Camarillo Sanitary District System Evaluation and Capacity Assurance Plan

Submitted to:

Camarillo Sanitary District
Camarillo, California

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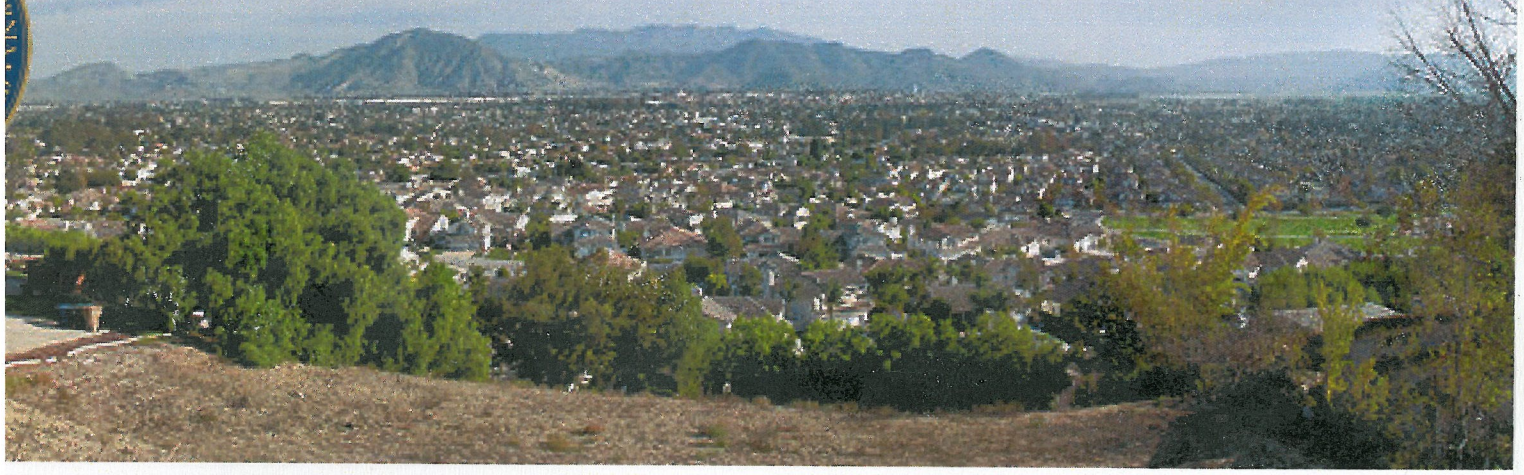

CAMARILLO SANITARY DISTRICT

SYSTEM EVALUATION AND CAPACITY ASSURANCE PLAN

Prepared By:

AKM CONSULTING ENGINEERS
553 Wald
Irvine, California 92618
(949) 753-7333

Prepared For:

CAMARILLO SANITARY DISTRICT
601 Carmen Drive
Camarillo, CA 93010
(805) 388-5307

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Section 1

EXECUTIVE SUMMARY

1-1 INTRODUCTION

Background

The Camarillo Sanitary District (District) was established in 1955 to provide service to most of the current City areas. The wastewater treatment plant was built on the south east portion of the City, south of Calle Quetzal and west of Conejo Creek. The District became a subsidiary district of the City of Camarillo, when the City was incorporated. The District provides wastewater collection, treatment, and disposal service to a population of approximately 42,000 within its corporate boundaries, as well as several small unincorporated Ventura County areas. The existing study area is approximately 15.3 square miles.

The District's Sphere of Influence includes a significant portion of unincorporated Ventura County to the north of the City. If this area were incorporated by the City of Camarillo, the District's ultimate population would be approximately 70,000 and the ultimate study area would encompass approximately 18.6 square miles. The majority of the unincorporated area is currently on septic systems.

The portions of the City east of Calleguas Creek and north of Ventura Freeway is served by Camrosa Water District.

Previous Studies

The City's latest Sewer Master Plan was prepared in December 1999 by Parsons Engineering Science (1999 Master Plan). It evaluated the wastewater treatment plant, the pump stations, the forcemains, and the larger gravity sewers. Approximately 44 miles of 10-inch diameter to 30-inch diameter pipe of the District's system were included in the capacity analysis. The remaining 97 miles of 6-inch diameter and 8-inch diameter sewers were not included in the previous study. The 1999 Master Plan recommended that two gravity sewers be monitored for potential capacity deficiencies. Based on the report criteria, the pump stations and forcemains were sufficient, and the wastewater treatment plant had sufficient capacity through 2010.

Studies of the District's sewer Pump Stations No.3 and No.6 were conducted in 2007 by AKM Consulting Engineers. The study of Pump Station No.3 was necessary because one of the three pumps had bearing problems and failed. It included flow measurements at Pump Station No.3 to determine if it could be operated with only two pumps. It was determined that while two pumps could handle the anticipated peak wet weather flows, the pump station would not have a standby pump to operate in the event that one of the two (2) functioning pumps has to be taken out of service. The study recommended replacement of the third damaged pump with a new pump.

