Gravity Main	$42.5
Lift Station	$9.2
Treatment Facilities	$321.9
Land Acquisition	$19.8
Total	**$398.2**

Chapter 1

INTRODUCTION

1.1 GENERAL

The City of Hesperia (City) is a high desert community located in the northern portion of San Bernardino County (County), California, approximately 30 miles north of the City of San Bernardino. Figure 1.1 shows a vicinity map highlighting the nearby cities and towns.

Geographically, approximately 5 percent of the study area is currently served by sewers that ultimately flow to a regional wastewater treatment plant (WWTP) that is owned and operated by the Victor Valley Wastewater Reclamation Authority (VVWRA). The remaining area is undeveloped or served by on-site systems. The City's wastewater system is managed by the Hesperia Water District (District), which is a subsidiary special district of the City.

The City retained Carollo Engineers (Carollo) to prepare this Wastewater Master Plan (Master Plan) to aid in the planning of its wastewater infrastructure and operations.

The overall goals of this Master Plan are as follows:

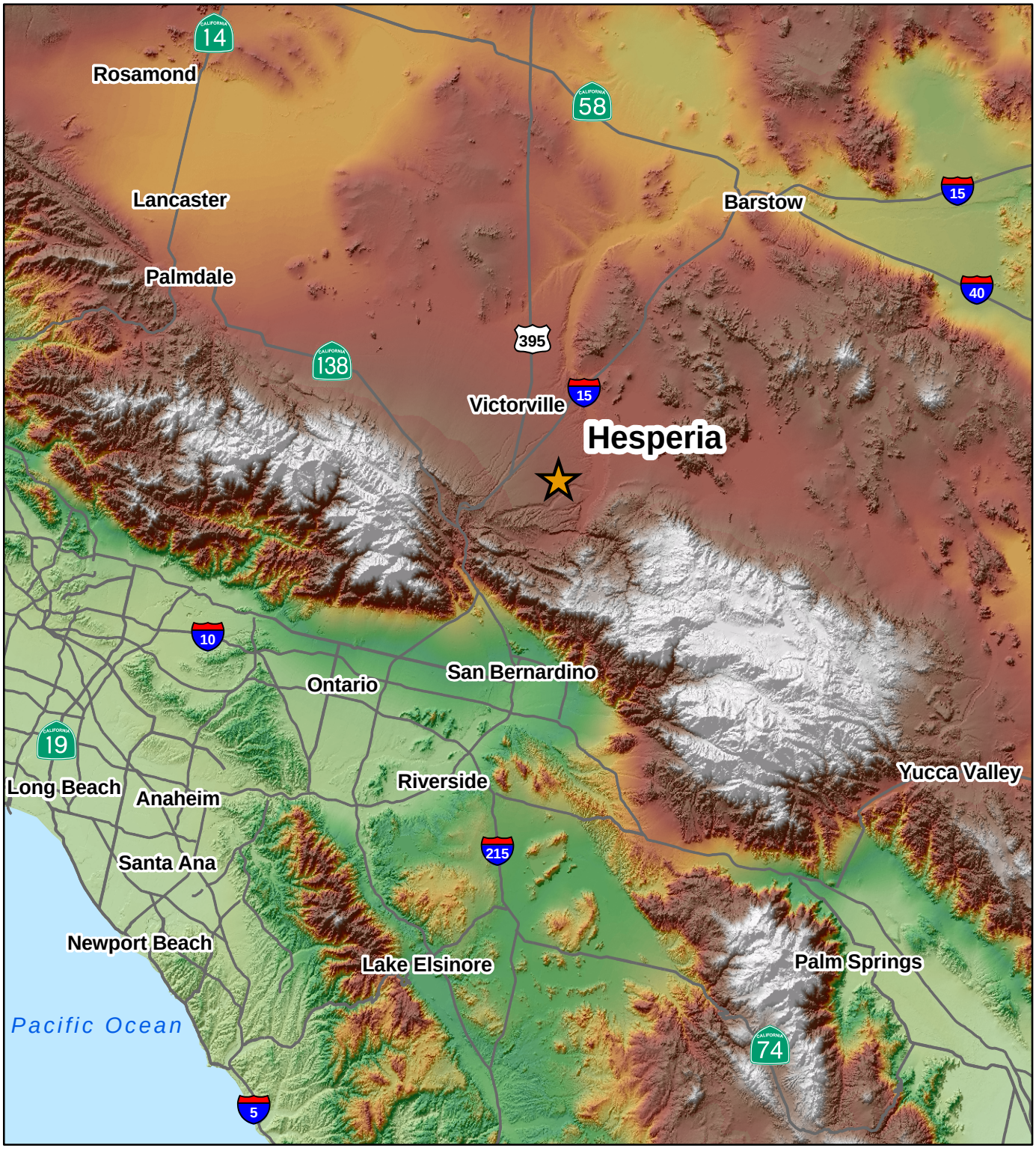
1. Create an updated computer model by incorporating new facilities, new pipelines, and proposed new developments.
2. Incorporate the area's growing development patterns into the wastewater production projections.
3. Evaluate what improvements are needed or will be needed to meet current and future wastewater production.
4. Maximize the efficiency of system operations for these changes.
5. Establish realistic cost estimates for the recommended capital improvements.

A computer model was developed to analyze the existing wastewater system, proposed facilities, and various "what-if" scenarios. The computer analysis assisted in the identification and selection of infrastructure and operational improvements to help the City meet its goals.

1.2 CHAPTER OBJECTIVES

This chapter discusses fundamental information such as:

1. History of the City and District.
2. The objectives of this Master Plan report.
3. Assumptions used to evaluate the existing system.



Elevation

High : 11,500 Feet

Low : Sea Level

Major Roads

Miles

0 5 10 20

FIGURE 1.1
VICINITY MAP

WASTEWATER MASTER PLAN UPDATE

CITY OF HESPERIA

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4. The analysis and sizing criteria to identify improvements.
5. The organization of this report.
6. A list of the abbreviations used throughout this report.
7. A list of unit conversions is provided to convert the units shown to another set of units.

1.3 HISTORY OF THE CITY OF HESPERIA

It is believed that the first Native American tribes to inhabit the area were the Mojave Indians, with evidence suggesting that the hub of their settlement was near the Mojave River southeast of Hesperia. By the 1800s, the first easterners began exploring and establishing trails near the headwaters of the Mojave River. In 1847, the first railroad tracks were built through the area and in 1885, the area was officially named Hesperia.

The Hesperia Water District was originally formed on March 28, 1975 as County Water District pursuant to the county water district law of the State of California. In 1973, preparation of a Wastewater Facilities Plan was undertaken by the Mojave Water Agency to seek “Clean Water Grants” to construct a regional interceptor system and wastewater treatment plant. In 1975, the Hesperia Water District joined the regional planning effort. A special tax was established by Mojave Water Agency to finance the local share of the regional facilities. In 1977-1978, the regional joint power agency, Victor Valley Wastewater Reclamation Authority (VVWRA), was formed which included seven members consisting of Mojave Water Agency, County Service Areas 42 and 64, Apple Valley Water District, the City of Adelanto, Hesperia Water District, the City of Victorville, and the Victorville Sanitary District.

In 1980, the Hesperia Water District Board of Directors approved the formation of the first sewer assessment district. Formation of Assessment District No. 2 (including water and sewer system) was approved in 1984. Sewer Assessment District No. 3 (principally for the Bear Valley Road corridor) was established in 1987. The Maple/Mauna Loa Trunk Sewer was financed under the VVWRA “deferred connection fee program.” Assessment District 91-1 was established to sewer the commercial/industrial acreage around the Main Street and Interstate 15 area with the tributary flows connecting mainly to the Bear Valley Road trunk sewer system. Assessment District 91-3 was formed to serve the residential area surrounding Muscatel St., west of Escondido Ave.

Currently, Hesperia Water District remains as a joint-power member of VVWRA with three other remaining members including the County Service Areas 42/64, the Town of Apple Valley, and the City of Victorville. The City of Adelanto withdrew from VVWRA when it constructed its own wastewater treatment plant.

In 1988, the City was incorporated and in 1992, the District was reorganized as a subsidiary special district of the City. The City Council serves as the District’s Board of Directors.

The District provides utility service for the water and sewer systems within the City and operates as a self-sustaining utility business enterprise. Income generated by the District is from water and sewer service charges and from facility connection fees.

Today, the City encompasses an area of approximately 74 square miles, as shown on Figure 1.2. The City limit is the approximate boundary of the study area for this Master Plan, with the exception of the identified development areas, Planning Area 15.

1.4 CLIMATE

The climate within the City is typical of a desert climate, which includes hot, dry summers and cool winters. Temperatures in the summer months vary between an average low of 60 degrees Fahrenheit (degrees F) and an average high of 99 degrees F. In the winter months, the average low and high temperatures are 34 to 63 degrees F, respectively. Average annual precipitation is about 6.4 inches. Because of the City's dry weather, well-drained soils, and relatively new infrastructure, no significant infiltration/inflow (I/I) and seasonal flow variations would be contributed to the overall flow. Dry weather flows are used in the evaluations of this study.

1.5 WASTEWATER MASTER PLAN OBJECTIVES

This Master Plan is prepared to provide a reference document for the existing wastewater system operations and maintenance and a framework for future water system planning. The plan objectives can be divided into three primary categories: facilities planning, treatment capacity, and capital improvements.

1.5.1 Collection Facilities Planning Objectives

The objectives of the Master Plan with respect to wastewater collection system facilities planning include:

1. Develop performance criteria for both existing and proposed facilities.
2. Incorporate wastewater production into the computer model based on the City's existing and proposed land use types and associated densities.
3. Use the computer model to conduct hydraulic analyses of the existing sewer system and identify current deficiencies in existing sewer system facilities.
4. Identify and evaluate sewer system improvements that will alleviate existing system deficiencies.
5. Incorporate projected wastewater production into the model and identify future system improvements that will be needed to meet the future flows.

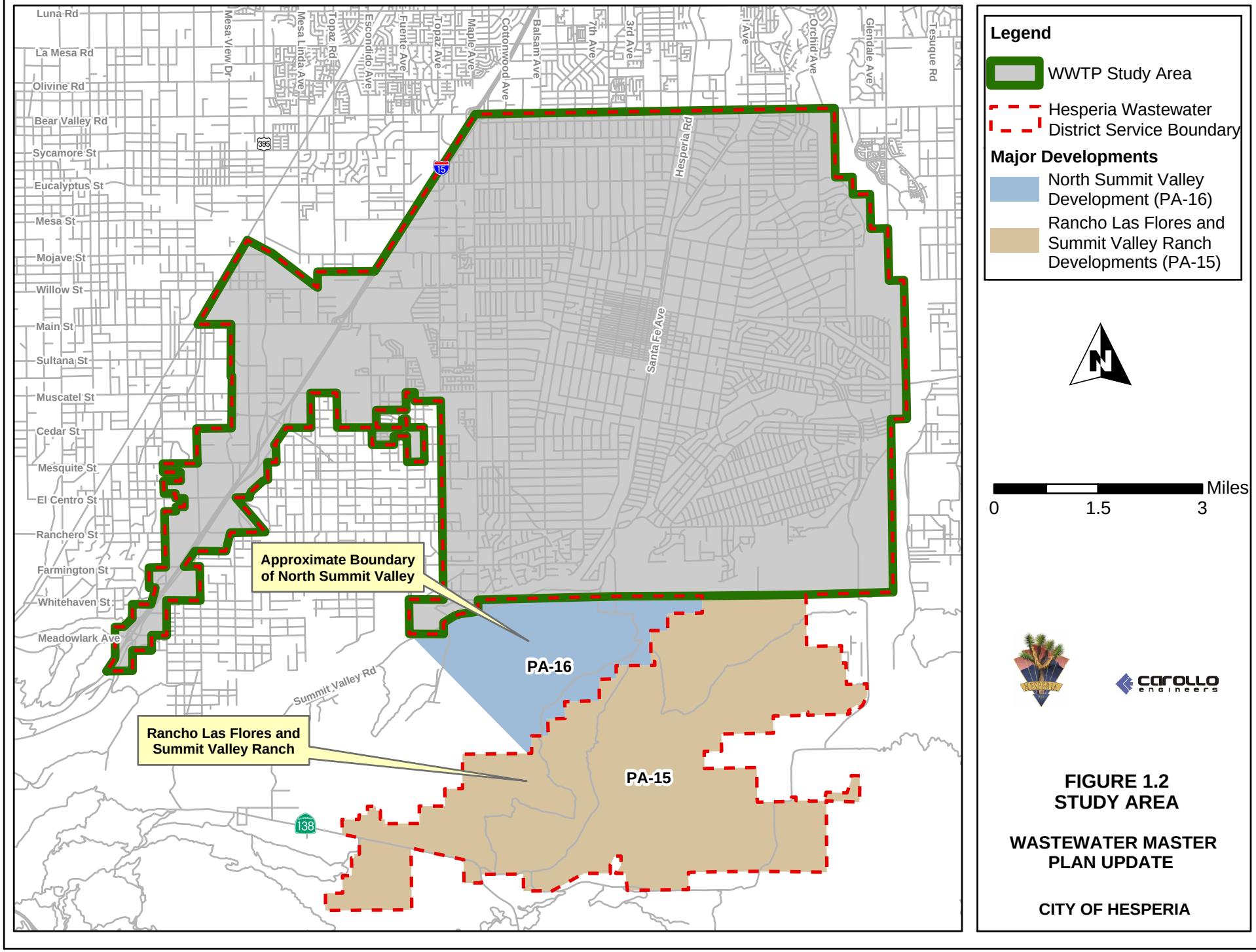

FIGURE 1.2
STUDY AREA

WASTEWATER MASTER PLAN UPDATE

CITY OF HESPERIA

1.5.2 Treatment Capacity Objectives

The objectives of the Master Plan with respect to available treatment capacity are to:

1. Determine available capacity in the VVWRA interceptor.
2. Forecast future wastewater production based upon projected development.
3. Compare wastewater production with available treatment capacity to determine the adequacy of the VVWRA to meet the City's future needs.
4. Discuss proposed satellite WWTPs and water reclamation facilities that can potentially meet future capacity shortfalls.
5. Determine the phasing and capacity needs of potential satellite plants.

1.5.3 Capital Improvement Objectives

The objectives of the Master Plan with respect to capital improvements are to:

1. Estimate the construction and capital costs for the recommended sewer system improvements.
2. Develop a phased project list to prioritize future sewer system improvement projects.
3. Prepare a capital improvement program that presents the phasing and cost estimates of recommended improvements.

1.6 MASTER PLAN ASSUMPTIONS

This Master Plan is based on fundamental assumptions that were established throughout the project. The City and Carollo discussed these assumptions and agreed that they resulted in a reasonable approach to developing the Master Plan. These assumptions are discussed in the following sections.

1.6.1 Existing Conditions and Planning Horizon

The end of 2005 is assumed to represent the status of the City's existing sewer system for this Master Plan. This allows for the use of a full calendar year of data and provides a current picture of the City's existing system. Per discussion with the City, the years 2012, 2017, 2022, 2027, and 2032 are used as future planning years throughout this Master Plan.

1.6.2 Major Development Projects

The City has identified three large development projects that could generate significant wastewater flows. These are the Rancho Las Flores (RLF), Summit Valley Ranch (SVR), and North Summit Valley (NSV) developments. Wastewater flows for the combined RLF and SVR developments are not estimated in this Plan because these developments fall outside the study area of this project. Capital improvements for the RLF, SVR, and NSV

projects are therefore not included in this Plan. Figure 1.2 shows the locations of these projects as well as the study area boundary of this Master Plan.

1.7 MASTER PLAN ANALYSIS AND DESIGN CRITERIA

Analysis criteria define an acceptable level of service for existing facilities, while sizing criteria define acceptable sizing parameters for new facilities. The following subsections present the analysis and sizing criteria used in this Wastewater Master Plan.

1.7.1 Gravity Sewers

As noted in the previous section, the City has negligible I/I due to its dry weather climate, well-drained soils, and relatively new infrastructure. Therefore, analysis and sizing of gravity sewers is based on water depth at peak dry weather flow (PDWF). The PDWF is defined as the highest 1-hour flow that occurs during dry weather conditions.

For analysis of existing sewers, City standards indicate a replacement or relief sewer should be constructed when the ratio of the PDWF depth to the inside pipe diameter (d/D) exceeds the analysis criteria. The analysis criteria are d/D less than 0.75 for pipes 12 inches and smaller, and d/D less than 0.89 for pipes 15 inches and larger.

For sizing of new sewers, the diameter and slope shall be selected so that the d/D is less than the sizing criteria for the useful life of the sewer. The sizing criteria are d/D less than 0.50 for pipes 12 inches and smaller, and d/D less than 0.75 for pipes 15 inches and larger. Over-sizing a sewer pipe to gain a reduction in slope is generally not permissible.

Minimum slopes are specified in gravity sewers to keep solid matter suspended. In general, minimum slopes are calculated to maintain a velocity of 2 feet per second at full-pipe flow. The minimum slope for 8-inch diameter pipe is slightly greater.

For all flow calculations, a Manning's roughness coefficient n = 0.014 is used.

Table 1.1 summarizes the analysis and sizing criteria for gravity sewers.

Table 1.1 Gravity Sewer Analysis and Sizing Criteria
Wastewater Master Plan Update
City of Hesperia

Pipe Diameter (inches)	Minimum Allowable Slope	Maximum Allowable Depth/Diameter Ratio[1]	
		Analysis	Design
8	0.40%	0.75[2]	0.50[3]
10	0.29%	0.75[2]	0.50[3]
12	0.22%	0.75[2]	0.50[3]
15	0.16%	0.89[4]	0.75[2]
18	0.12%	0.89[4]	0.75[2]

Table 1.1 Gravity Sewer Analysis and Sizing Criteria (Continued) Wastewater Master Plan Update City of Hesperia			
Pipe Diameter (inches)	Minimum Allowable Slope	Maximum Allowable Depth/Diameter Ratio[1]	
		Analysis	Design
21	0.10%	0.89[4]	0.75[2]
24	0.08%	0.89[4]	0.75[2]

Notes:
(1) Dimensionless ratio of sewage depth at peak dry weather flow/inside pipe diameter.
(2) A depth/diameter ratio of 0.75 means the flow is 92% of full-pipe capacity.
(3) A depth/diameter ratio of 0.50 means the flow is 50% of full-pipe capacity.
(4) A depth/diameter ratio of 0.89 means the flow is 108% of full-pipe capacity.

By comparison, the VVWRA Ordinance 001 requires new gravity sewer pipes 10 inches in diameter and smaller to have a maximum depth/diameter ratio of 0.50 (50 percent of full-pipe capacity), and new sewer pipes 12 inches in diameter and larger to have a maximum depth/diameter ratio of 0.67 (75 percent of full-pipe capacity). Hence, it can be concluded that the VVWRA ordinance establishes more conservative sizing criteria than those listed in Table 1.1.

1.7.2 Lift Stations and Force Mains

Where possible, sewer service should be provided by gravity sewers and not by lift stations. The topography should ultimately allow gravity sewers to serve the entire City limits. However, sometimes leap-frog development patterns make it necessary to build and operate lift stations, at least until infill makes a trunk gravity sewer economically feasible.

In the event that a developer proposes to design and construct a lift station, the following is a partial list of sizing criteria that should be met:

1. Pumps shall be capable of pumping the peak hour flow with the largest pump out of service.
2. Sufficient backup power shall be provided to pump the peak hour flow.
3. The velocity of sewage in the force mains shall be between 2 and 8 feet per second.
4. Force mains shall be equipped with air-vacuum valves at all high points and significant changes in grade, and cleanouts at all low points.
5. Odor and corrosion control shall be provided if the detention time in the lift station and force main exceeds 30 minutes or if odor is detected at the pump station or at the discharge of the force main.
6. Wet well shall be sized to buffer 10 minutes of PDWF and the wet well diameters are based on a maximum wet well depth of 25 to 30 feet.

1.7.3 Grease Interceptors

The evaluation and sizing criteria used for sizing sewers do not account for a reduction in pipe diameter due to grease. Therefore, it is highly recommended that the City adopt a grease interceptor ordinance that applies to all restaurants and food processing industries in the service area. Grease interceptors should meet the design standards of Appendix H of the Uniform Plumbing Code.

1.8 ORGANIZATION OF THIS REPORT

This report has been structured to help City staff easily locate and identify information regarding the City's wastewater system. The following list provides a brief description of the information provided in each section:

- The Executive Summary (Chapter ES) provides an overview of the Master Plan process and document.
- Chapter 1 describes the Master Plan objectives and performance criteria.
- Chapter 2 identifies the major facilities in the City's existing wastewater system.
- Chapter 3 presents the current and projected wastewater flows.
- Chapter 4 describes the hydraulic computer model development and calibration.
- Chapter 5 describes the sewer collection system evaluation results and the proposed recommendations.
- Chapter 6 discusses the future wastewater treatment facilities.
- Chapter 7 outlines the recommended capital improvement program, including cost estimates and prioritization.

1.9 ABBREVIATIONS

The following is a list of abbreviations used in this report:

AAF	average annual flow
ac	acre
ac-ft	acre-foot (one acre-foot of water is equal to 325,829 gallons)
ac-ft/yr	acre-foot/year
AD	Assessment District
ADWF	average dry weather flow
BOD_5	5-day bio-chemical oxygen demand
CDHS	California Department of Health Services
cf	cubic foot

CIP	capital improvement program
City	City of Hesperia
cfs	cubic feet per second
COD	chemical oxygen demand
d/D	Ratio of depth of flow to diameter of pipe. The value ranges from 0 percent for empty pipe to 100 percent for full or surcharged pipe.
DIP	ductile iron pipe
DMR	Discharge Monitoring Report
du	dwelling unit
ENR	Engineering and News Record
EPS	extended period simulation (special type of hydraulic model simulation)
FP	future project
FCV	flow control valve
fps	feet per second
GIMS	Geographical Information Management System
GIS	Geographical Information System
gpad	gallons per acre per day
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
HGL	hydraulic grade line
hp	horsepower
I/I	infiltration and inflow
in	inch
kWh	kilowatt-hours
LS	Lift Station
MDF	maximum day flow
MG	million gallons
mgd	million gallons per day
MMDWF	maximum month dry weather flow
MMF	maximum month flow
NH_4	Ammonia
NPDES	National Pollutant Discharge Elimination System
NO_3	Nitrate
NSV	North Summit Valley

OCSD	Orange County Sanitation District
PA	Planning Area
PDWF	Peak dry weather flow
PHF	Peak hour flow
psi	pounds per square inch (measure of pressure)
PVC	polyvinyl chloride
RLF	Rancho Las Flores
SCADA	Supervisory Control And Data Acquisition
SCAG	Southern California Association of Governments
SSO	sanitary sewer overflows
SVR	Summit Valley Ranch
TDH	total dynamic head
UPC	Uniform Plumbing Code
USGS	United States Geologic Survey
VVWRA	Victor Valley Wastewater Reclamation Authority
WRP	wastewater reclamation plant
WWTP	wastewater treatment plant

1.10 UNIT CONVERSION

This report uses standard engineering units when reporting volumes, flow rates, etc. However, the use of selected units when discussing different aspects of the wastewater system can make comparisons difficult if the proper conversion factors are not known. This section provides a list of conversion factors that are commonly used to convert values from one unit to another.

1.10.1 Volume

Two common units used in the water/wastewater industry to measure volume are acre-feet and gallons (or million gallons). Water and reclaimed water production is often reported in terms of acre-feet (ac-ft). Stored water, such as in a reservoir, is commonly measured in million gallons (MG).

Conversion factors for the units of volume used in this report are listed below. To convert a volume from MG to the equivalent volume in units of ac-ft, the value in MG should be multiplied by 3.0691 to convert the value into ac-ft (see conversion factor below):

- Convert MG to ac-ft: Multiply by 3.0691.
- Convert ac-ft to MG: Multiply by 0.32583.

1.10.2 Flow

Common units used to report wastewater flow rates include cubic feet per second (cfs), gallons per day (gpd), gallons per minute (gpm), and million gallons per day (mgd). Flow rates may represent instantaneous flows, such as cfs or gpm. Conversion factors for many units of flow rate are listed below. To convert a flow rate from cfs to gpm, multiply by the factor 448.8 from the list below:

- Convert cfs to ac-ft/yr: Multiply by 724.
- Convert cfs to gpd: Multiply by 646,300.
- Convert cfs to gpm: Multiply by 448.8.
- Convert cfs to mgd: Multiply by 0.646.
- Convert gpd to cfs: Multiply by 0.000001547.
- Convert gpd to gpm: Multiply by 0.0006944.
- Convert gpd to mgd: Multiply by 0.000001 (or divide by one million).
- Convert gpm to cfs: Multiply by 0.002228.
- Convert gpm to gpd: Multiply by 1,440.
- Convert gpm to mgd: Multiply by 0.00144.
- Convert mgd to cfs: Multiply by 1.547.
- Convert mgd to gpd: Multiply by 1,000,000.
- Convert mgd to gpm: Multiply by 694.4.

1.11 ACKNOWLEDGEMENTS

1.11.1 City of Hesperia Council

Rita Vogler, Mayor.

Mike Leonard, Mayor Pro Tem.

Tad Honeycutt, Council Member.

Thurston Smith, Council Member.

Ed Pack, Council Member.

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1.11.4 Carollo's Subconsultants

Paul Hauffen, IDModeling, Sewer Collection Modeling.

David Harrington, IDModeling, Sewer Collection Modeling.

Chapter 2

EXISTING SYSTEM FACILITIES

2.1 GENERAL

The Hesperia Water District (District), which is a subsidiary special district of the City of Hesperia (City), manages the City's wastewater collection system that includes approximately 60 miles of gravity sewer pipe, 882 manholes, 51 cleanouts, 1 operational lift station, and 1 force main. The City's sewer system connects to Victor Valley Wastewater Reclamation Authority's (VVWRA's) 2.87-mile interceptor (12- and 18-inch diameter) that runs along the northeast boundary of the City.

2.2 CHAPTER OBJECTIVES

This chapter discusses the features of the following existing assets:

- Previous wastewater master plans.
- Existing sewers and manholes.
- Existing lift stations and force mains.
- Existing operations and maintenance equipment.

2.3 PREVIOUS WASTEWATER STUDIES

Previous studies that addressed wastewater in the study area include the following:

- City of Hesperia Sewer Master Plan, August 2002, So and Associates.
- VVWRA Sewer Facilities Plan Update, October 2000.
- Rancho Las Flores Water & Sewer Master Plan, 1995.
- Hesperia Water District Sewer Master Plan, 1987.

2.4 EXISTING GRAVITY SEWERS

The City's service area includes approximately 60 miles of gravity sewers, which serves about 5 percent of the developed area. This is based on the tabulated percent developed and sewered for each planning area that was provided by the City's planning department. The sizes of the sewer mains range from 8- to 21-inch diameter. In general, the system sewer flows from southwest to northeast and into the VVWRA interceptor. The pipe size distribution is shown in Table 2.1, while Figure 2.1 shows a map of the existing sewer system.

Table 2.1 Existing Gravity Sewer Pipe Size Distribution Wastewater Master Plan Update City of Hesperia			
Diameter (inches)	**Length (feet)**	**Length (miles)**	**Percent of Total**
8	129,300	24.5	40%
10	68,500	13.0	22%
12	66,100	12.5	21%
15	34,500	6.5	11%
18	16,600	3.1	5%
21	3,300	0.6	1%
TOTAL	**318,300(1)**	**60.3(2)**	**100%**

Notes:
(1) Totals do not include VVWRA interceptor.
(2) Totals may not agree with the sum of the length due to rounding.

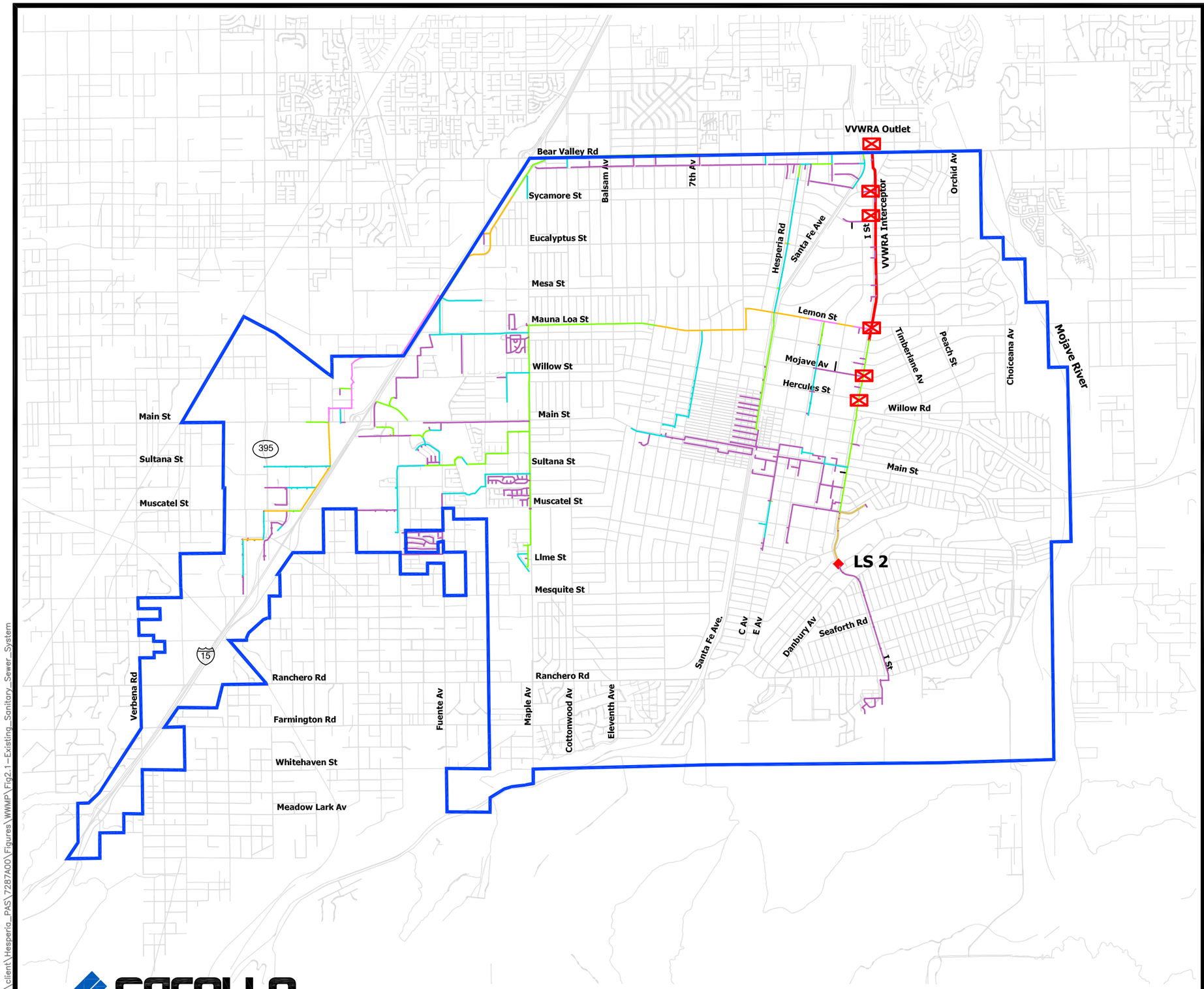
2.4.1 Gravity Sewer Sanitary Sewer Overflows

The City's sewer system connects to the VVWRA sewers at six locations. The VVWRA's 2004 Discharge Monitoring Report (DMR) reports a 1,000- and a 10,000-gallon sanitary sewer overflow (SSO) in 2004 and a 100,000-gallon spill in 2005. The 2004 DMR reports that the overflows were caused by a combination of high flows resulting from rainfall and by sewer debris that was washed in by the storm. An incomplete 4-inch sewer at a housing construction project was cited as a contributing factor. The 2005 DMR reports that the SSO was caused by stormwater entering the sewer. It should be noted that these stormwater overflows do not occur often and thus, are not included in the study's analyses.

2.5 EXISTING LIFT STATIONS AND FORCE MAINS

In the majority of the service area, ground elevation decreases at a uniform slope of about 1 to 2 percent from the southwest to the northeast. Therefore, most of the service area is easily served by gravity sewers without the need for lift stations. Nevertheless, the City operates a lift station and associated force main in the southeast side of the City to deliver wastewater flows to VVWRA's interceptor and from there to VVWRA's wastewater treatment plant (WWTP). Table 2.2 lists the lift station and force main information and Figure 2.1 shows the location of the lift station.

Table 2.2 **I Avenue Lift Station** **Wastewater Master Plan Update** **City of Hesperia**	
Parameter	**SP-2**
Location	I Avenue at Bangor Avenue
Number of Pumps	2
Design Point	340 gpm at 95 feet
Wet Well Volume	226 cubic feet
Backup Generator	diesel generator
Force Main Length	2,100 feet
Force Main Diameter	6 inches



Legend

- Study Area Boundary
- 8" Gravity Sewers
- 10" Gravity Sewers
- 12" Gravity Sewers
- 15" and 16" Gravity Sewers
- 18" and 21" Gravity Sewers
- VVWRA Interceptor
- 6" Force Mains
- Streets
- Lift Station (LS)
- VVWRA Outlet

N

0 6000' 12000'

FIGURE 2.1
EXISTING SYSTEM

WASTEWATER MASTER PLAN UPDATE

CITY OF HESPERIA

H:\client\Hesperia_PAS\7287A00\Figures\WWMP\Fig2.1-Existing_Sanitary_Sewer_System

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WASTEWATER FLOW

3.1 GENERAL

The principal sources of wastewater in the City of Hesperia's (City's) sewer system include sanitary flow from residential, commercial, and industrial sources, plus infiltration/inflow (I/I). Because of Hesperia's dry climate, well-draining soils, and relatively new infrastructure, the City has directed Carollo to consider I/I and seasonal flow variations to be negligible compared with sanitary flow. Future wastewater flows are projected from the City's land use plans and flow monitoring results.

This chapter describes the City's land use, wastewater generation factors, and wastewater flow projections.

3.2 CHAPTER OBJECTIVES

The objectives of this chapter are to:

1. Describe the City's land use.
2. Determine wastewater generation factors.
3. Project the wastewater flows through year 2032.

3.3 LAND USE

Land use is used to estimate wastewater flows and the amount of wastewater generated per acre throughout the City. Land use is a good predictor of wastewater flows and is readily available and verifiable. Flows from future developments are estimated using wastewater factors developed for existing land uses that are similar to the proposed development.

3.3.1 Planning Areas

To itemize the existing and future land uses within the City's service area, the service area is divided into 16 planning areas numbered 1 through 16.

For analysis, the 16 planning areas are further divided into 70 subareas. The boundaries of each subarea are selected so that each subarea has a homogeneous land use, development pattern, sewer service pattern, and water pressure zone. Furthermore, subarea boundaries are selected to coincide with flow monitor tributary areas.

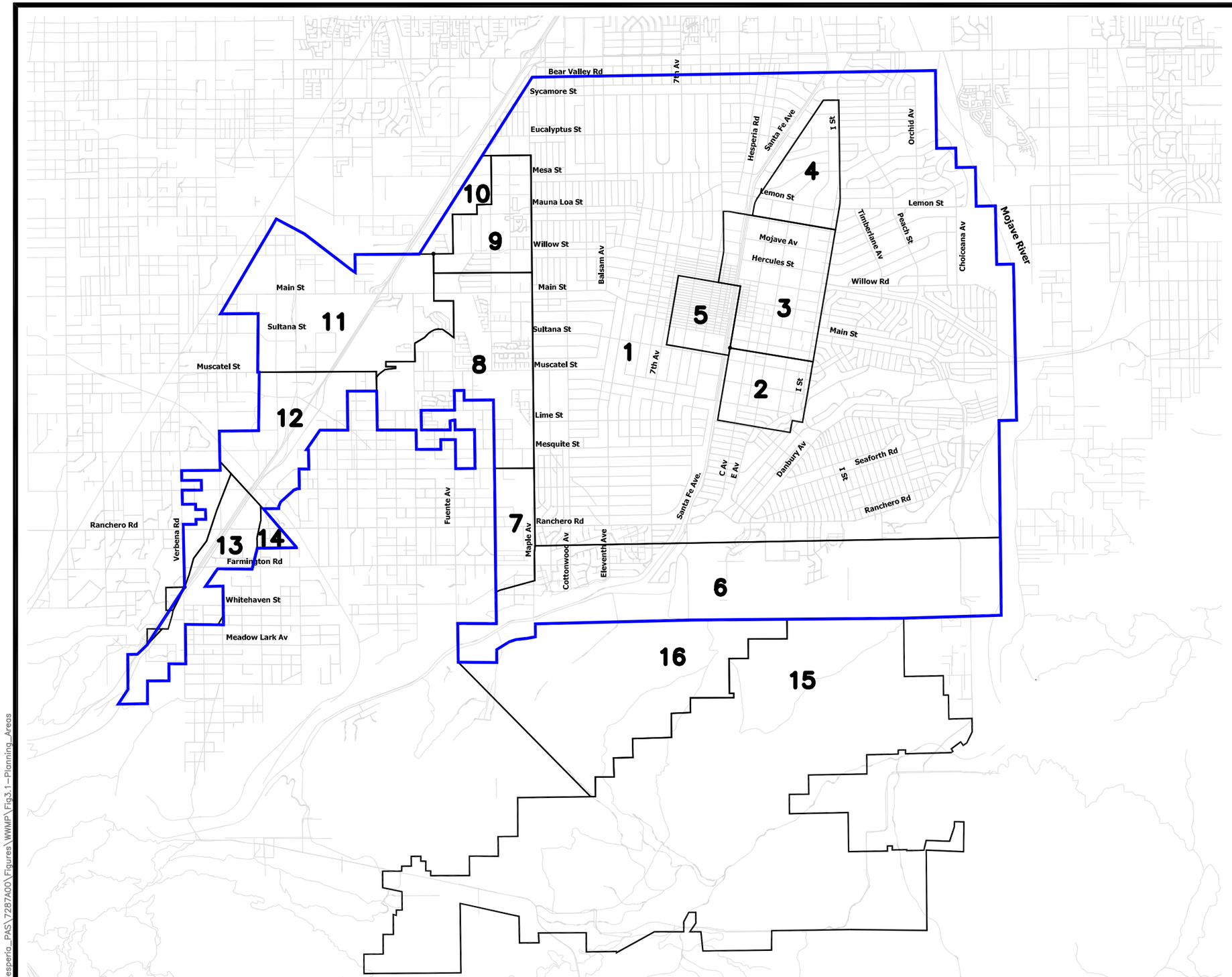
Table 3.1 provides a brief description of each planning area, while the planning areas are shown on Figure 3.1.

Table 3.1	Planning Areas Wastewater Master Plan Update City of Hesperia	
Planning Area	**Description**	**Area (ac)**
PA-1	Main City Area	19,593
PA-2	Main Street Corridor - Neighborhood District	638
PA-3	Main Street Corridor - Industrial District	1,375
PA-4	Industrial District	728
PA-5	Main Street Corridor - City Center District	466
PA-6	Southern District	4,212
PA-7	Western District - Residential	490
PA-8	Southwestern District - Residential	2,197
PA-9	Freeway Corridor - North District - Residential	787
PA-10	Freeway Corridor - North District	244
PA-11	Freeway Corridor - Main Street District	2,397
PA-12	Freeway Corridor - HWY 395	1,169
PA-13	Freeway Corridor - South District - Commercial	937
PA-14	Freeway Corridor - South District - Residential	392
PA-15(1)	Rancho Las Flores (RLF) and Summit Valley Ranch (SVR)	10,868
PA-16(2)	North Summit Valley (NSV)	3,052
	Total (all 16 planning areas)	**49,547**(2)
	Total without NSV, RLF, and SVR	**35,627**(2)

Notes:
(1) PA-15 is within the City's service area but not included in the study area.
(2) PA-16 is outside the Hesperia city limits and not within the City's service area.
(3) Totals may not agree with the sum of the planning areas due to rounding.

3.3.2 Land Use Distribution by Planning Year

A spreadsheet was developed to tabulate the area, percent developed, percent sewered, density, and land-use type for each planning area. The City's planning department provided estimates of percent developed, percent sewered, density, and land-use type for each planning year in this study. The detailed calculations are provided in Appendix A-1. The resulting land use is summarized by planning year in Table 3.2. Note that this table does not include the RLF, SVR, (PA-15) and NSV (PA-16) projects and that the total service area does not change through the year 2032. Per discussion with the City, the developers are responsible for sewer flows generated in PA-15. In addition, PA-16 is not currently a part of the City's service area and the land use planning for the NSV project was considered conceptual. Therefore, these areas were not included in the study area of this Master Plan.



Legend

- Study Area Boundary
- 1 — Planning Area
- Streets

N

0 6000’ 12000’

FIGURE 3.1
PLANNING AREAS

WASTEWATER MASTER PLAN UPDATE

City of Hesperia

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Table 3.2 Projected Sewered Land Use by Planning Year
Wastewater Master Plan Update
City of Hesperia

Land Use Type	Area by Planning Year (acres)[1]					
	2005	2012	2017	2022	2027	2032
Low-Density Residential	874	1,802	2,306	2,723	3,111	3,382
High-Density Residential	297	746	1,148	1,411	1,612	1,721
Commercial	556	1,221	2,128	2,737	3,138	3,301
Industrial	151	406	710	1,033	1,334	1,555
OS/Vacant or Not Sewered	33,705	31,199	28,783	26,890	25,402	24,553
Total Area[2]	**35,627**	**35,627**	**35,627**	**35,627**	**35,627**	**35,627**

Notes:
(1) Excludes PA-15 and PA-16. Detailed calculations are provided in Appendix A-1.
(2) Totals may not agree with sum due to rounding.

As provided by the planning department, low-density residential is defined as areas with 0.4 to 6 units per acre. High-density residential is defined as areas with 7 to 16 units per acre.

3.3.3 Projected Wastewater Customers

For each planning subarea, the following parameters were determined for each planning year from 2005 to 2032:

1. Percent of land that will be developed.
2. Percent of developed land that will be connected to City sewer.
3. Percentage of low-density residential, high-density residential, commercial, and industrial land uses.

Using the above parameters, the number of residential customers is estimated for each planning year. The results showing residential customers are summarized in Table 3.3. Table 3.4 shows the projected non-residential customers. Detailed calculations are included in Appendix A-2. As shown in the tables, there is a sharp increase in number of customers between 2005 and 2012. This is mainly due to the sharp increase in the estimated percent developed and percent sewered in the City's collection system for these years.

Table 3.3 Projected Residential Wastewater Customers
Wastewater Master Plan Update
City of Hesperia

Land Use Type	Customers by Planning Year (du)[1]					
	2005	2012	2017	2022	2027	2032
LDR Sewer Connections	2,766	6,367	7,996	9,290	10,415	11,081
HDR Sewer Connections	2,908	8,464	13,519	16,969	19,381	20,579
Total Residential Customers (du)[2]	**5,675**	**14,830**	**21,515**	**26,258**	**29,796**	**31,660**

Notes:
(1) Excludes PA-15 and PA-16. Detailed calculations are provided in Appendix A-2.
(2) Totals may not agree with sum due to rounding.

Table 3.4 Projected Non-Residential Sewered Area
Wastewater Master Plan Update
City of Hesperia

Land Use Type	Area by Planning Year (acres)[1]					
	2005	2012	2017	2022	2027	2032
Commercial Sewered Area (ac)	556	1,221	2,128	2,737	3,138	3,301
Industrial Sewered Area (ac)	151	406	710	1,033	1,334	1,555
Total Non-Residential Sewered Area (ac)	**706**	**1,628**	**2,837**	**3,770**	**4,472**	**4,856**

Notes:
(1) Excludes PA-15 and PA-16. Detailed calculations are provided in Appendix A-1.
(2) Totals may not agree with sum due to rounding.

3.3.4 Wastewater Generation Factors

A wastewater generation factor is the estimated amount of wastewater generation for a certain land use type. They are typically expressed in gallons per capita per day (gpcd) for residential areas and gallon per acre per day (gpad) for commercial, industrial, and public areas. These factors are used to estimate the average dry weather flow (ADWF) for existing and future planning years by multiplying the factor with the total number of people or acres within each land use area. The wastewater generation factors were calibrated by comparing the calculated flow rates against the measured flows from the flow monitoring study. The flow monitoring was conducted as part of the model calibration and results are presented in more detail in Chapter 4. An iterative method was used to refine the factors until differences between the calculated and observed flows were minimized. Table 3.5 presents the calibrated wastewater generation factors.

Table 3.5 Wastewater Generation Factors Wastewater Master Plan Update City of Hesperia	
Customer Type	**Wastewater Factors**
Low-Density Residential	264 gallons per dwelling unit per day(1)
High-Density Residential	216 gallons per dwelling unit per day (2)
Commercial	1,000 gallons per acre per day(3)
Industrial	1,000 gallons per acre per day(3)

Notes:
(1) Using a unit flow factor of 80 gal/cap/day and based on 3.3 persons per low-density residential dwelling unit.
(2) Using a unit flow factor of 80 gal/cap/day and based on 2.7 persons per high-density residential dwelling unit.
(3) Unit flow values iteratively calculated to match flow-monitoring results.

3.4 PROJECTED FLOWS

Using the estimated customer count from Tables 3.3 and 3.4 and the unit flows from Table 3.5, the ADWF are projected by land use type and planning year; the results are summarized in Table 3.6. Projected flows from Planning Areas 15 and 16 are excluded from Table 3.6 and the hydraulic model, as the developers are responsible for sewers in these areas. A sharp increase in the projected flow can be seen between year 2005 and year 2012 due to a sharp increase in the number of customers that were projected.

Table 3.6 Projected Average Dry Weather Flow Wastewater Master Plan Update City of Hesperia						
Year	**2005**	**2012**	**2017**	**2022**	**2027**	**2032**
LDR ADWF (mgd)	0.73	1.68	2.11	2.45	2.75	2.93
HDR ADWF (mgd)	0.63	1.83	2.92	3.67	4.19	4.45
Commercial ADWF (mgd)	0.56	1.22	2.13	2.74	3.14	3.30
Industrial ADWF (mgd)	0.15	0.41	0.71	1.03	1.33	1.55
Total ADWF (mgd)(2),(3)	**2.06(1)**	**5.14**	**7.87**	**9.89**	**11.41**	**12.23**

Notes:
(1) 2.04 mgd was measured at the downstream end of the Hesperia collection system for 7 days in April 2006.
(2) Totals may not agree with the sum of the planning areas due to rounding.
(3) Excluded flows from PA-15 and PA-16

3.5 VICTOR VALLEY WASTEWATER RECLAMATION AUTHORITY FLOW DATA

The historical wastewater flows discharged to the Victor Valley Wastewater Reclamation Authority (VVWRA) in year 2004 are summarized in Table 3.7. This data is obtained from the VVWRA Discharge Monitoring Reports (DMRs) and is used to estimate ratios between maximum month, maximum day, and average annual flows. The DMR summarizes daily and peak hour flows for the VVWRA, and daily flows for the City.

Table 3.7 VVWRA Year 2004 Discharge Monitoring Report Data
Wastewater Master Plan Update
City of Hesperia

Flow Conditions	VVWRA		Hesperia	
	Flow (mgd)	Flow/ADWF	Flow (mgd)	Flow/ADWF
Average Annual	10.6	1.0	1.36	1.0
Maximum Month	11.5	1.1	1.53	1.1
Maximum Day	13.7	1.3	1.74	1.3
Peak Hour	26.4	2.5	N/A(1)	N/A(1)

Notes:
(1) Peak hour flow for Hesperia was not reported on the 2004 DMR.

Table 3.7 indicates a measured average annual flow of 1.36 mgd in 2004, whereas Table 3.6 indicates a measured average flow of 2.06 mgd for 1 week in April 2006, a 51-percent increase. Data in Table 3.7 was based on flow monitoring results at the VVWRA, whereas data in Table 3.6 was based on more local flow monitoring results in the Hesperia collection system. Considering 2 years of growth between mid-2004 and the mid-2006, there is a reasonable correlation between flow monitoring results in the Hesperia collection system and measured flows at the VVWRA.

3.6 PEAKING FACTOR AND PEAKING EQUATION

The peaking factor is defined as the ratio of the peak hour flow to the average flow. The peaking factor is used to estimate peak flows based on average flows. Peak flows are in turn used for the design of new collection system facilities. Therefore, an accurate or conservative estimation of the peaking factor is essential to prevent future sanitary sewer overflows (SSOs).

The peaking factor is dependent on the geometry of the collection system, number and configuration of lift stations, demographics, and land use. Typically, at small flows, the peaking factor is relatively large, and decreases as flows increase.

3.6.1 Typical Peaking Factors in Southern California

In Southern California, several agencies use equations to relate the peaking factor to average flow. For example, the previous Hesperia Sewer Master Plan used an equation developed by the San Bernardino County Special Districts Department:

$$Qpeak = 2.5186 * Qaverage^{0.8992}$$

where Qpeak is the peak hour flow in mgd and Qaverage is the average annual flow in mgd.

The City of San Bernardino uses a more conservative equation to estimate peak flows from average flows, as seen in the following equation:

$$Qpeak = 3.6 * Qaverage^{0.85}$$

where Qaverage is the average flow in cfs.

Another common peaking factor equation is the Ten-State Standard equation, which is expressed as:

$$PF = (18 + \sqrt{P})/(4 + \sqrt{P})$$

where PF is the peaking factor and P is the population in thousands.

3.6.2 Projected Peak Hour Flows and Peaking Factors

As shown in Table 3.7, the VVWRA had an ADWF of 10.6 mgd and a peaking factor of 2.5 for the year 2004. The Orange County Sanitation District (OCSD) uses a peaking factor of 2.1 at its 85- and 155-mgd facilities. Because the Hesperia collection system is considerably smaller than VVWRA or OCSD, the Hesperia peaking factor is expected to be greater than 2.5. However, as directed by City staff, the equation developed by the San Bernardino County Special District is used in this Plan. The resulted peaking factor for 2005 is less than 2.5. The projected peak hour flows and peaking factors for all the planning years are summarized in Table 3.8. Projected average and peak flows are shown graphically on Figure 3.2.

Table 3.8 Projected Peak Hour Flow and Peaking Factors
Wastewater Master Plan Update
City of Hesperia

Year	2005	2012	2017	2022	2027	2032
Projected ADWF (mgd)	2.1	5.1	7.8	9.9	11.4	12.2
Projected PDWF (mgd)(1)	4.8	12.0	18.7	23.0	26.2	27.9
Estimated Peaking Factor(2)	2.3	2.3	2.4	2.3	2.3	2.3

Notes:
(1) Peak hour flows based on the San Bernardino Special County District Equation.
(2) Peaking factor is calculated using PDWF/ADWF.

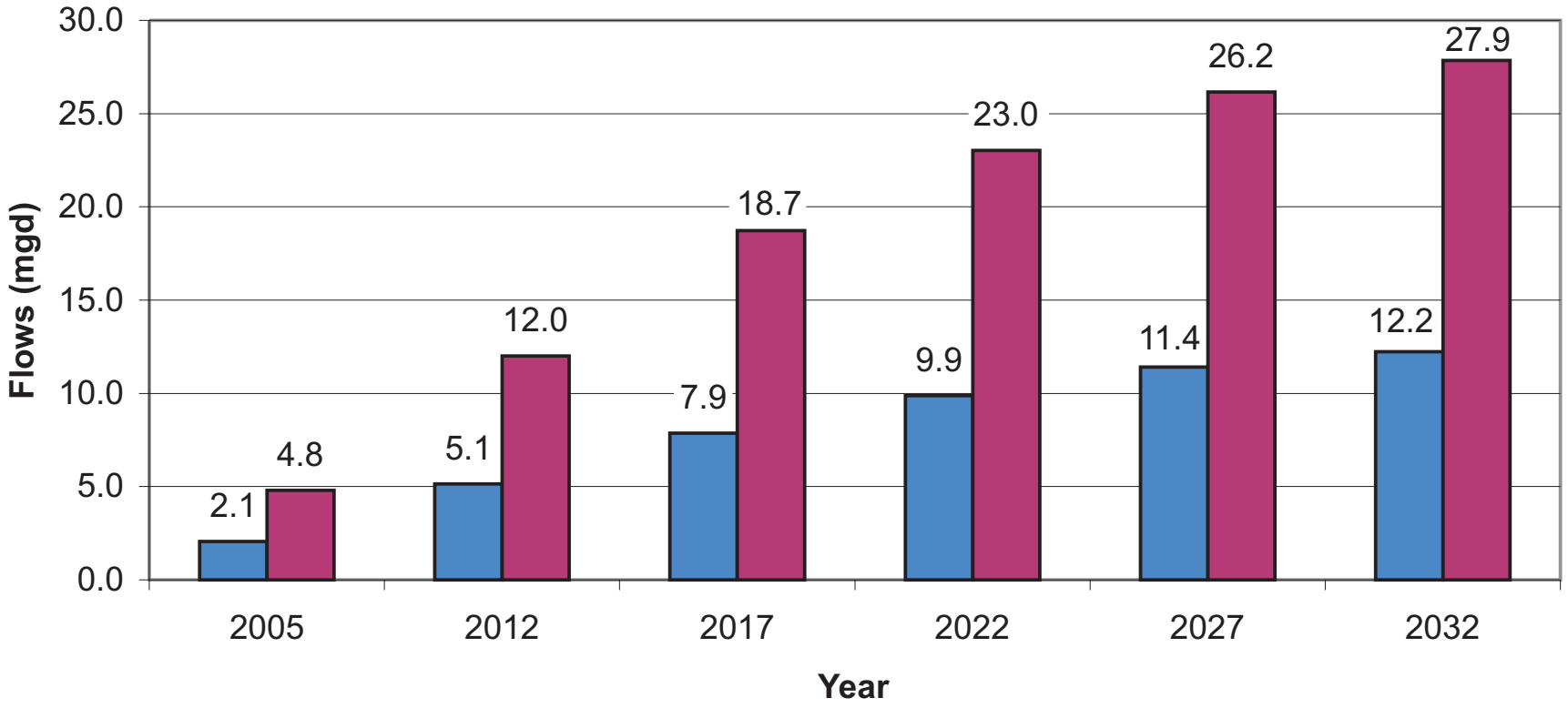


FIGURE 3.2
PROJECTED WASTEWATER FLOWS MODELED

Chapter 4

HYDRAULIC COMPUTER MODEL DEVELOPMENT

4.1 GENERAL

A hydraulic computer model of the sewer system is an important tool for a sewer master plan. In master planning, the computer model assists in measuring system performance and capabilities, in analyzing operational improvements, and in developing a systematic method of determining the size and timing required for new facilities. The hydraulic model allows numerous scenarios to be analyzed relatively quickly and easily and helps provide answers to many “what if” questions.

The Hydraulic Model is composed of three main parts:

1. The data file for geographic location of facilities.
2. The database that defines the physical system. This database is linked to the geographic data file.
3. A computer program “calculator” that solves a series of hydraulic equations to define the performance of the sewer system for depth of flow inside the gravity pipe.

The geographic data file provides sewer system facility locations and is typically represented in the following formats:

1. AutoCAD drawing.
2. Geographic Information Systems (GIS) file.
3. Other database providing “to” and “from” manholes for pipelines and x,y coordinate locations for manholes and pipeline vertices. This database is typically developed as a Microsoft® Excel, Microsoft® Access, or text file.

Graphic elements used in the computer model to emulate sewer system facilities include gravity mains, force mains, manholes, outlets, wet wells, and lift stations. Manholes may contain specific hydraulic characteristics assigned to them, such as a drop manhole or a diversion structure.

The database also includes sewer system facility information, such as facility sizing and geometries, operational characteristics, wastewater loading and peaking data, and potentially Infiltration & Inflow (I&I). Facility sizing and geometries include length and diameter of pipe, wet well dimensions, manhole sizing, and pump curves. Operational characteristics include parameters that control how facilities pump waste through the system, such as pump supervisory control and data acquisition (SCADA) control settings or line closures.

The computer program “calculator” analyzes the hydraulic information in the database file and generates results for base flow, peak flow, ratio of depth over diameter (d/D), percent surcharge, depth of flow inside the manhole, and hydraulic grade line (HGL) across the profile of the pipeline and through the manhole. The key to maximizing use of the hydraulic model is to correctly interpret results and understand how the sewer collection system is being impacted. This understanding enables the engineer to be proactive in developing solutions to existing and future sewer system goals and objectives. With this approach, the hydraulic model is then used as a tool to identify the adequacy of system performance and manage proactive solutions to maintain system criteria.

4.2 CHAPTER OBJECTIVES

This chapter discusses the following elements involved in updating and developing the City of Hesperia’s (City’s) hydraulic computer model:

1. Software Overview and Hydraulic Model Conversion.
2. Manhole Development: Hydraulics and Loading.
3. Demand Peaking.
4. Wet Wells.
5. Lift Stations.
6. Database Management.

4.3 EXISTING COMPUTER MODEL

Wilson So & Associates created the City’s original hydraulic computer model for the 2002 Sewer Master Plan. The hydraulic model used for this project was developed in Microsoft® Excel as a series of formulas to calculate depth versus diameter (d/D) ratios for each pipe given tributary flows and peaking. This model was a database only without graphic or mapping capabilities and contained completely within the Microsoft® Excel spreadsheets.

The Microsoft® Excel database contained three separate worksheets, each designated by the Assessment District (AD) where the sewer facility was located, AD#1, AD#2, and AD#3. The AD# was used as the primary identifier between the different tributary systems, using node numbers such as “10” or “40” several times within each worksheet to create a segment or branch system. The following data, at a minimum, was used from this Microsoft® Excel database to create a 2005 hydraulic computer model of the City’s sewer collection system:

1. Pipe and Manhole element numbers, “10”, “20”, “30”, “40”, etc. Non-unique element identifiers (repeating IDs).
2. Upstream Manhole/Downstream Manhole.

3. Ground Elevation (manhole rim elevation).
4. Pipeline Invert Elevations.
5. Pipeline length and slope.
6. Street of pipeline and manhole.
7. Pump stations, diversion structures, and drop-manholes were not included in the original Microsoft® Excel model.

As the original computer model was constructed in Microsoft® Excel, there were no constraints on unique identifiers (IDs) for each sewer system element. Therefore, there were consistently repeating element IDs in the Microsoft® Excel database, which cannot occur with a graphically linked sewer model.

4.4 SOFTWARE SELECTION

The City has historically used AutoCAD as its software for as-built, tract map, construction, and other in-house design and mapping needs. As the City continues to experience rates of growth similar to the past 5 years, the reliance on mapping tools alone is becoming outdated. As such, there is a growing need to manage and maintain the *data* that the City uses to run an efficient business for its customers.

4.4.1 The Software

As the City works to migrate towards GIS as its future database management and mapping platform, this Master Plan presents the opportunity to convert the previous sewer collection system model to a GIS-based tool consistent with other future City database platforms. The City currently employs, and is satisfied with, H_2ONET Analyzer (H_2ONET) for its water distribution system modeling software. Therefore, it was recommended to continue with MWH Soft as the software vendor and use MWH Soft's InfoSewer sewer collection system modeling software.

The InfoSewer modeling software offers the following benefits to this project:

1. The ability to run directly inside of GIS allows the new sewer model to be created directly on top of the City's GEMS basemap for accurate pipe lengths and alignments.
2. The software accurately calculates flow, depth, backwater curves, and manhole surcharges.
3. The program models lift stations, diversion structures, and drop manholes.
4. Querying and input/output results are viewed directly on the sewer system model map.
5. The program offers graphic capabilities to view HGL profiles and depth of wastewater in the pipeline.

6. The scenario structure allows for unlimited “what-ifs” for varied loading, peaking, and proposed improvements within the project database.

Conversion of the previous sewer model to the InfoSewer platform supports the City’s overall direction for this Master Plan and future database management initiatives.

4.5 MODEL DEVELOPMENT

The following is a detailed summary of the steps involved in converting the City’s previous Microsoft® Excel-based sewer model to InfoSewer:

1. Unique element identifiers were established within the Microsoft® Excel database:
    a. The AD designations were kept as prefixes for all model manholes and Pipes. Pipes were also assigned a “P-“ before the ”AD” prefix. Therefore, sewer model element IDs, were prefixed with:
        1) AD1_.
        2) AD2_.
        3) AD3_.
        4) P-AD1_.
        5) P-AD2_.
        6) P-AD3_.
    b. All manholes and pipes were assigned a number, sequentially starting from the furthest upstream manhole and pipe location. There were approximately 350 AD1 elements, 870 AD2 elements, and 360 AD3 elements. AD1 began with “1” and ended with “345”, AD2 elements began with a “400” designation and ended with “866,” and AD3 elements began with a “900” designation and ended with “1262”. This numbering system ensured unique IDs for all manhole and pipeline elements. An example of sewer model element IDs includes the following:
        1) AD1_100 (manhole in AD1, between 1 and 345).
        2) P-AD2_462 (pipe in AD2, between 400 and 866).
        3) AD3_1236 (manhole in AD3, between 900 and 1262).
2. Base map and reference maps were established and the sewer collection system was digitized:
    a. The City has invested in the County of San Bernardino Geographic Information Management System (GIMS) base maps. This includes a GIS layer that provides parcels and rights-of-way on a geographically correct scale and registered coordinate system. This GIMS map was used as a layer within InfoSewer (within ArcGIS) to digitize the sewer collection system.
    b. The previous Sewer Master Plan had developed an AutoCAD drawing of the sewer model as a “node map.” This drawing indicated the locations of each of the corresponding manhole and pipeline element from the Microsoft® Excel database. Note: These two data sources were not linked. They were two separate data references.

c. The previous Sewer Master Plan node map was rescaled and projected to accurately overlay on the County GIMS map.

d. All pipelines and manholes were digitized using InfoSewer per the node map and the new ID convention summarized above. As each element was digitized, a new, unique record with the geographic linkage was created in the database.

3. The Microsoft® Excel spreadsheet data with the new ID convention was connected to InfoSewer:

   a. With each sewer model element having been digitized in InfoSewer and a unique ID placeholder created in the database, the Microsoft® Excel database (now also populated with the new, unique IDs) was imported to InfoSewer. The unique IDs, common to both databases, were used as the linkage.

   b. Data captured from the original Microsoft® Excel model includes:

      1) Manhole rim elevations.

      2) From/to invert elevations.

      3) From/to manhole.

      4) Pipeline diameter.

4. The InfoSewer model was developed:

   a. Several reaches of pipeline containing no data from the Microsoft® Excel-based model were digitized using the node map. All of these reaches occurred within developments and they were placed in the model for future data and development needs.

   b. Pipeline lengths were automatically calculated using the geographic reference and scale of the County GIMS map.

   c. Pipeline years of installation received from the City were manually inputted to the sewer model. Layers in an AutoCAD drawing delineated the years of installation. This AutoCAD drawing was scaled and projected to overlay the City's InfoSewer model. Each layer was isolated and the corresponding year of installation was assigned to the sewer pipeline in the sewer model database.

   d. Sewage lift station LS2 was added to the InfoSewer model since the original Microsoft® Excel-based sewer model did not contain lift stations. Hydraulic data for LS2 was provided by the City for wet well depths, lift station operating points, and on/off settings.

5. The Data was developed and checked for missing information and anomalies. Additional data needs were identified:

   a. Using the existing from/to invert elevations and the length of each pipeline, a slope was calculated and assigned to each pipe within the model database.

   b. Queries for the database were created and the results were applied to the map for visual locating, validating, or correcting of:

      1) Missing diameters, invert elevations, and manhole rim elevations.

      2) Negative slopes or slopes less than 0.0008 (as per sizing criteria minimum slope, Section 1).

   c. Missing or questionable data was reconciled with the City by collecting as-builts for the particular facility in question. The I-Avenue Victor Valley Wastewater Reclamation Authority (VVWRA) interceptor, for example, contained no

hydraulic data for pipes or manholes. Data for this reach of pipe was received by VVWRA and inputted to the City's sewer model.

d. An elevation contour file was created using all the given manhole rim elevations:
    1) Any "busts" in elevation were easily detected referencing the generated contour linework to find "holes" or "hills" that were not consistent with the surrounding topology.
    2) Elevations were interpolated using the surrounding topology.

e. Cleanouts, force mains, flow monitor locations, and the VVWRA I Avenue. interceptor were assigned unique element IDs such as:
    1) CO = Cleanout: CO-AD3_1111 (cleanout in AD3, No. 1111).
    2) FM = Force main: FM_2A (Flow Monitor No. 2A).
    3) I_INT_HESP = I-Avenue Interceptor: I_INT_HESP_MH69 (Manhole No. 69 specifically along the VVWRA I Avenue interceptor).

f. Subcategories of existing facilities (drop manholes, diversion structures, and force mains) were identified:
    1) Drop manholes occurred where there was a significant difference in elevation between the manhole's upstream and downstream invert elevations. The City had provided locations of each drop manhole and the as-builts for invert elevations.
    2) Diversion structures exist in the City's sewer collection system to allow flow to build up in a certain direction to create a gravity flow situation in another direction. The City has installed several weir-type structures to control the direction of flow in the system. The City has provided the locations of these structures and the controlled flow direction for our sewer model recreation.
    3) Force mains were identified in the model on the discharge side of LS2 in the southeast section of the system, along I Avenue.

The step-by-step process described above was initiated using the original Microsoft® Excel-based sewer model. The data from the process was combined with a map created with a database. The database was populated and the sewer model then benefited from the graphic-to-database linkage features such as queries, contouring, and graphical references to City AutoCAD drawings.

4.5.1 The Master Plan Model

The conversion described above created a sewer model totaling 1,231 pipes. This total includes pipelines within developments as well as collector gravity mains and force mains. For the purposes of this Master Plan, only the collector gravity main and force main pipelines were used for analyses. The development-specific gravity main pipelines remained in the model, but were not used in the analysis. Wastewater loading from developments is therefore, assigned to the collector gravity main's tributary manhole.

The existence of the development-specific piping in the InfoSewer database remains a benefit for future modeling of these pipes. In addition, the installation dates assigned to the pipes will also benefit the City's inventory needs.

The InfoSewer modeling software provides the ability to create scenarios, which allow different piping/system configurations to be run independently of each other. Therefore, scenarios were created in the model to analyze of only collector pipes and force mains. These scenarios were assigned a specific date, "2005" for example, to identify the particular facilities included in the analysis. Only facilities with an installation date earlier than the scenario date are analyzed. Therefore, the development specific gravity main pipelines were not included in the "2005" scenario because these pipes have future installation dates. This method resulted in approximately 980 pipes being included for Master Plan existing system analyses. Note: as future pipes are added, they were assigned a year designation and became available in future planning scenarios, "2012" for example.

4.5.2 Facilities

In InfoSewer, facilities in the collection system are modeled as either a node or a link. Pipes and pumps are links and pipes are separated into two categories: gravity mains and force mains for pressurized flow. Manholes and wet wells are considered nodes and must be connected to a link. A node contains geometry data that provides the coordinates (x,y,z) of the facility while a link contains geometry data that indicate the "To" and "From" nodes of the link.

This Master Plan incorporated the latest round of updated data for key facilities in the City's sewer collection system in order to bring model facilities, loading, peaking, lift station controls, and calibrations up to date. Data sources used in this update include as-builts, drawings, previous Master Plan node maps, and flow monitoring data. Highlights of the City's computer hydraulic model upgrade include:

1. Addition of lift station LS2.
2. Addition of the VVWRA I Avenue Interceptor.
3. Addition of six diversion structures located at the intersections of:
    a. Mojave Street and Blanchard Road.
    b. Mariposa Road and Maple Avenue.
    c. Hesperia Road and Lemon Street.
    d. Main Street and 9th Avenue.
    e. Yucca Avenue and Hesperia Road.
    f. Main Street and C Avenue.
4. Creation of 12 drop manhole structures located at:
    a. Main Street and G Avenue.
    b. Hesperia Road and Spruce Street.
    c. Hesperia Road and Juniper Street.

d. Hesperia Road and Yucca Street.
e. 2nd Avenue, south of Bear Valley Road.
f. Topaz Road and Palmetto Way.
g. Verde and I-15 State Highway frontage/Mariposa east of I-15.
h. Sequoia Avenue, east of 1st Avenue (No drop MH modeled here).
i. I Avenue and Darwin (No drop MH modeled here).
j. Lemon Street west of I Avenue.
k. Sequoia Avenue east of Hesperia Road.
l. Sequoia Avenue and Hesperia Road.

5. The 2005 loads and loading distribution based on City planning areas (PA).

6. The 2005 peaking factors based on flow monitoring.

The objective in updating model elements with recent information is to increase the level of confidence in the model results. This Master Plan will consider the model "calibrated" when the model results are within an accepted tolerance of the measured flow-monitoring results. In addition, City operators must feel comfortable that the modeled depths of flow are in line with their field experience. With these criteria met, model calibration will produce a level of confidence in the subsequent recommendations made in this Master Plan.

The sewer system facilities included in the computer model for the existing 2005 system are shown on Figure 2.1.

4.5.2.1 Pipelines

The computer modeling software used for this Master Plan, InfoSewer, allows the sewer system facilities to be drawn over a map of the service area in real world scale. This Master Plan makes use of the San Bernardino County GIMS map, which is real world scale and projection (meaning that the City's sewer model will overlay adjacent to neighboring communities, which were also based on GIMS or other GIS real world coordinates). Using this approach, the program automatically calculates the pipe length from the scaled drawing. Additionally, this background layer allows the modeler to view the locations of rights-of-way, street names, etc., with respect to the modeled facilities.

The City's hydraulic computer model consists of 1,231 pipe segments, of which approximately 980 are included and analyzed as part of the 2005 model. These pipes range from 6 to 21 inches in diameter and are required for conveyance in the hydraulic analyses. Years of installation provided by the City are attributed to the pipes. Table 4.1 summarizes the sewer collection system pipelines in the model database by diameter for approximately every 5 years of installation.

Table 4.1 Length of Pipelines by Diameter and Year of Installation Wastewater Master Plan Update City of Hesperia						
Pipe Diameter (in)	**Length of Pipe (ft) by Year of Installation**					**Total Length (ft)**
	1980-1985	**1986-1990**	**1991-1995**	**1996-2000**	**2001-2005**	
6	-	600	-	2,000	1,500	4,142
8	34,700	69,200	29,800	15,700	18,000	167,369
10	2,400	22,300	31,500	8,800	6,100	71,058
12	13,400	33,900	20,200	1,600	4,100	73,213
15	400	25,300	8,900	-	-	34,509
18	9,300	6,900	9,500	100	-	25,919
21	-	-	3,300	-	-	3,283
Total Length (ft)	**60,200**	**158,200**	**103,200**	**28,200**	**29,700**	**379,500**
Total Length (mi)	**11.4**	**30.0**	**20.6**	**5.4**	**5.6**	**71.9**
Percent of Total	**16%**	**42%**	**27%**	**7%**	**8%**	**100%**

Pipeline roughness coefficients were globally assigned to all pipes in the sewer model. A Manning's roughness coefficient of 0.014 was used.

The primary model output for pipelines is the ratio of the depth of flow to the diameter of the pipe. This ratio, abbreviated d/D, is the driver for pipeline sizing and paralleling. This Master Plan will use the criteria developed in Section 1 to define deficiencies.

4.5.2.2 Nodes

In the model, a node represents a manhole in the sewer system and is located where two or more pipes connect. The minimum information required by InfoSewer to complete the hydraulic analysis includes rim elevation and manhole diameter. Nodes represent the location of wastewater loading and peaking in the model. All wastewater flows to the system are placed at the nodes for conveyance to the downstream piping.

InfoSewer allows the user to create three types of nodes:

1. Gravity Node:
   This node is a manhole connected to two or more gravity pipes. Manholes can become full and discharge if the backwater curve in a pipe rises above the manhole's rim elevation.

2. Chamber Node:
   In the model, a chamber node is located between a lift station pump and a force main. Chamber nodes are modeled as full, pressurized, and incapable of discharging. There is no physical structure equivalent to a chamber node.

3. Outlet Node:
   This manhole is placed at the furthest downstream terminus of a system. Outlet nodes are the final collection point for treatment or disposal. The City's modeled outlet node represents the location of the VVWRA wastewater treatment plant (WWTP) just north of Bear Valley Road, east of I-Avenue.

Among gravity nodes there are three subsets that more closely define node function. A closer emulation of actual conditions is achieved with the subset nodes. The subset nodes model three different types of City manholes with differing performances:

1. Standard Manhole:
   Typically have a tenth of a foot drop across the manhole.

2. Drop Manholes:
   Per the City's definition, a drop manhole occurs where an inlet pipe enters a manhole at a different elevation than the existing shelf or the existing flow line. There are 12 cases of drop manholes in the City's sewer collection system. Table 4.2 summarizes the locations and the fall across each drop manhole.

Table 4.2 Drop Manhole Summary
Wastewater Master Plan Update
City of Hesperia

Manhole Model ID/ City ID	Location	Upstream Invert (ft)	Downstream Invert (ft)	Drop Across Manhole (ft)
MH-AD1_281/ L15S-MH145	Main St and G Ave	3,148	3,142	6
MH-AD1_53/ K15N-MH080	Hesperia Rd and Spruce St	3,182	3,177	5
MH-AD1_58/ K15N-MH060	Hesperia Rd and Juniper St	3,180	3,177	3
MH-D3_1173/ K12N-MH112	Hesperia Rd and Yucca St	3,179	3,178	1
MH-D3_1011/ G14N-MH160	2nd Ave, south of Bear Valley Rd	3,029	3,028	1
AD3_1047/ H13S-MH005	Topaz Rd and Palmetto Way	3,450	3,439	11
MH-D3_1215/ L12N-MH285	Verde and I-15 State Highway frontage/Mariposa east of I-15	3,122	3,112	10
VVWRA_MH58/ L13N-MH002	Sequoia Ave, east of 1st Ave (Drop in field from the west)	2998	2993	5
MH-AD1_137/ L13S-MH002	I Ave and Darwin (Drop in field from the south)	3043	3036	7
MH-D3_1222/ L12N-MH250	Lemon St west of I Ave	3,044	3,034	10
MH-D3_1216/ L12N-MH255	Sequoia Ave east of Hesperia Rd	3,002.72	3,002.32	0.4
MH-D3_1173/ K12N-MH112	Sequoia Ave and Hesperia Rd	3,020	3,010	10

3. Diversion Structures:

Weir-type structures used by the City to control the direction of flow in the sewer system at points where there is more than one inlet or outlet to a manhole. These occur at six locations within the City's collection system and are summarized in Table 4.3.

Table 4.3 Diversion Structure Summary
Wastewater Master Plan Update
City of Hesperia (Group 1 of 2, MHs 1-3)

Manhole ID	MH-AD2_780	MH-AD3_1084	MH-AD1_105
City MH ID	G14N-MH001	H12N-MH020	K13S-MH010
Intersection	Mojave St and Blanchard Rd	Mariposa Rd and Maple Ave	Hesperia Rd and Lemon St
Upstream Pipe ID 1 and Street	P-AD2_779 Mojave St	P-AD3_1078 Mariposa Rd	P-AD2_866 Lemon St
Upstream Pipe ID 2 and Street	N/A	P-AD3_1083 Maple Ave	P-AD1_104 Hesperia Rd
Downstream Pipe ID 1 and Street	P-AD3_1035 Blanchard Rd	P-AD3_1084 Mariposa Rd	P-AD1_105 Lemon St
Downstream Pipe ID 2 and Street	P-AD2_780 Mojave St	N/A	P-AD3_1187_1 Hesperia Rd
Percent of Flow Downstream Pipe ID 1	0 – North	100 – North	0 – East
Percent of Flow Downstream Pipe ID 2	100 - East	N/A	100 - North
(Group 2 of 2, MHs 4-6)			
Manhole ID	MH-AD1_4	MH-AD1_59	MH-AD1_267
City MH ID	J15N-MH060	K15N-MH035	K15N-MH230
Intersection	Main St and 9th Ave	Yucca Ave and Hesperia Rd	Main St and C Ave
Upstream Pipe ID 1 and Street	P-AD1_3 Main St	P-AD1_47 Yucca Ave	P-AD1_266 C Ave
Upstream Pipe ID 2 and Street	P-AD1_4_7 N/A	P-AD1_43 Hesperia Rd	N/A
Downstream Pipe ID 1 and Street	P-AD1_4 Main St	P-AD1_48_1 Hesperia Rd	P-AD1_267 C Ave
Downstream Pipe ID 2 and Street	N/A	P-AD1_48 Yucca Ave	P-AD1_268 Main St
Percent of Flow Downstream Pipe ID 1	100 – East	100 – North	100 – North
Percent of Flow Downstream Pipe ID 2	N/A	0 - East	0 - East

The primary model output for manholes is the unfilled depth inside the manhole. This output variable summarizes the amount of freeboard in the manhole. If the depth of flow is negative, than the manhole is surcharging and InfoSewer will report a "Full" status for that manhole. In these cases, this Master Plan identifies a new pipe size or parallel pipe to relieve the downstream pipeline backwater curve.

4.5.2.3 Wet Wells

In InfoSewer, the wet well receives gravity flow from upstream pipes and discharges the flow on the suction side of the lift station. The wastewater is then lifted to the pump's energy gradient and released into the force main.

Wet wells fill and drain to a defined level and require the following geometry data for hydraulic analysis: type (cylindrical or non-cylindrical), bottom elevation, minimum level, maximum level, initial water level, and diameter.

The City's sewer collection system model includes one wet well, which is located on the suction side of lift station LS2. This wet well has the following model attributes:

1. ID: LS2.
    a. Bottom Elevation: 3,069 feet.
    b. Minimum Level (from bottom elevation): 2 feet.
    c. Maximum Level (from bottom elevation): 8 feet.
    d. Initial Level (from bottom elevation): 5.5 feet.
    e. Diameter: 6 feet.

InfoSewer provides one output result for wet wells, which is the Gradient. The calculated Gradient equals the bottom elevation plus the initial level. In the case of LS2 then, the gradient equals: 3,074.5 feet.

4.5.2.4 Sewer Lift Stations

Information required to model each pump in the lift station includes a unique identification number (ID), pump curve, and the to/from nodes, which define the lift station pump as a link. Pumps can be modeled in several ways including fixed capacity, single design point (i.e., design flow and total dynamic head), or exponential 3-point curve (i.e., characteristic pump curve using three operating points). The most precise of these methods is to use an exponential 3-point curve based on the actual pump curve from the manufacturer. Greater accuracy can be achieved by basing the pump test data.

The lift station is located at a low point in the reach of the sewer pipeline and acts to lift the wastewater flow the point in the sewer line where gravity flow takes over.

The City has one duplex lift station; however, only one pump is modeled because the duplex lift station must be able to operate with one pump out of service. The pump has been given the unique pump ID of LS2 and is modeled using the following hydraulic data:

1. ID: LS2.
2. Design Head: 95 feet.
3. Design Flow: 0.49 mgd.

InfoSewer models lift stations using an algorithm to ensure that mass balance and peak flow are maintained throughout the system. The output results provided for the lift station pump include the total flow and head delivered to the collection system.

4.6 BASE LOAD ALLOCATION

Wastewater loading for a sewer model is largely driven by the amount of data available to correlate wastewater flows with a customer location or land use type within the service area. The geographic connection between land use and the system nodes allows for accurate loading using the calculated wastewater flows from the nearest tributary land use category. There are several methods to approach the wastewater flow generation and allocation process. The selected approach depends on the following factors:

1. Density (percent built out), land use (primarily residential, mix of residential, commercial, industrial, etc.), and number of tributary areas.
2. GIS parcel layer and land use maps available for the geographic correlation.
3. Water demand data available for calculation of a wastewater duty factor (gpd/acre) or water demand return-to-sewer ratios.
4. Ability to estimate wastewater generation factors.
5. Availability of flow-monitoring data.
6. Availability of data from a treatment plant or treatment plants, which record wastewater flows on a regular time interval.

Over the next 20 years, the direction and rate of growth may vary greatly. Additionally, the City serves several different land use types. Although primarily residential and zoned for residential land use, the City currently serves corridors of commercial and industrial land uses. With the addition of County Service Area Zone-J, North Summit Valley (NSV), the Rancho Las Flores (RLF), and Summit Valley Ranch (SVR) developments, the City's service will be expanding its commercial land use types. These new developments will introduce opportunities to expand the City's WWTPs for potential tertiary treatment and future recycled water distribution system.

The current sewer system uses over 20 tributary reaches to convey flows from residential and commercial developments in a northeast direction towards the VVWRA wastewater

reclamation plant on Bear Valley Road, east of I-Avenue. Land use maps, which would overlay on top of the current sewer tributary piping, were not available to help correlate a land use with the tributary sewer manholes. Therefore, Carollo Engineers (Carollo) worked with the City staff to enhance the City's current PA drawing to produce a detailed breakdown including:

1. Sub-Planning Areas (sub-PAs) delineated by tributary reach of gravity pipeline. For example, PA 1 was subdivided to 1A through 1Z to denote different tributary areas, or sub-areas, within the PA 1. This was necessary because the wastewater flow allocations play a significant role in the ability of the model to calibrate by matching flow-monitoring data within a reasonable tolerance. Of the remaining 15 PAs, 11 are subdivided into sub-PAs. Only PAs 2, 7, 15, and 16 were not subdivided.
2. Percent distribution of land use categories among:
    a. Low-Density Residential.
    b. High-Density Residential.
    c. Commercial.
    d. Industrial.
3. Percent developed within the land use category per PA.
4. Percent sewered within each PA.

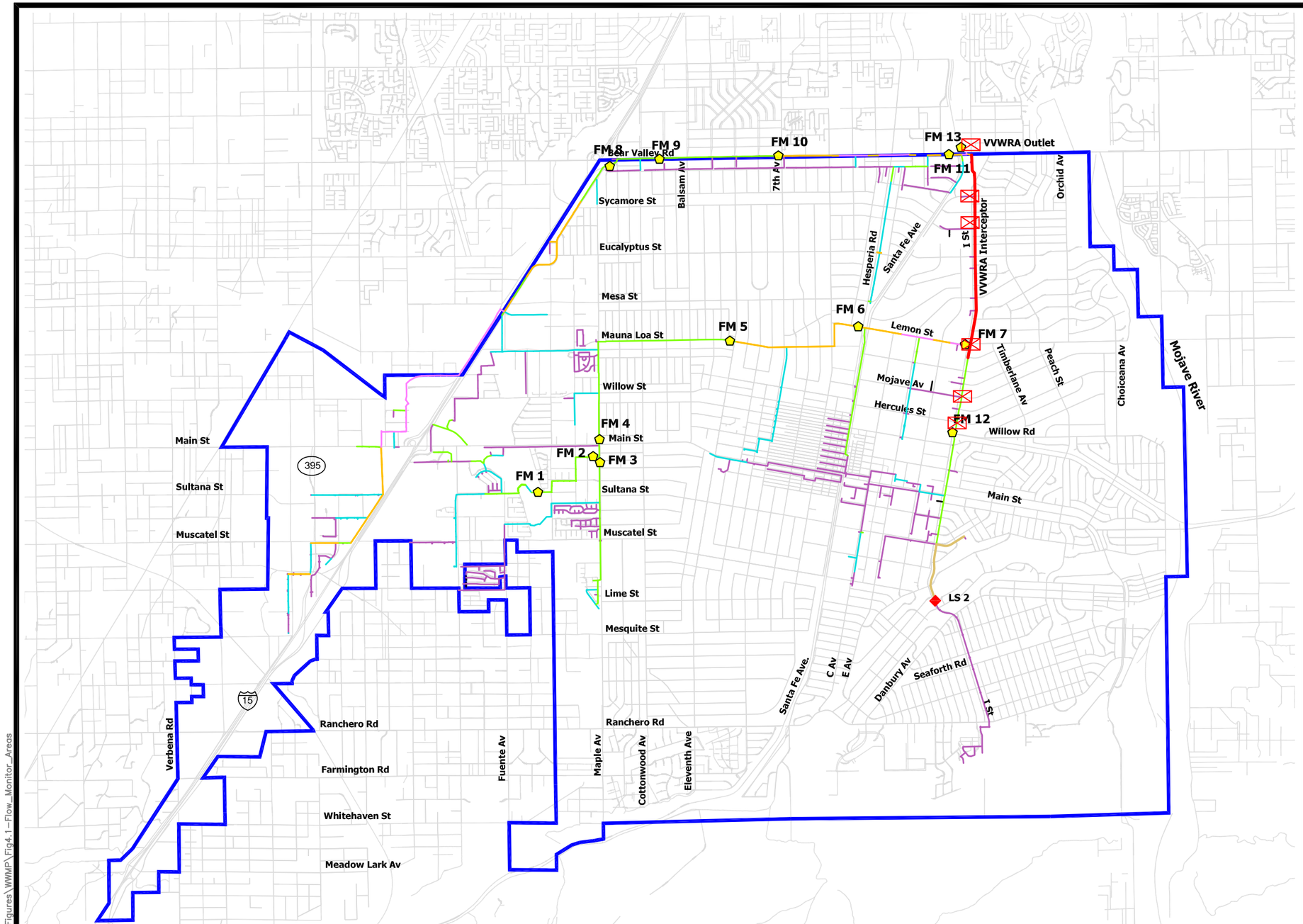
The Water Master Plan worked in concert with the wastewater flow generations. Water duty factors were developed with City staff and wastewater generation factors for residential land uses (low- and high-density) were estimated at half of the water usage. Wastewater generation factors were estimated for commercial and industrial land use types. These factors were applied to the final calculated percentage of land use sewered within a given sub-PA. This total wastewater flow was then evenly distributed to each manhole tributary to its respective sub-PA.