The District experienced ragging problems at Pump Station No. 6. AKM Consulting Engineers conducted a study of the pump station and recommended replacement of the original variable frequency drive operated pumps with enclosed screw centrifugal impeller pumps and electronic soft starters.

Objectives

The objective of this System Evaluation and Capacity Assurance Plan is to evaluate the District's sewer collection system under the existing and ultimate land use conditions, and provide a framework for undertaking the construction of new and replacement facilities for the service area in an efficient and cost effective manner. As a planning document, it is general in nature and is predicated upon the best information available at this time. Project specific preliminary design studies will need to be conducted prior to final design of the recommended improvements.

1-2 STUDY AREA

Location

The study area is located approximately 50 miles northwest of downtown Los Angeles, and 40 miles south of Santa Barbara. The Pacific Ocean is approximately 10 miles to the south. Currently, the Camarillo Sanitary District encompasses approximately 15.3 square miles of residential, commercial, industrial and agricultural, land uses within the City of Camarillo and several small portions of unincorporated Ventura County. Camrosa Water District serves the area generally east of Calleguas Creek and north of Ventura Boulevard. If the City's Sphere of Influence is extended to its fullest, the District's study area will be approximately 18.6 square miles.

Topography

Elevations within the study area range from 518 feet above mean seal level (amsl) at the north District boundary near Via Con Dios and Vista Del Cima Estates, to 55 feet amsl at the Camarillo Airport. The terrain slopes generally from north to south and east to west.

Climate

The climate in the study area is Mediterranean-like with generally moderate temperatures and low humidity year-round. The average year-round temperatures are in the low seventies, with over 300 days of sunshine. The historical average annual rainfall is about 16 inches. Most of the rainfall typically occurs between November and February.

Land Use

Camarillo is a well planned community with a balance of residential, commercial, industrial, and agricultural land uses. The District serves the majority of the City; however, the area east of Calleguas Creek and north of the Ventura Freeway (US 101) is provided wastewater service by the Camrosa Water District. Currently, the primary land use in the District's tributary area is residential (2,860 Ac or 34.6 %). Agricultural use makes up a significant portion of the total existing land use as well (1,270 Ac or 15.3%). The total acreage of the District's study area, including streets and right-of-way, is about 9,777 acres or 15.3 square miles.

Population

Since its incorporation in 1964, the City of Camarillo has grown from a population of 7,500 to approximately 65,453 in 2007 (*Ref: California Department of Finance, City/County Population and Housing Estimates,*

1/1/2008)). Currently, the District serves a population of approximately 42,000. The ultimate population is estimated to be approximately 70,000 if the City's Sphere of Influence is incorporated.

1-3 CRITERIA

General

Establishing performance standards is an important part of evaluating existing wastewater collection systems, as it forms the basis for system analysis and system improvement recommendations. These standards include methodology for estimating wastewater design flows and minimum design standards for the collection system pipes, pump stations, and forcemains.

Flow Monitoring

In order to estimate the residential, commercial, and industrial wastewater flows in the study area, a temporary flow monitoring study was conducted by GEOtivity from January 23, 2007 to March 28, 2007 at ten (10) locations. The flow monitoring results at two (2) of the original flow monitoring sites appeared significantly lower than the flows expected from their tributary areas. Flow monitors were reinstalled at these two locations from July 16, 2008 to August 13, 2008. During this period, flow monitors were also installed at two (2) other locations to verify hydraulic deficiencies indicated by the District's existing sewer model analysis. Two additional flow monitors were installed to measure the flows through parallel pipes downstream of split manhole F11-133, located at Ponderosa Drive and Rosewood Avenue.

Unit Flow Factors

The unit flow factors utilized in analysis of the existing system were developed based upon the existing land uses obtained from the City's GIS and the results of the flow monitoring studies, described in Section 4-2. The ultimate land use was based on the City's General Plan. The flow factors were identified by the nomenclature included in the General Plan. Water use records, aerial photographs and field reviews supplemented the selection of the unit flow factors.

Peaking Factors

The adequacy of a sewage collection system is based upon its ability to convey the peak dry weather flow (PDWF) and peak wet weather flow.

The temporary flow monitoring data was reviewed to develop peaking relationships at each site. As expected, these relationships varied from site to site depending upon the makeup and size of the tributary land use. The following peaking relationship was selected for this study:

$$Q_{peak}\ (mgd) = 2.1 \times Q_{ave}(mgd)^{0.92}$$

where Q_{peak} = Peak Dry Weather Flow (mgd)
Q_{ave} = Average Dry Weather Flow (mgd)

Sewer Design Criteria

Design criteria are established to ensure that the wastewater collection system can operate effectively under all flow conditions. Each pipe segment must be capable of carrying peak wet weather flows in the hydraulically stable zone of the pipe. Low flows must be conveyed at a velocity that will prevent solids from settling and blocking the system.