VVWRA wastewater reclamation plant flows were made available and these flows were used as targets for comparison with flow-monitoring data and sewer model calibration.

4.6.1 Flow Monitoring

A flow-monitoring study was performed by DownStream Services, Inc., from April 24 to April 30, 2006; 12 flow monitors were placed at selected locations in the Hesperia sewer system. Locations were selected to measure flow from a variety of different land uses from different parts of the City. Figure 4.1 shows the flow-monitoring locations 1 through 12 and the tributary area for each flow monitor.

Each flow monitor measured the flow, depth, and velocity in 15-minute intervals. From depth and velocity measurements, flow was calculated using the assumption of uniform velocity in the pipe cross section (fully turbulent flow). During the flow-monitoring period, there was no significant rainfall.



Legend

- Study Area Boundary
- Streets
- Flow Monitors
- VVWRA Outlet
- 8" Gravity Sewers
- 10" Gravity Sewers
- 12" Gravity Sewers
- 15" and 16" Gravity Sewers
- 18" and 21" Gravity Sewers
- VVWRA Interceptor
- 6" Force Mains
- Lift Stations (LS)

N

0' 6,000' 12,000'

FIGURE 4.1
SEWER FLOW MONITORING LOCATIONS

WASTEWATER MASTER PLAN UPDATE

City of Hesperia

H:\client\Hesperia_PAS\7287A00\Figures\WWMP\Fig4.1-Flow_Monitor_Areas

carollo engineers

Results of the flow monitoring are summarized in Table 4.4. The total flow for the City is calculated by summarizing flows from Flow Monitors 7, 11, and 12.

Table 4.4 Flow Monitoring Results
Wastewater Master Plan Update
City of Hesperia

Flow Monitor No.	Manhole No.	Location	Average Measured Flow (mgd)	Peak Hour Measured Flow (mgd)
1	185	Sultana Street west of Topaz Avenue	0.200	0.41
2	110	Yucca Street west of Maple Avenue	0.221	0.42
3	10	Yucca Street at the intersection with Maple Avenue	0.280	0.481
4	33	Maple Avenue north of Main Street	0.598	0.968
5	22	North of the intersection of Banning Avenue and Mauna Loa Street	0.698	1.094
6	12	West of the intersection of Lemon Street and Hesperia Road	0.854	1.433
7	1	17592 Lemon Street west of I Avenue at the crest of the hill	1.213	1.799
8	50	12033 Mariposa Road (south of Bear Valley Road and east of the I-15 ramp)	0.757	0.109
9	10	Bear Valley Road west of the intersection with Locust Avenue	0.177	0.299
10	1	16061 Bear Valley Road	0.267	0.411
11	10	17537 W. Santa Fe Avenue	0.447	0.597
12	15	On I Avenue west of the intersection with Willow Street and north of the railroad tracks	0.381	0.502
VVWRA	-	VVWRA Interceptor (sum of FM #7, 11, 12)	2.041	2.898

4.6.2 Planning Areas to Sewer Manholes

As described, Carollo worked closely with City staff to generate reasonable and conservative PA densities for existing and planning periods. Land use wastewater generation factors and developed densities were used to calculate wastewater loading within unique sub-PAs, which also represented sub-basins for segments of gravity sewer mains. This approach produced wastewater flows, which were specific to each sub-PA for existing, 2012, 2017, 2022, 2027, and 2032.

As summarized in this chapter, under Section 4.5.1.2: Sewer Manholes, the sewer system model is typically made up of manholes of various types. The standard manhole was assigned the base wastewater flows. Outlet and chamber manholes are not assigned flows.

After the sub-PA wastewater flows were generated and the sub-PA manholes were created, the sub-PA drawing was converted to a GIS polygon layer. This sub-PA polygon layer was overlayed on top of the computer model. A spatial join was used to assign all manholes within the sub-PA polygon the sub-PA designation. These designations are outlined and discussed in Chapter 3.

After the spatial join was complete, the manhole database was examined to ensure that all manholes had received a PA assignment. There were approximately 100 manholes that were missing an assignment. Visual inspection revealed that these manholes did not fall within a PA boundary; these manholes were manually assigned the correct PA. A manhole was attributed with the PA to which it was tributary if that manhole was outside of the PA "envelope."

With each manhole in the model assigned the sub-PA designation, the hydraulic model database was then linked to the sub-PA database to calculate wastewater flows in the model for existing and all planning periods. This database connection allowed the total wastewater flow for a given sub-PA to be divided by the total number of manholes with that sub-PA designation. Each node within the sub-PA was then evenly distributed the total sub-PA demand.

Several quality control steps were followed at this stage to ensure that all the demands were accounted and brought correctly into the model. First, the loading database had internal checks placed to ensure that the entire load was accounted for. After the loads were imported to the model, the loads in the manhole table were summed to ensure that the total in the model matched the total in the loading database.

This approach allowed the wastewater flow allocations to incorporate City staff input regarding PA, densities, percent sewered, and growth rates. The existing average dry weather flow (ADWF), also defined as the Base Flow, produced a total wastewater flow that matched the anticipated wastewater flows as generated from the PA calculations.

4.7 PEAKING AND SCENARIOS

Scenarios are created in the model to capture a unique set of conditions specific to a hydraulic analysis. Scenarios might include existing or future wastewater loading, average dry weather or peak wet weather flow conditions, existing versus proposed developments, etc. The operational definition of a scenario may be considered a "what-if." "What-if" the loading condition changes in this hydraulic simulation? How does that impact the sewer system? There were several "What-ifs", or scenarios developed for this Master Plan hydraulic model. The primary reason for scenarios in this Master Plan was that each

planning period contained a unique set of facilities due to the differences in peaking and projected flow between periods. These difference required new facilities for either additional flow or system deficiencies.

4.7.1 Existing Scenarios and Peaking

The Base Flow, or Base Scenario, is created in the model to represent the ADWF conditions. This Master Plan considers the 2005 ADWF equal to 2.06 mgd.

The San Bernardino County curve, shown on Figure 4.2, is used to calculate peak flows, because it is based on a history of observed peaking factors in Hesperia and in other sewer systems in San Bernardino County.

This peaking information was entered into the model as a curve that denotes average flow on the X-axis, and the corresponding peak flow on the Y-axis.

4.7.2 Model Calibration

The model calibration approach involved matching the calculated flow values at every flow monitor with the model output. A correctly created and calibrated model will show the correct loadings from their tributary sub-PAs, and will therefore match the calculated flows predicted from each sub-PA.

The ADWF conditions were imported to the model, and a steady state simulation was run to compare the flow monitor data with the flows calculated by the model at the same locations.

It was this Master Plan's intent of matching well within 5 percent of flow monitoring data. Provided the flows matched within our target criteria and considering the method of model creation and quality assurance (QA) checks explained above, it can be assumed that the sewer model would reasonably predict locations of manhole surcharging and excessive d/D ratios for gravity main pipelines.

4.7.3 Calibration Results

The calibration performance of the model is shown in Table 4.5.

Table 4.5 Sewer Flow Calibration Results Wastewater Master Plan Update City of Hesperia

Flow Monitoring Location	Measured Flow (gpd)	Calculated Flow (gpd)	Difference Between Measured and Calculated (%)	Model Flow (gpd)[(1)]
FM-1	199,935	201,168	1%	201,160
FM-2	220,978	222,676	1%	222,670
FM-3	279,601	282,728	1%	283,110
FM-4	597,815	601,826	1%	601,829

Table 4.5 Sewer Flow Calibration Results (Continued)
Wastewater Master Plan Update
City of Hesperia

Flow Monitoring Location	Measured Flow (gpd)	Calculated Flow (gpd)	Difference Between Measured and Calculated (%)	Model Flow (gpd)[1]
FM-5	698,140	700,803	0%	700,792
FM-6	853,987	848,224	-1%	848,225
FM-7	1,213,223	1,213,593	0%	1,214,721
FM-8	75,705	72,807	-4%	72,800
FM-9	176,702	133,042	-25%	132,768
FM-10	267,451	217,511	-19%	217,245
FM-11	447,192	407,021	-9%	406,339[2]
FM-12	381,394	375,350	-2%	375,351
VVWRA	2,041,810	2,064,912	1%	2,062,351

Notes:
(1) There is no percentage difference shown between the calculated and the modeled flow, as the calculated flow numbers were used to load the model, yielding the Model Flow values.
(2) A car wash in this planning area contributed to the difference between measured and calculated flow values.

As demonstrated in the Table 4.5, the model shows excellent agreement with the calculated flow at all of the flow monitoring locations.

Finally, the model shows very close agreement with calculated results at the VVWRA outlet. This indicates that the model is calibrated for ADWF conditions.

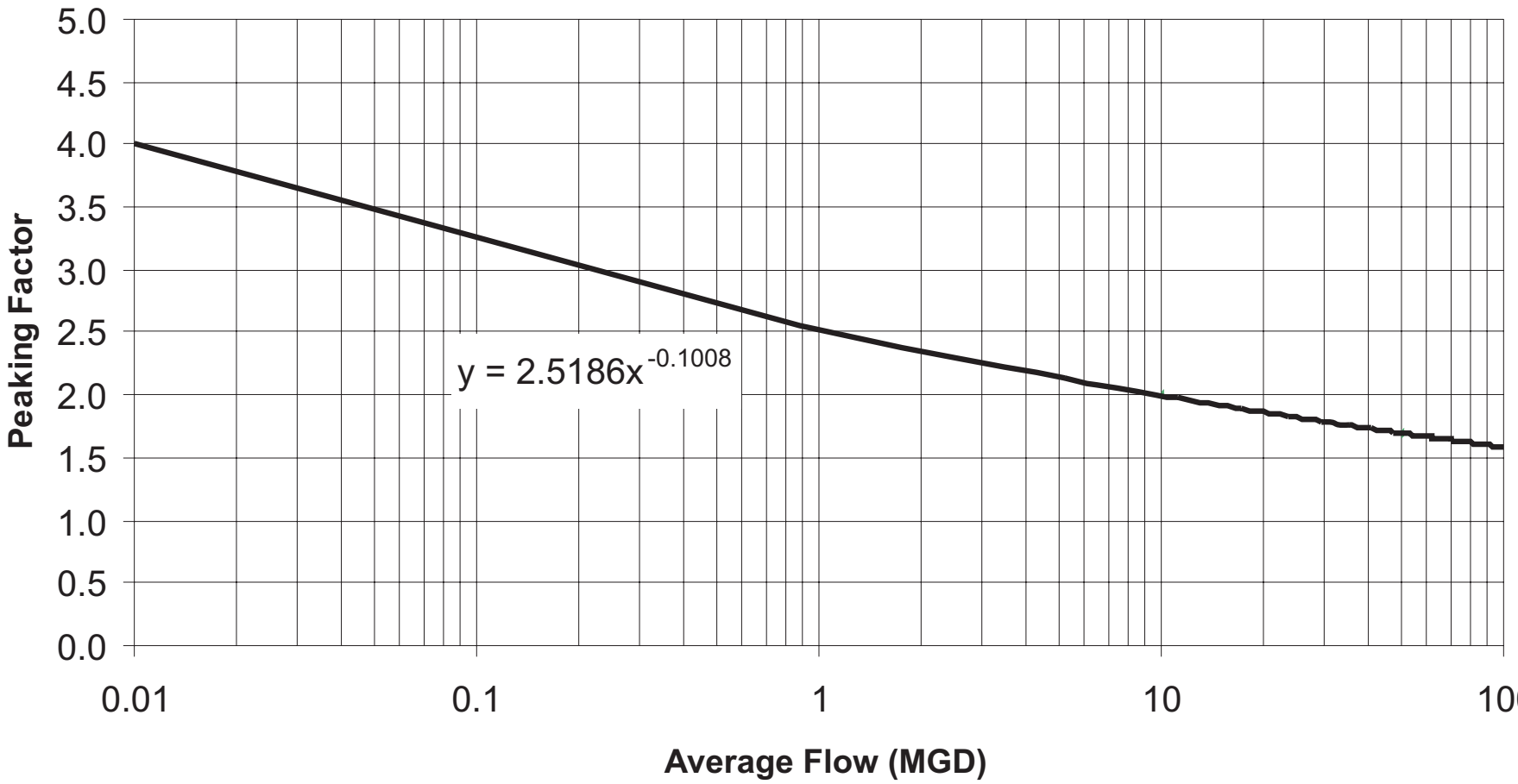


FIGURE 4.2
SAN BERNARDINO COUNTY
SEWER PEAKING CURVE

EXISTING AND FUTURE SYSTEM ANALYSIS

5.1 GENERAL

This chapter presents a system analysis under existing and future flow condition. Model simulations are used to determine flow rates, velocities, and the depth of flow for each pipeline in the City of Hesperia's (City's) collection system. Several steady state simulations were run using the calibrated sewer model to evaluate system deficiencies and identify improvements.

5.2 CHAPTER OBJECTIVES

The objectives of this chapter are to present:

1. The results of the existing system analysis and identified deficiencies.
2. The results of the future system analysis and identified deficiencies.
3. The recommended projects to address the identified collection system deficiencies.

5.3 EXISTING SYSTEM ANALYSIS

This section describes the existing system analysis, the identified deficiencies, and the proposed improvements to address these deficiencies. The existing system analysis is performed under peak dry weather flow (PDWF) conditions of 4.8 mgd with the existing sewer collection system infrastructure as described in Chapter 2 and with the analysis criteria described in Chapter 1.

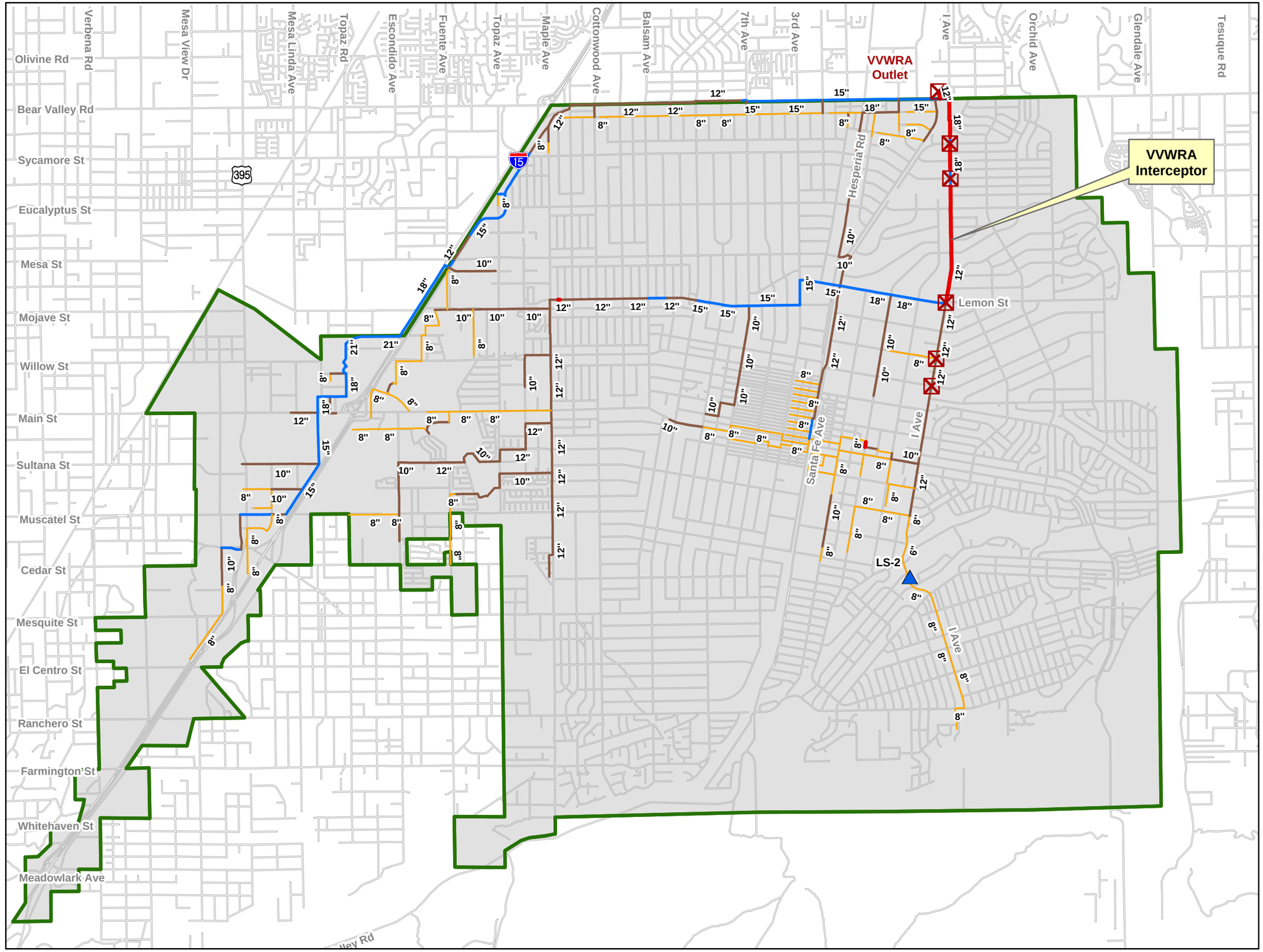
5.3.1 Existing System Deficiencies

The hydraulic model was used to identify pipelines that exceeded their allowable threshold d/D ratio under existing system PDWF conditions. These deficient pipelines are shown on Figure 5.1 and are summarized in Table 5.1.

Table 5.1 Existing Peak Dry Weather Flow Deficiencies
Wastewater Master Plan Update
City of Hesperia

Deficiency ID	Pipeline Location	Length (ft)	Pipe Size (in)	d/D Ratio
2005-A(1)	I Avenue from Lemon Street to 330 feet north of Valencia Street	1,800	12	>1
2005-B(1)	I Avenue from 330 feet north of Valencia Street to Bear Valley Road	8,900	18	>1

Notes:
(1) Victor Valley Wastewater Reclamation Authority's interceptors.



Legend

- Existing Lift Station
- VVWRA Outlet
- Existing System Deficiency

Existing Collection System Pipes Diameter

- 8" and Smaller
- 10" - 12"
- 15" and Larger
- WWMP Study Area
- Roadways

N

0 5,000 10,000 Feet

FIGURE 5.1
EXISTING SYSTEM DEFICIENCIES

WASTEWATER MASTER PLAN UPDATE

CITY OF HESPERIA

Figure 5.1 shows that the primary existing system deficiency is found in the 12-inch/18-inch diameter Victor Valley Wastewater Reclamation Authority's (VVWRA's) interceptor that runs along I Avenue from Lemon Street to Bear Valley Road.

In addition to the deficiency along I Avenue (VVWRA's interceptor), there are very short segments of pipe along Mauna Loa Road at Hemlock Avenue and along E Avenue at Juniper Street, that are identified as deficient under 2005 PDWF conditions. However, their failure to flow below their analysis d/D ratio in these cases is due to being a short segment with an extremely shallow slope (approximately 0.2 percent), rather than being a highly surcharged main. Hence, no recommendations are made to address this deficiency.

As the system ages and the City continues to grow, the deficiencies are projected to increase. The remedies presented in this chapter are sized to accommodate the flows projected for Year 2037.

5.3.2 Existing System Recommendations

One approach to alleviate the deficiency along I Avenue (VVWRA's interceptor) would be to construct 8,600 feet of 18-inch diameter pipe and 2,000 feet of 30-inch diameter pipe parallel to the I Avenue sewer. However, paralleling or replacing the trunk line along I Avenue is not attractive due to the high traffic volume along I Avenue and depth of the current trunk line, which is as deep as 35 feet.

The recommended alternative is a 10,500-foot, 18-inch diameter gravity main along Santa Fe Avenue from Mesa Street to Bear Valley Road. This recommendation is identified as Future Project (FP) No. 1 (FP-1) on Figure 5.2. It is recommended that this project be completed in the near term.

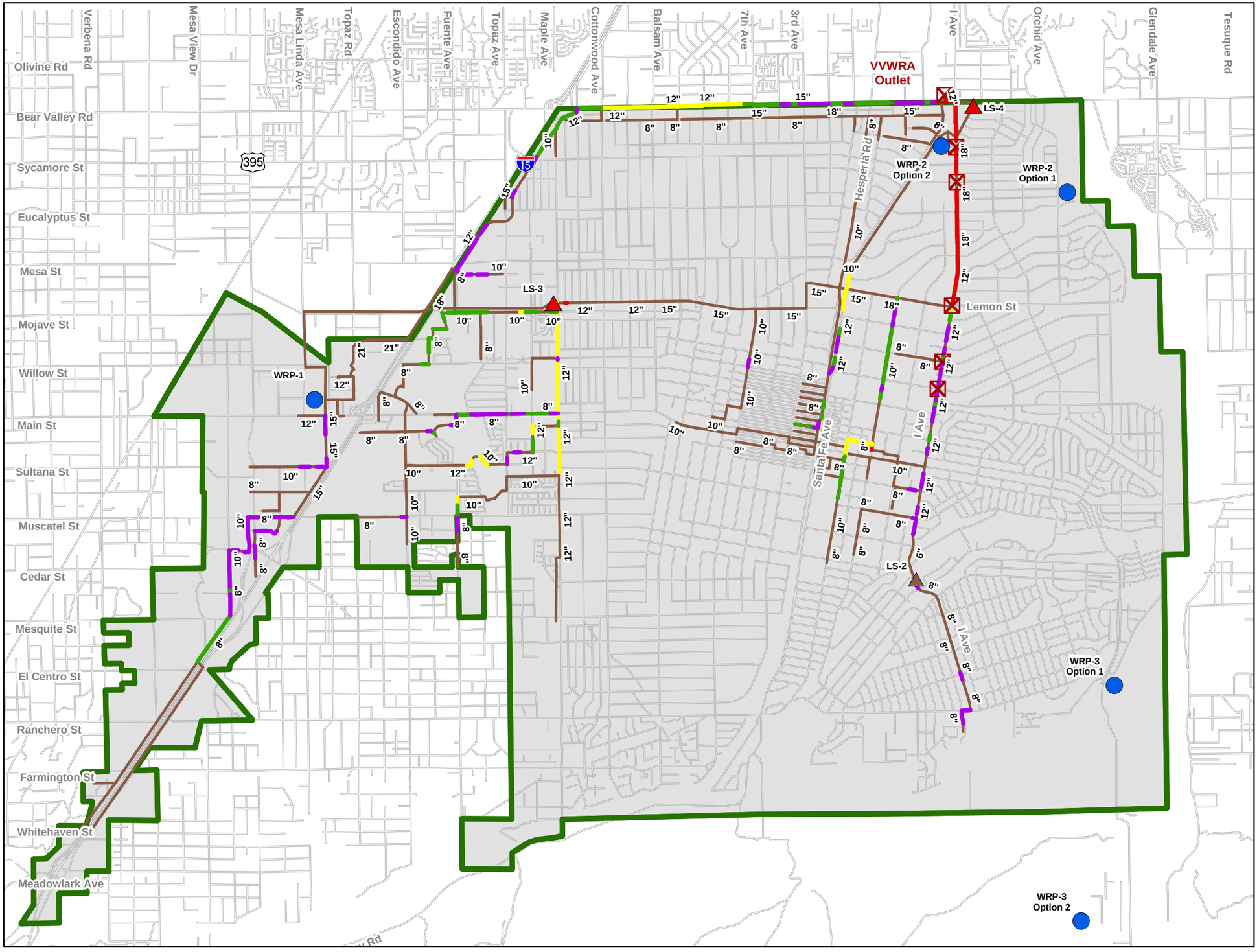
In addition to this project, proposed wastewater reclamation plants (WRPs) will also alleviate future deficiencies along I Avenue (VVWRA's interceptor). These WRPs are further discussed in Section 5.4 and Chapter 6.

5.4 FUTURE SYSTEM ANALYSIS

This section describes the future system analysis, the identified deficiencies, and the proposed improvements to address these deficiencies. The future system analysis is performed under PDWF conditions of 27.9 mgd for year 2032.

Satellite treatment plants are proposed to provide a source of recycled water and to alleviate future deficiencies in the collection system. Based on discussions with City staff, three WRPs are proposed. The locations of these WRPs are shown on Figure 5.2 at the following locations:

1. The recommended location of WRP-1 is planned near the intersection of Cataba Road and Main Street and will collect flows from Planning Areas (PAs) 7, 8, 9, 11, 12, 13, and 14.



Legend

- Existing Lift Station
- Proposed Lift Station
- VVWRA Outlet
- Water Reclamation Plants (WRP)

Modeled Collection System

Year Deficient

- 2005 VVWRA Interceptor Deficiencies
- 2012
- 2017
- 2032
- Proposed and Existing Pipelines (Not Deficient)
- WWMP Study Area
- Roadways

N

0 5,000 10,000 Feet

FIGURE 5.2
FUTURE SYSTEM DEFICIENCIES

WASTEWATER MASTER PLAN UPDATE

CITY OF HESPERIA

2. The recommended location of WRP-2 is planned near the intersection of Osbrink Drive and Santa Fe Avenue East and will collect flows from PAs 1, 2, 3, 4, 5, 6, and 10.

3. The recommended location of WRP-3 is planned to be located in the northeastern portion of the Rancho Las Flores (RLF) Development, approximately 2 miles south of Ranchero Road. WRP-3 will collect flows from PAs 15 and 16. This treatment plant is not included in the model as its tributary area falls outside the study area of this Master Plan.

4. In addition, a separate WRP will be constructed for the first phase of the RLF Development. This plant will treat the flows collected from this development and will be located in the southern part of the development as shown on Figure 6.1. The sizing of this plant is outside the scope of this project and the associated costs are therefore excluded from the capital improvement program (CIP) presented in Chapter 7.

For the future system analyses, it is assumed that the City's wastewater will eventually be treated at these facilities, and no discharge into the VVWRA will take place with the exception of solids disposal as discussed in Chapter 6. Solid flows into VVWRA are estimated to be no more than 0.2 mgd by year 2022 and 0.4 mgd by year 2032. Future system analyses use the following schedule to project flows at WRP-1 and WRP-2:

1. 2005:
   All flow goes to VVWRA.

2. 2012:
   WRP-1 (north of Main Street and west of Cataba Road) and diversions to WRP-1 are built and operated. Flow to VVWRA is reduced. Solids of WRP-1 are discharged in the gravity sewer system and would be treated by VVWRA.

3. 2017:
   WRP-2 (near the intersection of Osbrink Drive and Santa Fe Avenue East) and diversions to WRP-2 are built. WRP-2 is sized to treat the balance of system flow not flowing to WRP-1. By 2017, the City's wastewater no longer flows to VVWRA. However, solids from both WRP-1 and WRP-2 would be treated by VVWRA.

The flows projected for each plant are shown in Tables 5.2 and 5.3.

Table 5.2 Modeled Average Dry Weather Flow
Wastewater Master Plan Update
City of Hesperia

Year	Total Flow (mgd)	Flow to VVWRA (mgd)	Flow to WRP-1 (mgd)	Flow to WRP-2 (mgd)
2005	2.1	2.1	0	0
2012	5.1	2.8	2.3	0

Table 5.2 Modeled Average Dry Weather Flow (Continued) Wastewater Master Plan Update City of Hesperia				
Year	Total Flow (mgd)	Flow to VVWRA (mgd)	Flow to WRP-1 (mgd)	Flow to WRP-2 (mgd)
2017	7.9	0	3.8	4.1
2022	9.9	0	4.8	5.1
2027	11.4	0	5.5	5.9
2032	12.2	0	5.7	6.5

Table 5.3 Modeled Peak Dry Weather Flow Wastewater Master Plan Update City of Hesperia				
Year	Total Flow (mgd)	Flow to WRP-1 (mgd)	Flow to VVWRA (mgd)	Flow to WRP-2 (mgd)
2005	4.8	0	4.8	0
2012	12.0	5.6	6.4	0
2017	18.7	8.9	0	9.8
2022	23.0	11.0	0	12.0
2027	26.2	12.4	0	13.8
2032	27.9	12.8	0	15.0

5.4.1 Future System Deficiencies

Future model runs indicate that from 2005 to 2032 an increasing number of pipes will become deficient as defined by the d/D analysis criteria presented in Chapter 1. The model predicts that larger trunk lines have the largest deficiencies. The year in which each pipe is predicted to be deficient is tabulated in a GIS database, which is shown on Figure 5.2.

5.4.2 Future System Recommendations

As the modeling of future scenarios developed, it became apparent that the largest single deficient pipe (both under current and future PDWF conditions) was the VVWRA's interceptor running along I Avenue between Lemon Street and Bear Valley Road. A combination of projects will alleviate the deficiencies along I Avenue (VVWRA's interceptor). The projects are:

1. Future Project No. 1 (FP-1):
   A 10,500-linear foot 18-inch diameter gravity main that would run along Santa Fe Avenue from Mesa Street to Bear Valley Road.

2. Future Project No. 2 (FP-2):
   The new WRP-2 in the northeastern part of the City. Construction of WRP-2 would

allow diversion of some of the flows through FP-10, which will directly reduce the flows through the trunk along I Avenue.

3. Future Project No. 18 (FP-18):
   An 8,300-linear foot 21-inch diameter gravity main that would run along I Avenue from Lemon Street to Santa Fe Avenue.

4. Future Project No. 19 (FP-19):
   A 1,000-linear foot 30-inch diameter gravity main from the intersection of I Avenue and Santa Fe Avenue to WRP-2.

In addition to the deficiency along I Avenue (VVWRA's interceptor), other collection system deficiencies are identified under the future projected wastewater flow conditions. To address these potential deficiencies and divert the flows to the proposed new WRPs, a number of projects are recommended. A summary of all proposed collection system improvements is presented in Table 5.4, while other improvements are summarized in Table 5.5. The projects are graphically presented in on Figure 5.3. Some of the key projects are described in more detail in the following sections.

Table 5.4 Collection System Improvements
Wastewater Master Plan Update
City of Hesperia

CIP Project No.	Project Type	Location	Diameter (in) Existing Pipe	Parallel Pipe	Replacement Pipe	New Pipe	Pipe Length (ft)
FP-1	New Gravity Sewer	Santa Fe Avenue from Mesa Street to Bear Valley Road.	-	-	-	18	10,500
FP-3	New Force Sewer	Mauna Loa Street and Maple Avenue west along Mojave Street to Mesa Linda Avenue, and south along Mesa Linda Avenue to WRP-1.	-	-	-	20	15,300
FP-4	New Gravity Sewer	From Amargosa Road and Cataba Avenue, along Cataba Street and Yucca Terrace to WRP-1.	-	-	-	18	2,800
FP-7	Parallel Gravity Sewer	Bear Valley Road from Cottonwood Avenue to 7th Avenue.	12	21	21	-	8,000
FP-8	Parallel Gravity Sewer	Sultana Street and Maple Avenue to Main Street and Maple Avenue.	12	12	18		3,500
FP-9	Parallel Gravity Main	Mojave Street and Maple Avenue to Muana Loa Street and Maple Avenue.	12	18	21	-	500
FP-10	Parallel Gravity Main	Main Street and Maple Avenue to Mojave Street and Maple Avenue.	12	15	18	-	5,300

Table 5.4 Collection System Improvements (Continued)
Wastewater Master Plan Update
City of Hesperia

CIP Project No.	Project Type	Location	Diameter (in)				Pipe Length (ft)
			Existing Pipe	Parallel Pipe	Replacement Pipe	New Pipe	
FP-11	New Diversion	Pipe extending northward from corner of Sultana Street and Escondido Avenue.	-	-	-	10	3,200
FP-12	Parallel Gravity Main	Following Live Oak Street, continuing west of Mount Shasta Drive, terminating on Mojave Street 850 feet west of Blanchard Road.	8	10	15	-	7,000
FP-13	Parallel Gravity Main	Mojave Avenue from 800 feet west of Blanchard Road to Maple Avenue.	10	15	18	-	6,000
FP-15	New Force Main	I Avenue from Intersection of Bear Valley Road and I Avenue to WRP-2.	-	-	-	20	3,000
FP-18[(1)]	Parallel Gravity Main	Lemon Street and I Avenue north to I Avenue and Santa Fe Avenue.	18	21	24	-	8,300
FP-19	New Gravity Main	Connecting I Avenue main from corner of I Avenue and Santa Fe Avenue to WRP-2.	-	-	-	30	1,000
FP-20	New Gravity Main	Connecting Santa Fe Avenue diversion to WRP-2.	-	-	-	18	500
FP-21	Parallel Gravity Main	Bear Valley Road from 7th Avenue to Santa Fe Avenue.	15	18	24	-	9,800
FP-22	Parallel Gravity Main	Mariposa Road from Sycamore Street to Bear Valley Road and Bear Valley Road from Mariposa Road to Cottonwood Avenue.	12	15	18	-	5,000
FP-23	Parallel Gravity Main	Santa Fe Avenue from Hercules Street to Mesa Street.	12	15	18	-	5,200
FP-24	Parallel Gravity Main	E Avenue from Muana Loa Street to Lemon Street.	12	15	18	-	1,500
FP-25	Parallel Gravity Main	E Avenue from Live Oak Street to Muana Loa Street.	10	15	18	-	4,100
FP-26	Parallel Gravity Main	C Avenue from Sultana Street to Juniper Street and Juniper Street C Avenue to E Avenue.	8	10	15	-	4,300
FP-27	New Diversion	E Street diversion.	-	-	-	15	2,600
FP-28	Parallel Gravity Main	Main Street from 600 feet west of Pyrite Avenue to Maple Avenue.	8	10	15	-	5,400

Table 5.4 Collection System Improvements (Continued)
Wastewater Master Plan Update
City of Hesperia

CIP Project No.	Project Type	Location	Diameter (in) Existing Pipe	Parallel Pipe	Replacement Pipe	New Pipe	Pipe Length (ft)
FP-29	Parallel Gravity Main	Along I-15, Caliente Road, Joshua Street, Highway 395, and Muscatel Street.	10	12	18	-	12,200
FP-30	Parallel Gravity Main	Mariposa Road from Verde Street to Gabriel Road.	12	10	18	-	2,000
FP-31	Parallel Gravity Main	Mariposa Road from Gabriel Road to 800 feet north of Gabriel Road.	15	12	18	-	1,000
FP-32	Parallel Gravity Main	I Avenue from Aspen Street to Lemon Street.	12	15	18	-	13,200
FP-33	Parallel Gravity Main	1,000 feet south of the intersection of Cataba Road and Main Street to the intersection of Cataba Road and Main Street.	15	12	18	-	1,000
FP-34	New Gravity Main	Bear Valley Road from Santa Fe Avenue to I Avenue.	-	-	-	24	1,500
FP-35	New Gravity Main	750 feet southwest of the intersection of Farmington Street and Caliente Road to the intersection of Caliente Road and Mesquite Street.	-	-	-	8	14,300
FP-36	New Gravity Main	600 feet northeast of the intersection of Blue Jay Way and Mariposa Road to the intersection of Mariposa Road and El Centro Road.	-	-	-	8	10,700
FP-37	New Gravity Main	265 feet west of the intersection of Maple Avenue and Mesquite Street to the intersection of Dove Creek Trail and Briarwood Street.	-	-	-	12	2,200
FP-38	New Gravity Main	650 feet north of the intersection of Jenny Street and Greenwood Street to 750 feet southwest of the intersection of Farmington Street and Caliente Road.	-	-	-	8	1,200
FP-39	New Gravity Main	Approximately 800 feet south of the intersection of Oak Hill Road and Elkridge Drive to 750 feet southwest of the intersection of Farmington Street and Caliente Road.	-	-	-	8	3,900

Notes:
(1) This is an improvement to address the VVWRA interceptor deficiencies.

Table 5.5 Other System Improvements Wastewater Master Plan Update City of Hesperia			
CIP Project No.	**Description**	**Location**	**Capacity**
FP-2A	WRP-1 Phase 1	Northwest corner of Main Street and Cataba Avenue.	5.0 mgd
FP-2B	WRP-1 Expansion	Northwest corner of Main Street and Cataba Avenue.	2.4 mgd
FP-5	LS-3, New Lift Station	LS-3 near the intersection of Mauna Loa Street and Maple Avenue.	450 hp
FP-6	LS-3 Backup Power	Backup Power for LS-3.	450 hp
FP-14A	WRP-2 Phase 1	Near the intersection of Osbrink Drive and Santa Fe East Avenue.	6.0 mgd
FP-149B	WRP-2 Expansion	Near the intersection of Osbrink Drive and Santa Fe East Avenue.	2.5 mgd
FP-16	LS-4, New Lift Station	LS-4 at the intersection of Bear Valley Road and I Avenue.	300 hp
FP-17	LS-4 Backup Power	Backup Power for LS-4.	300 hp

5.4.2.1 Wastewater Reclamation Plant 1

The WRP-1 (FP-2A and FP-2B) is proposed to be constructed in two phases with an ultimate capacity of 7.4 mgd. A 2,800-foot, 18-inch diameter gravity main (FP-4) will be required along Cataba Road from Amargosa Road to Yucca Terrance, and then continue along Yucca Terrace to WRP-1. In addition, a 15,300-linear foot 20-inch force main (FP-3) will be required to pump wastewater from the intersection of Mauna Loa Avenue and Maple Avenue to WRP-1. This force main would require the construction of a new lift station (FP-5) with backup power (FP-6). Details of this force main and lift station are presented in Section 5.4.3.

5.4.2.2 Wastewater Reclamation Plant 2

The recommended location of WRP-2 (FP-9A and FP-9B) would be near the intersection of Osbrink Drive and Santa Fe Avenue East. It is recommended that this plant would be constructed in two phases with an ultimate capacity of 8.5 mgd. Three new gravity mains are proposed to divert the projected wastewater flows to the WRP-2. These mains are:

1. An 8,300-linear foot 21-inch diameter gravity main (FP-18) that would convey flows from the area south of WRP-2. This project would also eliminate the strain on the I Avenue trunk (VVWRA's interceptor). This pipeline would be routed along I Avenue from the intersection of Lemon Street and I Avenue north to the intersection of I Avenue and Santa Fe Avenue to WRP-2.

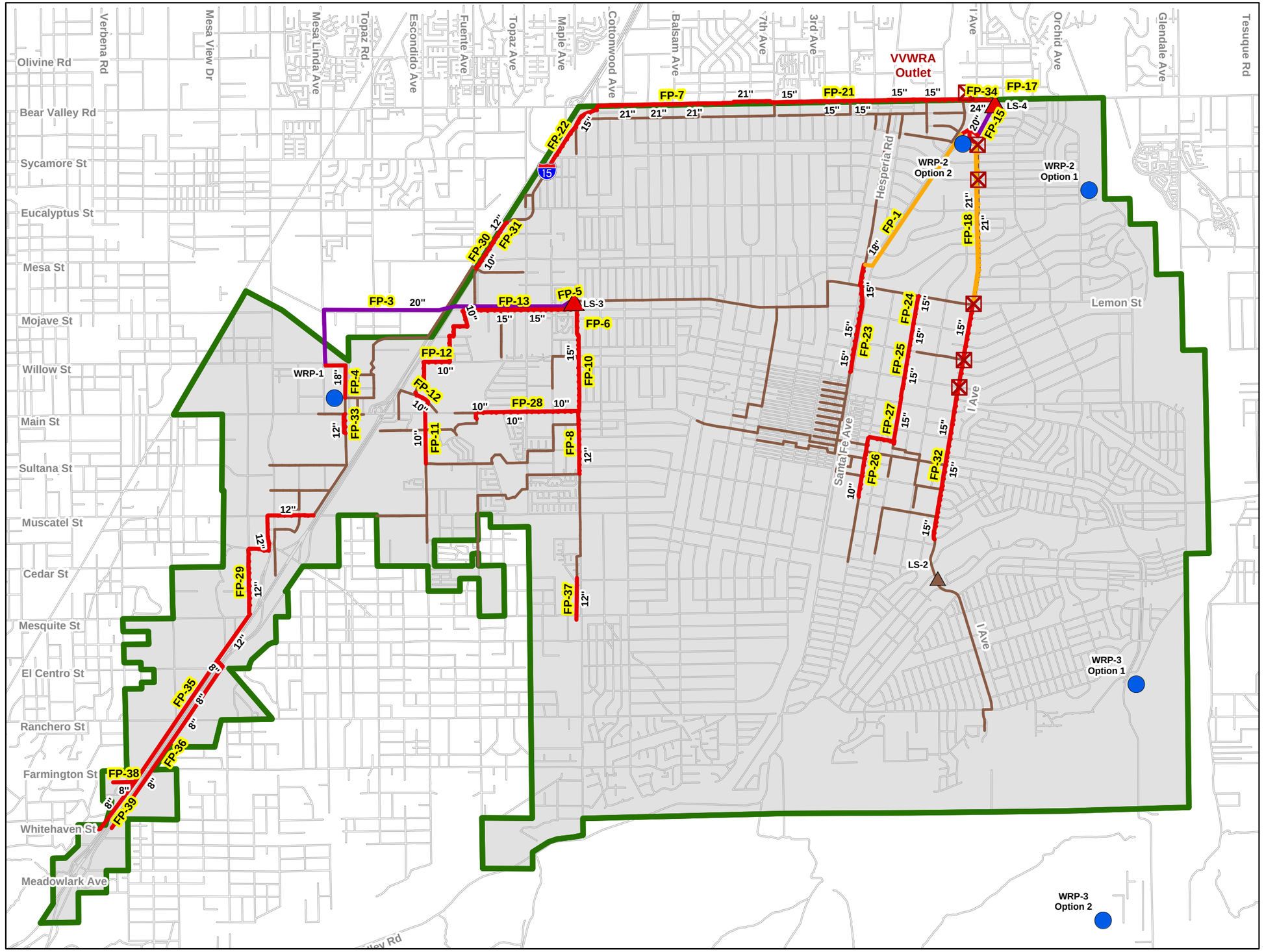


FIGURE 5.3
PROPOSED COLLECTION SYSTEM IMPROVEMENTS

WASTEWATER MASTER PLAN UPDATE

CITY OF HESPERIA

2. A 10,500-linear foot 18-inch diameter gravity main (FP-1) that would run along Santa Fe Avenue from Mesa Street to Bear Valley Road.

3. A 1,000-linear foot 30-inch diameter gravity main (FP-19) that would connect the VVWRA Interceptor from the intersection of I Avenue and Santa Fe Avenue East to WRP-2.

4. A 1,500-linear foot, 24-inch diameter gravity main (FP-34) that runs along Bear Valley Road from Santa Fe Avenue to I Avenue.