The analysis of the City's existing gravity sewer system was based upon the calculated peak dry weather flows. Any segment of existing sewer pipe with a depth to diameter ratio (d/D) of 0.62 or more was considered to be hydraulically deficient. This allows for approximately 40 percent capacity above the peak dry weather flow for inflow and infiltration.

For **new construction**, the design and analysis of gravity sewer pipes should be based on the following depth to diameter ratios:

- Pipes **15-inches and smaller** in diameter shall be designed to flow at a maximum **D/d of 0.50** under peak dry weather flows
- Pipes **18-inches and greater** in diameter shall be designed to flow at a maximum **D/d of 0.62** under peak dry weather flows

Details of the criteria recommended for the collection system, the pump stations, and forcemains are included in Section 4 of this report.

1-4 EXISTING WASTEWATER SYSTEM

General Description

The District's existing sewer collection system is made up of a network of gravity sewers, pump stations, and forcemains. The gravity sewer system consists of approximately 143.7 miles (758,607 ft) of pipe and 2,947 manholes and cleanouts. The system also includes four (4) existing major pump stations and 33,660 feet of associated forcemains, as well as several smaller pump facilities. Pump Stations 2, 3, 5, and 6 are the larger pump stations, and Pump Station No. 4 is a smaller facility that pumps minimal flow from irrigational land use. There are also 20 individual parcels in the northwest portion of the City that pump sewage into a common forcemain on Ramona Drive.

The general direction of gravity flow is from north to south and east to west. However, the pump stations redirect the flow from the west to the Wastewater Treatment Plant in the southeast portion of the City.

The sewers are primarily constructed of vitrified clay pipe with sizes ranging from 6-inches to 36-inches in diameter. Approximately 67 percent of the pipes are 8-inches in diameter.

Tributary Areas

The District's service area has been divided into six (6) tributary areas based on the downstream gravity sewer termination locations, which include Pump Station No. 5, Pump Station No. 3, Pump Station No. 2,

Pump Station No. 6, the Wastewater Treatment Plant, and the major flow split (MH K10-101), located near Lewis Road and Adolfo Road.

Flow Splits

Multiple flow splits exist within the District sewer collection system. During this study, the flows at the "major" flow splits were evaluated in depth. Major flow splits were identified at locations with larger tributary areas, where the flows are diverted into multiple reaches. If the flow split occurs at the upstream end of a system, it was not considered "major".

Siphons

The District's sewer collection system includes inverted siphons at four locations. Each was constructed to go under a major flood control channel or a conflicting utility. The primary concern with each siphon is the fact that grease and debris can often build up in the siphon, requiring frequent maintenance to prevent sewer spills.

Septic Tanks

Currently, the District has identified approximately 107 septic tanks within the City boundary near Las Posas Estates and Las Posas Country Club on northwest portion of Camarillo. Including the Camarillo Sphere of Influence (SOI), there are approximately 1,895 septic tanks within the District's ultimate study area. A detailed evaluation of the areas currently on septic systems will be conducted during the planning stages of the SOI incorporation.

Pump Stations

Details of the existing Pump Station No. 5, Pump Station No. 3, Pump Station No. 2, and Pump Station No. 6 are included in Section 5-5. The pump station analysis includes the following:

- Tributary Area and Flows
- Wet Well and Dry Well evaluation
- Pump Evaluation
- Discharge Pipe and Forcemain Evaluation
- Electrical Service and Telemetry Evaluation
- Generator Evaluation

1-5 HYDRAULIC SEWER MODEL

Hydraulic Model Software

To perform a detailed analysis of the sewer collection system, it is essential to create a mathematical model that is capable of simulating the operating characteristics of the system. The software selected for this study is H2OMap Sewer. It is a GIS based computer program with the ability to perform steady state analyses of the flows in sanitary sewer systems.

Construction of Model Geometry

Information gathered from the District's sewer GIS files, atlas sheets, as-built drawings and interviews with District staff was used to create the model geometry of the existing system.

Missing Information

The District's existing sewer GIS data was not complete. Approximately 308 study reaches were found to be missing invert elevations, the length of the pipe, and/or the slope of the pipe. There were also 16 reaches that had discrepancies between the as-built slope and the slope calculated based on the inverts and the length. Several steps, described in Section 6-3, were taken to fill in the data gaps with the most accurate data available.

Split Manholes and flow Patterns

From the existing sewer GIS and sewer atlas sheets, 50 split manholes (more than one pipe exiting the manhole) were identified in the collection system. Many of the split manholes are either located at summits in the upstream portions of the system or they divert flow to a stub-out, which are not currently in operation. Seventeen (17) split manholes were identified for further investigation due to their potential significance on the hydraulic model results. The District researched the flow behavior at these 17 split manholes. In general, the flows at these locations were diverted based on invert elevations of the exiting sewers.

Tributary Areas

For better accuracy, a polygon was manually created around individual sewer nodes (manholes) in the model. Approximately 2,650 polygons were created for the existing system analysis, and 2,700 polygons were created for the ultimate analysis. Most manholes have a tributary area assigned to it unless there are multiple manholes in the same area.

Model Loads

The existing land uses and the calibrated unit flow factors were utilized to apply the average loads (sewage flows) to the existing model. The ultimate land uses and the ultimate unit flow factors were utilized to apply the average loads to the ultimate model.

Schools

The City's existing land use map and general plan map were used to designate land uses for the model. Schools are given a distinct land use designation in the City's GIS shapefile. The estimated flows based on the unit flow factor (1,200 gpd/ac) at the schools within the District's study area were similar to the flows calculated with the student enrollment from 2007 and a unit flow factor of 25 gpd per student. Therefore, it is reasonable to generate the loads from schools with the land use unit flow factor.

High Water Users

High water users will typically contribute large volumes of sewage to the sewer system. From previous master planning efforts, AKM Consulting Engineers has observed that many of the agencies cannot generate unit flow factors that are capable of representing these high sewage volumes. As shown on Figure 3-1, the City's land use designations are exceptionally detailed. Since the unit flow factors are based on land use designation, the wide variety of unit flow factors are generally capable of accurately accounting for the high flows produced by different high water users. The sewage volumes for land uses such as carwash and hospitals are estimated with unique high unit flow factors. The unit flow factors for these areas have been calibrated with the City's water use records and flow monitoring data.

The Camarillo Airport and the St. John's Seminary College consist of open space or agricultural areas which do not contribute wastewater flow. The water records for these areas were reviewed, and these flows are represented as point sources in the model.

Pump Stations

The District's four (4) pump stations and respective forcemains are included in the model preparation. These facilities were primarily modeled to analyze the entire gravity sewer set.

Most of the gravity sewers are tributary to the four (4) major pump stations. The wastewater accumulated at the wet wells is pumped through forcemains that terminate at either other gravity sewers or the Wastewater Treatment Plant. Wastewater flows pumped by Pump Station No.2 discharge into the Pump Station No.3 Forcemain. The forcemains are long, ranging from approximately 2,850 feet to 23,000 feet. Consequently, the pumped flows are attenuated in these facilities. While the model is set up with the firm capacity at each pump station through its corresponding forcemain; the discharge manhole is allocated the average dry weather flow calculated upstream of the pump station, which is then peaked utilizing the peaking relationship developed for determining the peak dry weather flows.

The location of the existing Wastewater Treatment Plant requires the District to pump the wastewater, at most, approximately 6 miles to the Wastewater Treatment Plant. The existing pump stations and forcemains cannot be analyzed solely by running the hydraulic model of the District's sewer system. The flows tributary to the pump station were estimated by the model and verified by flow monitoring.

1-6 SYSTEM ANALYSIS

Hydraulic Analysis

The analysis of the District's sewer collection system was based upon the calculated existing and ultimate peak dry weather flows. While the District's sewer system was analyzed under the existing and ultimate conditions, this report will only include the recommended improvement projects for the existing deficiencies. The deficiencies identified by the model under the ultimate conditions were due to the increased flows generated by the Sphere of Influence (SOI). In the future, the City of Camarillo will incorporate the SOI is into the City limits. At that time, the Camarillo Sanitary District shall address the ultimate deficiency improvements.

The hydraulic analysis results can be found in the appendix of this report, which is bound separately. Pipes that exceed the following criteria are considered hydraulically deficient:

Peak Dry Weather d/D > 0.62

The District's sewer model was set up based on the current sewer system operations. The twenty (20) flow splits were modeled to represent the current operations that were determined from the flow split analysis, detailed in Section 6-4. The existing and ultimate hydraulic deficiencies, based upon the criteria above, are shown on Figure 1-1 listed in Table 1-1.

The total length of sewer found to be capacity deficient with the existing and ultimate conditions are 17,443 feet and 29,195 feet, respectively.. This is about about 2.3 (17,443 / 758,607) percent of the total system length for the existing conditions.

Pump Station Evaluation

The City currently owns and operates four major sewer pump stations. Detailed evaluations of each pump station can be found in Section 5-6.