In addition, a 3,000-linear foot 20-inch diameter force main (FP-15) will be required to transport flows from just before the Bear Valley Road VVWRA outlet to the proposed WRP-2. The proposed route for this main is from intersection of Bear Valley Road and I Avenue, and southwest to WRP-2. This force main would require the construction of a new lift station (FP-16 and FP-17). Details of this force main and lift station are presented in Section 5.4.3. WRP-2 will treat the remaining flow that is generated in the area east of the Maple Avenue, with the exception of planning areas PA-15 and PA-16.

5.4.2.3 Wastewater Reclamation Plant 3

This plant is proposed to be located in the northeastern portion of the RLF development, approximately 2 miles south of Ranchero Road. The estimated ultimate capacity of WRP-3 is 7.6 mgd. The associated wastewater collection and treatment facilities are not part of the scope of this project.

5.4.3 Force Mains and Lift Stations

A new sewer lift station (FP-5) is required to convey wastewater flows to the proposed WRP-1. This lift station is identified as Lift Station 3 (LS-3) and is proposed near the intersection of Mauna Loa Road and Maple Avenue and would collect all the flow that is generated in the area between Interstate 15 and Maple Avenue. A 3-mile, 20-inch diameter force main (FP-3) is proposed to deliver the tributary flow from the LS-3 into WRP-1. Another sewer lift station (FP-16) is proposed to convey wastewater flows to the proposed WRP-2. This lift station is identified as Lift Station 4 (LS-4) and is proposed near the intersection of Bear Valley Road and I Avenue. It would collect all of the sewer flows that are generated north and west of WRP-2 and the solid flows from WRP-1. A 3,000-foot, 20-inch diameter force main (FP-15) is proposed to deliver the tributary flows from the LS-4 into WRP-2.

As discussed in Section 5.2.3, lift stations are sized to handle the PDWF of its tributary area. The hydraulic sewer model was used to estimate the PDWF for each lift station. Based on the model results it was determined that LS-3 will need to have a capacity of 6.8 mgd or 4,800 gpm and LS-4 will need to have a capacity of 6.0 mgd. Table 5.6 lists the design parameters for LS-3 and LS-4.

Table 5.6 Lift Station Facilities
Wastewater Master Plan Update
City of Hesperia

Description	Lift Station 3	Lift Station 4
Approximate Location	Mauna Loa Street and Maple Road	Bear Valley Road and I Avenue
Pumps to	WRP-1	WRP-2
Average Dry Weather Flow[(1)]	2,100 gpm	2,500 gpm
Peak Dry Weather Flow[(1)]	4,800 gpm	4,200 gpm
LS Capacity	6.8 mgd	6.8 mgd
Number of Pumps	3	3
Capacity per Pump[(2)(3)(4)]	2,400 gpm, 150 hp	2,100 gpm, 100 hp
Force Main Length	15,300 feet	3,000 feet
Force Main Diameter	20 inches	20 inches
Force Main Velocity	5 ft/s	5 ft/s
Headloss in Force Main[(3)]	79 feet	12 feet
Elevation Gain	41 feet	77 feet
Depth of Wet Well	25 feet	25 feet
Total Design Head	135 feet	113 feet
Capacity	450 hp	300 hp

Notes:
(1) Based on hydraulic model results and rounded up to nearest 100 gpm.
(2) Sized to pump PDWF with one pump out of service.
(3) Based on a Hazen Williams roughness coefficient of 120 and 15 percent minor losses.
(4) Based on 60 percent wire to water efficiency.

As shown in Table 5.5, the lift station that pumps to WRP-1 would have a capacity of 450 hp, while the lift station that pumps to WRP-2 would have a capacity of 300 hp. Backup power is recommended (FP-6 and FP-36) to allow pumping during a power outage and avoid spills.

WASTEWATER TREATMENT FACILITIES

6.1 GENERAL

Currently, the City of Hesperia (City) discharges its wastewater into a regional gravity sewer collection main that conveys an average flow of approximately 2.1 mgd from the City to the Victor Valley Wastewater Reclamation Authority (VVWRA) wastewater treatment plant (WWTP), which is located approximately 15 miles north of the City.

As discussed in Chapters 1 and 3, the City has identified major development projects in future years that will lead to increased wastewater flows and additional wastewater treatment needs. In addition, the City is planning to offset some of its potable water demand with recycled water, which requires access to tertiary treated wastewater in close proximity to the potential recycled water customers.

This chapter discusses the wastewater treatment requirements, the City's treatment options, and the preliminary sizing of treatment facilities. A detailed evaluation of wastewater treatment processes and on-site treatment facility planning is beyond the scope of this project. The facilities identified in this chapter are used to prepare planning level cost estimates for the wastewater capital improvement program (CIP), which is discussed in Chapter 7.

6.2 CHAPTER OBJECTIVES

The objectives of this chapter are to:

1. Discuss future wastewater treatment requirements.
2. Discuss future wastewater treatment alternatives.
3. Determine proposed treatment facility design parameters.
4. Present preliminary sizing of treatment facilities.
5. Phase the identified treatment facilities.

6.3 EXISTING WASTEWATER TREATMENT

The City's wastewater is currently treated at the regional wastewater treatment facility owned and operated by the VVWRA. This plant is located approximately 5 miles north of the City of Victorville, which is approximately 15 miles north of the northern boundary of the City of Hesperia. This plant treats wastewater from the City of Hesperia, the City of Victorville, the Town of Apple Valley, and County Service Areas 42/64. The plant has been expanded several times since it began operation in 1981 and has a current Average Dry Weather Flow (ADWF) capacity of 12.5 mgd. Expansion construction continues in 2007 to increase its size to 14 mgd. Further expansion is planned to increase its capacity to 18 mgd.

The VVWRA is currently capable of treating a portion of the flow to a tertiary level and the remaining flow to a secondary level for percolation. The plant effluent is discharged into the Mojave River. Without the addition of tertiary treatment processes, the effluent of this plant cannot be used to serve non-potable water demands in the region.

The City currently plans to offset some of its potable water demand with recycled water. Therefore, access to tertiary treated wastewater is necessary. Due to the current treatment configuration at the VVWRA plant and the need for a 15-mile pipeline to convey recycled water from the plant back to the City, the City would need to treat (some of) its own wastewater to tertiary standards to serve recycled water in the near future. Local treatment plants are being considered as the solution to providing a source for recycled water and for alleviating some of the anticipated deficiencies in major trunk sewers of the City's wastewater collection system

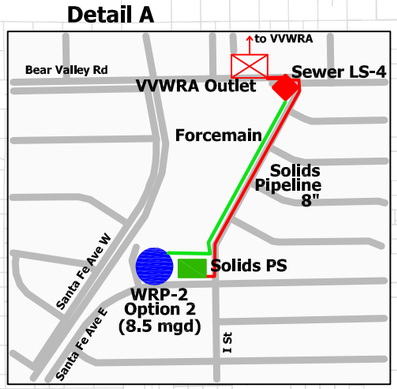
6.4 FUTURE WASTEWATER TREATMENT

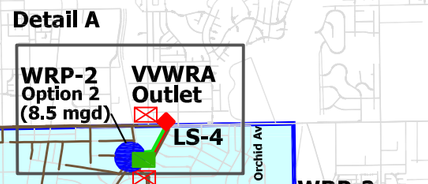
As discussed in Chapter 5, Existing and Future System Analysis, the City's planning areas (PAs) 1 through 14 will produce and can require treatment of an average dry weather flow (ADWF) of 12.2 mgd by 2032. In addition, PA-15 and PA-16 will need additional treatment capacity after development.

Based on discussions with the City staff, the City's plan is construction of three WWTPs to treat all of the City's future wastewater flows. These plants are referred to as Wastewater Reclamation Plants 1 to 3 (WRP-1 to WRP-3). Figure 6.1 shows the proposed locations and the tributary areas of these three WRPs, while Table 6.1 lists the proposed locations.

Table 6.1 Treatment Facility Locations
Wastewater Master Plan Update
City of Hesperia

Facility ID	APN Number	Parcel Size (ac)	Approximate Location	Current Property Ownership
WRP-1	3064-471-02	44	North of Main Street and west of Cataba Road.	Ownership transfer is pending
WRP-2 Option 1	399-011-54	20	Near the intersection of Orchid Avenue and Hackberry Street.	City of Hesperia
WRP-2 Option 2	TBD	TBD	Near the intersection of Osbrink Drive and Santa Fe East Avenue.	Unknown
WRP-3 Option 1	TBD	TBD	Directly south of Hesperia Lakes.	Unknown
WRP-3 Option 2	TBD	TBD	In the northeastern portion of the Rancho Las Flores Development, approximately 2 miles south of Ranchero Road.	Unknown





Legend

- Tributary Area WRP-1
- Tributary Area WRP-2
- Tributary Area WRP-3
- Study Area Boundary
- Streets
- Wastewater Reclamation Plant (WRP)
- Solids Pipeline
- Solids Pump Station
- Lift Station (LS)
- VVWRA Outlet
- Proposed and Existing Pipelines
- Forcemain

N

0' 6,000' 12,000'

FIGURE 6.1
PROPOSED TREATMENT FACILITIES LOCATIONS

WASTEWATER MASTER PLAN UPDATE

City of Hesperia

carollo engineers

As shown on Figure 6.1, treatment plant WRP-1 is proposed to be located north of Main Street and west of Cataba Road.

Two locations are considered for WRP-2, which are shown as Option 1 and Option 2 in Figure 6.1. In the previous 1994 sewer master plan, a location was selected for WRP-2 near the northeast corner of Orchid Avenue and Hackberry Street. This location is shown as Option 1. The City purchased this property and this site was initially used in the hydraulic evaluation conducted for this master plan. This conveyance study showed that two large lift stations would be needed to pump the collected wastewater flows to the treatment plant. To avoid the need for these lift stations, an alternative treatment plant location was selected by City staff. This location, which is referred to as WRP-2 Option 2, is located near the intersection of Osbrink Drive and Santa Fe East Avenue. It is estimated that a 20-acre parcel would need to be purchased by the City. The Capital Improvement Program (CIP) presented in this master plan is based on Option 2. However, it is recommended that a feasibility study be conducted during the design phase of this treatment plant.

There are also two locations considered for WRP-3, which will be required to treat the wastewater from portions of PA-15, PA-16, and a small portion of PA-6. A portion of the wastewater generated by the Rancho Las Flores (RLF) development, which is primarily located in PA-15, would be treated by a separate WRP that is planned to be constructed in the southern part of the RLF development . This plant is referred to “Water Reclamation Plant No. 1” in the *Design Criteria Memorandum for the Rancho Las Flores Water Reclamation Plant* prepared by Boyle Engineering in July 2006.

In Option 1, WRP-3 would be located directly south of Hesperia Lakes towards the southeastern boundary of the City. In Option 2, WRP-3 would be located within the RLF development at the site that is indicated as “Water Reclamation Plant No. 1” in the *Design Criteria Memorandum for the Rancho Las Flores Water Reclamation Plant* prepared by Boyle Engineering in July 2006. The locations of both options are depicted on Figure 6.1.

In Option 1, wastewater from PA-16, PA-15, and the area east of RLF in PA-6 would flow by gravity to WRP-3 near Hesperia Lakes. This would require an 18,000 linear foot 24-inch and 30-inch diameter gravity trunk sewer from the northern boundary of PA-15 to the WRP at Hesperia Lakes. In addition, recycled water would need to be pumped back to PA-15, requiring a 400-hp pump station and an 18,000 linear foot 24-inch diameter pipeline. Due to the location near Hesperia Lakes, recycled water from this plant could also directly be used to supply the northern portion of the City by upsizing a 7,400 linear foot pipeline from 8-inch to 16-inch diameter.

In Option 2, wastewater from PA-16 and PA-15 would flow by gravity to WRP-3 located within the RLF development. Wastewater from the 800-acre area east of RLF in PA-6 would need to be pumped back to WRP-3 through a 18,000 linear foot 4-inch diameter force main requiring a 5-hp lift station. In addition, wastewater generated north of WRP-3 Option 2

would need to be pumped through a 12,000 linear foot 8-inch diameter force main requiring a 75-hp lift station. Due to the location of this plant within the RLF, recycled water from this plant could also directly be used to supply the northern portion of the City by upsizing a 7,600 linear foot pipeline from 8-inch to 16-inch diameter.

The estimated capital cost of the required wastewater and recycled water facilities that are unique for each option is presented in Table 6.2. As shown in this table, the facilities required for Option 1 cost approximately three times more than the facilities required for Option 2. Therefore, the location near the southern boundary of the RLF development is recommended and used for further planning in this Master Plan and the Recycled Water Master Plan.

Table 6.2 Comparison of Locations for WRP-3
Wastewater Master Plan Update
City of Hesperia

Option	Project Description	Size	Unit	Quantity	Unit	Capital Cost ($ million)
1	Gravity Sewer from PA-15 to WRP-3	24	inch	13,200	feet	$4.9
	Gravity Sewer from PA-15 to WRP-3	30	inch	4,800	feet	$1.7
	RW Pump Station From WRP-3 to PA-15	700	hp	11,500	gpm	$2.1
	RW Pipeline from WRP-3 to PA-15	30	inch	18,000	feet	$3.5
	Upsizing of RW pipeline between Hesperia Lakes and RLF	16 vs. 8	inch	7,400	feet	$0.6
	Total Option 1					**$12.7**
2	Sewer Lift Station from Hesperia Lakes to WRP-3	40	hp	0	mgd	$0.1
	Sewer Force main from Hesperia Lakes to WRP-3	4	inch	18,000	feet	$1.8
	Sewer Lift Station from Ranchero St. to WRP-3 Option 2	75	hp	1.0	mgd	$0.6
	Sewer Forcemain from Ranchero St. to WRP-3 Option 2	8	inch	12,000	feet	$1.4
	Upsizing of RW pipeline between WRP-3 and northern portion of RLF.	16 vs. 8	inch	7,600	feet	$0.6
	Total Option 2					**$4.5**

6.5 TREATMENT FACILITY SIZING

6.5.1 Sizing Criteria

Treatment facilities shall be sized with sufficient capacity to treat the Maximum Month Dry Weather Flow (MMDWF). The criteria used to size treatment plants are as follows:

1. Per the National Pollutant Discharge Elimination System (NPDES) permit requirement, the design capacity of the treatment facilities is such that 85 percent of the new treatment plant capacity is equal to MMDWF (proposed treatment plant capacity = MMDWF/0.85).
2. To reduce land requirements and avoid potential odor issues, treatment facilities will not include primary equalization basins.

6.5.2 Treatment Plant Capacity

As listed in Tables 5.3 and 5.4, the estimated 2032 ADWF for the City is 15.8 mgd with a PDWF of 27.9 mgd. The flows contributing to WRP-3 were estimated for sizing of the facility. The estimated 2032 ADWF is 5.9 mgd with a PDWF of 11.6 mgd. These estimates include flows from PA-15 and PA-16. Table 6.3 lists the ultimate flow that was projected for each treatment plant and the estimated maximum month solids flow generated by each plant.

Table 6.3 Treatment Facility Sizing
Wastewater Master Plan Update
City of Hesperia

No.	Average Dry Weather Flow (mgd)(1)	Maximum Month Dry Weather Flow (mgd)(2)	Peak Dry Weather Flow (mgd)(1)	Ultimate Nameplate Capacity (mgd)	Phase I Nameplate Capacity (mgd)	Maximum Month Solids Flow (gpm)(3)
WRP-1	5.7	6.3	12.8	7.4	4.9	116
WRP-2	6.5	7.2	15.0	8.5	5.6	133
Subtotal(4)	**12.2**	**13.5**	**27.9**	**--**	**--**	**249**
WRP-3	3.7	4.0	8.0	4.7	4.7	75
Total(5)	**15.9**	**17.5**	**35.8**	**--**	**--**	**324**

Notes:
(1) Based on 100 percent of modeled flow for year 2032.
(2) Based on a Maximum Month Flow/Annual Average Flow ratio of 1.1, from VVWRA discharge monitoring report records.
(3) Used to size solids conveyance facilities. Based on a raw wastewater strength of 400 mg/L BOD_5 (average from VVWRA DMRs), net observed yield = 0.8 mg VSS/mg BOD_5, and settled solids content of 12,000 mg/L.
(4) Excludes PA-15 and PA-16 and is based on the total of WRP-1 and WRP-2 only.
(5) Includes WRP-1, WRP-2, and WRP-3. This total excludes the RLF Water Reclamation Plant No. 1, which has an estimated average flow of 3.7 mgd.

Based on the MMDWF data presented in Table 6.3, WRP-1 capacity should be 7.4 mgd (6.3/0.85) and WRP-2 capacity should be 8.5 mgd (7.2/0.85). Capacity of WRP-3 is estimated to be 4.7 mgd (4.0/0.85). Three process trains are proposed for each treatment plant to allow operational flexibility and phased construction.

6.5.3 Solids Handling Facilities

Several alternatives can be used to dispose of the solids from the treatment plants and are listed as follows:

- Option 1:
  Redirect the flow back to the gravity sewer main to deliver to VVWRA.
- Option 2:
  Pump the solids to VVWRA through a new dedicated solids pipeline.
- Option 3:
  Build solids handling facilities at the WRPs.

6.5.3.1 Option 1

Option 1 will require the construction of short segments of solids pipelines and solids pump stations at the WRPs. The constraints of Option 1 are that putting untreated solids back to the gravity pipeline can cause odor and erosion problems. Chemicals such as nitrate or peroxide can be used to keep the sludge oxidized, however the operational cost of this option for chemicals would be high and corrosion could still occur in VVWRA's gravity pipeline. A disadvantage of this option is that the City will have to pay twice for treatment, first for treatment at the WRPs and then second for the solids handling treatment at VVWRA.

6.5.3.2 Option 2

Option 2 will require the construction of solids pipelines and solids pump stations. The capital cost of these pipelines would be significant due to the long distance (more than 20 miles total) between the treatment plants and the VVWRA WWTP. A 16-mile long, 6-inch diameter pipeline would be required from WRP-1 to VVWRA, and an additional 6.5-mile, 4-inch diameter pipeline would be required to connect a solids pipeline from WRP-2 to the solids pipeline from WRP-1 to VVWRA. The solids pump stations at WRP-1 and WRP-2 would be approximately 3 hp and 15 hp, respectively. These stations are relatively small due to the low flow rate and the downstream profile (flow could potentially flow by gravity). It should be noted that this does not include the solids handling of WRP-3. A disadvantage of this option would be that the City would have to pay twice for treatment, first for treatment at the WRPs and then second for the solids handling at VVWRA.

6.5.3.3 Option 3

Option 3 would require the construction of digesters and sludge thickeners, which could be built on-site at the WRPs. A disadvantage of this alternative is that the treatment plant sites would require additional land for these facilities and more operational staff. This option would also require hauling of the dried sludge to an off-site disposal site. However, this option would avoid payment for solids handling at VVWRA.

6.5.3.4 Conclusion

Per discussion with City staff at this time, the City prefers that the WRPs would only provide the treatment for liquids and not for the solids. It is recommended that the City perform a detailed evaluation on these alternatives to determine the cost and overall feasibility of each option when designing these plants.

Based on discussions with the City, solids from WRP-1 would be discharged into the existing gravity sewers, which will convey solids and additional sewage collected along I-15 and Bear Valley Road to WRP-2. The solids from WRP-1 would be treated again at WRP-2. Solids from WRP-2 would be pumped via a 4,000 linear foot designated solids pipeline from WRP-2 to the existing VVWRA outlet along Bear Valley Road. Solids from WRP-3 would be treated on site. Table 6.4 lists the design parameters for the recommended solids option, while the cost estimates for the solids pipeline from WRP-2 and the associated solids lift station are included in Chapter 7.

Table 6.4 Proposed Solids Facilities
Wastewater Master Plan Update
City of Hesperia

Project	Parameter	Size	Unit
Solids PS at WRP-2	Design Flow	250	gpm
	Design Head	20	feet
	Number of Pumps	1	pump
	Capacity	2	hp
	Backup Power	2	hp
Solids Force Main from WRP-2 to VVWRA Outlet	Design Flow	250	gpm
	Design Velocity	5	ft/s
	Length	4,000	feet
	Diameter	6	inches

6.6 TREATMENT FACILITY PHASING

The recommended treatment facilities are divided into two development phases. WRP-1 is scheduled to be operational by year 2012, and WRP-2 is scheduled to be operational by year 2017. Table 6.5 lists the phasing information for each plant. Phasing of WRP-3 is not included in the table because the tributary area of this plant falls outside the study area of this Master Plan.

Table 6.5 Treatment Facilities Phasing
Wastewater Master Plan Update
City of Hesperia

Description	2012	2017	2022	2027	2032
WRP-1					
Average Dry Weather Flow (mgd)[1]	2.3	3.8	4.8	5.5	5.7
Maximum Month Dry Weather Flow (mgd)[2]	2.5	4.2	5.3	6.1	6.3
Peak Dry Weather Flow (mgd)[1]	5.6	8.9	11.1	12.4	12.8
Number of New Basins	2	0	1	0	0
Cumulative Treatment Capacity (mgd)	**5**	**5**	**7.4**	**7.4**	**7.4**
Number of New Recycled Water Tanks	1	0	1	0	0
Capacity of Each Process Module (MG)	3.0	N/A	3.0	N/A	N/A
Cumulative Storage Capacity (MG)	**3.0**	**3.0**	**6.0**	**6.0**	**6.0**
WRP-2					
Average Dry Weather Flow (mgd)[1]	N/A	4.1	5.1	5.9	6.5
Maximum Month Dry Weather Flow (mgd)[2]	N/A	4.5	5.6	6.5	7.2
Peak Dry Weather Flow (mgd)[1]	N/A	9.8	12.0	13.8	15.0
Number of New Basins	N/A	2	1	0	0
Cumulative Treatment Capacity (mgd)	**N/A**	**5.6**	**8.5**	**8.5**	**8.5**
Number of Recycled Water Tanks	0	1	1	0	0
Capacity of Each Process Module (MG)	N/A	2.5	2.5	N/A	N/A
Cumulative Storage Capacity (MG)	**N/A**	**2.5**	**5.0**	**5.0**	**5.0**

Notes:
(1) Results from model simulation.
(2) MMDWF is 1.1 times the ADWF.

As shown in Table 6.5, two construction phases are recommended for each plant. The first construction phase for each plant will be sized to handle approximately 67 percent of the ultimate flow, while the second phase will be sized to handle 100 percent of the flow projected for year 2032. This division is based on the assumption that each plant will consist of three process modules, where two modules will be constructed in Phase 1 and the third module in Phase 2. It is assumed that the phasing of recycled water storage tanks will be aligned with the treatment plant phasing.

The associated facilities and pipelines for WRP-1 will be completed by 2012, while the facilities and pipelines required for WRP-2 will be completed by 2017. The phasing of these facilities and the cost estimates of all proposed projects are discussed in Chapter 7.

RECOMMENDATIONS AND CAPITAL IMPROVEMENT PROGRAM

7.1 GENERAL

The capital improvement program (CIP) summarizes the recommended improvements, the phasing of the improvement projects, cost estimates of the projects, and the allocation of project cost for the recommended collection improvements, as defined in Sections 5 and 6. In addition, cost estimates of the proposed wastewater reclamation plants (WRP) are included in the CIP to provide a comprehensive picture of the required wastewater system improvements for the City of Hesperia (City) through year 2032.

7.2 CHAPTER OBJECTIVES

The goals of this chapter of the Master Plan Report are to:

1. Summarize the recommended improvements and estimated project costs.
2. Prioritize the recommended improvements and identify the planning period in which the improvements should be constructed.
3. Present the estimated improvement cost for each planning period.

7.3 COST ASSUMPTIONS

Cost estimates presented in this Master Plan are based on the current Engineering and News Record (ENR) cost index for the Los Angeles metropolitan area of 8,871 published in January 2007. Future adjustments of cost estimates presented in this report can be estimated by increasing the estimated capital cost by the ratio of the future ENR to 8,871.

Total project cost estimates include estimated costs for construction, engineering, legal, administration, construction management, and contingency. Estimated construction costs are based on historical bids submitted by contractors for similar projects for Carollo Engineers (Carollo). A contingency of 25 percent of the estimated construction cost is included in the cost estimates. In addition, the capital cost for each project includes the estimated costs of engineering, legal, administration, and construction management and were assumed to be 35 percent of the estimated construction and contingency cost. These cost assumptions are shown in Table 7.1.

The cost estimates are based on current perceptions of conditions at the project locations. These estimates reflect Carollo's professional opinion of costs at this time and are subject to change as the project design matures. Carollo has no control over variances in the cost of labor, materials, equipment, and services provided by others; contractor's methods of determining prices; competitive bidding; or market conditions, practices, or bidding strategies. Carollo cannot, and does not, warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented herein.

Table 7.1 General Project Cost Assumptions Wastewater Master Plan Update City of Hesperia	
Description	**Value**
Contingency	25% of the construction cost(1)
Engineering, Administration, Legal, and Construction Management	35% of the construction cost plus contingency(2)
Capital Cost	169% of the construction cost

Notes:
(1) Construction cost is the cost of materials and installation only.
(2) Construction cost includes direct construction cost and contingency cost.
(3) Capital Cost includes the construction cost, contingency, engineering, administration, legal, and construction management cost.

The cost estimates presented in this report are based on the unit construction costs listed in Table 7.2. All unit costs were assumed to include material and installation. Costs for engineering, legal, administration, construction management, and contingency were not included in the listed unit costs.

Table 7.2 Unit Construction Costs Wastewater Master Plan Update City of Hesperia	
Description	**Unit Cost(1)**
Gravity Pipelines	
8-inch diameter	$137 $/linear ft
10-inch diameter	$146 $/linear ft
12-inch diameter	$154 $/linear ft
15-inch diameter	$159 $/linear ft
18-inch diameter	$179 $/linear ft
21-inch diameter	$198 $/linear ft
24-inch diameter	$218 $/linear ft
30-inch diameter	$275 $/linear ft
36-inch diameter	$334 $/linear ft
Force Mains	
6-inch diameter	$60 $/linear ft
8-inch diameter	$70 $/linear ft
12-inch diameter	$90 $/linear ft
16-inch diameter	$115 $/linear ft
18-inch diameter	$128 $/linear ft

Table 7.2 Unit Construction Costs (Continued) Wastewater Master Plan Update City of Hesperia	
Description	**Unit Cost**[1]
20-inch diameter	$140 $/linear ft
24-inch diameter	$170 $/linear ft
30-inch diameter	$210 $/linear ft
Lift Stations	$375,000/mgd capacity
Back-Up Power	$40,000/mgd capacity
Land Acquisition	
Per Site	$250,000 $/acre
Other Items	
Wastewater Treatment[2]	$11/gpd max month capacity
Tertiary Treatment	$1/gpd max month capacity

Notes:
(1) Unit construction costs do not include contingency or other mark-ups.
(2) Treatment to secondary standards.

Land acquisition cost estimates are included for lift stations and WRPs. Lift stations are assumed to require 0.5 acre per facility. The potential site identified by the City for the WRP-1 facility is approximately 44 acres. It is assumed that WRP-2 will require a site of approximately 20 acres.

7.4 CAPITAL IMPROVEMENT PROGRAM

7.4.1 Phasing of Improvement Projects

The improvement projects identified in Chapters 5 and 6 are recommended to be part of the City's CIP. The projects were evaluated and prioritized into different phases based on the system's need for the projected wastewater flows. The improvements were assigned with a phasing period in which the projects shall be completed by. The improvements were divided into five phasing periods. These are:

- Phase 1:
  Near Term: Existing system improvements that need to be completed as soon as possible.
- Phase 2:
  2007 - 2012: Future system improvements that need to be completed by 2012.
- Phase 3:
  2013 - 2017: Future system improvements that need to be completed by 2017.

- Phase 4:
  2018 - 2022: Future system improvements that need to be completed by 2022.
- Phase 5:
  2023 - 2032: Future system improvements that need to be completed by 2032.

Improvements identified to alleviate deficiencies in the existing system were assigned a phasing designation of "Near Term" and given the highest priority. As mentioned in Chapter 6, WRP-1 should be operational by year 2012 and WRP-2 should be operational by year 2017. As a result, a large number of improvements that are associated with these plants are phased in the periods 2007 to 2012 and 2013 to 2017. The phasing of the remaining projects is based on the hydraulic model results that indicate the year in which deficiencies were observed. Improvements shall take place before the year of deficiencies occurred. Tables 7.3, 7.4, and 7.5 indicate the phasing of all the proposed projects. Figure 7.1 shows the phasing of all projects.

7.4.2 Existing System Improvements

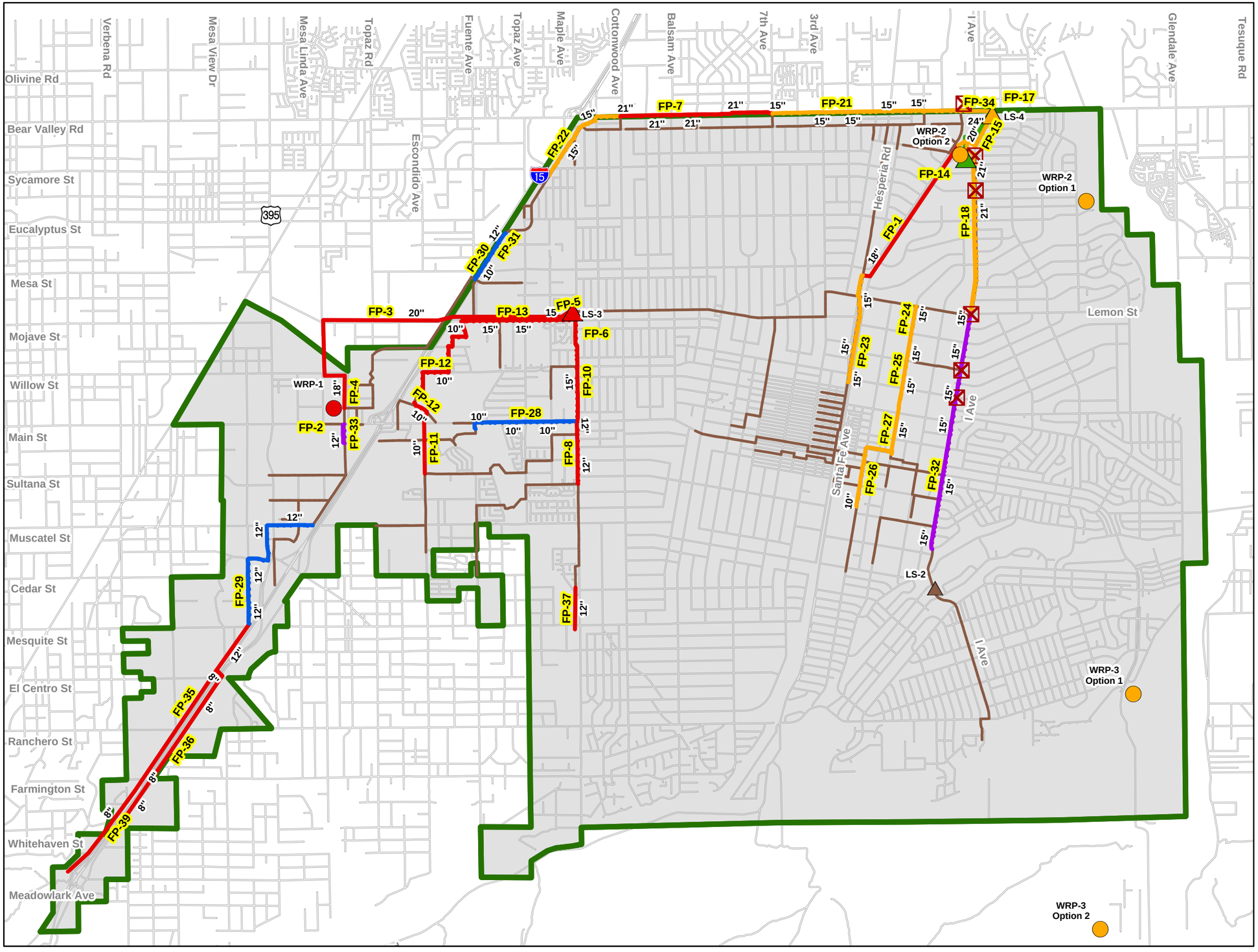
The City's existing collection system was analyzed to identify sewers that exceed their capacities. From the model results, main deficiencies were found on the Victor Valley Wastewater Reclamation Authority (VVWRA) Interceptor in I Avenue from Lemon Street to Bear Valley Road. As discussed in Chapter 5, a new gravity pipeline was recommended along Santa Fe Avenue from Mesa Street to Sequoia Avenue as an alternative to replacing the existing sewer in I Avenue. This improvement project, identified as Future Project No. 1 (FP-1), should be implemented in the near term to mitigate the deficiencies along I Avenue.

Table 7.3 lists the description, phasing, and estimated cost for each existing improvement project. A detailed cost breakdown of direct construction, contingency, and mark-up is included in Appendix B.

Table 7.3 Existing System Improvement Projects
Wastewater Master Plan Update
City of Hesperia

Project No.[1]	Phasing Period	Facility Description	Location	Size (in)	Length (ft)	Capital Cost[2]
FP-1[3]	Near Term	New Gravity Sewer	Santa Fe Avenue from Mesa Street to Bear Valley	18	10,500	$3,169,000

Notes:
(1) The project Nos. correspond to the IDs on Figure 7.1.
(2) Estimated capital costs are based on January 2007 dollars and include a factor for engineering, legal and administrative costs, and contingency.
(3) This is an improvement to address the VVWRA interceptor deficiency.



Legend

- Existing Lift Station
- Existing Collection System

Proposed Lift Station

Year

- 2007
- 2012
- Proposed Solids Pump Station

Proposed Water Reclamation Plant (WRP)

Year

- WRP 1 (2012)
- WRP 2/WRP 3 (2017)
- VVWRA Outlet

Proposed Collection System Improvements

Phase (Year)

- 2007 - 2012
- 2013 - 2017
- 2018 - 2022
- 2023 - 2032
- Proposed Solids Pipeline
- Wastewater District Boundary
- Roadways

Text:

- FP-10 CIP Project No.
- 12" Proposed Diameter

N

0 5,000 10,000 Feet

FIGURE 7.1
WASTEWATER SYSTEM CIP

WASTEWATER MASTER PLAN UPDATE

CITY OF HESPERIA

7.4.3 Future System Improvements

The sewer model is also used to analyze deficiencies in future planning years. As discussed in Chapter 5, 32 pipeline improvements are recommended with a combined length of approximately 30.7 miles, including a new 3-mile force main to WRP-1 and 27.3 miles of gravity mains. In addition, two new lift stations (LS-3 and LS-4), three new WRPs, one new solids lift station, and 0.76 mile of solids pipeline are proposed to help alleviate the identified system deficiencies and develop a local source to supply potential recycled water demands. The cost for WRP-3 is not included in the CIP.

Similar to near-term project FP-1, FP-18 is also proposed to alleviate deficiencies for the VVWRA Interceptor. This project will be required in Phase 3 when sewer flows are projected to increase, which will require additional conveyance capacity to WRP-2. Table 7.4 lists the description, phasing, and estimated costs for all the conveyance improvements for the future system and Table 7.5 lists the description, phasing, and estimated costs for the WRP facilities. It should be noted that the CIP is based on parallel pipelines, which avoids the need of replacements for temporary facilities that would be required for pipeline replacements. For locations where space is limited, main replacements may be a better alternative.

7.4.4 Phasing of Project Cost

Table 7.6 summarizes project costs for each of the phasing periods. As shown, improvement projects are categorized into three different project types:

1. Existing Collection System Improvements:
   Improvements such as gravity mains and force mains that are proposed to resolve existing system deficiencies.
2. Future Collection System Improvements:
   Improvements such as gravity mains, force mains, and lift stations that are proposed to resolve system deficiencies in the future planning years.
3. Future Treatment Improvements:
   Improvements such as proposed WRPs and solid handling facilities.

As shown in Table 7.5, the total estimated capital cost is $398 million, with the majority of the cost related to wastewater treatment. Table 7.6 also shows that the majority of the project costs are for growth related improvements. These future system improvements account for $395 million of the $398 million CIP and would be paid for by future customers. Improvements for the VVWRA interceptor account for a total of $6 million.

It is recommended that the City conduct a rate study based on this CIP to further establish sewer rates, developer impact fees, and financing options. The distribution of the estimated total capital cost is graphically presented on Figure 7.2.

Table 7.4 CIP for Future System Conveyance Projects
Wastewater Master Plan Update
City of Hesperia

Project No.[1]	Phase	Facility Description	Location	Size	Unit	Quantity	Unit	Estimated Capital Cost[2]
FP-3	2007-2012	New Force Main	Mauna Loa Street and Maple Avenue west along Mojave Street to Mesa Linda Avenue, and south along Mesa Linda Avenue to WRP-1	20	in	15,300	ft	$3,616,000
FP-4	2007-2012	New Gravity Main	Main Street and Cataba Avenue to WRP-1	18	in	2,800	ft	$847,000
FP-5	2007-2012	New Lift Station LS-3	Muana Loa Street and Maple Avenue	6.83	mgd	1	ea	$4,325,000
FP-5	2007-2012	Land Acquistion for LS-3	Muana Loa Street and Maple Avenue	0.5	ac	1	ea	$125,000
FP-6	2007-2012	Backup Power	Muana Loa Street and Maple Avenue	6.83	mgd	1	ea	$464,000
FP-7	2007-2012	Parallel Gravity Main	Bear Valley Road from Cottonwood Avenue to 7th Avenue	18	in	8,000	ea	$2,414,000
FP-8	2007-2012	Parallel Gravity Main	Sultana Street and Maple Avenue to Main Street and Maple Avenue	12	in	3,500	ft	$910,000
FP-9	2007-2012	Parallel Gravity Main	Mojave Street and Maple Avenue to Muana Loa Street and Maple Avenue	18	in	500	ft	$153,000
FP-10	2007-2012	Parallel Gravity Main	Main Street and Maple Avenue to Mojave Street and Maple Avenue	15	in	5,300	ft	$1,421,000
FP-11	2007-2012	New Diversion	Pipe extending northward from corner of Sultana Street and Escondido Avenue	10	in	3,200	ft	$789,000
FP-12	2007-2012	Parallel Gravity Main	Following Live Oak Street, continuing west of Mount Shasta Drive, terminating on Mojave Street 850 feet west of Blanchard Road	10	in	7,000	ft	$1,726,000
FP-13	2007-2012	Parallel Gravity Main	Mojave Avenue from 800 feet west of Blanchard Road to Maple Avenue	15	in	6,000	ft	$1,607,000
FP-35	2007-2012	New Gravity Main	750 feet southwest of the intersection of Farmington Street and Caliente Road to the intersection of Caliente Road and Mesquite Street	8	in	14,300	ft	$3,311,000
FP-36	2007-2012	New Gravity Main	600 feet northeast of the intersection of Blue Jay Way and Mariposa Road to the intersection of Mariposa Road and El Centro Road	8	in	10,700	ft	$2,478,000
FP-37	2007-2012	New Gravity Main	265 feet west of the intersection of Maple Avenue and Mesquite Street to intersection of Dove Creek Trail and Briarwood Street	12	in	2,200	ft	$573,000
FP-15	2013-2017	New Force Main	From Intersection of Bear Valley Road and I Avenue to WRP-2	20	in	3,000	ft	$709,000
FP-34	2013-2017	New Gravity Main	Bear Valley Road from Santa Fe Avenue to I Avenue	24	in	1,500	ft	$553,000
FP-16	2013-2017	New Lift Station LS-4	Bear Valley Road 500 feet west of Ridgecrest Road	6	mgd	1	ft	$3,798,000
FP-16	2013-2017	Land Acquistion for LS-4	Bear Valley Road 500 feet west of Ridgecrest Road	0.5	ac	1	ea	$212,000
FP-17	2013-2017	Backup Power	Bear Valley Road 500 feet west of Ridgecrest Road	6	mgd	1	ea	$405,000

Table 7.4 CIP for Future System Conveyance Projects (Continued)
Wastewater Master Plan Update
City of Hesperia

Project No.[1]	Phase	Facility Description	Location	Size	Unit	Quantity	Unit	Estimated Capital Cost[2]
FP-18[3]	2013-2017	Parallel Gravity Main	Lemon Street and I ave north to I Avenue and Santa Fe Avenue	21	in	8,300	ft	$2,772,000
FP-19	2013-2017	New Gravity Main	Connecting I Avenue main from corner of I Avenue and Santa Fe Avenue to WRP-2	30	in	1,000	ft	$466,000
FP-20	2013-2017	New Gravity Main	Connecting Santa Fe Avenue diversion to WRP-2	18	in	500	ft	$153,000
FP-21	2013-2017	Parallel Gravity Main	Bear Valley Road from 7th Avenue to Santa Fe Avenue	18	in	9,800	ft	$2,957,000
FP-22	2013-2017	Parallel Gravity Main	Mariposa Road from Sycamore Street to Bear Valley Road and Bear Valley Road from Mariposa Road to Cottonwood Avenue	15	in	5,000	ft	$1,340,000
FP-23	2013-2017	Parallel Gravity Main	Sante Fe Avenue from Hercules Street to Mesa Street	15	in	5,200	ft	$1,394,000
FP-24	2013-2017	Parallel Gravity Main	E Avenue from Muana Loa Street to Lemon Street	15	in	1,500	ft	$403,000
FP-25	2013-2017	Parallel Gravity Main	E Avenue from Live Oak Street to Muana Loa Street	15	in	4,100	ft	$1,099,000
FP-26	2013-2017	Parallel Gravity Main	C Avenue from Sultana Street to Juniper Street and Juniper Street C Avenue to E Avenue	10	in	4,300	ft	$1,060,000
FP-27	2013-2017	New Gravity Main	E Street diversion	15	in	2,600	ft	$698,000
FP-38	2013-2017	New Gravity Main	650 feet north of the intersection of Jenny Street and Greenwood Street to 750 feet southwest of the intersection of Farmington Street and Caliente Road	8	in	1,200	ft	$280,000
FP-39	2013-2017	New Gravity Main	Approximately 800 feet south of the intersection of Oak Hill Road and Elkridge Drive to 750 feet southwest of the intersection of Farmington Street and Caliente Road	8	in	3,900	ft	$904,000
FP-28	2018-2022	Parallel Gravity Main	Main Street from 600 feet west of Pyrite Avenue to Maple Avenue	10	in	5,400	ft	$1,333,000
FP-29	2018-2022	Parallel Gravity Main	Along I-15, Caliente Road, Joshua Street, Highway 395, and	12	in	12,200	ft	$3,170,000
FP-30	2018-2022	Parallel Gravity Main	Mariposa Road from Verde Street to Gabriel Road	10	in	2,000	ft	$493,000
FP-31	2018-2022	Parallel Gravity Main	Mariposa Road from Gabriel Road to 800 feet north of Gabriel Road	12	in	1,000	ft	$261,000
FP-32	2023-2032	Parallel Gravity Main	I Avenue from Aspen Street to Lemon Street	15	in	13,200	ft	$3,535,000
FP-33	2023-2032	Parallel Gravity Main	1,000 feet south of the intersection of Cataba Road and Main Street to the intersection of Cataba Road and Main Street	12	in	1,000	ft	$261,000
						Total Estimated Costs		**$53,015,000**

Notes:
(1) Project Nos. correspond to the Project Nos. on Figure 7.2.
(2) Estimated Project Costs are based on January 2007 dollars and include estimated engineering, legal and administrative costs, and a contingency. Costs were rounded to the nearest $1,000.
(3) This is an improvement for the VVWRA interceptor deficiency.