1-7 CAPITAL IMPROVEMENT PROGRAM

Capital Improvement Project Priorities

The capital improvement projects were selected primarily with consideration of the health and safety of the public and protection of the environment by minimizing the possibility of overflows. When segments of sewers with lower priorities are located in the same vicinity as a higher priority project, an exception can be made to include the lower priority sewers in that project to provide a more economically feasible Capital Improvement Program.

While the recommended capital improvement projects are given general prioritizations, the District should review the projects periodically and establish the annual capital improvement program to address any changed conditions based upon the most current information available, and to take advantage of concurrent construction such as street paving projects or adjacent infrastructure work.

It may not be feasible to implement some small projects as one single project. In such cases several projects can be combined into on construction package. Some large projects may be broken down into smaller components to fit the City's budget and other obligations.

Sewer Capacity Improvement Projects

The gravity sewer capacity improvement projects were chosen to eliminate the hydraulic deficiencies identified by the existing system model, which include the existing general plan land uses and existing service area. The deficiencies under ultimate conditions were evaluated with the Camarillo Sphere of Influence (SOI) incorporated into the City.

Las Posas Estates

Camarillo Heights

CAMROSA WATER DISTRICT

Beardsley Wash

Las Posas Rd

Upland Rd

Mission Dr

La Posas Rd

Divert Flow to West at Split MH H9-127

Edgemont Dr

Carmen Dr

Bedford Dr

Mobile Av

Arneil Rd

Temple Ave

Eston St

Lewis Rd

Adolfo Rd

Mission Oaks Blvd

Santa Rosa Rd

Conejo Creek

Broadmoor Ave

La Posas Rd

Rosewood Ave

Skeel Dr

Ponderosa Dr

Daily Dr

See Detail A

Ventura Freeway

Bajo Aqua Ave

P.S. #5

Camarillo Airport

Ventura Blvd

Camarillo Center Dr

Dawson Dr

Ventura Freeway

Pleasant Valley Rd

P.S. #3

P.S. #4

Pleasant Valley Dr

P.S. #2

P.S. #6

Las Posas Rd

Calleguas Creek

Pancho Rd

Calle Quetzal

Wastewater Treatment Plant

5th St

28 17 24 14 3 3 18 9 29 23 26 15 16 8 25 6

Detail A

Skeel Dr

7 13 27 2

1" = 1,000'

Legend

- Beginning/End of Deficiency Location
- Pump Stations
- Existing Deficiencies
- Ultimate Deficiencies (Including Sphere of Influence)
- CSD Sewers
- City Boundary
- Not Served by Camarillo Sanitary District

N

0 1,500 3,000 6,000 9,000 Feet

1" = 3,000'