Table 7.5 CIP for Wastewater Reclamation Facilities
Wastewater Master Plan Update
City of Hesperia

Project No[1]	Phase	Facility Description	Location	Size	unit	Quantity	unit	Estimated Capital Cost[2]
FP-2A	2007-2012	WRP-1 Phase 1: Construction of 5-mgd Treatment Plant	North of Main Street and west of Cataba Road	5.0	mgd	1.0	ea	$92,813,000
FP-2A	2007-2012	Land Acquisition for WRP-1	Land Acqusition for WRP-1	44.0	ac	1.0	ea	$11,000,000
FP-2B	2007-2012	WRP-1 Phase 1: Tertiary Treatment	WRP-1	5.0	mgd	1.0	ea	$8,438,000
FP-14A	2013-2017	WRP-2 Phase 1: Construction of 6-mgd Treatment Plant	Osbrink Drive and Santa Fe East Avenue	6.0	mgd	1.0	ea	$111,375,000
FP-14A	2013-2017	Land Acquisition for WRP-2	Osbrink Drive and Santa Fe East Avenue	20.0	ac	1.0	ea	$8,438,000
FP-14B	2013-2017	WRP-2 Phase 1: Tertiary Treatment	WRP-2	6.0	mgd	1.0	ea	$10,125,000
FP-34	2013-2017	New Force Main	Solids Pipeline from WRP-2 to VVWRA Outlet	6.0	in	4,000.0	ft	$405,000
FP-35	2013-2017	Solids PS at WRP-2	WRP-2	0.4	mgd	1.0	ea	$229,000
FP-2D	2018-2022	WRP-1 Expansion from 5 mgd to 7.4 mgd	WRP-1	2.4	mgd	1.0	ea	$44,550,000
FP-2E	2018-2022	WRP-1 Expansion of Tertiary Treatment	WRP-1	2.4	mgd	1.0	ea	$4,050,000
FP-9D	2023-2032	WRP-2 Expansion from 6 mgd to 8.5 mgd	WRP-2	2.5	mgd	1.0	ea	$46,407,000
FP-9E	2023-2032	WRP-2 Expansion of Tertiary Treatment	WRP-2	2.5	mgd	1.0	ea	$4,219,000
						Total Estimated Costs		**$342,049,000**

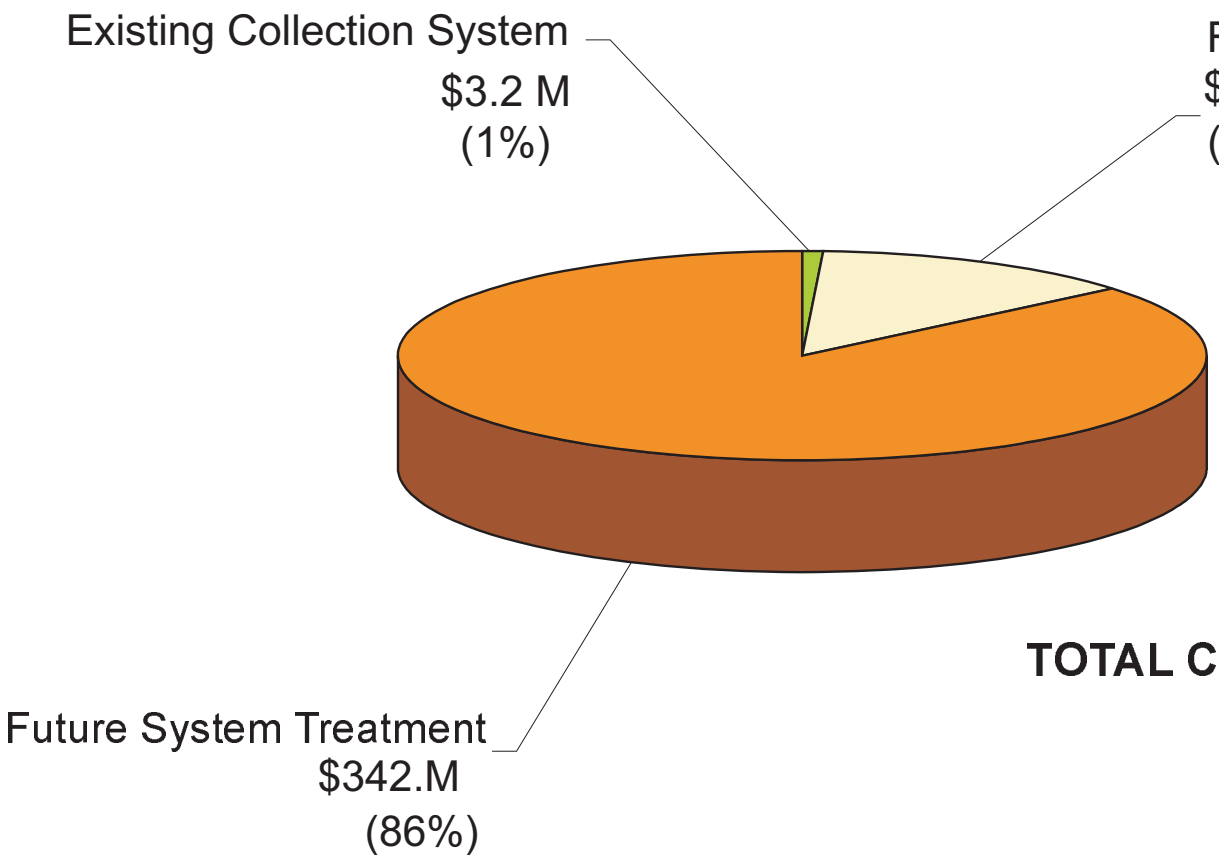
Notes:

(1) Project Nos. correspond to the Project Nos. on Figure 7.2.
(2) Estimated Project Costs are based on January 2007 dollars and include estimated engineering, legal and administrative costs, and a contingency. Costs were rounded to the nearest $1,000.

Table 7.6 Phasing of Wastewater System CIP
Wastewater Master Plan Update
City of Hesperia

Improvement Type	Near Term ($ M)	2007-2012 ($ M)	2013-2017 ($ M)	2018-2022 ($ M)	2023-2032 ($ M)	Total ($ M)
Existing Collection System Improvements[(1)]	$3.2	$0.0	$0.0	$0.0	$0.0	$3.2
Future Collection System Improvements	$0.0	$24.8	$19.2[(2)]	$5.3	$3.8	$53.0
Future Treatment Improvements	$0.0	$112.3	$130.6	$48.6	$50.6	$342.0
Total Per Planning Period	**$3.2**	**$137.1**	**$149.8**	**$53.9**	**$54.4**	**$398.2**

Notes:
(1) Improvement cost is for VVWRA interceptor deficiencies (FP-1).
(2) Approximately $2.8 million of the improvement cost is for VVWRA interceptor deficiencies (FP-18).



TOTAL CAPITAL COST = $398M

FIGURE 7.2
DISTRIBUTION OF
CAPITAL COST

APPENDIX A-1

PROJECTED SEWERED LAND USE

Appendix A -1 Projected Sewered Land Use by Planning Year
Development by Planning Area
Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	874	297	556	151	44	33,705
2012	1,802	746	1,221	406	253	31,199
2017	2,306	1,148	2,128	710	554	28,783
2022	2,723	1,411	2,737	1,033	833	26,890
2027	3,111	1,612	3,138	1,334	1,031	25,402
2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	No.	Description	(acres)	Developed	Sewered	LDR	HDR	COMM	IND	OS	Total	LDR	HDR	Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	PA-01A	Main City Area (Was PA-1)	360	75%	0%	100%	--	--	--	--	100%	2.00		2005	-	-	-	-	-	360
2012	PA-01A	Main City Area (Was PA-1)	360	80%	0%	100%	--	--	--	--	100%	2.00		2012	-	-	-	-	-	360
2017	PA-01A	Main City Area (Was PA-1)	360	85%	0%	100%	--	--	--	--	100%	2.00		2017	-	-	-	-	-	360
2022	PA-01A	Main City Area (Was PA-1)	360	90%	0%	100%	--	--	--	--	100%	2.00		2022	-	-	-	-	-	360
2027	PA-01A	Main City Area (Was PA-1)	360	92%	0%	100%	--	--	--	--	100%	2.00		2027	-	-	-	-	-	360
2032	PA-01A	Main City Area (Was PA-1)	360	95%	0%	100%	--	--	--	--	100%	2.00		2032	-	-	-	-	-	360
2005	PA-01B1	Main City Area (Was PA-1)	4,036	60%	0%	100%	--	--	--	--	100%	0.80		2005	-	-	-	-	-	4,036
2012	PA-01B1	Main City Area (Was PA-1)	4,036	70%	0%	100%	--	--	--	--	100%	0.80		2012	-	-	-	-	-	4,036
2017	PA-01B1	Main City Area (Was PA-1)	4,036	75%	0%	100%	--	--	--	--	100%	0.80		2017	-	-	-	-	-	4,036
2022	PA-01B1	Main City Area (Was PA-1)	4,036	80%	0%	100%	--	--	--	--	100%	0.80		2022	-	-	-	-	-	4,036
2027	PA-01B1	Main City Area (Was PA-1)	4,036	85%	0%	100%	--	--	--	--	100%	0.80		2027	-	-	-	-	-	4,036
2032	PA-01B1	Main City Area (Was PA-1)	4,036	90%	0%	100%	--	--	--	--	100%	0.80		2032	-	-	-	-	-	4,036
2005	PA-01B2	Main City Area (Was PA-1)	89	90%	100%	--	--	100%	--	--	100%			2005	-	-	80	-	-	9
2012	PA-01B2	Main City Area (Was PA-1)	89	92%	100%	--	--	100%	--	--	100%			2012	-	-	82	-	-	7
2017	PA-01B2	Main City Area (Was PA-1)	89	95%	100%	--	--	100%	--	--	100%			2017	-	-	85	-	-	4
2022	PA-01B2	Main City Area (Was PA-1)	89	98%	100%	--	--	100%	--	--	100%			2022	-	-	87	-	-	2
2027	PA-01B2	Main City Area (Was PA-1)	89	100%	100%	--	--	100%	--	--	100%			2027	-	-	89	-	-	-
2032	PA-01B2	Main City Area (Was PA-1)	89	100%	100%	--	--	100%	--	--	100%			2032	-	-	89	-	-	-
2005	PA-01C	Main City Area (Was PA-1)	496	55%	45%	35%	15%	50%	--	--	100%	2.00	12.0	2005	43	18	61	-	-	374
2012	PA-01C	Main City Area (Was PA-1)	496	65%	50%	35%	15%	50%	--	--	100%	2.00	12.0	2012	56	24	81	-	-	335
2017	PA-01C	Main City Area (Was PA-1)	496	68%	55%	35%	15%	50%	--	--	100%	2.00	12.0	2017	65	28	93	-	-	311
2022	PA-01C	Main City Area (Was PA-1)	496	72%	60%	35%	15%	50%	--	--	100%	2.00	12.0	2022	75	32	107	-	-	282
2027	PA-01C	Main City Area (Was PA-1)	496	75%	70%	35%	15%	50%	--	--	100%	2.00	12.0	2027	91	39	130	-	-	236
2032	PA-01C	Main City Area (Was PA-1)	496	80%	80%	35%	15%	50%	--	--	100%	2.00	12.0	2032	111	48	159	-	-	179
2005	PA-01D	Main City Area (Was PA-1)	238	85%	0%	100%	--	--	--	--	100%	2.00		2005	-	-	-	-	-	238
2012	PA-01D	Main City Area (Was PA-1)	238	88%	0%	100%	--	--	--	--	100%	2.00		2012	-	-	-	-	-	238
2017	PA-01D	Main City Area (Was PA-1)	238	90%	0%	100%	--	--	--	--	100%	2.00		2017	-	-	-	-	-	238
2022	PA-01D	Main City Area (Was PA-1)	238	92%	0%	100%	--	--	--	--	100%	2.00		2022	-	-	-	-	-	238
2027	PA-01D	Main City Area (Was PA-1)	238	95%	0%	100%	--	--	--	--	100%	2.00		2027	-	-	-	-	-	238
2032	PA-01D	Main City Area (Was PA-1)	238	98%	0%	100%	--	--	--	--	100%	2.00		2032	-	-	-	-	-	238
2005	PA-01E	Main City Area (Was PA-1)	100	40%	10%	100%	--	--	--	--	100%	2.00		2005	4	-	-	-	-	96
2012	PA-01E	Main City Area (Was PA-1)	100	45%	15%	100%	--	--	--	--	100%	2.00		2012	7	-	-	-	-	93
2017	PA-01E	Main City Area (Was PA-1)	100	50%	20%	100%	--	--	--	--	100%	2.00		2017	10	-	-	-	-	90
2022	PA-01E	Main City Area (Was PA-1)	100	60%	30%	100%	--	--	--	--	100%	2.00		2022	18	-	-	-	-	82
2027	PA-01E	Main City Area (Was PA-1)	100	70%	40%	100%	--	--	--	--	100%	2.00		2027	28	-	-	-	-	72
2032	PA-01E	Main City Area (Was PA-1)	100	80%	50%	100%	--	--	--	--	100%	2.00		2032	40	-	-	-	-	60

Appendix A -1 Projected Sewered Land Use by Planning Year
Development by Planning Area
Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	3.3	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	2.7	HWD (11/16/05 meeting)
Main Area	(sq mi):	36	HWD (9/6/05 meeting)
Population	(2032):	179,000	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	160	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	2,000	Estimated
WDF (Ind)	(gpd/ac):	3,000	Estimated
WWGF (res)	(gpcd):	80	Estimated
WWGF (Comm)	(gpd/ac):	1,000	Estimated
WWGF (Ind)	(gpd/ac):	1,000	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	874	297	556	151	44	33,705
2012	1,802	746	1,221	406	253	31,199
2017	2,306	1,148	2,128	710	554	28,783
2022	2,723	1,411	2,737	1,033	833	26,890
2027	3,111	1,612	3,138	1,334	1,031	25,402
2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	No.	Description	(acres)	Developed	Sewered	LDR	HDR	COMM	IND	OS	Total	LDR	HDR	Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	PA-01F	Main City Area (Was PA-1)	173	50%	0%	100%	--	--	--	--	100%	2.00		2005	-	-	-	-	-	173
2012	PA-01F	Main City Area (Was PA-1)	173	60%	0%	100%	--	--	--	--	100%	2.00		2012	-	-	-	-	-	173
2017	PA-01F	Main City Area (Was PA-1)	173	70%	0%	100%	--	--	--	--	100%	2.00		2017	-	-	-	-	-	173
2022	PA-01F	Main City Area (Was PA-1)	173	75%	0%	100%	--	--	--	--	100%	2.00		2022	-	-	-	-	-	173
2027	PA-01F	Main City Area (Was PA-1)	173	80%	0%	100%	--	--	--	--	100%	2.00		2027	-	-	-	-	-	173
2032	PA-01F	Main City Area (Was PA-1)	173	85%	0%	100%	--	--	--	--	100%	2.00		2032	-	-	-	-	-	173
2005	PA-01G	Main City Area (Was PA-1)	1,736	75%	0%	100%	--	--	--	--	100%	1.50		2005	-	-	-	-	-	1,736
2012	PA-01G	Main City Area (Was PA-1)	1,736	85%	0%	100%	--	--	--	--	100%	1.50		2012	-	-	-	-	-	1,736
2017	PA-01G	Main City Area (Was PA-1)	1,736	88%	0%	100%	--	--	--	--	100%	1.50		2017	-	-	-	-	-	1,736
2022	PA-01G	Main City Area (Was PA-1)	1,736	92%	0%	100%	--	--	--	--	100%	1.50		2022	-	-	-	-	-	1,736
2027	PA-01G	Main City Area (Was PA-1)	1,736	95%	0%	100%	--	--	--	--	100%	1.50		2027	-	-	-	-	-	1,736
2032	PA-01G	Main City Area (Was PA-1)	1,736	100%	0%	100%	--	--	--	--	100%	1.50		2032	-	-	-	-	-	1,736
2005	PA-01H	Main City Area (Was PA-1)	106	60%	37%	5%	--	95%	--	--	100%	2.00		2005	1	-	22	-	-	83
2012	PA-01H	Main City Area (Was PA-1)	106	80%	75%	5%	--	95%	--	--	100%	2.00		2012	3	-	61	-	-	42
2017	PA-01H	Main City Area (Was PA-1)	106	85%	100%	5%	--	95%	--	--	100%	2.00		2017	5	-	86	-	-	16
2022	PA-01H	Main City Area (Was PA-1)	106	90%	100%	5%	--	95%	--	--	100%	2.00		2022	5	-	91	-	-	11
2027	PA-01H	Main City Area (Was PA-1)	106	95%	100%	5%	--	95%	--	--	100%	2.00		2027	5	-	96	-	-	5
2032	PA-01H	Main City Area (Was PA-1)	106	100%	100%	5%	--	95%	--	--	100%	2.00		2032	5	-	101	-	-	-
2005	PA-01I1	Main City Area (Was PA-1)	52	75%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2005	8	16	16	-	-	13
2012	PA-01I1	Main City Area (Was PA-1)	52	85%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2012	9	18	18	-	-	8
2017	PA-01I1	Main City Area (Was PA-1)	52	90%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2017	9	19	19	-	-	5
2022	PA-01I1	Main City Area (Was PA-1)	52	92%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2022	10	19	19	-	-	4
2027	PA-01I1	Main City Area (Was PA-1)	52	95%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2027	10	20	20	-	-	3
2032	PA-01I1	Main City Area (Was PA-1)	52	100%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2032	10	21	21	-	-	-
2005	PA-01I2	Main City Area (Was PA-1)	98	70%	80%	5%	35%	60%	--	--	100%	2.00	12.0	2005	3	19	33	-	-	43
2012	PA-01I2	Main City Area (Was PA-1)	98	80%	90%	5%	35%	60%	--	--	100%	2.00	12.0	2012	4	25	42	-	-	28
2017	PA-01I2	Main City Area (Was PA-1)	98	85%	100%	5%	35%	60%	--	--	100%	2.00	12.0	2017	4	29	50	-	-	15
2022	PA-01I2	Main City Area (Was PA-1)	98	90%	100%	5%	35%	60%	--	--	100%	2.00	12.0	2022	4	31	53	-	-	10
2027	PA-01I2	Main City Area (Was PA-1)	98	95%	100%	5%	35%	60%	--	--	100%	2.00	12.0	2027	5	33	56	-	-	5
2032	PA-01I2	Main City Area (Was PA-1)	98	100%	100%	5%	35%	60%	--	--	100%	2.00	12.0	2032	5	34	59	-	-	-
2005	PA-01J	Main City Area (Was PA-1)	53	40%	50%	30%	70%	--	--	--	100%	2.00	12.0	2005	3	7	-	-	-	42
2012	PA-01J	Main City Area (Was PA-1)	53	50%	60%	30%	70%	--	--	--	100%	2.00	12.0	2012	5	11	-	-	-	37
2017	PA-01J	Main City Area (Was PA-1)	53	60%	70%	30%	70%	--	--	--	100%	2.00	12.0	2017	7	16	-	-	-	31
2022	PA-01J	Main City Area (Was PA-1)	53	70%	80%	30%	70%	--	--	--	100%	2.00	12.0	2022	9	21	-	-	-	23
2027	PA-01J	Main City Area (Was PA-1)	53	80%	90%	30%	70%	--	--	--	100%	2.00	12.0	2027	11	27	-	-	-	15
2032	PA-01J	Main City Area (Was PA-1)	53	85%	100%	30%	70%	--	--	--	100%	2.00	12.0	2032	14	32	-	-	-	8

Appendix A -1 Projected Sewered Land Use by Planning Year
Development by Planning Area
Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Vacant**
2005	874	297	556	151	44	33,705
2012	1,802	746	1,221	406	253	31,199
2017	2,306	1,148	2,128	710	554	28,783
2022	2,723	1,411	2,737	1,033	833	26,890
2027	3,111	1,612	3,138	1,334	1,031	25,402
2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	**No.**	**Description**	**(acres)**	**Developed**	**Sewered**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Total**	**LDR**	**HDR**	**Offset**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Vacant**
2005	PA-01K	Main City Area (Was PA-1)	1,116	60%	0%	100%	--	--	--	--	100%	1.00		2005	-	-	-	-	-	1,116
2012	PA-01K	Main City Area (Was PA-1)	1,116	70%	0%	100%	--	--	--	--	100%	1.00		2012	-	-	-	-	-	1,116
2017	PA-01K	Main City Area (Was PA-1)	1,116	72%	0%	100%	--	--	--	--	100%	1.00		2017	-	-	-	-	-	1,116
2022	PA-01K	Main City Area (Was PA-1)	1,116	80%	0%	100%	--	--	--	--	100%	1.00		2022	-	-	-	-	-	1,116
2027	PA-01K	Main City Area (Was PA-1)	1,116	85%	0%	100%	--	--	--	--	100%	1.00		2027	-	-	-	-	-	1,116
2032	PA-01K	Main City Area (Was PA-1)	1,116	90%	0%	100%	--	--	--	--	100%	1.00		2032	-	-	-	-	-	1,116
2005	PA-01L	Main City Area (Was PA-1)	162	95%	2%	95%	5%	--	--	--	100%	2.00	12.0	2005	3	0	-	-	-	159
2012	PA-01L	Main City Area (Was PA-1)	162	96%	2%	95%	5%	--	--	--	100%	2.00	12.0	2012	3	0	-	-	-	159
2017	PA-01L	Main City Area (Was PA-1)	162	97%	2%	95%	5%	--	--	--	100%	2.00	12.0	2017	3	0	-	-	-	159
2022	PA-01L	Main City Area (Was PA-1)	162	98%	2%	95%	5%	--	--	--	100%	2.00	12.0	2022	3	0	-	-	-	159
2027	PA-01L	Main City Area (Was PA-1)	162	99%	2%	95%	5%	--	--	--	100%	2.00	12.0	2027	3	0	-	-	-	159
2032	PA-01L	Main City Area (Was PA-1)	162	100%	2%	95%	5%	--	--	--	100%	2.00	12.0	2032	3	0	-	-	-	159
2005	PA-01M1	Main City Area (Was PA-1)	83	40%	75%	10%	10%	80%	--	--	100%	2.00	12.0	2005	2	2	20	-	-	58
2012	PA-01M1	Main City Area (Was PA-1)	83	60%	85%	10%	10%	80%	--	--	100%	2.00	12.0	2012	4	4	34	-	-	40
2017	PA-01M1	Main City Area (Was PA-1)	83	80%	95%	10%	10%	80%	--	--	100%	2.00	12.0	2017	6	6	50	-	-	20
2022	PA-01M1	Main City Area (Was PA-1)	83	90%	100%	10%	10%	80%	--	--	100%	2.00	12.0	2022	7	7	59	-	-	8
2027	PA-01M1	Main City Area (Was PA-1)	83	100%	100%	10%	10%	80%	--	--	100%	2.00	12.0	2027	8	8	66	-	-	-
2032	PA-01M1	Main City Area (Was PA-1)	83	100%	100%	10%	10%	80%	--	--	100%	2.00	12.0	2032	8	8	66	-	-	-
2005	PA-01M2	Main City Area (Was PA-1)	137	25%	10%	30%	--	70%	--	--	100%	2.00		2005	1	-	2	-	-	133
2012	PA-01M2	Main City Area (Was PA-1)	137	45%	50%	30%	--	70%	--	--	100%	2.00		2012	9	-	22	-	-	106
2017	PA-01M2	Main City Area (Was PA-1)	137	60%	75%	30%	--	70%	--	--	100%	2.00		2017	18	-	43	-	-	75
2022	PA-01M2	Main City Area (Was PA-1)	137	70%	85%	30%	--	70%	--	--	100%	2.00		2022	24	-	57	-	-	55
2027	PA-01M2	Main City Area (Was PA-1)	137	80%	95%	30%	--	70%	--	--	100%	2.00		2027	31	-	73	-	-	33
2032	PA-01M2	Main City Area (Was PA-1)	137	85%	100%	30%	--	70%	--	--	100%	2.00		2032	35	-	81	-	-	21
2005	PA-01N	Main City Area (Was PA-1)	5,498	60%	0%	85%	--	--	--	15%	100%	1.50		2005	-	-	-	-	-	5,498
2012	PA-01N	Main City Area (Was PA-1)	5,498	75%	0%	85%	--	--	--	15%	100%	1.50		2012	-	-	-	-	-	5,498
2017	PA-01N	Main City Area (Was PA-1)	5,498	78%	0%	85%	--	--	--	15%	100%	1.50		2017	-	-	-	-	-	5,498
2022	PA-01N	Main City Area (Was PA-1)	5,498	83%	0%	85%	--	--	--	15%	100%	1.50		2022	-	-	-	-	-	5,498
2027	PA-01N	Main City Area (Was PA-1)	5,498	85%	0%	85%	--	--	--	15%	100%	1.50		2027	-	-	-	-	-	5,498
2032	PA-01N	Main City Area (Was PA-1)	5,498	90%	0%	85%	--	--	--	15%	100%	1.50		2032	-	-	-	-	-	5,498
2005	PA-01O	Main City Area (Was PA-1)	369	80%	0%	100%	--	--	--	--	100%	1.00		2005	-	-	-	-	-	369
2012	PA-01O	Main City Area (Was PA-1)	369	85%	0%	100%	--	--	--	--	100%	1.00		2012	-	-	-	-	-	369
2017	PA-01O	Main City Area (Was PA-1)	369	90%	0%	100%	--	--	--	--	100%	1.00		2017	-	-	-	-	-	369
2022	PA-01O	Main City Area (Was PA-1)	369	95%	0%	100%	--	--	--	--	100%	1.00		2022	-	-	-	-	-	369
2027	PA-01O	Main City Area (Was PA-1)	369	100%	0%	100%	--	--	--	--	100%	1.00		2027	-	-	-	-	-	369
2032	PA-01O	Main City Area (Was PA-1)	369	100%	0%	100%	--	--	--	--	100%	1.00		2032	-	-	-	-	-	369

Appendix A -1 Projected Sewered Land Use by Planning Year
Development by Planning Area
Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Vacant**
2005	874	297	556	151	44	33,705
2012	1,802	746	1,221	406	253	31,199
2017	2,306	1,148	2,128	710	554	28,783
2022	2,723	1,411	2,737	1,033	833	26,890
2027	3,111	1,612	3,138	1,334	1,031	25,402
2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	**No.**	**Description**	**(acres)**	**Developed**	**Sewered**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Total**	**LDR**	**HDR**	**Offset**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Vacant**
2005	PA-01P	Main City Area (Was PA-1)	31	90%	75%	20%	--	80%	--	--	100%			2005	4	-	17	-	-	10
2012	PA-01P	Main City Area (Was PA-1)	31	92%	78%	20%	--	80%	--	--	100%			2012	4	-	18	-	-	9
2017	PA-01P	Main City Area (Was PA-1)	31	94%	80%	20%	--	80%	--	--	100%			2017	5	-	19	-	-	8
2022	PA-01P	Main City Area (Was PA-1)	31	96%	83%	20%	--	80%	--	--	100%			2022	5	-	20	-	-	6
2027	PA-01P	Main City Area (Was PA-1)	31	98%	85%	20%	--	80%	--	--	100%			2027	5	-	21	-	-	5
2032	PA-01P	Main City Area (Was PA-1)	31	100%	90%	20%	--	80%	--	--	100%			2032	6	-	23	-	-	3
2005	PA-01Q1	Main City Area (Was PA-1)	247	90%	2%	100%	--	--	--	--	100%	1.50		2005	4	-	-	-	-	243
2012	PA-01Q1	Main City Area (Was PA-1)	247	92%	2%	100%	--	--	--	--	100%	1.50		2012	5	-	-	-	-	243
2017	PA-01Q1	Main City Area (Was PA-1)	247	95%	2%	100%	--	--	--	--	100%	1.50		2017	5	-	-	-	-	242
2022	PA-01Q1	Main City Area (Was PA-1)	247	98%	2%	100%	--	--	--	--	100%	1.50		2022	5	-	-	-	-	242
2027	PA-01Q1	Main City Area (Was PA-1)	247	100%	2%	100%	--	--	--	--	100%	1.50		2027	5	-	-	-	-	242
2032	PA-01Q1	Main City Area (Was PA-1)	247	100%	2%	100%	--	--	--	--	100%	1.50		2032	5	-	-	-	-	242
2005	PA-01Q2	Main City Area (Was PA-1)	23	80%	100%	--	95%	5%	--	--	100%		3.0	2005	-	17	1	-	-	5
2012	PA-01Q2	Main City Area (Was PA-1)	23	83%	100%	--	95%	5%	--	--	100%		3.0	2012	-	18	1	-	-	4
2017	PA-01Q2	Main City Area (Was PA-1)	23	86%	100%	--	95%	5%	--	--	100%		3.0	2017	-	19	1	-	-	3
2022	PA-01Q2	Main City Area (Was PA-1)	23	88%	100%	--	95%	5%	--	--	100%		3.0	2022	-	19	1	-	-	3
2027	PA-01Q2	Main City Area (Was PA-1)	23	90%	100%	--	95%	5%	--	--	100%		3.0	2027	-	20	1	-	-	2
2032	PA-01Q2	Main City Area (Was PA-1)	23	92%	100%	--	95%	5%	--	--	100%		3.0	2032	-	20	1	-	-	2
2005	PA-01R	Main City Area (Was PA-1)	323	90%	0%	100%	--	--	--	--	100%	1.00		2005	-	-	-	-	-	323
2012	PA-01R	Main City Area (Was PA-1)	323	92%	0%	100%	--	--	--	--	100%	1.00		2012	-	-	-	-	-	323
2017	PA-01R	Main City Area (Was PA-1)	323	95%	0%	100%	--	--	--	--	100%	1.00		2017	-	-	-	-	-	323
2022	PA-01R	Main City Area (Was PA-1)	323	95%	0%	100%	--	--	--	--	100%	1.00		2022	-	-	-	-	-	323
2027	PA-01R	Main City Area (Was PA-1)	323	95%	0%	100%	--	--	--	--	100%	1.00		2027	-	-	-	-	-	323
2032	PA-01R	Main City Area (Was PA-1)	323	95%	0%	100%	--	--	--	--	100%	1.00		2032	-	-	-	-	-	323
2005	PA-01S	Main City Area (Was PA-1)	460	70%	0%	95%	--	--	--	5%	100%	1.80		2005	-	-	-	-	-	460
2012	PA-01S	Main City Area (Was PA-1)	460	80%	0%	95%	--	--	--	5%	100%	1.80		2012	-	-	-	-	-	460
2017	PA-01S	Main City Area (Was PA-1)	460	85%	0%	95%	--	--	--	5%	100%	1.80		2017	-	-	-	-	-	460
2022	PA-01S	Main City Area (Was PA-1)	460	90%	0%	95%	--	--	--	5%	100%	1.80		2022	-	-	-	-	-	460
2027	PA-01S	Main City Area (Was PA-1)	460	95%	0%	95%	--	--	--	5%	100%	1.80		2027	-	-	-	-	-	460
2032	PA-01S	Main City Area (Was PA-1)	460	100%	0%	95%	--	--	--	5%	100%	1.80		2032	-	-	-	-	-	460
2005	PA-01T	Main City Area (Was PA-1)	930	75%	0%	95%	--	--	--	5%	100%	1.80		2005	-	-	-	-	-	930
2012	PA-01T	Main City Area (Was PA-1)	930	85%	0%	95%	--	--	--	5%	100%	1.80		2012	-	-	-	-	-	930
2017	PA-01T	Main City Area (Was PA-1)	930	88%	0%	95%	--	--	--	5%	100%	1.80		2017	-	-	-	-	-	930
2022	PA-01T	Main City Area (Was PA-1)	930	92%	0%	95%	--	--	--	5%	100%	1.80		2022	-	-	-	-	-	930
2027	PA-01T	Main City Area (Was PA-1)	930	94%	0%	95%	--	--	--	5%	100%	1.80		2027	-	-	-	-	-	930
2032	PA-01T	Main City Area (Was PA-1)	930	95%	0%	95%	--	--	--	5%	100%	1.80		2032	-	-	-	-	-	930

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Occupancy (MFR)	(people/du):	2.7	HWD (11/16/05 meeting)
Main Area	(sq mi):	36	HWD (9/6/05 meeting)
Population	(2032):	179,000	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	160	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	2,000	Estimated
WDF (Ind)	(gpd/ac):	3,000	Estimated
WWGF (res)	(gpcd):	80	Estimated
WWGF (Comm)	(gpd/ac):	1,000	Estimated
WWGF (Ind)	(gpd/ac):	1,000	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	874	297	556	151	44	33,705
2012	1,802	746	1,221	406	253	31,199
2017	2,306	1,148	2,128	710	554	28,783
2022	2,723	1,411	2,737	1,033	833	26,890
2027	3,111	1,612	3,138	1,334	1,031	25,402
2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	No.	Description	(acres)	Developed	Sewered	LDR	HDR	COMM	IND	OS	Total	LDR	HDR	Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	PA-01U1	Main City Area (Was PA-1)	488	80%	0%	100%	--	--	--	--	100%	1.80		2005	-	-	-	-	-	488
2012	PA-01U1	Main City Area (Was PA-1)	488	83%	0%	100%	--	--	--	--	100%	1.80		2012	-	-	-	-	-	488
2017	PA-01U1	Main City Area (Was PA-1)	488	86%	0%	100%	--	--	--	--	100%	1.80		2017	-	-	-	-	-	488
2022	PA-01U1	Main City Area (Was PA-1)	488	90%	0%	100%	--	--	--	--	100%	1.80		2022	-	-	-	-	-	488
2027	PA-01U1	Main City Area (Was PA-1)	488	95%	0%	100%	--	--	--	--	100%	1.80		2027	-	-	-	-	-	488
2032	PA-01U1	Main City Area (Was PA-1)	488	100%	0%	100%	--	--	--	--	100%	1.80		2032	-	-	-	-	-	488
2005	PA-01U2	Main City Area (Was PA-1)	24	0%	0%	100%	--	--	--	--	100%	1.80		2005	-	-	-	-	-	24
2012	PA-01U2	Main City Area (Was PA-1)	24	50%	0%	100%	--	--	--	--	100%	1.80		2012	-	-	-	-	-	24
2017	PA-01U2	Main City Area (Was PA-1)	24	50%	0%	100%	--	--	--	--	100%	1.80		2017	-	-	-	-	-	24
2022	PA-01U2	Main City Area (Was PA-1)	24	75%	0%	100%	--	--	--	--	100%	1.80		2022	-	-	-	-	-	24
2027	PA-01U2	Main City Area (Was PA-1)	24	85%	0%	100%	--	--	--	--	100%	1.80		2027	-	-	-	-	-	24
2032	PA-01U2	Main City Area (Was PA-1)	24	90%	0%	100%	--	--	--	--	100%	1.80		2032	-	-	-	-	-	24
2005	PA-01V	Main City Area (Was PA-1)	69	60%	20%	100%	--	--	--	--	100%	2.00		2005	8	-	-	-	-	61
2012	PA-01V	Main City Area (Was PA-1)	69	65%	25%	100%	--	--	--	--	100%	2.00		2012	11	-	-	-	-	58
2017	PA-01V	Main City Area (Was PA-1)	69	70%	30%	100%	--	--	--	--	100%	2.00		2017	15	-	-	-	-	55
2022	PA-01V	Main City Area (Was PA-1)	69	75%	35%	100%	--	--	--	--	100%	2.00		2022	18	-	-	-	-	51
2027	PA-01V	Main City Area (Was PA-1)	69	85%	40%	100%	--	--	--	--	100%	2.00		2027	24	-	-	-	-	46
2032	PA-01V	Main City Area (Was PA-1)	69	90%	50%	100%	--	--	--	--	100%	2.00		2032	31	-	-	-	-	38
2005	PA-01W	Main City Area (Was PA-1)	91	90%	40%	100%	--	--	--	--	100%	1.50		2005	33	-	-	-	-	58
2012	PA-01W	Main City Area (Was PA-1)	91	92%	45%	100%	--	--	--	--	100%	1.50		2012	38	-	-	-	-	54
2017	PA-01W	Main City Area (Was PA-1)	91	94%	50%	100%	--	--	--	--	100%	1.50		2017	43	-	-	-	-	48
2022	PA-01W	Main City Area (Was PA-1)	91	96%	55%	100%	--	--	--	--	100%	1.50		2022	48	-	-	-	-	43
2027	PA-01W	Main City Area (Was PA-1)	91	98%	65%	100%	--	--	--	--	100%	1.50		2027	58	-	-	-	-	33
2032	PA-01W	Main City Area (Was PA-1)	91	100%	75%	100%	--	--	--	--	100%	1.50		2032	69	-	-	-	-	23
2005	PA-01X1	Main City Area (Was PA-1)	1,019	65%	0%	95%	--	--	--	5%	100%	1.80		2005	-	-	-	-	-	1,019
2012	PA-01X1	Main City Area (Was PA-1)	1,019	75%	0%	95%	--	--	--	5%	100%	1.80		2012	-	-	-	-	-	1,019
2017	PA-01X1	Main City Area (Was PA-1)	1,019	80%	0%	95%	--	--	--	5%	100%	1.80		2017	-	-	-	-	-	1,019
2022	PA-01X1	Main City Area (Was PA-1)	1,019	85%	0%	95%	--	--	--	5%	100%	1.80		2022	-	-	-	-	-	1,019
2027	PA-01X1	Main City Area (Was PA-1)	1,019	90%	0%	95%	--	--	--	5%	100%	1.80		2027	-	-	-	-	-	1,019
2032	PA-01X1	Main City Area (Was PA-1)	1,019	95%	0%	95%	--	--	--	5%	100%	1.80		2032	-	-	-	-	-	1,019
2005	PA-01X2	Main City Area (Was PA-1)	439	50%	0%	60%	40%	--	--	--	100%	1.00	12.0	2005	-	-	-	-	-	439
2012	PA-01X2	Main City Area (Was PA-1)	439	55%	20%	60%	40%	--	--	--	100%	1.00	12.0	2012	29	19	-	-	-	390
2017	PA-01X2	Main City Area (Was PA-1)	439	60%	40%	60%	40%	--	--	--	100%	1.00	12.0	2017	63	42	-	-	-	333
2022	PA-01X2	Main City Area (Was PA-1)	439	65%	40%	60%	40%	--	--	--	100%	1.00	12.0	2022	68	46	-	-	-	325
2027	PA-01X2	Main City Area (Was PA-1)	439	75%	40%	60%	40%	--	--	--	100%	1.00	12.0	2027	79	53	-	-	-	307
2032	PA-01X2	Main City Area (Was PA-1)	439	80%	40%	60%	40%	--	--	--	100%	1.00	12.0	2032	84	56	-	-	-	298

Appendix A -1 Projected Sewered Land Use by Planning Year
Development by Planning Area
Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Vacant**
2005	874	297	556	151	44	33,705
2012	1,802	746	1,221	406	253	31,199
2017	2,306	1,148	2,128	710	554	28,783
2022	2,723	1,411	2,737	1,033	833	26,890
2027	3,111	1,612	3,138	1,334	1,031	25,402
2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	**No.**	**Description**	**(acres)**	**Developed**	**Sewered**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Total**	**LDR**	**HDR**	**Offset**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Vacant**
2005	PA-01X3	Main City Area (Was PA-1)	23	0%	0%	100%	--	--	--	--	100%	1.80		2005	-	-	-	-	-	23
2012	PA-01X3	Main City Area (Was PA-1)	23	50%	0%	100%	--	--	--	--	100%	1.80		2012	-	-	-	-	-	23
2017	PA-01X3	Main City Area (Was PA-1)	23	50%	0%	100%	--	--	--	--	100%	1.80		2017	-	-	-	-	-	23
2022	PA-01X3	Main City Area (Was PA-1)	23	75%	0%	100%	--	--	--	--	100%	1.80		2022	-	-	-	-	-	23
2027	PA-01X3	Main City Area (Was PA-1)	23	85%	0%	100%	--	--	--	--	100%	1.80		2027	-	-	-	-	-	23
2032	PA-01X3	Main City Area (Was PA-1)	23	90%	0%	100%	--	--	--	--	100%	1.80		2032	-	-	-	-	-	23
2005	PA-01Y	Main City Area (Was PA-1)	177	50%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2005	4	34	46	-	-	93
2012	PA-01Y	Main City Area (Was PA-1)	177	55%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2012	5	37	51	-	-	85
2017	PA-01Y	Main City Area (Was PA-1)	177	60%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2017	5	40	56	-	-	76
2022	PA-01Y	Main City Area (Was PA-1)	177	65%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2022	5	44	60	-	-	68
2027	PA-01Y	Main City Area (Was PA-1)	177	75%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2027	6	51	69	-	-	51
2032	PA-01Y	Main City Area (Was PA-1)	177	80%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2032	7	54	74	-	-	43
2005	PA-01Z1	Main City Area (Was PA-1)	306	25%	10%	90%	5%	--	5%	--	100%	2.00	12.0	2005	7	0	-	0	-	298
2012	PA-01Z1	Main City Area (Was PA-1)	306	30%	15%	90%	5%	--	5%	--	100%	2.00	12.0	2012	12	1	-	1	-	292
2017	PA-01Z1	Main City Area (Was PA-1)	306	35%	20%	90%	5%	--	5%	--	100%	2.00	12.0	2017	19	1	-	1	-	285
2022	PA-01Z1	Main City Area (Was PA-1)	306	40%	25%	90%	5%	--	5%	--	100%	2.00	12.0	2022	28	2	-	2	-	275
2027	PA-01Z1	Main City Area (Was PA-1)	306	45%	30%	90%	5%	--	5%	--	100%	2.00	12.0	2027	37	2	-	2	-	265
2032	PA-01Z1	Main City Area (Was PA-1)	306	50%	35%	90%	5%	--	5%	--	100%	2.00	12.0	2032	48	3	-	3	-	252
2005	PA-01Z2	Main City Area (Was PA-1)	40	65%	0%	100%	--	--	--	--	100%	1.00		2005	-	-	-	-	-	40
2012	PA-01Z2	Main City Area (Was PA-1)	40	70%	0%	100%	--	--	--	--	100%	1.00		2012	-	-	-	-	-	40
2017	PA-01Z2	Main City Area (Was PA-1)	40	75%	0%	100%	--	--	--	--	100%	1.00		2017	-	-	-	-	-	40
2022	PA-01Z2	Main City Area (Was PA-1)	40	80%	0%	100%	--	--	--	--	100%	1.00		2022	-	-	-	-	-	40
2027	PA-01Z2	Main City Area (Was PA-1)	40	85%	0%	100%	--	--	--	--	100%	1.00		2027	-	-	-	-	-	40
2032	PA-01Z2	Main City Area (Was PA-1)	40	90%	0%	100%	--	--	--	--	100%	1.00		2032	-	-	-	-	-	40
2005	PA-02	Main St Cor - Neighborhood Dist	638	15%	95%	--	100%	--	--	--	100%		10.0	2005	-	91	-	-	-	547
2012	PA-02	Main St Cor - Neighborhood Dist	638	35%	96%	--	100%	--	--	--	100%		10.0	2012	-	214	-	-	-	423
2017	PA-02	Main St Cor - Neighborhood Dist	638	45%	97%	--	100%	--	--	--	100%		10.0	2017	-	278	-	-	-	359
2022	PA-02	Main St Cor - Neighborhood Dist	638	55%	98%	--	100%	--	--	--	100%		10.0	2022	-	344	-	-	-	294
2027	PA-02	Main St Cor - Neighborhood Dist	638	65%	99%	--	100%	--	--	--	100%		10.0	2027	-	410	-	-	-	227
2032	PA-02	Main St Cor - Neighborhood Dist	638	70%	100%	--	100%	--	--	--	100%		10.0	2032	-	446	-	-	-	191
2005	PA-03A1	Main St Corridor - Ind District	493	15%	95%	--	--	20%	80%	--	100%			2005	-	-	14	56	-	423
2012	PA-03A1	Main St Corridor - Ind District	493	25%	95%	--	--	20%	80%	--	100%			2012	-	-	23	94	-	376
2017	PA-03A1	Main St Corridor - Ind District	493	30%	95%	--	--	20%	80%	--	100%			2017	-	-	28	112	-	353
2022	PA-03A1	Main St Corridor - Ind District	493	35%	96%	--	--	20%	80%	--	100%			2022	-	-	33	133	-	327
2027	PA-03A1	Main St Corridor - Ind District	493	45%	98%	--	--	20%	80%	--	100%			2027	-	-	43	174	-	276
2032	PA-03A1	Main St Corridor - Ind District	493	50%	100%	--	--	20%	80%	--	100%			2032	-	-	49	197	-	247

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Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Vacant**
2005	874	297	556	151	44	33,705
2012	1,802	746	1,221	406	253	31,199
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2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	**No.**	**Description**	**(acres)**	**Developed**	**Sewered**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Total**	**LDR**	**HDR**	**Offset**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Vacant**
2005	PA-03A2	Main St Corridor - Ind District	20	75%	100%	20%	--	80%	--	--	100%	2.00		2005	3	-	12	-	-	5
2012	PA-03A2	Main St Corridor - Ind District	20	80%	100%	20%	--	80%	--	--	100%	2.00		2012	3	-	13	-	-	4
2017	PA-03A2	Main St Corridor - Ind District	20	85%	100%	20%	--	80%	--	--	100%	2.00		2017	3	-	13	-	-	3
2022	PA-03A2	Main St Corridor - Ind District	20	90%	100%	20%	--	80%	--	--	100%	2.00		2022	4	-	14	-	-	2
2027	PA-03A2	Main St Corridor - Ind District	20	95%	100%	20%	--	80%	--	--	100%	2.00		2027	4	-	15	-	-	1
2032	PA-03A2	Main St Corridor - Ind District	20	100%	100%	20%	--	80%	--	--	100%	2.00		2032	4	-	16	-	-	-
2005	PA-03B	Main St Corridor - Ind District	278	35%	10%	--	20%	--	80%	--	100%		10.0	2005	-	2	-	8	-	268
2012	PA-03B	Main St Corridor - Ind District	278	50%	20%	--	20%	--	80%	--	100%		10.0	2012	-	6	-	22	-	250
2017	PA-03B	Main St Corridor - Ind District	278	70%	40%	--	20%	--	80%	--	100%		10.0	2017	-	16	-	62	-	200
2022	PA-03B	Main St Corridor - Ind District	278	80%	60%	--	20%	--	80%	--	100%		10.0	2022	-	27	-	107	-	145
2027	PA-03B	Main St Corridor - Ind District	278	90%	80%	--	20%	--	80%	--	100%		10.0	2027	-	40	-	160	-	78
2032	PA-03B	Main St Corridor - Ind District	278	100%	100%	--	20%	--	80%	--	100%		10.0	2032	-	56	-	222	-	-
2005	PA-03C	Main St Corridor - Ind District	230	10%	90%	--	--	10%	90%	--	100%			2005	-	-	2	19	-	210
2012	PA-03C	Main St Corridor - Ind District	230	25%	92%	--	--	10%	90%	--	100%			2012	-	-	5	48	-	177
2017	PA-03C	Main St Corridor - Ind District	230	30%	94%	--	--	10%	90%	--	100%			2017	-	-	6	58	-	165
2022	PA-03C	Main St Corridor - Ind District	230	35%	96%	--	--	10%	90%	--	100%			2022	-	-	8	70	-	153
2027	PA-03C	Main St Corridor - Ind District	230	45%	98%	--	--	10%	90%	--	100%			2027	-	-	10	91	-	129
2032	PA-03C	Main St Corridor - Ind District	230	50%	100%	--	--	10%	90%	--	100%			2032	-	-	12	104	-	115
2005	PA-03D	Main St Corridor - Ind District	173	5%	20%	--	--	15%	85%	--	100%			2005	-	-	0	1	-	171
2012	PA-03D	Main St Corridor - Ind District	173	15%	50%	--	--	15%	85%	--	100%			2012	-	-	2	11	-	160
2017	PA-03D	Main St Corridor - Ind District	173	25%	60%	--	--	15%	85%	--	100%			2017	-	-	4	22	-	147
2022	PA-03D	Main St Corridor - Ind District	173	35%	70%	--	--	15%	85%	--	100%			2022	-	-	6	36	-	131
2027	PA-03D	Main St Corridor - Ind District	173	50%	80%	--	--	15%	85%	--	100%			2027	-	-	10	59	-	104
2032	PA-03D	Main St Corridor - Ind District	173	55%	100%	--	--	15%	85%	--	100%			2032	-	-	14	81	-	78
2005	PA-03E	Main St Corridor - Ind District	180	70%	90%	--	--	100%	--	--	100%			2005	-	-	114	-	-	67
2012	PA-03E	Main St Corridor - Ind District	180	80%	92%	--	--	100%	--	--	100%			2012	-	-	133	-	-	48
2017	PA-03E	Main St Corridor - Ind District	180	85%	94%	--	--	100%	--	--	100%			2017	-	-	144	-	-	36
2022	PA-03E	Main St Corridor - Ind District	180	90%	96%	--	--	100%	--	--	100%			2022	-	-	156	-	-	25
2027	PA-03E	Main St Corridor - Ind District	180	95%	98%	--	--	100%	--	--	100%			2027	-	-	168	-	-	12
2032	PA-03E	Main St Corridor - Ind District	180	98%	100%	--	--	100%	--	--	100%			2032	-	-	177	-	-	4
2005	PA-04A	Industrial District	228	30%	50%	--	--	20%	80%	--	100%			2005	-	-	7	27	-	194
2012	PA-04A	Industrial District	228	40%	60%	--	--	20%	80%	--	100%			2012	-	-	11	44	-	173
2017	PA-04A	Industrial District	228	50%	70%	--	--	20%	80%	--	100%			2017	-	-	16	64	-	148
2022	PA-04A	Industrial District	228	60%	80%	--	--	20%	80%	--	100%			2022	-	-	22	87	-	118
2027	PA-04A	Industrial District	228	65%	90%	--	--	20%	80%	--	100%			2027	-	-	27	107	-	94
2032	PA-04A	Industrial District	228	70%	100%	--	--	20%	80%	--	100%			2032	-	-	32	128	-	68

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Occupancy (SFR)	(people/du):	3.3	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	2.7	HWD (11/16/05 meeting)
Main Area	(sq mi):	36	HWD (9/6/05 meeting)
Population	(2032):	179,000	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	160	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	2,000	Estimated
WDF (Ind)	(gpd/ac):	3,000	Estimated
WWGF (res)	(gpcd):	80	Estimated
WWGF (Comm)	(gpd/ac):	1,000	Estimated
WWGF (Ind)	(gpd/ac):	1,000	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	874	297	556	151	44	33,705
2012	1,802	746	1,221	406	253	31,199
2017	2,306	1,148	2,128	710	554	28,783
2022	2,723	1,411	2,737	1,033	833	26,890
2027	3,111	1,612	3,138	1,334	1,031	25,402
2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	No.	Description	(acres)	Developed	Sewered	LDR	HDR	COMM	IND	OS	Total	LDR	HDR	Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	PA-04B	Industrial District	500	20%	5%	--	--	--	100%	--	100%			2005	-	-	-	5	-	495
2012	PA-04B	Industrial District	500	35%	10%	--	--	--	100%	--	100%			2012	-	-	-	18	-	483
2017	PA-04B	Industrial District	500	50%	20%	--	--	--	100%	--	100%			2017	-	-	-	50	-	450
2022	PA-04B	Industrial District	500	60%	30%	--	--	--	100%	--	100%			2022	-	-	-	90	-	410
2027	PA-04B	Industrial District	500	65%	40%	--	--	--	100%	--	100%			2027	-	-	-	130	-	370
2032	PA-04B	Industrial District	500	70%	50%	--	--	--	100%	--	100%			2032	-	-	-	175	-	325
2005	PA-05A	Main St Cor - City Center Dist	83	50%	50%	--	85%	15%	--	--	100%		8.0	2005	-	18	3	-	-	62
2012	PA-05A	Main St Cor - City Center Dist	83	60%	60%	--	85%	15%	--	--	100%		8.0	2012	-	25	4	-	-	53
2017	PA-05A	Main St Cor - City Center Dist	83	65%	70%	--	85%	15%	--	--	100%		8.0	2017	-	32	6	-	-	45
2022	PA-05A	Main St Cor - City Center Dist	83	70%	80%	--	85%	15%	--	--	100%		8.0	2022	-	39	7	-	-	36
2027	PA-05A	Main St Cor - City Center Dist	83	75%	90%	--	85%	15%	--	--	100%		8.0	2027	-	47	8	-	-	27
2032	PA-05A	Main St Cor - City Center Dist	83	80%	100%	--	85%	15%	--	--	100%		8.0	2032	-	56	10	-	-	17
2005	PA-05B	Main St Cor - City Center Dist	195	65%	0%	--	100%	--	--	--	100%		8.0	2005	-	-	-	-	-	195
2012	PA-05B	Main St Cor - City Center Dist	195	70%	50%	--	100%	--	--	--	100%		8.0	2012	-	68	-	-	-	127
2017	PA-05B	Main St Cor - City Center Dist	195	75%	100%	--	100%	--	--	--	100%		8.0	2017	-	146	-	-	-	49
2022	PA-05B	Main St Cor - City Center Dist	195	80%	100%	--	100%	--	--	--	100%		8.0	2022	-	156	-	-	-	39
2027	PA-05B	Main St Cor - City Center Dist	195	85%	100%	--	100%	--	--	--	100%		8.0	2027	-	165	-	-	-	29
2032	PA-05B	Main St Cor - City Center Dist	195	90%	100%	--	100%	--	--	--	100%		8.0	2032	-	175	-	-	-	19
2005	PA-05C	Main St Cor - City Center Dist	189	80%	80%	--	55%	45%	--	--	100%		8.0	2005	-	67	54	-	-	68
2012	PA-05C	Main St Cor - City Center Dist	189	85%	85%	--	55%	45%	--	--	100%		8.0	2012	-	75	62	-	-	53
2017	PA-05C	Main St Cor - City Center Dist	189	90%	90%	--	55%	45%	--	--	100%		8.0	2017	-	84	69	-	-	36
2022	PA-05C	Main St Cor - City Center Dist	189	95%	95%	--	55%	45%	--	--	100%		8.0	2022	-	94	77	-	-	18
2027	PA-05C	Main St Cor - City Center Dist	189	100%	95%	--	55%	45%	--	--	100%		8.0	2027	-	99	81	-	-	9
2032	PA-05C	Main St Cor - City Center Dist	189	100%	95%	--	55%	45%	--	--	100%		8.0	2032	-	99	81	-	-	9
2005	PA-06A	Planning Area 6	1,201	45%	0%	75%	--	--	--	25%	100%	1.20		2005	-	-	-	-	-	1,201
2012	PA-06A	Planning Area 6	1,201	55%	0%	75%	--	--	--	25%	100%	1.20		2012	-	-	-	-	-	1,201
2017	PA-06A	Planning Area 6	1,201	58%	0%	75%	--	--	--	25%	100%	1.20		2017	-	-	-	-	-	1,201
2022	PA-06A	Planning Area 6	1,201	65%	0%	75%	--	--	--	25%	100%	1.20		2022	-	-	-	-	-	1,201
2027	PA-06A	Planning Area 6	1,201	75%	0%	75%	--	--	--	25%	100%	1.20		2027	-	-	-	-	-	1,201
2032	PA-06A	Planning Area 6	1,201	80%	0%	75%	--	--	--	25%	100%	1.20		2032	-	-	-	-	-	1,201
2005	PA-06B	Planning Area 6	220	95%	0%	95%	--	--	--	5%	100%	1.80		2005	-	-	-	-	-	220
2012	PA-06B	Planning Area 6	220	98%	0%	95%	--	--	--	5%	100%	1.80		2012	-	-	-	-	-	220
2017	PA-06B	Planning Area 6	220	99%	0%	95%	--	--	--	5%	100%	1.80		2017	-	-	-	-	-	220
2022	PA-06B	Planning Area 6	220	100%	0%	95%	--	--	--	5%	100%	1.80		2022	-	-	-	-	-	220
2027	PA-06B	Planning Area 6	220	100%	0%	95%	--	--	--	5%	100%	1.80		2027	-	-	-	-	-	220
2032	PA-06B	Planning Area 6	220	100%	0%	95%	--	--	--	5%	100%	1.80		2032	-	-	-	-	-	220

Appendix A -1 Projected Sewered Land Use by Planning Year
Development by Planning Area
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Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Vacant**
2005	874	297	556	151	44	33,705
2012	1,802	746	1,221	406	253	31,199
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2022	2,723	1,411	2,737	1,033	833	26,890
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2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	**No.**	**Description**	**(acres)**	**Developed**	**Sewered**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Total**	**LDR**	**HDR**	**Offset**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Vacant**
2005	PA-06C	Planning Area 6	897	25%	0%	65%	--	2%	3%	30%	100%	1.50		2005	-	-	-	-	-	897
2012	PA-06C	Planning Area 6	897	35%	0%	65%	--	2%	3%	30%	100%	1.50		2012	-	-	-	-	-	897
2017	PA-06C	Planning Area 6	897	45%	0%	65%	--	2%	3%	30%	100%	1.50		2017	-	-	-	-	-	897
2022	PA-06C	Planning Area 6	897	50%	0%	65%	--	2%	3%	30%	100%	1.50		2022	-	-	-	-	-	897
2027	PA-06C	Planning Area 6	897	55%	0%	65%	--	2%	3%	30%	100%	1.50		2027	-	-	-	-	-	897
2032	PA-06C	Planning Area 6	897	60%	0%	65%	--	2%	3%	30%	100%	1.50		2032	-	-	-	-	-	897
2005	PA-06D1	Planning Area 6	1,360	5%	0%	65%	--	5%	--	30%	100%	1.20		2005	-	-	-	-	-	1,360
2012	PA-06D1	Planning Area 6	1,360	25%	10%	65%	--	5%	--	30%	100%	1.20		2012	22	-	2	-	10	1,326
2017	PA-06D1	Planning Area 6	1,360	35%	20%	65%	--	5%	--	30%	100%	1.20		2017	62	-	5	-	29	1,265
2022	PA-06D1	Planning Area 6	1,360	45%	25%	65%	--	5%	--	30%	100%	1.20		2022	99	-	8	-	46	1,207
2027	PA-06D1	Planning Area 6	1,360	55%	30%	65%	--	5%	--	30%	100%	1.20		2027	146	-	11	-	67	1,136
2032	PA-06D1	Planning Area 6	1,360	60%	40%	65%	--	5%	--	30%	100%	1.20		2032	212	-	16	-	98	1,034
2005	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2005	50	-	-	-	-	-
2012	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2012	50	-	-	-	-	-
2017	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2017	50	-	-	-	-	-
2022	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2022	50	-	-	-	-	-
2027	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2027	50	-	-	-	-	-
2032	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2032	50	-	-	-	-	-
2005	PA-06E	Planning Area 6	483	0%	0%	50%	--	--	--	50%	100%	1.00		2005	-	-	-	-	-	483
2012	PA-06E	Planning Area 6	483	0%	0%	50%	--	--	--	50%	100%	1.00		2012	-	-	-	-	-	483
2017	PA-06E	Planning Area 6	483	0%	0%	50%	--	--	--	50%	100%	1.00		2017	-	-	-	-	-	483
2022	PA-06E	Planning Area 6	483	20%	100%	50%	--	--	--	50%	100%	1.00		2022	48	-	-	-	48	386
2027	PA-06E	Planning Area 6	483	30%	100%	50%	--	--	--	50%	100%	1.00		2027	72	-	-	-	72	338
2032	PA-06E	Planning Area 6	483	35%	100%	50%	--	--	--	50%	100%	1.00		2032	84	-	-	-	84	314
2005	PA-07	Planning Area 7	490	5%	0%	85%	--	5%	--	10%	100%	1.00		2005	-	-	-	-	-	490
2012	PA-07	Planning Area 7	490	25%	50%	85%	--	5%	--	10%	100%	1.50		2012	52	-	3	-	6	429
2017	PA-07	Planning Area 7	490	45%	55%	85%	--	5%	--	10%	100%	2.00		2017	103	-	6	-	12	369
2022	PA-07	Planning Area 7	490	55%	60%	85%	--	5%	--	10%	100%	2.50		2022	138	-	8	-	16	329
2027	PA-07	Planning Area 7	490	65%	65%	85%	--	5%	--	10%	100%	2.50		2027	176	-	10	-	21	283
2032	PA-07	Planning Area 7	490	70%	70%	85%	--	5%	--	10%	100%	2.50		2032	204	-	12	-	24	250
2005	PA-08A	Planning Area 8	384	50%	20%	80%	5%	10%	--	5%	100%	3.00	15.0	2005	31	2	4	-	2	346
2012	PA-08A	Planning Area 8	384	60%	60%	65%	10%	20%	--	5%	100%	3.00	15.0	2012	90	14	28	-	7	246
2017	PA-08A	Planning Area 8	384	70%	70%	65%	10%	20%	--	5%	100%	3.00	15.0	2017	122	19	38	-	9	196
2022	PA-08A	Planning Area 8	384	80%	75%	65%	10%	20%	--	5%	100%	3.00	15.0	2022	150	23	46	-	12	154
2027	PA-08A	Planning Area 8	384	90%	75%	65%	10%	20%	--	5%	100%	3.00	15.0	2027	169	26	52	-	13	125
2032	PA-08A	Planning Area 8	384	95%	75%	65%	10%	20%	--	5%	100%	3.00	15.0	2032	178	27	55	-	14	110

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Water Master Plan Update
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Occupancy (SFR)	(people/du):	3.3	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	2.7	HWD (11/16/05 meeting)
Main Area	(sq mi):	36	HWD (9/6/05 meeting)
Population	(2032):	179,000	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	160	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	2,000	Estimated
WDF (Ind)	(gpd/ac):	3,000	Estimated
WWGF (res)	(gpcd):	80	Estimated
WWGF (Comm)	(gpd/ac):	1,000	Estimated
WWGF (Ind)	(gpd/ac):	1,000	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	874	297	556	151	44	33,705
2012	1,802	746	1,221	406	253	31,199
2017	2,306	1,148	2,128	710	554	28,783
2022	2,723	1,411	2,737	1,033	833	26,890
2027	3,111	1,612	3,138	1,334	1,031	25,402
2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	No.	Description	(acres)	Developed	Sewered	LDR	HDR	COMM	IND	OS	Total	LDR	HDR	Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	PA-08B1	Planning Area 8	537	29%	100%	80%	--	10%	--	10%	100%	3.20		2005	124	-	16	-	16	381
2012	PA-08B1	Planning Area 8	537	55%	100%	80%	--	10%	--	10%	100%	3.20		2012	236	-	30	-	30	241
2017	PA-08B1	Planning Area 8	537	70%	100%	80%	--	10%	--	10%	100%	3.20		2017	300	-	38	-	38	161
2022	PA-08B1	Planning Area 8	537	80%	100%	80%	--	10%	--	10%	100%	3.20		2022	343	-	43	-	43	107
2027	PA-08B1	Planning Area 8	537	90%	100%	80%	--	10%	--	10%	100%	3.20		2027	386	-	48	-	48	54
2032	PA-08B1	Planning Area 8	537	95%	100%	80%	--	10%	--	10%	100%	3.20		2032	408	-	51	-	51	27
2005	PA-08B2	Planning Area 8	138	20%	100%	80%	--	10%	--	10%	100%	3.20		2005	22	-	3	-	3	111
2012	PA-08B2	Planning Area 8	138	55%	100%	80%	--	10%	--	10%	100%	4.00		2012	61	-	8	-	8	62
2017	PA-08B2	Planning Area 8	138	70%	100%	80%	--	10%	--	10%	100%	4.00		2017	77	-	10	-	10	41
2022	PA-08B2	Planning Area 8	138	80%	100%	80%	--	10%	--	10%	100%	4.00		2022	88	-	11	-	11	28
2027	PA-08B2	Planning Area 8	138	90%	100%	80%	--	10%	--	10%	100%	4.00		2027	99	-	12	-	12	14
2032	PA-08B2	Planning Area 8	138	95%	100%	80%	--	10%	--	10%	100%	4.00		2032	105	-	13	-	13	7
2005	PA-08B3	Planning Area 8	188	20%	100%	75%	--	10%	--	15%	100%	4.00		2005	28	-	4	-	6	150
2012	PA-08B3	Planning Area 8	188	55%	100%	80%	--	10%	--	10%	100%	4.00		2012	83	-	10	-	10	84
2017	PA-08B3	Planning Area 8	188	70%	100%	80%	--	10%	--	10%	100%	4.00		2017	105	-	13	-	13	56
2022	PA-08B3	Planning Area 8	188	80%	100%	80%	--	10%	--	10%	100%	4.00		2022	120	-	15	-	15	38
2027	PA-08B3	Planning Area 8	188	90%	100%	80%	--	10%	--	10%	100%	4.00		2027	135	-	17	-	17	19
2032	PA-08B3	Planning Area 8	188	95%	100%	80%	--	10%	--	10%	100%	4.00		2032	143	-	18	-	18	9
2005	PA-08C	Planning Area 8	92	50%	100%	90%	--	5%	--	5%	100%	4.20		2005	41	-	2	-	2	46
2012	PA-08C	Planning Area 8	92	75%	100%	90%	--	5%	--	5%	100%	4.20		2012	62	-	3	-	3	23
2017	PA-08C	Planning Area 8	92	80%	100%	90%	--	5%	--	5%	100%	4.20		2017	66	-	4	-	4	18
2022	PA-08C	Planning Area 8	92	85%	100%	90%	--	5%	--	5%	100%	4.20		2022	70	-	4	-	4	14
2027	PA-08C	Planning Area 8	92	90%	100%	90%	--	5%	--	5%	100%	4.20		2027	74	-	4	-	4	9
2032	PA-08C	Planning Area 8	92	95%	100%	90%	--	5%	--	5%	100%	4.20		2032	79	-	4	-	4	5
2005	PA-08D	Planning Area 8	491	37%	100%	100%	--	--	--	--	100%	4.20		2005	182	-	-	-	-	309
2012	PA-08D	Planning Area 8	491	75%	100%	100%	--	--	--	--	100%	4.20		2012	368	-	-	-	-	123
2017	PA-08D	Planning Area 8	491	85%	100%	100%	--	--	--	--	100%	4.20		2017	417	-	-	-	-	74
2022	PA-08D	Planning Area 8	491	95%	100%	100%	--	--	--	--	100%	4.20		2022	466	-	-	-	-	25
2027	PA-08D	Planning Area 8	491	100%	100%	100%	--	--	--	--	100%	4.20		2027	491	-	-	-	-	-
2032	PA-08D	Planning Area 8	491	100%	100%	100%	--	--	--	--	100%	4.20		2032	491	-	-	-	-	-
2005	PA-08E	Planning Area 8	143	25%	100%	100%	--	--	--	--	100%	3.20		2005	36	-	-	-	-	107
2012	PA-08E	Planning Area 8	143	55%	100%	100%	--	--	--	--	100%	3.20		2012	78	-	-	-	-	64
2017	PA-08E	Planning Area 8	143	65%	100%	100%	--	--	--	--	100%	3.20		2017	93	-	-	-	-	50
2022	PA-08E	Planning Area 8	143	75%	100%	100%	--	--	--	--	100%	3.20		2022	107	-	-	-	-	36
2027	PA-08E	Planning Area 8	143	85%	100%	100%	--	--	--	--	100%	3.20		2027	121	-	-	-	-	21
2032	PA-08E	Planning Area 8	143	90%	100%	100%	--	--	--	--	100%	3.20		2032	128	-	-	-	-	14

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WWGF (Comm)	(gpd/ac):	1,000	Estimated
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2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	No.	Description	(acres)	Developed	Sewered	LDR	HDR	COMM	IND	OS	Total	LDR	HDR	Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	PA-08F	Planning Area 8	160	60%	100%	95%	--	--	--	5%	100%	3.20		2005	91	-	-	-	5	64
2012	PA-08F	Planning Area 8	160	80%	100%	95%	--	--	--	5%	100%	3.20		2012	122	-	-	-	6	32
2017	PA-08F	Planning Area 8	160	95%	100%	95%	--	--	--	5%	100%	3.20		2017	144	-	-	-	8	8
2022	PA-08F	Planning Area 8	160	100%	100%	95%	--	--	--	5%	100%	3.20		2022	152	-	-	-	8	-
2027	PA-08F	Planning Area 8	160	100%	100%	95%	--	--	--	5%	100%	3.20		2027	152	-	-	-	8	-
2032	PA-08F	Planning Area 8	160	100%	100%	95%	--	--	--	5%	100%	3.20		2032	152	-	-	-	8	-
2005	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2005	65	-	-	-	-	-
2012	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2012	65	-	-	-	-	-
2017	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2017	65	-	-	-	-	-
2022	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2022	65	-	-	-	-	-
2027	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2027	65	-	-	-	-	-
2032	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2032	65	-	-	-	-	-
2005	PA-09A	Frwy Corridor - North Dist - Res	342	0%	0%	80%	--	20%	--	--	100%	5.20		2005	-	-	-	-	-	342
2012	PA-09A	Frwy Corridor - North Dist - Res	342	50%	100%	80%	--	20%	--	--	100%	5.20		2012	137	-	34	-	-	171
2017	PA-09A	Frwy Corridor - North Dist - Res	342	60%	100%	80%	--	20%	--	--	100%	5.20		2017	164	-	41	-	-	137
2022	PA-09A	Frwy Corridor - North Dist - Res	342	70%	100%	80%	--	20%	--	--	100%	5.20		2022	192	-	48	-	-	103
2027	PA-09A	Frwy Corridor - North Dist - Res	342	80%	100%	80%	--	20%	--	--	100%	5.20		2027	219	-	55	-	-	68
2032	PA-09A	Frwy Corridor - North Dist - Res	342	85%	100%	80%	--	20%	--	--	100%	5.20		2032	233	-	58	-	-	51
2005	PA-09B	Frwy Corridor - North Dist - Res	445	40%	40%	100%	--	--	--	--	100%	3.20		2005	71	-	-	-	-	374
2012	PA-09B	Frwy Corridor - North Dist - Res	445	50%	75%	100%	--	--	--	--	100%	5.20		2012	167	-	-	-	-	278
2017	PA-09B	Frwy Corridor - North Dist - Res	445	60%	90%	100%	--	--	--	--	100%	5.20		2017	241	-	-	-	-	205
2022	PA-09B	Frwy Corridor - North Dist - Res	445	70%	90%	100%	--	--	--	--	100%	5.20		2022	281	-	-	-	-	165
2027	PA-09B	Frwy Corridor - North Dist - Res	445	80%	90%	100%	--	--	--	--	100%	5.20		2027	321	-	-	-	-	125
2032	PA-09B	Frwy Corridor - North Dist - Res	445	85%	90%	100%	--	--	--	--	100%	5.20		2032	341	-	-	-	-	105
2005	PA-10A	Frwy Corridor - North Dist	188	0%	100%	--	--	95%	--	5%	100%			2005	-	-	-	-	-	188
2012	PA-10A	Frwy Corridor - North Dist	188	10%	100%	--	--	95%	--	5%	100%			2012	-	-	18	-	1	169
2017	PA-10A	Frwy Corridor - North Dist	188	25%	100%	--	--	95%	--	5%	100%			2017	-	-	45	-	2	141
2022	PA-10A	Frwy Corridor - North Dist	188	75%	100%	--	--	95%	--	5%	100%			2022	-	-	134	-	7	47
2027	PA-10A	Frwy Corridor - North Dist	188	85%	100%	--	--	95%	--	5%	100%			2027	-	-	152	-	8	28
2032	PA-10A	Frwy Corridor - North Dist	188	90%	100%	--	--	95%	--	5%	100%			2032	-	-	161	-	8	19
2005	PA-10B	Frwy Corridor - North Dist	57	0%	0%	--	--	75%	--	25%	100%			2005	-	-	-	-	-	57
2012	PA-10B	Frwy Corridor - North Dist	57	50%	100%	--	--	75%	--	25%	100%			2012	-	-	21	-	7	28
2017	PA-10B	Frwy Corridor - North Dist	57	100%	100%	--	--	75%	--	25%	100%			2017	-	-	42	-	14	-
2022	PA-10B	Frwy Corridor - North Dist	57	100%	100%	--	--	75%	--	25%	100%			2022	-	-	42	-	14	-
2027	PA-10B	Frwy Corridor - North Dist	57	100%	100%	--	--	75%	--	25%	100%			2027	-	-	42	-	14	-
2032	PA-10B	Frwy Corridor - North Dist	57	100%	100%	--	--	75%	--	25%	100%			2032	-	-	42	-	14	-

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Development by Planning Area
Water Master Plan Update
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Main Area	(sq mi):	36	HWD (9/6/05 meeting)
Population	(2032):	179,000	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	160	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	2,000	Estimated
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WWGF (res)	(gpcd):	80	Estimated
WWGF (Comm)	(gpd/ac):	1,000	Estimated
WWGF (Ind)	(gpd/ac):	1,000	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	LDR	HDR	COMM	IND	OS	Vacant
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Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	No.	Description	(acres)	Developed	Sewered	LDR	HDR	COMM	IND	OS	Total	LDR	HDR	Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	PA-11A	Frwy Corridor - Main St Dist	173	0%	100%	--	10%	80%		10%	100%		16.0	2005	-	-	-	-	-	173
2012	PA-11A	Frwy Corridor - Main St Dist	173	50%	100%	--	10%	80%		10%	100%		16.0	2012	-	9	69	-	9	87
2017	PA-11A	Frwy Corridor - Main St Dist	173	100%	100%	--	10%	80%		10%	100%		16.0	2017	-	17	139	-	17	-
2022	PA-11A	Frwy Corridor - Main St Dist	173	100%	100%	--	10%	80%		10%	100%		16.0	2022	-	17	139	-	17	-
2027	PA-11A	Frwy Corridor - Main St Dist	173	100%	100%	--	10%	80%		10%	100%		16.0	2027	-	17	139	-	17	-
2032	PA-11A	Frwy Corridor - Main St Dist	173	100%	100%	--	10%	80%		10%	100%		16.0	2032	-	17	139	-	17	-
2005	PA-11B	Frwy Corridor - Main St Dist	81	5%	100%	--	--	100%		--	100%			2005	-	-	4	-	-	77
2012	PA-11B	Frwy Corridor - Main St Dist	81	50%	100%	--	--	100%		--	100%			2012	-	-	40	-	-	40
2017	PA-11B	Frwy Corridor - Main St Dist	81	100%	100%	--	--	100%		--	100%			2017	-	-	81	-	-	-
2022	PA-11B	Frwy Corridor - Main St Dist	81	100%	100%	--	--	100%		--	100%			2022	-	-	81	-	-	-
2027	PA-11B	Frwy Corridor - Main St Dist	81	100%	100%	--	--	100%		--	100%			2027	-	-	81	-	-	-
2032	PA-11B	Frwy Corridor - Main St Dist	81	100%	100%	--	--	100%		--	100%			2032	-	-	81	-	-	-
2005	PA-11C	Frwy Corridor - Main St Dist	365	5%	100%	--	--	80%		20%	100%			2005	-	-	15	-	4	347
2012	PA-11C	Frwy Corridor - Main St Dist	365	25%	100%	--	--	80%		20%	100%			2012	-	-	73	-	18	274
2017	PA-11C	Frwy Corridor - Main St Dist	365	50%	100%	--	--	80%		20%	100%			2017	-	-	146	-	37	183
2022	PA-11C	Frwy Corridor - Main St Dist	365	75%	100%	--	--	80%		20%	100%			2022	-	-	219	-	55	91
2027	PA-11C	Frwy Corridor - Main St Dist	365	100%	100%	--	--	80%		20%	100%			2027	-	-	292	-	73	-
2032	PA-11C	Frwy Corridor - Main St Dist	365	100%	100%	--	--	80%		20%	100%			2032	-	-	292	-	73	-
2005	PA-11D	Frwy Corridor - Main St Dist	1,778	1%	50%	--	40%	40%		20%	100%		16.0	2005	-	4	4	-	2	1,769
2012	PA-11D	Frwy Corridor - Main St Dist	1,778	25%	100%	--	40%	40%		20%	100%		16.0	2012	-	178	178	-	89	1,334
2017	PA-11D	Frwy Corridor - Main St Dist	1,778	50%	100%	--	40%	40%		20%	100%		16.0	2017	-	356	356	-	178	889
2022	PA-11D	Frwy Corridor - Main St Dist	1,778	69%	100%	--	40%	40%		20%	100%		16.0	2022	-	491	491	-	245	551
2027	PA-11D	Frwy Corridor - Main St Dist	1,778	78%	100%	--	40%	40%		20%	100%		16.0	2027	-	555	555	-	277	391
2032	PA-11D	Frwy Corridor - Main St Dist	1,778	80%	100%	--	40%	40%		20%	100%		16.0	2032	-	569	569	-	285	356
2005	PA-12A	Frwy Corridor - HWY 395	370	2%	0%	10%	--	50%	--	40%	100%	0.50		2005	-	-	-	-	-	370
2012	PA-12A	Frwy Corridor - HWY 395	370	5%	90%	10%	--	50%	--	40%	100%	0.50		2012	2	-	8	-	7	354
2017	PA-12A	Frwy Corridor - HWY 395	370	30%	90%	10%	--	50%	--	40%	100%	0.50		2017	10	-	50	-	40	270
2022	PA-12A	Frwy Corridor - HWY 395	370	50%	90%	10%	--	50%	--	40%	100%	0.50		2022	17	-	83	-	67	204
2027	PA-12A	Frwy Corridor - HWY 395	370	70%	90%	10%	--	50%	--	40%	100%	0.50		2027	23	-	117	-	93	137
2032	PA-12A	Frwy Corridor - HWY 395	370	75%	90%	10%	--	50%	--	40%	100%	0.50		2032	25	-	125	-	100	120
2005	PA-12B	Frwy Corridor - HWY 395	799	5%	100%	--	--	--	85%	15%	100%			2005	-	-	-	34	6	759
2012	PA-12B	Frwy Corridor - HWY 395	799	25%	100%	--	--	--	85%	15%	100%			2012	-	-	-	170	30	599
2017	PA-12B	Frwy Corridor - HWY 395	799	50%	100%	--	--	--	85%	15%	100%			2017	-	-	-	340	60	399
2022	PA-12B	Frwy Corridor - HWY 395	799	75%	100%	--	--	--	85%	15%	100%			2022	-	-	-	509	90	200
2027	PA-12B	Frwy Corridor - HWY 395	799	90%	100%	--	--	--	85%	15%	100%			2027	-	-	-	611	108	80
2032	PA-12B	Frwy Corridor - HWY 395	799	95%	100%	--	--	--	85%	15%	100%			2032	-	-	-	645	114	40

Appendix A -1 Projected Sewered Land Use by Planning Year
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Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Year	Table 3.2 Sewered Land Use Type					
Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	874	297	556	151	44	33,705
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Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	No.	Description	(acres)	Developed	Sewered	LDR	HDR	COMM	IND	OS	Total	LDR	HDR	Offset	LDR	HDR	COMM	IND	OS	Vacant
2005	PA-13A	Frwy Corridor - South Dist - Com	499	2%	0%	--	--	60%		40%	100%			2005	-	-	-	-	-	499
2012	PA-13A	Frwy Corridor - South Dist - Com	499	5%	100%	--	--	60%		40%	100%			2012	-	-	15	-	10	474
2017	PA-13A	Frwy Corridor - South Dist - Com	499	30%	100%	--	--	60%		40%	100%			2017	-	-	90	-	60	349
2022	PA-13A	Frwy Corridor - South Dist - Com	499	50%	100%	--	--	60%		40%	100%			2022	-	-	150	-	100	249
2027	PA-13A	Frwy Corridor - South Dist - Com	499	70%	100%	--	--	60%		40%	100%			2027	-	-	209	-	140	150
2032	PA-13A	Frwy Corridor - South Dist - Com	499	75%	100%	--	--	60%		40%	100%			2032	-	-	224	-	150	125
2005	PA-13B	Frwy Corridor - South Dist - Com	439	2%	0%	--	--	90%		10%	100%			2005	-	-	-	-	-	439
2012	PA-13B	Frwy Corridor - South Dist - Com	439	5%	100%	--	--	90%		10%	100%			2012	-	-	20	-	2	417
2017	PA-13B	Frwy Corridor - South Dist - Com	439	50%	100%	--	--	90%		10%	100%			2017	-	-	197	-	22	219
2022	PA-13B	Frwy Corridor - South Dist - Com	439	75%	100%	--	--	90%		10%	100%			2022	-	-	296	-	33	110
2027	PA-13B	Frwy Corridor - South Dist - Com	439	80%	100%	--	--	90%		10%	100%			2027	-	-	316	-	35	88
2032	PA-13B	Frwy Corridor - South Dist - Com	439	85%	100%	--	--	90%		10%	100%			2032	-	-	336	-	37	66
2005	PA-14A	Frwy Corridor - South Dist - Res	88	50%	0%	95%	--	--	--	5%	100%	0.40		2005	-	-	-	-	-	88
2012	PA-14A	Frwy Corridor - South Dist - Res	88	100%	0%	95%	--	--	--	5%	100%	0.40		2012	-	-	-	-	-	88
2017	PA-14A	Frwy Corridor - South Dist - Res	88	100%	0%	95%	--	--	--	5%	100%	0.40		2017	-	-	-	-	-	88
2022	PA-14A	Frwy Corridor - South Dist - Res	88	100%	0%	95%	--	--	--	5%	100%	0.40		2022	-	-	-	-	-	88
2027	PA-14A	Frwy Corridor - South Dist - Res	88	100%	0%	95%	--	--	--	5%	100%	0.40		2027	-	-	-	-	-	88
2032	PA-14A	Frwy Corridor - South Dist - Res	88	100%	0%	95%	--	--	--	5%	100%	0.40		2032	-	-	-	-	-	88
2005	PA-14B	Frwy Corridor - South Dist - Res	261	0%	0%	90%	--	--	--	10%	100%	0.40		2005	-	-	-	-	-	261
2012	PA-14B	Frwy Corridor - South Dist - Res	261	10%	0%	90%	--	--	--	10%	100%	0.40		2012	-	-	-	-	-	261
2017	PA-14B	Frwy Corridor - South Dist - Res	261	20%	0%	90%	--	--	--	10%	100%	0.40		2017	-	-	-	-	-	261
2022	PA-14B	Frwy Corridor - South Dist - Res	261	30%	0%	90%	--	--	--	10%	100%	0.40		2022	-	-	-	-	-	261
2027	PA-14B	Frwy Corridor - South Dist - Res	261	50%	0%	90%	--	--	--	10%	100%	0.40		2027	-	-	-	-	-	261
2032	PA-14B	Frwy Corridor - South Dist - Res	261	70%	0%	90%	--	--	--	10%	100%	0.40		2032	-	-	-	-	-	261
2005	PA-14C	Frwy Corridor - South Dist - Res	31	0%	0%	--	--	95%	--	5%	100%			2005	-	-	-	-	-	31
2012	PA-14C	Frwy Corridor - South Dist - Res	31	0%	0%	--	--	95%	--	5%	100%			2012	-	-	-	-	-	31
2017	PA-14C	Frwy Corridor - South Dist - Res	31	100%	100%	--	--	95%	--	5%	100%			2017	-	-	29	-	2	-
2022	PA-14C	Frwy Corridor - South Dist - Res	31	100%	100%	--	--	95%	--	5%	100%			2022	-	-	29	-	2	-
2027	PA-14C	Frwy Corridor - South Dist - Res	31	100%	100%	--	--	95%	--	5%	100%			2027	-	-	29	-	2	-
2032	PA-14C	Frwy Corridor - South Dist - Res	31	100%	100%	--	--	95%	--	5%	100%			2032	-	-	29	-	2	-
2005	PA-14D	Frwy Corridor - South Dist - Res	13	0%	0%	--	--	95%	--	5%	100%			2005	-	-	-	-	-	13
2012	PA-14D	Frwy Corridor - South Dist - Res	13	0%	0%	--	--	95%	--	5%	100%			2012	-	-	-	-	-	13
2017	PA-14D	Frwy Corridor - South Dist - Res	13	100%	100%	--	--	95%	--	5%	100%			2017	-	-	12	-	1	-
2022	PA-14D	Frwy Corridor - South Dist - Res	13	100%	100%	--	--	95%	--	5%	100%			2022	-	-	12	-	1	-
2027	PA-14D	Frwy Corridor - South Dist - Res	13	100%	100%	--	--	95%	--	5%	100%			2027	-	-	12	-	1	-
2032	PA-14D	Frwy Corridor - South Dist - Res	13	100%	100%	--	--	95%	--	5%	100%			2032	-	-	12	-	1	-

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WWGF (res)	(gpcd):	**80**	Estimated
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2032	3,382	1,721	3,301	1,555	1,115	24,553