AKM

PROJECT NO: 1450763.00

DATE: July 2009

CAMARILLO SANITARY DISTRICT SECAP

Capacity Deficiencies

Figure 1-1

Table 1-1
Hydraulic Deficiencies, Existing Operations

General Information								Existing Conditions				Ultimate Conditions (Including SOI Flows*)			
Deficiency Location	Pipe ID	U/S MH	D/S MH	Diameter (in)	Length (ft)	Installation Date	Slope	PDWF (mgd)	ADWF (mgd)	PDWF d/D	PDWF Water Depth (ft)	PDWF (mgd)	ADWF (mgd)	PDWF d/D	PDWF Water Depth (ft)
2	F12-1069	F12-128	F12-124	12	350	9/15/1997	0.0059	1.84	0.86	1.00	1.00	2.24	1.07	1.00	1.00
2	F12-1019	F12-124	F12-122	12	350	9/15/1997	0.0079	1.84	0.86	0.74	0.74	2.24	1.07	1.00	1.00
2	F12-1068	F12-122	F12-119	12	350	9/15/1997	0.0079	1.84	0.86	0.74	0.74	2.24	1.07	1.00	1.00
2	F12-1022	F12-119	F12-115	12	350	9/15/1997	0.0079	1.84	0.86	0.74	0.74	2.24	1.07	1.00	1.00
2	F12-1021	F12-115	F12-110	12	386	9/15/1997	0.0079	1.84	0.86	0.74	0.74	2.24	1.07	1.00	1.00
3	H11-1080	H11-126	H11-125	12	340	3/1/1964	0.0020	0.88	0.39	0.71	0.71	1.01	0.45	0.80	0.80
3	H11-1009	H11-125	H11-124	12	274		0.0022	0.92	0.41	0.71	0.71	1.05	0.47	0.79	0.79
3	H11-1008	H11-124	H11-131	12	375		0.0022	0.92	0.41	0.71	0.71	1.05	0.47	0.80	0.80
3	H11-1007	H11-131	H11-129	12	375		0.0022	0.92	0.41	0.71	0.71	1.05	0.47	0.79	0.79
3	H11-1005	H11-129	H11-127	12	445		0.0037	1.22	0.55	0.72	0.72	1.34	0.62	0.79	0.79
3	H11-1006	H11-127	G11-131	12	450		0.0037	1.22	0.55	0.72	0.72	1.34	0.62	0.79	0.79
3	G11-1105	G11-131	G11-130	12	130	5/1/1966	0.0044	1.25	0.57	0.69	0.69	1.38	0.63	0.74	0.74
3	G11-1142	G11-130	G11-124	12	300	5/1/1966	0.0033	1.60	0.74	1.00	1.00	1.76	0.82	1.00	1.00
3	G11-1143	G11-124	G11-125	12	455	5/1/1966	0.0052	1.61	0.75	0.79	0.79	1.77	0.83	1.00	1.00
3	G11-1044	G11-125	G11-126	12	440	5/1/1966	0.0053	1.61	0.75	0.79	0.79	1.77	0.83	1.00	1.00
3	G11-1011	G11-126	G11-127	12	85	5/1/1966	0.0227	1.61	0.75	0.78	0.78	1.77	0.83	1.00	1.00
3	G11-1010	G11-127	G11-129	12	355	5/1/1966	0.0005	1.61	0.75	0.79	0.79	1.77	0.83	1.00	1.00
3	G11-1013	G11-129	G11-128	12	440	5/1/1966	0.0052	1.61	0.75	0.79	0.79	1.77	0.83	1.00	1.00
3	G11-1012	G11-128	G11-123	12	430	5/1/1966	0.0052	1.61	0.75	0.79	0.79	1.77	0.83	1.00	0.00
3	G11-1034	G11-123	F11-133	12	430	5/1/1966	0.0052	1.61	0.75	0.79	0.79	1.77	0.83	1.00	1.00
3	I11-1046	I11-137	I11-136	8	65		0.0060	0.45	0.19	0.64	0.43	0.47	0.20	0.66	0.44
6	M14-1001	M14-101	L14-102	12	41		0.0007	0.37	0.15	0.55	0.55	0.62	0.26	0.81	0.81
6	L14-1013	L14-102	L14-107	12	210		0.0004	0.37	0.15	0.69	0.69	0.62	0.26	1.00	1.00
6	L14-1008	L14-107	L15-100	12	380		0.0004	0.37	0.15	0.68	0.68	0.62	0.26	1.00	1.00
6	L15-1005	L15-100	L15-101	12	317		0.0004	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L15-1011	L15-101	L15-108	12	317		0.0004	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L15-1006	L15-108	L15-110	12	317		0.0004	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L15-1010	L15-110	L15-112	12	330		0.0004	0.37	0.15	0.66	0.66	0.62	0.26	1.00	1.00