Planning	Planning Area		Area	Percent	Percent	Land Use Type						Density (du/ac)		Year	Sewered Land Use Type (ac)					
Year	**No.**	**Description**	**(acres)**	**Developed**	**Sewered**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Total**	**LDR**	**HDR**	**Offset**	**LDR**	**HDR**	**COMM**	**IND**	**OS**	**Vacant**
2005	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	0%	0%	100%	--	--	--	--	100%	1.63		2005	-	-	-	-	-	10,868
2012	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	35%	100%	100%	--	--	--	--	100%	1.63		2012	3,804	-	-	-	-	7,065
2017	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	70%	100%	100%	--	--	--	--	100%	1.63		2017	7,608	-	-	-	-	3,261
2022	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	95%	100%	100%	--	--	--	--	100%	1.63		2022	10,325	-	-	-	-	543
2027	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	95%	100%	100%	--	--	--	--	100%	1.63		2027	10,325	-	-	-	-	543
2032	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	100%	100%	100%	--	--	--	--	100%	1.63		2032	10,868	-	-	-	-	-
2005	PA-16	North Summit Valley (NSV)	3,052	0%	0%	100%	--	--	--	--	100%	1.62		2005	-	-	-	-	-	3,052
2012	PA-16	North Summit Valley (NSV)	3,052	0%	0%	100%	--	--	--	--	100%	1.62		2012	-	-	-	-	-	3,052
2017	PA-16	North Summit Valley (NSV)	3,052	35%	100%	100%	--	--	--	--	100%	1.62		2017	1,068	-	-	-	-	1,984
2022	PA-16	North Summit Valley (NSV)	3,052	70%	100%	100%	--	--	--	--	100%	1.62		2022	2,136	-	-	-	-	915
2027	PA-16	North Summit Valley (NSV)	3,052	95%	100%	100%	--	--	--	--	100%	1.62		2027	2,899	-	-	-	-	153
2032	PA-16	North Summit Valley (NSV)	3,052	95%	100%	100%	--	--	--	--	100%	1.62		2032	2,899	-	-	-	-	153

APPENDIX A-2

PROJECTED WASTEWATER CUSTOMERS

Appendix A-2 Projected Wastewater Customers Development by Planning Area

Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	3.3	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	2.7	HWD (11/16/05 meeting)
Main Area	(sq mi):	36	HWD (9/6/05 meeting)
Population	(2032):	179,000	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	160	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	2,000	Estimated
WDF (Ind)	(gpd/ac):	3,000	Estimated
WWGF (res)	(gpcd):	80	Estimated
WWGF (Comm)	(gpd/ac):	1,000	Estimated
WWGF (Ind)	(gpd/ac):	1,000	Estimated

Table 3.3 Projected Wastewater Customers

Year Offset	LDR (du)	HDR (du)
2005	2,766	2,908
2012	6,367	8,464
2017	7,996	13,519
2022	9,290	16,969
2027	10,415	19,381
2032	11,081	20,579

Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-01A	Main City Area (Was PA-1)	360	75%	0%	100%	--	--	--	--	100%	2.00		2005	-	-
2012	PA-01A	Main City Area (Was PA-1)	360	80%	0%	100%	--	--	--	--	100%	2.00		2012	-	-
2017	PA-01A	Main City Area (Was PA-1)	360	85%	0%	100%	--	--	--	--	100%	2.00		2017	-	-
2022	PA-01A	Main City Area (Was PA-1)	360	90%	0%	100%	--	--	--	--	100%	2.00		2022	-	-
2027	PA-01A	Main City Area (Was PA-1)	360	92%	0%	100%	--	--	--	--	100%	2.00		2027	-	-
2032	PA-01A	Main City Area (Was PA-1)	360	95%	0%	100%	--	--	--	--	100%	2.00		2032	-	-
2005	PA-01B1	Main City Area (Was PA-1)	4,036	60%	0%	100%	--	--	--	--	100%	0.80		2005	-	-
2012	PA-01B1	Main City Area (Was PA-1)	4,036	70%	0%	100%	--	--	--	--	100%	0.80		2012	-	-
2017	PA-01B1	Main City Area (Was PA-1)	4,036	75%	0%	100%	--	--	--	--	100%	0.80		2017	-	-
2022	PA-01B1	Main City Area (Was PA-1)	4,036	80%	0%	100%	--	--	--	--	100%	0.80		2022	-	-
2027	PA-01B1	Main City Area (Was PA-1)	4,036	85%	0%	100%	--	--	--	--	100%	0.80		2027	-	-
2032	PA-01B1	Main City Area (Was PA-1)	4,036	90%	0%	100%	--	--	--	--	100%	0.80		2032	-	-
2005	PA-01B2	Main City Area (Was PA-1)	89	90%	100%	--	--	100%	--	--	100%			2005	-	-
2012	PA-01B2	Main City Area (Was PA-1)	89	92%	100%	--	--	100%	--	--	100%			2012	-	-
2017	PA-01B2	Main City Area (Was PA-1)	89	95%	100%	--	--	100%	--	--	100%			2017	-	-
2022	PA-01B2	Main City Area (Was PA-1)	89	98%	100%	--	--	100%	--	--	100%			2022	-	-
2027	PA-01B2	Main City Area (Was PA-1)	89	100%	100%	--	--	100%	--	--	100%			2027	-	-
2032	PA-01B2	Main City Area (Was PA-1)	89	100%	100%	--	--	100%	--	--	100%			2032	-	-
2005	PA-01C	Main City Area (Was PA-1)	496	55%	45%	35%	15%	50%	--	--	100%	2.00	12.0	2005	86	221
2012	PA-01C	Main City Area (Was PA-1)	496	65%	50%	35%	15%	50%	--	--	100%	2.00	12.0	2012	113	291
2017	PA-01C	Main City Area (Was PA-1)	496	68%	55%	35%	15%	50%	--	--	100%	2.00	12.0	2017	130	334
2022	PA-01C	Main City Area (Was PA-1)	496	72%	60%	35%	15%	50%	--	--	100%	2.00	12.0	2022	150	386
2027	PA-01C	Main City Area (Was PA-1)	496	75%	70%	35%	15%	50%	--	--	100%	2.00	12.0	2027	183	469
2032	PA-01C	Main City Area (Was PA-1)	496	80%	80%	35%	15%	50%	--	--	100%	2.00	12.0	2032	222	572
2005	PA-01D	Main City Area (Was PA-1)	238	85%	0%	100%	--	--	--	--	100%	2.00		2005	-	-
2012	PA-01D	Main City Area (Was PA-1)	238	88%	0%	100%	--	--	--	--	100%	2.00		2012	-	-
2017	PA-01D	Main City Area (Was PA-1)	238	90%	0%	100%	--	--	--	--	100%	2.00		2017	-	-
2022	PA-01D	Main City Area (Was PA-1)	238	92%	0%	100%	--	--	--	--	100%	2.00		2022	-	-
2027	PA-01D	Main City Area (Was PA-1)	238	95%	0%	100%	--	--	--	--	100%	2.00		2027	-	-
2032	PA-01D	Main City Area (Was PA-1)	238	98%	0%	100%	--	--	--	--	100%	2.00		2032	-	-
2005	PA-01E	Main City Area (Was PA-1)	100	40%	10%	100%	--	--	--	--	100%	2.00		2005	8	-
2012	PA-01E	Main City Area (Was PA-1)	100	45%	15%	100%	--	--	--	--	100%	2.00		2012	14	-
2017	PA-01E	Main City Area (Was PA-1)	100	50%	20%	100%	--	--	--	--	100%	2.00		2017	20	-
2022	PA-01E	Main City Area (Was PA-1)	100	60%	30%	100%	--	--	--	--	100%	2.00		2022	36	-
2027	PA-01E	Main City Area (Was PA-1)	100	70%	40%	100%	--	--	--	--	100%	2.00		2027	56	-
2032	PA-01E	Main City Area (Was PA-1)	100	80%	50%	100%	--	--	--	--	100%	2.00		2032	80	-

Appendix A-2 Projected Wastewater Customers
Development by Planning Area

Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Table 3.3 Projected Wastewater Customers

Year Offset	LDR (du)	HDR (du)
2005	2,766	2,908
2012	6,367	8,464
2017	7,996	13,519
2022	9,290	16,969
2027	10,415	19,381
2032	11,081	20,579

Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-01F	Main City Area (Was PA-1)	173	50%	0%	100%	--	--	--	--	100%	2.00		2005	-	-
2012	PA-01F	Main City Area (Was PA-1)	173	60%	0%	100%	--	--	--	--	100%	2.00		2012	-	-
2017	PA-01F	Main City Area (Was PA-1)	173	70%	0%	100%	--	--	--	--	100%	2.00		2017	-	-
2022	PA-01F	Main City Area (Was PA-1)	173	75%	0%	100%	--	--	--	--	100%	2.00		2022	-	-
2027	PA-01F	Main City Area (Was PA-1)	173	80%	0%	100%	--	--	--	--	100%	2.00		2027	-	-
2032	PA-01F	Main City Area (Was PA-1)	173	85%	0%	100%	--	--	--	--	100%	2.00		2032	-	-
2005	PA-01G	Main City Area (Was PA-1)	1,736	75%	0%	100%	--	--	--	--	100%	1.50		2005	-	-
2012	PA-01G	Main City Area (Was PA-1)	1,736	85%	0%	100%	--	--	--	--	100%	1.50		2012	-	-
2017	PA-01G	Main City Area (Was PA-1)	1,736	88%	0%	100%	--	--	--	--	100%	1.50		2017	-	-
2022	PA-01G	Main City Area (Was PA-1)	1,736	92%	0%	100%	--	--	--	--	100%	1.50		2022	-	-
2027	PA-01G	Main City Area (Was PA-1)	1,736	95%	0%	100%	--	--	--	--	100%	1.50		2027	-	-
2032	PA-01G	Main City Area (Was PA-1)	1,736	100%	0%	100%	--	--	--	--	100%	1.50		2032	-	-
2005	PA-01H	Main City Area (Was PA-1)	106	60%	37%	5%	--	95%	--	--	100%	2.00		2005	2	-
2012	PA-01H	Main City Area (Was PA-1)	106	80%	75%	5%	--	95%	--	--	100%	2.00		2012	6	-
2017	PA-01H	Main City Area (Was PA-1)	106	85%	100%	5%	--	95%	--	--	100%	2.00		2017	9	-
2022	PA-01H	Main City Area (Was PA-1)	106	90%	100%	5%	--	95%	--	--	100%	2.00		2022	10	-
2027	PA-01H	Main City Area (Was PA-1)	106	95%	100%	5%	--	95%	--	--	100%	2.00		2027	10	-
2032	PA-01H	Main City Area (Was PA-1)	106	100%	100%	5%	--	95%	--	--	100%	2.00		2032	11	-
2005	PA-01I1	Main City Area (Was PA-1)	52	75%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2005	16	187
2012	PA-01I1	Main City Area (Was PA-1)	52	85%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2012	18	212
2017	PA-01I1	Main City Area (Was PA-1)	52	90%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2017	19	225
2022	PA-01I1	Main City Area (Was PA-1)	52	92%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2022	19	230
2027	PA-01I1	Main City Area (Was PA-1)	52	95%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2027	20	237
2032	PA-01I1	Main City Area (Was PA-1)	52	100%	100%	20%	40%	40%	--	--	100%	2.00	12.0	2032	21	250
2005	PA-01I2	Main City Area (Was PA-1)	98	70%	80%	5%	35%	60%	--	--	100%	2.00	12.0	2005	6	231
2012	PA-01I2	Main City Area (Was PA-1)	98	80%	90%	5%	35%	60%	--	--	100%	2.00	12.0	2012	7	298
2017	PA-01I2	Main City Area (Was PA-1)	98	85%	100%	5%	35%	60%	--	--	100%	2.00	12.0	2017	8	351
2022	PA-01I2	Main City Area (Was PA-1)	98	90%	100%	5%	35%	60%	--	--	100%	2.00	12.0	2022	9	372
2027	PA-01I2	Main City Area (Was PA-1)	98	95%	100%	5%	35%	60%	--	--	100%	2.00	12.0	2027	9	392
2032	PA-01I2	Main City Area (Was PA-1)	98	100%	100%	5%	35%	60%	--	--	100%	2.00	12.0	2032	10	413
2005	PA-01J	Main City Area (Was PA-1)	53	40%	50%	30%	70%	--	--	--	100%	2.00	12.0	2005	7	89
2012	PA-01J	Main City Area (Was PA-1)	53	50%	60%	30%	70%	--	--	--	100%	2.00	12.0	2012	10	134
2017	PA-01J	Main City Area (Was PA-1)	53	60%	70%	30%	70%	--	--	--	100%	2.00	12.0	2017	13	187
2022	PA-01J	Main City Area (Was PA-1)	53	70%	80%	30%	70%	--	--	--	100%	2.00	12.0	2022	18	250
2027	PA-01J	Main City Area (Was PA-1)	53	80%	90%	30%	70%	--	--	--	100%	2.00	12.0	2027	23	320
2032	PA-01J	Main City Area (Was PA-1)	53	85%	100%	30%	70%	--	--	--	100%	2.00	12.0	2032	27	378

Appendix A-2 Projected Wastewater Customers Development by Planning Area

Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
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WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Table 3.3 Projected Wastewater Customers

Year Offset	LDR (du)	HDR (du)
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2017	7,996	13,519
2022	9,290	16,969
2027	10,415	19,381
2032	11,081	20,579

Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-01K	Main City Area (Was PA-1)	1,116	60%	0%	100%	--	--	--	--	100%	1.00		2005	-	-
2012	PA-01K	Main City Area (Was PA-1)	1,116	70%	0%	100%	--	--	--	--	100%	1.00		2012	-	-
2017	PA-01K	Main City Area (Was PA-1)	1,116	72%	0%	100%	--	--	--	--	100%	1.00		2017	-	-
2022	PA-01K	Main City Area (Was PA-1)	1,116	80%	0%	100%	--	--	--	--	100%	1.00		2022	-	-
2027	PA-01K	Main City Area (Was PA-1)	1,116	85%	0%	100%	--	--	--	--	100%	1.00		2027	-	-
2032	PA-01K	Main City Area (Was PA-1)	1,116	90%	0%	100%	--	--	--	--	100%	1.00		2032	-	-
2005	PA-01L	Main City Area (Was PA-1)	162	95%	2%	95%	5%	--	--	--	100%	2.00	12.0	2005	6	2
2012	PA-01L	Main City Area (Was PA-1)	162	96%	2%	95%	5%	--	--	--	100%	2.00	12.0	2012	6	2
2017	PA-01L	Main City Area (Was PA-1)	162	97%	2%	95%	5%	--	--	--	100%	2.00	12.0	2017	6	2
2022	PA-01L	Main City Area (Was PA-1)	162	98%	2%	95%	5%	--	--	--	100%	2.00	12.0	2022	6	2
2027	PA-01L	Main City Area (Was PA-1)	162	99%	2%	95%	5%	--	--	--	100%	2.00	12.0	2027	6	2
2032	PA-01L	Main City Area (Was PA-1)	162	100%	2%	95%	5%	--	--	--	100%	2.00	12.0	2032	6	2
2005	PA-01M1	Main City Area (Was PA-1)	83	40%	75%	10%	10%	80%	--	--	100%	2.00	12.0	2005	5	30
2012	PA-01M1	Main City Area (Was PA-1)	83	60%	85%	10%	10%	80%	--	--	100%	2.00	12.0	2012	9	50
2017	PA-01M1	Main City Area (Was PA-1)	83	80%	95%	10%	10%	80%	--	--	100%	2.00	12.0	2017	12	75
2022	PA-01M1	Main City Area (Was PA-1)	83	90%	100%	10%	10%	80%	--	--	100%	2.00	12.0	2022	15	89
2027	PA-01M1	Main City Area (Was PA-1)	83	100%	100%	10%	10%	80%	--	--	100%	2.00	12.0	2027	17	99
2032	PA-01M1	Main City Area (Was PA-1)	83	100%	100%	10%	10%	80%	--	--	100%	2.00	12.0	2032	17	99
2005	PA-01M2	Main City Area (Was PA-1)	137	25%	10%	30%	--	70%	--	--	100%	2.00		2005	2	-
2012	PA-01M2	Main City Area (Was PA-1)	137	45%	50%	30%	--	70%	--	--	100%	2.00		2012	19	-
2017	PA-01M2	Main City Area (Was PA-1)	137	60%	75%	30%	--	70%	--	--	100%	2.00		2017	37	-
2022	PA-01M2	Main City Area (Was PA-1)	137	70%	85%	30%	--	70%	--	--	100%	2.00		2022	48	-
2027	PA-01M2	Main City Area (Was PA-1)	137	80%	95%	30%	--	70%	--	--	100%	2.00		2027	63	-
2032	PA-01M2	Main City Area (Was PA-1)	137	85%	100%	30%	--	70%	--	--	100%	2.00		2032	70	-
2005	PA-01N	Main City Area (Was PA-1)	5,498	60%	0%	85%	--	--	--	15%	100%	1.50		2005	-	-
2012	PA-01N	Main City Area (Was PA-1)	5,498	75%	0%	85%	--	--	--	15%	100%	1.50		2012	-	-
2017	PA-01N	Main City Area (Was PA-1)	5,498	78%	0%	85%	--	--	--	15%	100%	1.50		2017	-	-
2022	PA-01N	Main City Area (Was PA-1)	5,498	83%	0%	85%	--	--	--	15%	100%	1.50		2022	-	-
2027	PA-01N	Main City Area (Was PA-1)	5,498	85%	0%	85%	--	--	--	15%	100%	1.50		2027	-	-
2032	PA-01N	Main City Area (Was PA-1)	5,498	90%	0%	85%	--	--	--	15%	100%	1.50		2032	-	-
2005	PA-01O	Main City Area (Was PA-1)	369	80%	0%	100%	--	--	--	--	100%	1.00		2005	-	-
2012	PA-01O	Main City Area (Was PA-1)	369	85%	0%	100%	--	--	--	--	100%	1.00		2012	-	-
2017	PA-01O	Main City Area (Was PA-1)	369	90%	0%	100%	--	--	--	--	100%	1.00		2017	-	-
2022	PA-01O	Main City Area (Was PA-1)	369	95%	0%	100%	--	--	--	--	100%	1.00		2022	-	-
2027	PA-01O	Main City Area (Was PA-1)	369	100%	0%	100%	--	--	--	--	100%	1.00		2027	-	-
2032	PA-01O	Main City Area (Was PA-1)	369	100%	0%	100%	--	--	--	--	100%	1.00		2032	-	-

Appendix A-2 Projected Wastewater Customers Development by Planning Area

Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	3.3	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	2.7	HWD (11/16/05 meeting)
Main Area	(sq mi):	36	HWD (9/6/05 meeting)
Population	(2032):	179,000	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	160	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	2,000	Estimated
WDF (Ind)	(gpd/ac):	3,000	Estimated
WWGF (res)	(gpcd):	80	Estimated
WWGF (Comm)	(gpd/ac):	1,000	Estimated
WWGF (Ind)	(gpd/ac):	1,000	Estimated

Table 3.3 Projected Wastewater Customers

Year Offset	LDR (du)	HDR (du)
2005	2,766	2,908
2012	6,367	8,464
2017	7,996	13,519
2022	9,290	16,969
2027	10,415	19,381
2032	11,081	20,579

Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-01P	Main City Area (Was PA-1)	31	90%	75%	20%	--	80%	--	--	100%			2005	-	-
2012	PA-01P	Main City Area (Was PA-1)	31	92%	78%	20%	--	80%	--	--	100%			2012	-	-
2017	PA-01P	Main City Area (Was PA-1)	31	94%	80%	20%	--	80%	--	--	100%			2017	-	-
2022	PA-01P	Main City Area (Was PA-1)	31	96%	83%	20%	--	80%	--	--	100%			2022	-	-
2027	PA-01P	Main City Area (Was PA-1)	31	98%	85%	20%	--	80%	--	--	100%			2027	-	-
2032	PA-01P	Main City Area (Was PA-1)	31	100%	90%	20%	--	80%	--	--	100%			2032	-	-
2005	PA-01Q1	Main City Area (Was PA-1)	247	90%	2%	100%	--	--	--	--	100%	1.50		2005	7	-
2012	PA-01Q1	Main City Area (Was PA-1)	247	92%	2%	100%	--	--	--	--	100%	1.50		2012	7	-
2017	PA-01Q1	Main City Area (Was PA-1)	247	95%	2%	100%	--	--	--	--	100%	1.50		2017	7	-
2022	PA-01Q1	Main City Area (Was PA-1)	247	98%	2%	100%	--	--	--	--	100%	1.50		2022	7	-
2027	PA-01Q1	Main City Area (Was PA-1)	247	100%	2%	100%	--	--	--	--	100%	1.50		2027	7	-
2032	PA-01Q1	Main City Area (Was PA-1)	247	100%	2%	100%	--	--	--	--	100%	1.50		2032	7	-
2005	PA-01Q2	Main City Area (Was PA-1)	23	80%	100%	--	95%	5%	--	--	100%		3.0	2005	-	52
2012	PA-01Q2	Main City Area (Was PA-1)	23	83%	100%	--	95%	5%	--	--	100%		3.0	2012	-	54
2017	PA-01Q2	Main City Area (Was PA-1)	23	86%	100%	--	95%	5%	--	--	100%		3.0	2017	-	56
2022	PA-01Q2	Main City Area (Was PA-1)	23	88%	100%	--	95%	5%	--	--	100%		3.0	2022	-	58
2027	PA-01Q2	Main City Area (Was PA-1)	23	90%	100%	--	95%	5%	--	--	100%		3.0	2027	-	59
2032	PA-01Q2	Main City Area (Was PA-1)	23	92%	100%	--	95%	5%	--	--	100%		3.0	2032	-	60
2005	PA-01R	Main City Area (Was PA-1)	323	90%	0%	100%	--	--	--	--	100%	1.00		2005	-	-
2012	PA-01R	Main City Area (Was PA-1)	323	92%	0%	100%	--	--	--	--	100%	1.00		2012	-	-
2017	PA-01R	Main City Area (Was PA-1)	323	95%	0%	100%	--	--	--	--	100%	1.00		2017	-	-
2022	PA-01R	Main City Area (Was PA-1)	323	95%	0%	100%	--	--	--	--	100%	1.00		2022	-	-
2027	PA-01R	Main City Area (Was PA-1)	323	95%	0%	100%	--	--	--	--	100%	1.00		2027	-	-
2032	PA-01R	Main City Area (Was PA-1)	323	95%	0%	100%	--	--	--	--	100%	1.00		2032	-	-
2005	PA-01S	Main City Area (Was PA-1)	460	70%	0%	95%	--	--	--	5%	100%	1.80		2005	-	-
2012	PA-01S	Main City Area (Was PA-1)	460	80%	0%	95%	--	--	--	5%	100%	1.80		2012	-	-
2017	PA-01S	Main City Area (Was PA-1)	460	85%	0%	95%	--	--	--	5%	100%	1.80		2017	-	-
2022	PA-01S	Main City Area (Was PA-1)	460	90%	0%	95%	--	--	--	5%	100%	1.80		2022	-	-
2027	PA-01S	Main City Area (Was PA-1)	460	95%	0%	95%	--	--	--	5%	100%	1.80		2027	-	-
2032	PA-01S	Main City Area (Was PA-1)	460	100%	0%	95%	--	--	--	5%	100%	1.80		2032	-	-
2005	PA-01T	Main City Area (Was PA-1)	930	75%	0%	95%	--	--	--	5%	100%	1.80		2005	-	-
2012	PA-01T	Main City Area (Was PA-1)	930	85%	0%	95%	--	--	--	5%	100%	1.80		2012	-	-
2017	PA-01T	Main City Area (Was PA-1)	930	88%	0%	95%	--	--	--	5%	100%	1.80		2017	-	-
2022	PA-01T	Main City Area (Was PA-1)	930	92%	0%	95%	--	--	--	5%	100%	1.80		2022	-	-
2027	PA-01T	Main City Area (Was PA-1)	930	94%	0%	95%	--	--	--	5%	100%	1.80		2027	-	-
2032	PA-01T	Main City Area (Was PA-1)	930	95%	0%	95%	--	--	--	5%	100%	1.80		2032	-	-

Appendix A-2 Projected Wastewater Customers Development by Planning Area

Water Master Plan Update
City of Hesperia Water District

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Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Table 3.3 Projected Wastewater Customers

Year Offset	LDR (du)	HDR (du)
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2012	6,367	8,464
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2022	9,290	16,969
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Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-01U1	Main City Area (Was PA-1)	488	80%	0%	100%	--	--	--	--	100%	1.80		2005	-	-
2012	PA-01U1	Main City Area (Was PA-1)	488	83%	0%	100%	--	--	--	--	100%	1.80		2012	-	-
2017	PA-01U1	Main City Area (Was PA-1)	488	86%	0%	100%	--	--	--	--	100%	1.80		2017	-	-
2022	PA-01U1	Main City Area (Was PA-1)	488	90%	0%	100%	--	--	--	--	100%	1.80		2022	-	-
2027	PA-01U1	Main City Area (Was PA-1)	488	95%	0%	100%	--	--	--	--	100%	1.80		2027	-	-
2032	PA-01U1	Main City Area (Was PA-1)	488	100%	0%	100%	--	--	--	--	100%	1.80		2032	-	-
2005	PA-01U2	Main City Area (Was PA-1)	24	0%	0%	100%	--	--	--	--	100%	1.80		2005	-	-
2012	PA-01U2	Main City Area (Was PA-1)	24	50%	0%	100%	--	--	--	--	100%	1.80		2012	-	-
2017	PA-01U2	Main City Area (Was PA-1)	24	50%	0%	100%	--	--	--	--	100%	1.80		2017	-	-
2022	PA-01U2	Main City Area (Was PA-1)	24	75%	0%	100%	--	--	--	--	100%	1.80		2022	-	-
2027	PA-01U2	Main City Area (Was PA-1)	24	85%	0%	100%	--	--	--	--	100%	1.80		2027	-	-
2032	PA-01U2	Main City Area (Was PA-1)	24	90%	0%	100%	--	--	--	--	100%	1.80		2032	-	-
2005	PA-01V	Main City Area (Was PA-1)	69	60%	20%	100%	--	--	--	--	100%	2.00		2005	17	-
2012	PA-01V	Main City Area (Was PA-1)	69	65%	25%	100%	--	--	--	--	100%	2.00		2012	23	-
2017	PA-01V	Main City Area (Was PA-1)	69	70%	30%	100%	--	--	--	--	100%	2.00		2017	29	-
2022	PA-01V	Main City Area (Was PA-1)	69	75%	35%	100%	--	--	--	--	100%	2.00		2022	36	-
2027	PA-01V	Main City Area (Was PA-1)	69	85%	40%	100%	--	--	--	--	100%	2.00		2027	47	-
2032	PA-01V	Main City Area (Was PA-1)	69	90%	50%	100%	--	--	--	--	100%	2.00		2032	63	-
2005	PA-01W	Main City Area (Was PA-1)	91	90%	40%	100%	--	--	--	--	100%	1.50		2005	49	-
2012	PA-01W	Main City Area (Was PA-1)	91	92%	45%	100%	--	--	--	--	100%	1.50		2012	57	-
2017	PA-01W	Main City Area (Was PA-1)	91	94%	50%	100%	--	--	--	--	100%	1.50		2017	65	-
2022	PA-01W	Main City Area (Was PA-1)	91	96%	55%	100%	--	--	--	--	100%	1.50		2022	73	-
2027	PA-01W	Main City Area (Was PA-1)	91	98%	65%	100%	--	--	--	--	100%	1.50		2027	87	-
2032	PA-01W	Main City Area (Was PA-1)	91	100%	75%	100%	--	--	--	--	100%	1.50		2032	103	-
2005	PA-01X1	Main City Area (Was PA-1)	1,019	65%	0%	95%	--	--	--	5%	100%	1.80		2005	-	-
2012	PA-01X1	Main City Area (Was PA-1)	1,019	75%	0%	95%	--	--	--	5%	100%	1.80		2012	-	-
2017	PA-01X1	Main City Area (Was PA-1)	1,019	80%	0%	95%	--	--	--	5%	100%	1.80		2017	-	-
2022	PA-01X1	Main City Area (Was PA-1)	1,019	85%	0%	95%	--	--	--	5%	100%	1.80		2022	-	-
2027	PA-01X1	Main City Area (Was PA-1)	1,019	90%	0%	95%	--	--	--	5%	100%	1.80		2027	-	-
2032	PA-01X1	Main City Area (Was PA-1)	1,019	95%	0%	95%	--	--	--	5%	100%	1.80		2032	-	-
2005	PA-01X2	Main City Area (Was PA-1)	439	50%	0%	60%	40%	--	--	--	100%	1.00	12.0	2005	-	-
2012	PA-01X2	Main City Area (Was PA-1)	439	55%	20%	60%	40%	--	--	--	100%	1.00	12.0	2012	29	232
2017	PA-01X2	Main City Area (Was PA-1)	439	60%	40%	60%	40%	--	--	--	100%	1.00	12.0	2017	63	505
2022	PA-01X2	Main City Area (Was PA-1)	439	65%	40%	60%	40%	--	--	--	100%	1.00	12.0	2022	68	547
2027	PA-01X2	Main City Area (Was PA-1)	439	75%	40%	60%	40%	--	--	--	100%	1.00	12.0	2027	79	632
2032	PA-01X2	Main City Area (Was PA-1)	439	80%	40%	60%	40%	--	--	--	100%	1.00	12.0	2032	84	674

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City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
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WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Table 3.3 Projected Wastewater Customers

Year Offset	LDR (du)	HDR (du)
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2022	9,290	16,969
2027	10,415	19,381
2032	11,081	20,579

Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-01X3	Main City Area (Was PA-1)	23	0%	0%	100%	--	--	--	--	100%	1.80		2005	-	-
2012	PA-01X3	Main City Area (Was PA-1)	23	50%	0%	100%	--	--	--	--	100%	1.80		2012	-	-
2017	PA-01X3	Main City Area (Was PA-1)	23	50%	0%	100%	--	--	--	--	100%	1.80		2017	-	-
2022	PA-01X3	Main City Area (Was PA-1)	23	75%	0%	100%	--	--	--	--	100%	1.80		2022	-	-
2027	PA-01X3	Main City Area (Was PA-1)	23	85%	0%	100%	--	--	--	--	100%	1.80		2027	-	-
2032	PA-01X3	Main City Area (Was PA-1)	23	90%	0%	100%	--	--	--	--	100%	1.80		2032	-	-
2005	PA-01Y	Main City Area (Was PA-1)	177	50%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2005	9	405
2012	PA-01Y	Main City Area (Was PA-1)	177	55%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2012	10	445
2017	PA-01Y	Main City Area (Was PA-1)	177	60%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2017	10	485
2022	PA-01Y	Main City Area (Was PA-1)	177	65%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2022	11	525
2027	PA-01Y	Main City Area (Was PA-1)	177	75%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2027	12	606
2032	PA-01Y	Main City Area (Was PA-1)	177	80%	95%	5%	40%	55%	--	--	100%	2.00	12.0	2032	13	647
2005	PA-01Z1	Main City Area (Was PA-1)	306	25%	10%	90%	5%	--	5%	--	100%	2.00	12.0	2005	14	5
2012	PA-01Z1	Main City Area (Was PA-1)	306	30%	15%	90%	5%	--	5%	--	100%	2.00	12.0	2012	25	8
2017	PA-01Z1	Main City Area (Was PA-1)	306	35%	20%	90%	5%	--	5%	--	100%	2.00	12.0	2017	39	13
2022	PA-01Z1	Main City Area (Was PA-1)	306	40%	25%	90%	5%	--	5%	--	100%	2.00	12.0	2022	55	18
2027	PA-01Z1	Main City Area (Was PA-1)	306	45%	30%	90%	5%	--	5%	--	100%	2.00	12.0	2027	74	25
2032	PA-01Z1	Main City Area (Was PA-1)	306	50%	35%	90%	5%	--	5%	--	100%	2.00	12.0	2032	96	32
2005	PA-01Z2	Main City Area (Was PA-1)	40	65%	0%	100%	--	--	--	--	100%	1.00		2005	-	-
2012	PA-01Z2	Main City Area (Was PA-1)	40	70%	0%	100%	--	--	--	--	100%	1.00		2012	-	-
2017	PA-01Z2	Main City Area (Was PA-1)	40	75%	0%	100%	--	--	--	--	100%	1.00		2017	-	-
2022	PA-01Z2	Main City Area (Was PA-1)	40	80%	0%	100%	--	--	--	--	100%	1.00		2022	-	-
2027	PA-01Z2	Main City Area (Was PA-1)	40	85%	0%	100%	--	--	--	--	100%	1.00		2027	-	-
2032	PA-01Z2	Main City Area (Was PA-1)	40	90%	0%	100%	--	--	--	--	100%	1.00		2032	-	-
2005	PA-02	Main St Cor - Neighborhood Dist	638	15%	95%	--	100%	--	--	--	100%		10.0	2005	-	908
2012	PA-02	Main St Cor - Neighborhood Dist	638	35%	96%	--	100%	--	--	--	100%		10.0	2012	-	2,143
2017	PA-02	Main St Cor - Neighborhood Dist	638	45%	97%	--	100%	--	--	--	100%		10.0	2017	-	2,783
2022	PA-02	Main St Cor - Neighborhood Dist	638	55%	98%	--	100%	--	--	--	100%		10.0	2022	-	3,437
2027	PA-02	Main St Cor - Neighborhood Dist	638	65%	99%	--	100%	--	--	--	100%		10.0	2027	-	4,104
2032	PA-02	Main St Cor - Neighborhood Dist	638	70%	100%	--	100%	--	--	--	100%		10.0	2032	-	4,463
2005	PA-03A1	Main St Corridor - Ind District	493	15%	95%	--	--	20%	80%	--	100%			2005	-	-
2012	PA-03A1	Main St Corridor - Ind District	493	25%	95%	--	--	20%	80%	--	100%			2012	-	-
2017	PA-03A1	Main St Corridor - Ind District	493	30%	95%	--	--	20%	80%	--	100%			2017	-	-
2022	PA-03A1	Main St Corridor - Ind District	493	35%	96%	--	--	20%	80%	--	100%			2022	-	-
2027	PA-03A1	Main St Corridor - Ind District	493	45%	98%	--	--	20%	80%	--	100%			2027	-	-
2032	PA-03A1	Main St Corridor - Ind District	493	50%	100%	--	--	20%	80%	--	100%			2032	-	-

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2005	PA-03A2	Main St Corridor - Ind District	20	75%	100%	20%	--	80%	--	--	100%	2.00		2005	6	-
2012	PA-03A2	Main St Corridor - Ind District	20	80%	100%	20%	--	80%	--	--	100%	2.00		2012	6	-
2017	PA-03A2	Main St Corridor - Ind District	20	85%	100%	20%	--	80%	--	--	100%	2.00		2017	7	-
2022	PA-03A2	Main St Corridor - Ind District	20	90%	100%	20%	--	80%	--	--	100%	2.00		2022	7	-
2027	PA-03A2	Main St Corridor - Ind District	20	95%	100%	20%	--	80%	--	--	100%	2.00		2027	8	-
2032	PA-03A2	Main St Corridor - Ind District	20	100%	100%	20%	--	80%	--	--	100%	2.00		2032	8	-
2005	PA-03B	Main St Corridor - Ind District	278	35%	10%	--	20%	--	80%	--	100%		10.0	2005	-	20
2012	PA-03B	Main St Corridor - Ind District	278	50%	20%	--	20%	--	80%	--	100%		10.0	2012	-	56
2017	PA-03B	Main St Corridor - Ind District	278	70%	40%	--	20%	--	80%	--	100%		10.0	2017	-	156
2022	PA-03B	Main St Corridor - Ind District	278	80%	60%	--	20%	--	80%	--	100%		10.0	2022	-	267
2027	PA-03B	Main St Corridor - Ind District	278	90%	80%	--	20%	--	80%	--	100%		10.0	2027	-	401
2032	PA-03B	Main St Corridor - Ind District	278	100%	100%	--	20%	--	80%	--	100%		10.0	2032	-	556
2005	PA-03C	Main St Corridor - Ind District	230	10%	90%	--	--	10%	90%	--	100%			2005	-	-
2012	PA-03C	Main St Corridor - Ind District	230	25%	92%	--	--	10%	90%	--	100%			2012	-	-
2017	PA-03C	Main St Corridor - Ind District	230	30%	94%	--	--	10%	90%	--	100%			2017	-	-
2022	PA-03C	Main St Corridor - Ind District	230	35%	96%	--	--	10%	90%	--	100%			2022	-	-
2027	PA-03C	Main St Corridor - Ind District	230	45%	98%	--	--	10%	90%	--	100%			2027	-	-
2032	PA-03C	Main St Corridor - Ind District	230	50%	100%	--	--	10%	90%	--	100%			2032	-	-
2005	PA-03D	Main St Corridor - Ind District	173	5%	20%	--	--	15%	85%	--	100%			2005	-	-
2012	PA-03D	Main St Corridor - Ind District	173	15%	50%	--	--	15%	85%	--	100%			2012	-	-
2017	PA-03D	Main St Corridor - Ind District	173	25%	60%	--	--	15%	85%	--	100%			2017	-	-
2022	PA-03D	Main St Corridor - Ind District	173	35%	70%	--	--	15%	85%	--	100%			2022	-	-
2027	PA-03D	Main St Corridor - Ind District	173	50%	80%	--	--	15%	85%	--	100%			2027	-	-
2032	PA-03D	Main St Corridor - Ind District	173	55%	100%	--	--	15%	85%	--	100%			2032	-	-
2005	PA-03E	Main St Corridor - Ind District	180	70%	90%	--	--	100%	--	--	100%			2005	-	-
2012	PA-03E	Main St Corridor - Ind District	180	80%	92%	--	--	100%	--	--	100%			2012	-	-
2017	PA-03E	Main St Corridor - Ind District	180	85%	94%	--	--	100%	--	--	100%			2017	-	-
2022	PA-03E	Main St Corridor - Ind District	180	90%	96%	--	--	100%	--	--	100%			2022	-	-
2027	PA-03E	Main St Corridor - Ind District	180	95%	98%	--	--	100%	--	--	100%			2027	-	-
2032	PA-03E	Main St Corridor - Ind District	180	98%	100%	--	--	100%	--	--	100%			2032	-	-
2005	PA-04A	Industrial District	228	30%	50%	--	--	20%	80%	--	100%			2005	-	-
2012	PA-04A	Industrial District	228	40%	60%	--	--	20%	80%	--	100%			2012	-	-
2017	PA-04A	Industrial District	228	50%	70%	--	--	20%	80%	--	100%			2017	-	-
2022	PA-04A	Industrial District	228	60%	80%	--	--	20%	80%	--	100%			2022	-	-
2027	PA-04A	Industrial District	228	65%	90%	--	--	20%	80%	--	100%			2027	-	-
2032	PA-04A	Industrial District	228	70%	100%	--	--	20%	80%	--	100%			2032	-	-

Appendix A-2 Projected Wastewater Customers Development by Planning Area

Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Table 3.3 Projected Wastewater Customers

Year Offset	LDR (du)	HDR (du)
2005	2,766	2,908
2012	6,367	8,464
2017	7,996	13,519
2022	9,290	16,969
2027	10,415	19,381
2032	11,081	20,579

Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-04B	Industrial District	500	20%	5%	--	--	--	100%	--	100%			2005	-	-
2012	PA-04B	Industrial District	500	35%	10%	--	--	--	100%	--	100%			2012	-	-
2017	PA-04B	Industrial District	500	50%	20%	--	--	--	100%	--	100%			2017	-	-
2022	PA-04B	Industrial District	500	60%	30%	--	--	--	100%	--	100%			2022	-	-
2027	PA-04B	Industrial District	500	65%	40%	--	--	--	100%	--	100%			2027	-	-
2032	PA-04B	Industrial District	500	70%	50%	--	--	--	100%	--	100%			2032	-	-
2005	PA-05A	Main St Cor - City Center Dist	83	50%	50%	--	85%	15%	--	--	100%		8.0	2005	-	141
2012	PA-05A	Main St Cor - City Center Dist	83	60%	60%	--	85%	15%	--	--	100%		8.0	2012	-	202
2017	PA-05A	Main St Cor - City Center Dist	83	65%	70%	--	85%	15%	--	--	100%		8.0	2017	-	256
2022	PA-05A	Main St Cor - City Center Dist	83	70%	80%	--	85%	15%	--	--	100%		8.0	2022	-	314
2027	PA-05A	Main St Cor - City Center Dist	83	75%	90%	--	85%	15%	--	--	100%		8.0	2027	-	379
2032	PA-05A	Main St Cor - City Center Dist	83	80%	100%	--	85%	15%	--	--	100%		8.0	2032	-	449
2005	PA-05B	Main St Cor - City Center Dist	195	65%	0%	--	100%	--	--	--	100%		8.0	2005	-	-
2012	PA-05B	Main St Cor - City Center Dist	195	70%	50%	--	100%	--	--	--	100%		8.0	2012	-	545
2017	PA-05B	Main St Cor - City Center Dist	195	75%	100%	--	100%	--	--	--	100%		8.0	2017	-	1,168
2022	PA-05B	Main St Cor - City Center Dist	195	80%	100%	--	100%	--	--	--	100%		8.0	2022	-	1,246
2027	PA-05B	Main St Cor - City Center Dist	195	85%	100%	--	100%	--	--	--	100%		8.0	2027	-	1,324
2032	PA-05B	Main St Cor - City Center Dist	195	90%	100%	--	100%	--	--	--	100%		8.0	2032	-	1,402
2005	PA-05C	Main St Cor - City Center Dist	189	80%	80%	--	55%	45%	--	--	100%		8.0	2005	-	533
2012	PA-05C	Main St Cor - City Center Dist	189	85%	85%	--	55%	45%	--	--	100%		8.0	2012	-	602
2017	PA-05C	Main St Cor - City Center Dist	189	90%	90%	--	55%	45%	--	--	100%		8.0	2017	-	674
2022	PA-05C	Main St Cor - City Center Dist	189	95%	95%	--	55%	45%	--	--	100%		8.0	2022	-	751
2027	PA-05C	Main St Cor - City Center Dist	189	100%	95%	--	55%	45%	--	--	100%		8.0	2027	-	790
2032	PA-05C	Main St Cor - City Center Dist	189	100%	95%	--	55%	45%	--	--	100%		8.0	2032	-	790
2005	PA-06A	Planning Area 6	1,201	45%	0%	75%	--	--	--	25%	100%	1.20		2005	-	-
2012	PA-06A	Planning Area 6	1,201	55%	0%	75%	--	--	--	25%	100%	1.20		2012	-	-
2017	PA-06A	Planning Area 6	1,201	58%	0%	75%	--	--	--	25%	100%	1.20		2017	-	-
2022	PA-06A	Planning Area 6	1,201	65%	0%	75%	--	--	--	25%	100%	1.20		2022	-	-
2027	PA-06A	Planning Area 6	1,201	75%	0%	75%	--	--	--	25%	100%	1.20		2027	-	-
2032	PA-06A	Planning Area 6	1,201	80%	0%	75%	--	--	--	25%	100%	1.20		2032	-	-
2005	PA-06B	Planning Area 6	220	95%	0%	95%	--	--	--	5%	100%	1.80		2005	-	-
2012	PA-06B	Planning Area 6	220	98%	0%	95%	--	--	--	5%	100%	1.80		2012	-	-
2017	PA-06B	Planning Area 6	220	99%	0%	95%	--	--	--	5%	100%	1.80		2017	-	-
2022	PA-06B	Planning Area 6	220	100%	0%	95%	--	--	--	5%	100%	1.80		2022	-	-
2027	PA-06B	Planning Area 6	220	100%	0%	95%	--	--	--	5%	100%	1.80		2027	-	-
2032	PA-06B	Planning Area 6	220	100%	0%	95%	--	--	--	5%	100%	1.80		2032	-	-

Appendix A-2 Projected Wastewater Customers Development by Planning Area

Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Table 3.3 Projected Wastewater Customers

Year Offset	LDR (du)	HDR (du)
2005	2,766	2,908
2012	6,367	8,464
2017	7,996	13,519
2022	9,290	16,969
2027	10,415	19,381
2032	11,081	20,579

Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-06C	Planning Area 6	897	25%	0%	65%	--	2%	3%	30%	100%	1.50		2005	-	-
2012	PA-06C	Planning Area 6	897	35%	0%	65%	--	2%	3%	30%	100%	1.50		2012	-	-
2017	PA-06C	Planning Area 6	897	45%	0%	65%	--	2%	3%	30%	100%	1.50		2017	-	-
2022	PA-06C	Planning Area 6	897	50%	0%	65%	--	2%	3%	30%	100%	1.50		2022	-	-
2027	PA-06C	Planning Area 6	897	55%	0%	65%	--	2%	3%	30%	100%	1.50		2027	-	-
2032	PA-06C	Planning Area 6	897	60%	0%	65%	--	2%	3%	30%	100%	1.50		2032	-	-
2005	PA-06D1	Planning Area 6	1,360	5%	0%	65%	--	5%	--	30%	100%	1.20		2005	-	-
2012	PA-06D1	Planning Area 6	1,360	25%	10%	65%	--	5%	--	30%	100%	1.20		2012	27	-
2017	PA-06D1	Planning Area 6	1,360	35%	20%	65%	--	5%	--	30%	100%	1.20		2017	74	-
2022	PA-06D1	Planning Area 6	1,360	45%	25%	65%	--	5%	--	30%	100%	1.20		2022	120	-
2027	PA-06D1	Planning Area 6	1,360	55%	30%	65%	--	5%	--	30%	100%	1.20		2027	175	-
2032	PA-06D1	Planning Area 6	1,360	60%	40%	65%	--	5%	--	30%	100%	1.20		2032	255	-
2005	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2005	76	-
2012	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2012	76	-
2017	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2017	76	-
2022	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2022	76	-
2027	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2027	76	-
2032	PA-06D2	Planning Area 6	50	100%	100%	100%	--	--	--	--	100%	1.50		2032	76	-
2005	PA-06E	Planning Area 6	483	0%	0%	50%	--	--	--	50%	100%	1.00		2005	-	-
2012	PA-06E	Planning Area 6	483	0%	0%	50%	--	--	--	50%	100%	1.00		2012	-	-
2017	PA-06E	Planning Area 6	483	0%	0%	50%	--	--	--	50%	100%	1.00		2017	-	-
2022	PA-06E	Planning Area 6	483	20%	100%	50%	--	--	--	50%	100%	1.00		2022	48	-
2027	PA-06E	Planning Area 6	483	30%	100%	50%	--	--	--	50%	100%	1.00		2027	72	-
2032	PA-06E	Planning Area 6	483	35%	100%	50%	--	--	--	50%	100%	1.00		2032	84	-
2005	PA-07	Planning Area 7	490	5%	0%	85%	--	5%	--	10%	100%	1.00		2005	-	-
2012	PA-07	Planning Area 7	490	25%	50%	85%	--	5%	--	10%	100%	1.50		2012	78	-
2017	PA-07	Planning Area 7	490	45%	55%	85%	--	5%	--	10%	100%	2.00		2017	206	-
2022	PA-07	Planning Area 7	490	55%	60%	85%	--	5%	--	10%	100%	2.50		2022	344	-
2027	PA-07	Planning Area 7	490	65%	65%	85%	--	5%	--	10%	100%	2.50		2027	440	-
2032	PA-07	Planning Area 7	490	70%	70%	85%	--	5%	--	10%	100%	2.50		2032	510	-
2005	PA-08A	Planning Area 8	384	50%	20%	80%	5%	10%	--	5%	100%	3.00	15.0	2005	92	29
2012	PA-08A	Planning Area 8	384	60%	60%	65%	10%	20%	--	5%	100%	3.00	15.0	2012	269	208
2017	PA-08A	Planning Area 8	384	70%	70%	65%	10%	20%	--	5%	100%	3.00	15.0	2017	367	282
2022	PA-08A	Planning Area 8	384	80%	75%	65%	10%	20%	--	5%	100%	3.00	15.0	2022	449	346
2027	PA-08A	Planning Area 8	384	90%	75%	65%	10%	20%	--	5%	100%	3.00	15.0	2027	506	389
2032	PA-08A	Planning Area 8	384	95%	75%	65%	10%	20%	--	5%	100%	3.00	15.0	2032	533	410

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Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
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Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

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Year Offset	LDR (du)	HDR (du)
2005	2,766	2,908
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2022	9,290	16,969
2027	10,415	19,381
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Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-08B1	Planning Area 8	537	29%	100%	80%	--	10%	--	10%	100%	3.20		2005	398	-
2012	PA-08B1	Planning Area 8	537	55%	100%	80%	--	10%	--	10%	100%	3.20		2012	755	-
2017	PA-08B1	Planning Area 8	537	70%	100%	80%	--	10%	--	10%	100%	3.20		2017	962	-
2022	PA-08B1	Planning Area 8	537	80%	100%	80%	--	10%	--	10%	100%	3.20		2022	1,099	-
2027	PA-08B1	Planning Area 8	537	90%	100%	80%	--	10%	--	10%	100%	3.20		2027	1,236	-
2032	PA-08B1	Planning Area 8	537	95%	100%	80%	--	10%	--	10%	100%	3.20		2032	1,305	-
2005	PA-08B2	Planning Area 8	138	20%	100%	80%	--	10%	--	10%	100%	3.20		2005	71	-
2012	PA-08B2	Planning Area 8	138	55%	100%	80%	--	10%	--	10%	100%	4.00		2012	243	-
2017	PA-08B2	Planning Area 8	138	70%	100%	80%	--	10%	--	10%	100%	4.00		2017	310	-
2022	PA-08B2	Planning Area 8	138	80%	100%	80%	--	10%	--	10%	100%	4.00		2022	354	-
2027	PA-08B2	Planning Area 8	138	90%	100%	80%	--	10%	--	10%	100%	4.00		2027	398	-
2032	PA-08B2	Planning Area 8	138	95%	100%	80%	--	10%	--	10%	100%	4.00		2032	420	-
2005	PA-08B3	Planning Area 8	188	20%	100%	75%	--	10%	--	15%	100%	4.00		2005	113	-
2012	PA-08B3	Planning Area 8	188	55%	100%	80%	--	10%	--	10%	100%	4.00		2012	330	-
2017	PA-08B3	Planning Area 8	188	70%	100%	80%	--	10%	--	10%	100%	4.00		2017	420	-
2022	PA-08B3	Planning Area 8	188	80%	100%	80%	--	10%	--	10%	100%	4.00		2022	480	-
2027	PA-08B3	Planning Area 8	188	90%	100%	80%	--	10%	--	10%	100%	4.00		2027	540	-
2032	PA-08B3	Planning Area 8	188	95%	100%	80%	--	10%	--	10%	100%	4.00		2032	570	-
2005	PA-08C	Planning Area 8	92	50%	100%	90%	--	5%	--	5%	100%	4.20		2005	174	-
2012	PA-08C	Planning Area 8	92	75%	100%	90%	--	5%	--	5%	100%	4.20		2012	260	-
2017	PA-08C	Planning Area 8	92	80%	100%	90%	--	5%	--	5%	100%	4.20		2017	278	-
2022	PA-08C	Planning Area 8	92	85%	100%	90%	--	5%	--	5%	100%	4.20		2022	295	-
2027	PA-08C	Planning Area 8	92	90%	100%	90%	--	5%	--	5%	100%	4.20		2027	312	-
2032	PA-08C	Planning Area 8	92	95%	100%	90%	--	5%	--	5%	100%	4.20		2032	330	-
2005	PA-08D	Planning Area 8	491	37%	100%	100%	--	--	--	--	100%	4.20		2005	762	-
2012	PA-08D	Planning Area 8	491	75%	100%	100%	--	--	--	--	100%	4.20		2012	1,545	-
2017	PA-08D	Planning Area 8	491	85%	100%	100%	--	--	--	--	100%	4.20		2017	1,751	-
2022	PA-08D	Planning Area 8	491	95%	100%	100%	--	--	--	--	100%	4.20		2022	1,957	-
2027	PA-08D	Planning Area 8	491	100%	100%	100%	--	--	--	--	100%	4.20		2027	2,060	-
2032	PA-08D	Planning Area 8	491	100%	100%	100%	--	--	--	--	100%	4.20		2032	2,060	-
2005	PA-08E	Planning Area 8	143	25%	100%	100%	--	--	--	--	100%	3.20		2005	114	-
2012	PA-08E	Planning Area 8	143	55%	100%	100%	--	--	--	--	100%	3.20		2012	251	-
2017	PA-08E	Planning Area 8	143	65%	100%	100%	--	--	--	--	100%	3.20		2017	297	-
2022	PA-08E	Planning Area 8	143	75%	100%	100%	--	--	--	--	100%	3.20		2022	342	-
2027	PA-08E	Planning Area 8	143	85%	100%	100%	--	--	--	--	100%	3.20		2027	388	-
2032	PA-08E	Planning Area 8	143	90%	100%	100%	--	--	--	--	100%	3.20		2032	411	-

Appendix A-2 Projected Wastewater Customers Development by Planning Area

Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
Main Area	(sq mi):	**36**	HWD (9/6/05 meeting)
Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Table 3.3 Projected Wastewater Customers

Year Offset	LDR (du)	HDR (du)
2005	2,766	2,908
2012	6,367	8,464
2017	7,996	13,519
2022	9,290	16,969
2027	10,415	19,381
2032	11,081	20,579

Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-08F	Planning Area 8	160	60%	100%	95%	--	--	--	5%	100%	3.20		2005	292	-
2012	PA-08F	Planning Area 8	160	80%	100%	95%	--	--	--	5%	100%	3.20		2012	389	-
2017	PA-08F	Planning Area 8	160	95%	100%	95%	--	--	--	5%	100%	3.20		2017	462	-
2022	PA-08F	Planning Area 8	160	100%	100%	95%	--	--	--	5%	100%	3.20		2022	486	-
2027	PA-08F	Planning Area 8	160	100%	100%	95%	--	--	--	5%	100%	3.20		2027	486	-
2032	PA-08F	Planning Area 8	160	100%	100%	95%	--	--	--	5%	100%	3.20		2032	486	-
2005	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2005	208	-
2012	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2012	208	-
2017	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2017	208	-
2022	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2022	208	-
2027	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2027	208	-
2032	PA-08G	Planning Area 8	65	100%	100%	100%	--	--	--	--	100%	3.20		2032	208	-
2005	PA-09A	Frwy Corridor - North Dist - Res	342	0%	0%	80%	--	20%	--	--	100%	5.20		2005	-	-
2012	PA-09A	Frwy Corridor - North Dist - Res	342	50%	100%	80%	--	20%	--	--	100%	5.20		2012	711	-
2017	PA-09A	Frwy Corridor - North Dist - Res	342	60%	100%	80%	--	20%	--	--	100%	5.20		2017	854	-
2022	PA-09A	Frwy Corridor - North Dist - Res	342	70%	100%	80%	--	20%	--	--	100%	5.20		2022	996	-
2027	PA-09A	Frwy Corridor - North Dist - Res	342	80%	100%	80%	--	20%	--	--	100%	5.20		2027	1,138	-
2032	PA-09A	Frwy Corridor - North Dist - Res	342	85%	100%	80%	--	20%	--	--	100%	5.20		2032	1,209	-
2005	PA-09B	Frwy Corridor - North Dist - Res	445	40%	40%	100%	--	--	--	--	100%	3.20		2005	228	-
2012	PA-09B	Frwy Corridor - North Dist - Res	445	50%	75%	100%	--	--	--	--	100%	5.20		2012	869	-
2017	PA-09B	Frwy Corridor - North Dist - Res	445	60%	90%	100%	--	--	--	--	100%	5.20		2017	1,251	-
2022	PA-09B	Frwy Corridor - North Dist - Res	445	70%	90%	100%	--	--	--	--	100%	5.20		2022	1,459	-
2027	PA-09B	Frwy Corridor - North Dist - Res	445	80%	90%	100%	--	--	--	--	100%	5.20		2027	1,668	-
2032	PA-09B	Frwy Corridor - North Dist - Res	445	85%	90%	100%	--	--	--	--	100%	5.20		2032	1,772	-
2005	PA-10A	Frwy Corridor - North Dist	188	0%	100%	--	--	95%	--	5%	100%			2005	-	-
2012	PA-10A	Frwy Corridor - North Dist	188	10%	100%	--	--	95%	--	5%	100%			2012	-	-
2017	PA-10A	Frwy Corridor - North Dist	188	25%	100%	--	--	95%	--	5%	100%			2017	-	-
2022	PA-10A	Frwy Corridor - North Dist	188	75%	100%	--	--	95%	--	5%	100%			2022	-	-
2027	PA-10A	Frwy Corridor - North Dist	188	85%	100%	--	--	95%	--	5%	100%			2027	-	-
2032	PA-10A	Frwy Corridor - North Dist	188	90%	100%	--	--	95%	--	5%	100%			2032	-	-
2005	PA-10B	Frwy Corridor - North Dist	57	0%	0%	--	--	75%	--	25%	100%			2005	-	-
2012	PA-10B	Frwy Corridor - North Dist	57	50%	100%	--	--	75%	--	25%	100%			2012	-	-
2017	PA-10B	Frwy Corridor - North Dist	57	100%	100%	--	--	75%	--	25%	100%			2017	-	-
2022	PA-10B	Frwy Corridor - North Dist	57	100%	100%	--	--	75%	--	25%	100%			2022	-	-
2027	PA-10B	Frwy Corridor - North Dist	57	100%	100%	--	--	75%	--	25%	100%			2027	-	-
2032	PA-10B	Frwy Corridor - North Dist	57	100%	100%	--	--	75%	--	25%	100%			2032	-	-

Appendix A-2 Projected Wastewater Customers Development by Planning Area

Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
Occupancy (MFR)	(people/du):	**2.7**	HWD (11/16/05 meeting)
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Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Table 3.3 Projected Wastewater Customers

Year Offset	LDR (du)	HDR (du)
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2012	6,367	8,464
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2022	9,290	16,969
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Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-11A	Frwy Corridor - Main St Dist	173	0%	100%	--	10%	80%		10%	100%		16.0	2005	-	-
2012	PA-11A	Frwy Corridor - Main St Dist	173	50%	100%	--	10%	80%		10%	100%		16.0	2012	-	139
2017	PA-11A	Frwy Corridor - Main St Dist	173	100%	100%	--	10%	80%		10%	100%		16.0	2017	-	277
2022	PA-11A	Frwy Corridor - Main St Dist	173	100%	100%	--	10%	80%		10%	100%		16.0	2022	-	277
2027	PA-11A	Frwy Corridor - Main St Dist	173	100%	100%	--	10%	80%		10%	100%		16.0	2027	-	277
2032	PA-11A	Frwy Corridor - Main St Dist	173	100%	100%	--	10%	80%		10%	100%		16.0	2032	-	277
2005	PA-11B	Frwy Corridor - Main St Dist	81	5%	100%	--	--	100%		--	100%			2005	-	-
2012	PA-11B	Frwy Corridor - Main St Dist	81	50%	100%	--	--	100%		--	100%			2012	-	-
2017	PA-11B	Frwy Corridor - Main St Dist	81	100%	100%	--	--	100%		--	100%			2017	-	-
2022	PA-11B	Frwy Corridor - Main St Dist	81	100%	100%	--	--	100%		--	100%			2022	-	-
2027	PA-11B	Frwy Corridor - Main St Dist	81	100%	100%	--	--	100%		--	100%			2027	-	-
2032	PA-11B	Frwy Corridor - Main St Dist	81	100%	100%	--	--	100%		--	100%			2032	-	-
2005	PA-11C	Frwy Corridor - Main St Dist	365	5%	100%	--	--	80%		20%	100%			2005	-	-
2012	PA-11C	Frwy Corridor - Main St Dist	365	25%	100%	--	--	80%		20%	100%			2012	-	-
2017	PA-11C	Frwy Corridor - Main St Dist	365	50%	100%	--	--	80%		20%	100%			2017	-	-
2022	PA-11C	Frwy Corridor - Main St Dist	365	75%	100%	--	--	80%		20%	100%			2022	-	-
2027	PA-11C	Frwy Corridor - Main St Dist	365	100%	100%	--	--	80%		20%	100%			2027	-	-
2032	PA-11C	Frwy Corridor - Main St Dist	365	100%	100%	--	--	80%		20%	100%			2032	-	-
2005	PA-11D	Frwy Corridor - Main St Dist	1,778	1%	50%	--	40%	40%		20%	100%		16.0	2005	-	57
2012	PA-11D	Frwy Corridor - Main St Dist	1,778	25%	100%	--	40%	40%		20%	100%		16.0	2012	-	2,845
2017	PA-11D	Frwy Corridor - Main St Dist	1,778	50%	100%	--	40%	40%		20%	100%		16.0	2017	-	5,690
2022	PA-11D	Frwy Corridor - Main St Dist	1,778	69%	100%	--	40%	40%		20%	100%		16.0	2022	-	7,853
2027	PA-11D	Frwy Corridor - Main St Dist	1,778	78%	100%	--	40%	40%		20%	100%		16.0	2027	-	8,877
2032	PA-11D	Frwy Corridor - Main St Dist	1,778	80%	100%	--	40%	40%		20%	100%		16.0	2032	-	9,105
2005	PA-12A	Frwy Corridor - HWY 395	370	2%	0%	10%	--	50%	--	40%	100%	0.50		2005	-	-
2012	PA-12A	Frwy Corridor - HWY 395	370	5%	90%	10%	--	50%	--	40%	100%	0.50		2012	1	-
2017	PA-12A	Frwy Corridor - HWY 395	370	30%	90%	10%	--	50%	--	40%	100%	0.50		2017	5	-
2022	PA-12A	Frwy Corridor - HWY 395	370	50%	90%	10%	--	50%	--	40%	100%	0.50		2022	8	-
2027	PA-12A	Frwy Corridor - HWY 395	370	70%	90%	10%	--	50%	--	40%	100%	0.50		2027	12	-
2032	PA-12A	Frwy Corridor - HWY 395	370	75%	90%	10%	--	50%	--	40%	100%	0.50		2032	13	-
2005	PA-12B	Frwy Corridor - HWY 395	799	5%	100%	--	--	--	85%	15%	100%			2005	-	-
2012	PA-12B	Frwy Corridor - HWY 395	799	25%	100%	--	--	--	85%	15%	100%			2012	-	-
2017	PA-12B	Frwy Corridor - HWY 395	799	50%	100%	--	--	--	85%	15%	100%			2017	-	-
2022	PA-12B	Frwy Corridor - HWY 395	799	75%	100%	--	--	--	85%	15%	100%			2022	-	-
2027	PA-12B	Frwy Corridor - HWY 395	799	90%	100%	--	--	--	85%	15%	100%			2027	-	-
2032	PA-12B	Frwy Corridor - HWY 395	799	95%	100%	--	--	--	85%	15%	100%			2032	-	-

Appendix A-2 Projected Wastewater Customers Development by Planning Area

Water Master Plan Update
City of Hesperia Water District

City-wide Variables			Source
Occupancy (SFR)	(people/du):	**3.3**	HWD (9/6/05 meeting)
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Population	(2032):	**179,000**	HWD (9/6/05 meeting)
WDF (res)	(gpcd):	**160**	HWD (9/6/05 meeting)
WDF (Comm)	(gpd/ac):	**2,000**	Estimated
WDF (Ind)	(gpd/ac):	**3,000**	Estimated
WWGF (res)	(gpcd):	**80**	Estimated
WWGF (Comm)	(gpd/ac):	**1,000**	Estimated
WWGF (Ind)	(gpd/ac):	**1,000**	Estimated

Table 3.3 Projected Wastewater Customers

Year Offset	LDR (du)	HDR (du)
2005	2,766	2,908
2012	6,367	8,464
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Exclude PA-15 and PA-16

Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-13A	Frwy Corridor - South Dist - Com	499	2%	0%	--	--	60%		40%	100%			2005	-	-
2012	PA-13A	Frwy Corridor - South Dist - Com	499	5%	100%	--	--	60%		40%	100%			2012	-	-
2017	PA-13A	Frwy Corridor - South Dist - Com	499	30%	100%	--	--	60%		40%	100%			2017	-	-
2022	PA-13A	Frwy Corridor - South Dist - Com	499	50%	100%	--	--	60%		40%	100%			2022	-	-
2027	PA-13A	Frwy Corridor - South Dist - Com	499	70%	100%	--	--	60%		40%	100%			2027	-	-
2032	PA-13A	Frwy Corridor - South Dist - Com	499	75%	100%	--	--	60%		40%	100%			2032	-	-
2005	PA-13B	Frwy Corridor - South Dist - Com	439	2%	0%	--	--	90%		10%	100%			2005	-	-
2012	PA-13B	Frwy Corridor - South Dist - Com	439	5%	100%	--	--	90%		10%	100%			2012	-	-
2017	PA-13B	Frwy Corridor - South Dist - Com	439	50%	100%	--	--	90%		10%	100%			2017	-	-
2022	PA-13B	Frwy Corridor - South Dist - Com	439	75%	100%	--	--	90%		10%	100%			2022	-	-
2027	PA-13B	Frwy Corridor - South Dist - Com	439	80%	100%	--	--	90%		10%	100%			2027	-	-
2032	PA-13B	Frwy Corridor - South Dist - Com	439	85%	100%	--	--	90%		10%	100%			2032	-	-
2005	PA-14A	Frwy Corridor - South Dist - Res	88	50%	0%	95%	--	--	--	5%	100%	0.40		2005	-	-
2012	PA-14A	Frwy Corridor - South Dist - Res	88	100%	0%	95%	--	--	--	5%	100%	0.40		2012	-	-
2017	PA-14A	Frwy Corridor - South Dist - Res	88	100%	0%	95%	--	--	--	5%	100%	0.40		2017	-	-
2022	PA-14A	Frwy Corridor - South Dist - Res	88	100%	0%	95%	--	--	--	5%	100%	0.40		2022	-	-
2027	PA-14A	Frwy Corridor - South Dist - Res	88	100%	0%	95%	--	--	--	5%	100%	0.40		2027	-	-
2032	PA-14A	Frwy Corridor - South Dist - Res	88	100%	0%	95%	--	--	--	5%	100%	0.40		2032	-	-
2005	PA-14B	Frwy Corridor - South Dist - Res	261	0%	0%	90%	--	--	--	10%	100%	0.40		2005	-	-
2012	PA-14B	Frwy Corridor - South Dist - Res	261	10%	0%	90%	--	--	--	10%	100%	0.40		2012	-	-
2017	PA-14B	Frwy Corridor - South Dist - Res	261	20%	0%	90%	--	--	--	10%	100%	0.40		2017	-	-
2022	PA-14B	Frwy Corridor - South Dist - Res	261	30%	0%	90%	--	--	--	10%	100%	0.40		2022	-	-
2027	PA-14B	Frwy Corridor - South Dist - Res	261	50%	0%	90%	--	--	--	10%	100%	0.40		2027	-	-
2032	PA-14B	Frwy Corridor - South Dist - Res	261	70%	0%	90%	--	--	--	10%	100%	0.40		2032	-	-
2005	PA-14C	Frwy Corridor - South Dist - Res	31	0%	0%	--	--	95%	--	5%	100%			2005	-	-
2012	PA-14C	Frwy Corridor - South Dist - Res	31	0%	0%	--	--	95%	--	5%	100%			2012	-	-
2017	PA-14C	Frwy Corridor - South Dist - Res	31	100%	100%	--	--	95%	--	5%	100%			2017	-	-
2022	PA-14C	Frwy Corridor - South Dist - Res	31	100%	100%	--	--	95%	--	5%	100%			2022	-	-
2027	PA-14C	Frwy Corridor - South Dist - Res	31	100%	100%	--	--	95%	--	5%	100%			2027	-	-
2032	PA-14C	Frwy Corridor - South Dist - Res	31	100%	100%	--	--	95%	--	5%	100%			2032	-	-
2005	PA-14D	Frwy Corridor - South Dist - Res	13	0%	0%	--	--	95%	--	5%	100%			2005	-	-
2012	PA-14D	Frwy Corridor - South Dist - Res	13	0%	0%	--	--	95%	--	5%	100%			2012	-	-
2017	PA-14D	Frwy Corridor - South Dist - Res	13	100%	100%	--	--	95%	--	5%	100%			2017	-	-
2022	PA-14D	Frwy Corridor - South Dist - Res	13	100%	100%	--	--	95%	--	5%	100%			2022	-	-
2027	PA-14D	Frwy Corridor - South Dist - Res	13	100%	100%	--	--	95%	--	5%	100%			2027	-	-
2032	PA-14D	Frwy Corridor - South Dist - Res	13	100%	100%	--	--	95%	--	5%	100%			2032	-	-

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WWGF (res)	(gpcd):	80	Estimated
WWGF (Comm)	(gpd/ac):	1,000	Estimated
WWGF (Ind)	(gpd/ac):	1,000	Estimated

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Planning Year	Planning Area No.	Planning Area Description	Area (acres)	Percent Developed	Percent Sewered	Land Use Type LDR	HDR	COMM	IND	OS	Total	Density (du/ac) LDR	HDR	Year Offset	Sewered Customers LDR (du)	HDR(du)
2005	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	0%	0%	100%	--	--	--	--	100%	1.63		2005	-	-
2012	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	35%	100%	100%	--	--	--	--	100%	1.63		2012	6,189	-
2017	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	70%	100%	100%	--	--	--	--	100%	1.63		2017	12,378	-
2022	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	95%	100%	100%	--	--	--	--	100%	1.63		2022	16,799	-
2027	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	95%	100%	100%	--	--	--	--	100%	1.63		2027	16,799	-
2032	PA-15	Rancho Las Flores (RLF) & Summit Valley Ranch (SVR)	10,868	100%	100%	100%	--	--	--	--	100%	1.63		2032	17,683	-
2005	PA-16	North Summit Valley (NSV)	3,052	0%	0%	100%	--	--	--	--	100%	1.62		2005	-	-
2012	PA-16	North Summit Valley (NSV)	3,052	0%	0%	100%	--	--	--	--	100%	1.62		2012	-	-
2017	PA-16	North Summit Valley (NSV)	3,052	35%	100%	100%	--	--	--	--	100%	1.62		2017	1,730	-
2022	PA-16	North Summit Valley (NSV)	3,052	70%	100%	100%	--	--	--	--	100%	1.62		2022	3,461	-
2027	PA-16	North Summit Valley (NSV)	3,052	95%	100%	100%	--	--	--	--	100%	1.62		2027	4,696	-
2032	PA-16	North Summit Valley (NSV)	3,052	95%	100%	100%	--	--	--	--	100%	1.62		2032	4,696	-

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APPENDIX B

DETAIL CIP COST BREAKDOWN

Appendix B - Detail CIP Cost Breakdown

Existing and Future Improvements

Project No[1]	Phase	Facility Description	Location	Size	Unit	Quantity	Unit	Unit Cost	Direct Construction	Contingency	Mark Up (Eng, Admin, Legal,	Capital Cost
FP-1	Near Term	New Diversion	Sante Fe Avenue from Mesa Street to Bear Valley Road	18	in	10,500	ft	$179	$1,877,000	$470,000	$822,000	$3,169,000
FP-3	2007-2012	New Force Main	Mauna Loa Street and Maple Avenue west along Mojave Street to Mesa Linda Avenue, and south along Mesa Linda Avenue to WRP-1	20	in	15,300	ft	$140	$2,142,000	$536,000	$938,000	$3,616,000
FP-4	2007-2012	New Gravity Main	Main Street and Cataba Avenue to WRP-1	18	in	2,800	ft	$179	$501,000	$126,000	$220,000	$847,000
FP-5	2007-2012	New Lift Station LS-3	Muana Loa Street and Maple Avenue	7	mgd	1	ea	$375,000	$2,562,000	$641,000	$1,122,000	$4,325,000
FP-5	2007-2012	Land Acquistion for LS-3	Muana Loa Street and Maple Avenue	0.5	ac	1	ea	$250,000	$125,000			$125,000
FP-6	2007-2012	Backup Power	Muana Loa Street and Maple Avenue	7	mgd	1	ea	$40,000	$274,000	$69,000	$121,000	$464,000
FP-7	2007-2012	Parallel Gravity Main	Bear Valley Road from Cottonwood Avenue to 7th Avenue	18	in	8,000	ea	$179	$1,430,000	$358,000	$626,000	$2,414,000
FP-8	2007-2012	Parallel Gravity Main	Sultana Street and Maple Avenue to Main Street and Maple Avenue	12	in	3,500	ft	$154	$539,000	$135,000	$236,000	$910,000
FP-9	2007-2012	Parallel Gravity Main	Mojave Street and Maple Avenue to Muana Loa Street and Maple Avenue	18	in	500	ft	$179	$90,000	$23,000	$40,000	$153,000
FP-10	2007-2012	Parallel Gravity Main	Main Street and Maple Avenue to Mojave Street and Maple Avenue	15	in	5,300	ft	$159	$841,000	$211,000	$369,000	$1,421,000
FP-11	2007-2012	New Diversion	Pipe extending northward from corner of Sultana Street and Escondido Avenue	10	in	3,200	ft	$146	$467,000	$117,000	$205,000	$789,000
FP-12	2007-2012	Parallel Gravity Main	Following Live Oak Street, continuing west of Mount Shasta Drive, terminating on Mojave Street 850 feet west of Blanchard Road	10	in	7,000	ft	$146	$1,022,000	$256,000	$448,000	$1,726,000
FP-13	2007-2012	Parallel Gravity Main	Mojave Avenue from 800 feet west of Blanchard Road to Maple Avenue	15	in	6,000	ft	$159	$952,000	$238,000	$417,000	$1,607,000
FP-35	2007-2012	New Gravity Main	750 feet southwest of the intersection of Farmington Street and Caliente Road to the intersection of Caliente Road and Mesquite Street	8	in	14,300	ft	$137	$1,961,000	$491,000	$859,000	$3,311,000
FP-36	2007-2012	New Gravity Main	600 feet northeast of the intersection of Blue Jay Way and Mariposa Road to the intersection of Mariposa Road and El Centro Road	8	in	10,700	ft	$137	$1,468,000	$367,000	$643,000	$2,478,000
FP-37	2007-2012	New Gravity Main	265 feet west of the intersection of Maple Avenue and Mesquite Street to intersection of Dove Creek Trail and Briarwood Street	12	in	2,200	ft	$154	$339,000	$85,000	$149,000	$573,000
FP-15	2013-2017	New Force Main	From Intersection of Bear Valley Road and I Avenue to WRP-2	20	in	3,000	ft	$140	$420,000	$105,000	$184,000	$709,000
FP-34	2013-2017	New Gravity Main	Bear Valley Road from Santa Fe Avenue to I Avenue	24	in	1,500	ft	$218	$327,000	$82,000	$144,000	$553,000
FP-16	2013-2017	New Lift Station LS-4	Bear Valley Road 500 feet west of Ridgecrest Road	6	mgd	1	ft	$375,000	$2,250,000	$563,000	$985,000	$3,798,000
FP-16	2013-2017	Land Acquistion for LS-4	Bear Valley Road 500 feet west of Ridgecrest Road	0.5	ac	1	ea	$250,000	$125,000	$32,000	$55,000	$212,000
FP-17	2013-2017	Backup Power	Bear Valley Road 500 feet west of Ridgecrest Road	6	mgd	1	ea	$40,000	$240,000	$60,000	$105,000	$405,000
FP-18	2013-2017	Parallel Gravity Main	Lemon Street and I ave north to I Avenue and Santa Fe Avenue	21	in	8,300	ft	$198	$1,642,000	$411,000	$719,000	$2,772,000
FP-19	2013-2017	New Gravity Main	Connecting I Avenue main from corner of I Avenue and Santa Fe Avenue to WRP-2	30	in	1,000	ft	$275	$276,000	$69,000	$121,000	$466,000
FP-20	2013-2017	New Gravity Main	Connecting Santa Fe Avenue diversion to WRP-2	18	in	500	ft	$179	$90,000	$23,000	$40,000	$153,000
FP-21	2013-2017	Parallel Gravity Main	Bear Valley Road from 7th Avenue to Santa Fe Avenue	18	in	9,800	ft	$179	$1,752,000	$438,000	$767,000	$2,957,000
FP-22	2013-2017	Parallel Gravity Main	Mariposa Road from Sycamore Street to Bear Valley Road and Bear Valley Road from Mariposa Road to Cottonwood Avenue	15	in	5,000	ft	$159	$793,000	$199,000	$348,000	$1,340,000
FP-23	2013-2017	Parallel Gravity Main	Sante Fe Avenue from Hercules Street to Mesa Street	15	in	5,200	ft	$159	$825,000	$207,000	$362,000	$1,394,000
FP-24	2013-2017	Parallel Gravity Main	E Avenue from Muana Loa Street to Lemon Street	15	in	1,500	ft	$159	$238,000	$60,000	$105,000	$403,000
FP-25	2013-2017	Parallel Gravity Main	E Avenue from Live Oak Street to Muana Loa Street	15	in	4,100	ft	$159	$651,000	$163,000	$285,000	$1,099,000
FP-26	2013-2017	Parallel Gravity Main	C Avenue from Sultana Street to Juniper Street and Juniper Street C Avenue to E Avenue	10	in	4,300	ft	$146	$628,000	$157,000	$275,000	$1,060,000
FP-27	2013-2017	New Gravity Main	E Street diversion	15	in	2,600	ft	$159	$413,000	$104,000	$181,000	$698,000
FP-38	2013-2017	New Gravity Main	650 feet north of the intersection of Jenny Street and Greenwood Street to 750 feet southwest of the intersection of Farmington Street and Caliente Road	8	in	1,200	ft	$137	$165,000	$42,000	$73,000	$280,000
FP-39	2013-2017	New Gravity Main	Approximately 800 feet south of the intersection of Oak Hill Road and Elkridge Drive to 750 feet southwest of the intersection of Farmington Street and Caliente Road	8	in	3,900	ft	$137	$535,000	$134,000	$235,000	$904,000
FP-28	2018-2022	Parallel Gravity Main	Main Street from 600 feet west of Pyrite Avenue to Maple Avenue	10	in	5,400	ft	$146	$789,000	$198,000	$346,000	$1,333,000
FP-29	2018-2022	Parallel Gravity Main	Along I-15, Caliente Road, Joshua Street, Highway 395, and Muscatel Street	12	in	12,200	ft	$154	$1,878,000	$470,000	$822,000	$3,170,000
FP-30	2018-2022	Parallel Gravity Main	Mariposa Road from Verde Street to Gabriel Road	10	in	2,000	ft	$146	$292,000	$73,000	$128,000	$493,000
FP-31	2018-2022	Parallel Gravity Main	Mariposa Road from Gabriel Road to 800 feet north of Gabriel Road	12	in	1,000	ft	$154	$154,000	$39,000	$68,000	$261,000
FP-32	2023-2032	Parallel Gravity Main	I Avenue from Aspen Street to Lemon Street	15	in	13,200	ft	$159	$2,094,000	$524,000	$917,000	$3,535,000
FP-33	2023-2032	Parallel Gravity Main	1,000 feet south of the intersection of Cataba Road and Main Street to the intersection of Cataba Road and Main Street	12	in	1,000	ft	$154	$154,000	$39,000	$68,000	$261,000
Subtotal Conveyance Improvements				***n/a***		***n/a***		***n/a***	***33,321,000***	***8,315,000***	***14,548,000***	***56,184,000***

Appendix B - Detail CIP Cost Breakdown

Future System Treatment Improvements

Project No[1]	Phase	Facility Description	Location	Size	Unit	Quantity	Unit	Unit Cost	Direct Construction	Contingency	Mark Up (Eng, Admin, Legal, Const. Mgnt)	Capital Cost
		WRP-1 Phase 1: Construction of 5-mgd										
FP-2A	2007-2012	Treatment Plant	North of Main Street and west of Cataba Road	5.0	mgd	1	ea	$11,000,000	$55,000,000	$13,750,000	$24,063,000	$92,813,000
FP-2A	2007-2012	Land Acquisition for WRP-1	Land Acqusition for WRP-1	44.0	ac	1	ea	$250,000	$11,000,000			$11,000,000
FP-2B	2007-2012	WRP-1 Phase 1: Tertiary Treatment	WRP-1	5.0	mgd	1	ea	$1,000,000	$5,000,000	$1,250,000	$2,188,000	$8,438,000
		WRP-2 Phase 1: Construction of 6-mgd										
FP-14A	2013-2017	Treatment Plant	Osbrink Drive and Santa Fe East Avenue	6.0	mgd	1	ea	$11,000,000	$66,000,000	$16,500,000	$28,875,000	$111,375,000
FP-14A	2013-2017	Land Acquisition for WRP-2	Osbrink Drive and Santa Fe East Avenue	20.0	ac	1	ea	$250,000	$5,000,000	$1,250,000	$2,188,000	$8,438,000
FP-14B	2013-2017	WRP-2 Phase 1: Tertiary Treatment	WRP-2	6.0	mgd	1	ea	$1,000,000	$6,000,000	$1,500,000	$2,625,000	$10,125,000
FP-34	2013-2017	New Force Main	Solids Pipeline from WRP-2 to VVWRA Outlet	6.0	in	4,000	ft	$60	$240,000	$60,000	$105,000	$405,000
FP-35	2013-2017	Solids PS at WRP-2	WRP-2	0.4	mgd	1	ea	$375,000	$135,000	$34,000	$60,000	$229,000
FP-2D	2018-2022	WRP-1 Expansion from 5 mgd to 7.4 mgd	WRP-1	2.4	mgd	1	ea	$11,000,000	$26,400,000	$6,600,000	$11,550,000	$44,550,000
FP-2E	2018-2022	WRP-1 Expansion of Tertiary Treatment	WRP-1	2.4	mgd	1	ea	$1,000,000	$2,400,000	$600,000	$1,050,000	$4,050,000
FP-9D	2023-2032	WRP-2 Expansion from 6 mgd to 8.5 mgd	WRP-2	2.5	mgd	1	ea	$11,000,000	$27,500,000	$6,875,000	$12,032,000	$46,407,000
FP-9E	2023-2032	WRP-2 Expansion of Tertiary Treatment	WRP-2	2.5	mgd	1	ea	$1,000,000	$2,500,000	$625,000	$1,094,000	$4,219,000
Subtotal Other Improvements									***$207,175,000***	***$49,044,000***	***$85,830,000***	***$342,049,000***
Total cost for all improvements									**$240,496,000**	**$57,359,000**	**$100,378,000**	**$398,233,000**

APPENDIX C

SUMMARY OF CMOM REQUIREMENTS

Summary of CMOM related components (SSMP in California)

City of Hesperia - Wastewater Master Plan Update

Description of SSMP Components*			Chapter in WWMP
1		Goal	
	a	Description of goal of SSMP report	not included
2		Organization	
	a	Name of authorized representative	not included
	b	Names and contact information of staff responsible for SSMP implementation	not included
	c	Chain of communication reporting SSOs	not included
3		Legal Authority	
	a	Prevention of illicit discharges	not included
	b	Proper design and construction	not included
	c	Maintenance access	not included
	d	Limitation of FOGs and other debris	not included
	e	Enforcement of ordinance violations	not included
4		Operation and Maintenance Program	
	a	Map of sewer system	Partially - Figure 2.1
	b	Description of preventive O&M activities	not included
	c	Rehabilitation and replacement plan	not included
	d	O&M training	not included
	e	Provision of equipment and replacement parts	not included
5		Design and Performance Provisions	
	a	Design and construction standards	not included
	b	Inspection and testing procedures	not included
6		Overflow Emergency Response Plan	
	a	SSO notification procedures (for primary responders)	not included
	b	SSP response plan	not included
	c	SSO notification procedures (for regulatory agencies)	not included
	d	Emergency Response Plan training	not included
	e	Emergency operation procedures	not included
	f	Program to prevent discharge into waters of the United States	not included
7		FOG Control Plan	
	a	Implementation plan and schedule for a FOG public outreach program	not included
	b	Plan and schedule of FOG disposal	not included
	c	Legal authority to prevent FOG disposal	not included
	d	Requirements to install grease removal devices	not included
	e	Authority to inspect grease producing facilities	not included
	f	Identification of areas subject to FOG blockages and cleaning schedule	not included
	g	Implementation plan for source control measures	not included
8		System Evaluation and Capacity Assurance Plan	
	a	System evaluation, including SSOs	partially - Chapter 5
	b	System design criteria	Chapter 1.7
	c	Capacity enhancement measures (including a short- and long-term CIP)	Chapter 7
	d	CIP completion schedule	Chapter 7
9		Monitoring, Measurement, and Program Modifications	
	a	Prioritization of SSMP activities	not included
	b	Monitoring of effectiveness of SSMP activities	not included
	c	Assessment of preventive maintenance program	not included
	d	Update of SSMP program	not included
	e	Identification of SSO trends	not included
10		SSMP Program Audits	
	a	Compliance with SSMP requirements	not included
11		Communication Program and Final Certification	
	a	Communication with the public	not included
	b	Communication Plan for tributary and/or satellite systems	not included

* SSMP Components per SWRCB Order No. 2006-0003

Abbreviations:

CMOM	Capacity, Management, Operations, and Maintenance
FOG	Fat, Oil and Grease
SSMP	Sewer System Management Plan
SSOs	Sewer System Overflows
SWRCB	State Water Resources Control Board
WWMP	2007 Wastewater Master Plan Update