6	L15-1009	L15-112	L15-115	12	334		0.0004	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L15-1008	L15-115	L15-117	12	401		0.0003	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L15-1007	L15-117	L16-104	12	360		0.0006	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L16-1003	L16-104	L16-800	12	370		0.0002	0.37	0.15	0.66	0.66	0.62	0.26	1.00	1.00
7	F11-1038	F11-130	F11-132	15	300	7/30/1970	0.0005	1.36	0.62	0.76	0.95	1.91	0.90	1.00	1.25
8	I13-1027	I13-104	I13-109	12	366	5/1/1957	0.0059	1.49	0.69	0.70	0.70	1.60	0.74	0.74	0.74
9	J11-1035	J11-122	J11-125	8	327	10/13/1959	0.0037	0.43	0.18	0.69	0.46	0.44	0.18	0.70	0.47
13	F11-1034	F11-132	F11-150	15	445		0.0016	2.18	1.04	1.00	1.25	2.78	1.36	1.00	1.25
13	F11-1067	F11-150	F11-162	15	315		0.0038	2.19	1.04	0.71	0.89	2.80	1.36	1.00	1.25
13	F11-1054	F11-162	F11-168	15	119		0.0016	2.19	1.04	1.00	1.25	2.80	1.36	1.00	1.25
13	F11-1030	F11-168	F11-170	15	13		0.0015	2.19	1.04	1.00	1.25	2.80	1.36	1.00	1.25
13	F11-1069	F11-170	F11-173	15	14	6/29/1981	0.0036	3.28	1.62	1.00	1.25	4.01	2.02	1.00	1.25
13	F11-1068	F11-173	F12-103	15	391	6/29/1981	0.0028	3.28	1.62	1.00	1.25	4.01	2.02	1.00	1.25
13	F12-1045	F12-103	F12-126	15	404	6/29/1981	0.0027	3.28	1.63	1.00	1.25	4.01	2.02	1.00	1.25
14	F10-1009	F10-123	F10-139	12	400		0.0065	1.30	0.59	0.62	0.62	1.85	0.87	0.81	0.81
14	F10-1010	F10-139	F10-149	12	400		0.0054	1.30	0.59	0.66	0.66	1.85	0.87	1.00	1.00
14	F10-1011	F10-149	F11-100	12	403		0.0059	1.30	0.59	0.64	0.64	1.85	0.87	1.00	1.00
14	F11-1101	F11-100	F11-114	12	400		0.0060	1.30	0.59	0.63	0.63	1.85	0.87	1.00	1.00
14	F11-1102	F11-114	F11-130	12	339		0.0059	1.30	0.59	0.63	0.63	1.85	0.87	1.00	1.00
15	I12-1080	I12-149	I12-158	12	290	5/1/1957	0.0072	1.49	0.69	0.65	0.65	1.59	0.74	0.68	0.68
15	I12-1079	I12-158	I13-102	12	400	5/1/1957	0.0080	1.49	0.69	0.63	0.63	1.59	0.74	0.66	0.66
15	I13-1026	I13-102	I13-104	12	44	5/1/1957	0.0093	1.49	0.69	0.60	0.60	1.60	0.74	0.63	0.63
15	I12-1012	I12-139	I12-143	15	428	5/1/1957	0.0020	1.39	0.64	0.64	0.80	1.48	0.68	0.67	0.84
15	I12-1088	I12-107	I12-120	12	415		0.0056	1.32	0.61	0.66	0.66	1.40	0.64	0.68	0.68
16	I13-1004	I13-109	I13-116	12	285	2/1/1957	0.0080	1.53	0.71	0.64	0.64	1.64	0.76	0.67	0.67
16	I13-1003	I13-116	I13-123	12	189	2/1/1957	0.0080	1.53	0.71	0.64	0.64	1.64	0.76	0.67	0.67
17	F10-1056	F9-161	F10-101	12	315	11/1/1999	0.0059	1.30	0.59	0.64	0.64	1.85	0.87	1.00	1.00
18	J10-1052	J10-132	J10-143	8	375	6/27/1960	0.0036	0.34	0.14	0.63	0.42	0.35	0.14	0.64	0.43
23	D11-1004	D11-131	D11-133	8	390	9/1/1993	0.0047	0.09	0.03	0.28	0.19	0.40	0.17	0.65	0.43

*Ultimate Conditions include flows from the Sphere of Influence (SOI)

Table 1-1
Hydraulic Deficiencies, Existing Operations (Continued)

General Information								Existing Conditions				Ultimate Conditions (Including SOI Flows*)			
Deficiency Location	Pipe ID	U/S MH	D/S MH	Diameter (in)	Length (ft)	Installation Date	Slope	PDWF (mgd)	ADWF (mgd)	PDWF d/D	PDWF Water Depth (ft)	PDWF (mgd)	ADWF (mgd)	PDWF d/D	PDWF Water Depth (ft)
24	E10-1027	E10-142	E10-148	8	250	9/1/1973	0.0048	0.15	0.06	0.36	0.24	0.54	0.23	0.81	0.54
24	E10-1044	E10-148	E11-101	8	250	9/1/1973	0.0048	0.16	0.06	0.37	0.25	0.55	0.23	1.00	0.67
24	E11-1002	E11-101	E11-117	8	255	5/25/1961	0.0017	0.17	0.07	0.52	0.35	0.56	0.24	1.00	0.67
24	E11-1008	E11-117	E11-126	8	250	5/25/1961	0.0034	0.19	0.07	0.44	0.30	0.57	0.24	1.00	0.67
24	E11-1047	E11-126	E11-125	10	260	5/25/1961	0.0025	0.19	0.07	0.35	0.30	0.58	0.25	0.69	0.57
25	F12-1034	F12-143	F13-100	24	415	7/16/1973	0.0022	4.39	2.23	0.58	1.16	5.75	2.99	0.70	1.40
25	F13-1006	F13-100	F13-106	24	400	7/16/1973	0.0022	4.39	2.23	0.58	1.16	5.75	2.99	0.70	1.40
25	F13-1007	F13-106	F13-108	24	87	7/16/1973	0.0057	4.39	2.23	0.57	1.14	5.75	2.99	0.69	1.38
25	F13-1005	F13-108	F13-115	24	400	7/16/1973	0.0014	4.55	2.32	0.60	1.21	6.04	3.15	0.74	1.48
25	F13-1014	F13-115	F13-117	21	400	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	F13-1001	F13-117	F13-119	21	400	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	F13-1002	F13-119	F14-100	21	400	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	F14-1010	F14-100	E14-109	21	400	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	E14-1021	E14-109	E14-123	21	400	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	E14-1035	E14-123	E14-128	21	200	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	E14-1030	E14-128	E14-131	21	196	2/1/1957	0.0040	4.01	2.06	0.57	1.00	5.70	3.02	0.73	1.27
26	F12-1059	F12-110	F12-134	18	450	7/16/1973	0.0084	4.34	2.20	0.61	0.92	5.55	2.88	0.73	1.10
26	F12-1071	F12-134	F12-137	24	396	7/16/1973	0.0012	4.34	2.20	0.58	1.15	5.55	2.88	0.68	1.36
26	F12-1070	F12-137	F12-139	24	402	7/16/1973	0.0022	4.34	2.20	0.58	1.15	5.57	2.88	0.68	1.37
26	F12-1063	F12-139	F12-143	24	483	7/16/1973	0.0027	4.34	2.20	0.54	1.08	5.57	2.88	0.63	1.26
27	F12-1061	F12-126	F12-123	15	328	7/16/1973	0.0051	1.74	0.86	0.55	0.69	2.12	1.07	0.62	0.78
28	G9-1045	G9-155	G9-159	12	294	2/14/1961	0.0051	0.79	0.34	0.49	0.49	1.30	0.59	0.67	0.67
28	G9-1029	G9-159	G9-161	12	181	2/14/1961	0.0051	0.91	0.40	0.53	0.53	1.47	0.68	0.73	0.73
28	G9-1001	G9-161	G9-164	12	350	2/14/1961	0.0051	0.91	0.40	0.53	0.53	1.48	0.68	0.74	0.74
28	G9-1002	G9-164	G9-170	12	349	2/14/1961	0.0051	0.91	0.40	0.53	0.53	1.48	0.68	0.74	0.74
28	G9-1049	G9-166	G9-170	12	231	8/10/2000	0.0022	0.19	0.07	0.28	0.28	0.19	0.07	0.28	0.28
28	G9-1063	G9-170	G9-172	12	283	11/1/1999	0.0050	1.06	0.48	0.59	0.59	1.62	0.75	0.82	0.82
28	G9-1040	G9-172	G9-176	12	400	11/1/1999	0.0057	1.06	0.48	0.56	0.56	1.62	0.75	0.76	0.76
28	G9-1010	G9-176	G9-180	12	254	11/1/1999	0.0060	1.20	0.54	0.60	0.60	1.75	0.82	0.80	0.80
28	F9-1041	G9-180	F9-161	12	257	11/1/1999	0.0059	1.20	0.54	0.60	0.60	1.75	0.82	0.81	0.81
29	J11-1040	J11-126	J11-128	12	334		0.0056	1.16	0.53	0.60	0.60	1.23	0.56	0.62	0.62
29	J11-1039	J11-128	J11-133	12	332		0.0055	1.16	0.53	0.61	0.61	1.23	0.56	0.63	0.63
29	J11-1027	J11-133	J11-141	12	336		0.0056	1.16	0.53	0.60	0.60	1.23	0.56	0.62	0.62
29	I11-1031	J11-141	I12-107	12	253		0.0056	1.16	0.53	0.60	0.60	1.23	0.56	0.62	0.62
			Total		29,195										

*Ultimate Conditions include flows from the Sphere of Influence (SOI)

For the gravity sewer deficiencies under the existing conditions, the capacity improvements are recommended to convey the ultimate peak dry weather flows. Improvements shall be planned to accommodate the additional flows that the SOI area will generate when incorporated into the City limits.

The projects that will eliminate the existing capacity deficiencies in the gravity collection system are prioritized as follows:

1. Facilities with verified existing dry weather capacity deficiencies.

2. The facilities that have shown calculated capacity deficiencies but are currently adequate. Flow monitoring is recommended prior to project implementation. When the measured peak flows exceed the pipe capacity (d/D = 0.62 during peak dry weather conditions), the projects should be reprioritized.

Pump Station and Forcemain Improvement Projects

The functionality of District's sewer system heavily depends on reliability of the four (4) main pump stations and corresponding force mains to convey the wastewater to the Wastewater Treatment Plant. It is recommended that the District build parallel force mains to provide redundancy.

The following improvements are recommended for the District's pump stations.

Pump Station No. 5

- Replace the three (3) existing "non clog" pumps (rated at 2,100 gpm) with three (3) enclosed screw centrifugal pumps (rated at 1,400 gpm).
- Replace the 10-inch discharge piping, with 12-inch piping.
- Construct 12-inch forcemain (7,981 feet) parallel to the existing 18-inch facility.
- Construct emergency storage

Pump Station No. 3

- Construct new submersible pump station with firm capacity of 5,000 gpm. Include plans to expand to 7,100 gpm when the SOI is incorporated.
- Replace the 10-inch discharge piping, with 18-inch piping.
- Construct 20-inch forcemain (10,685 feet) between Pump Station No. 3 and Calleguas Creek crossing, parallel to the existing 30-inch facility.
- Construct 30-inch forcemain (7,007 feet) parallel to the existing 30-inch facility, between the Calleguas Creek crossing and the Wastewater Treatment Plant.

Pump Station No. 2

- Replace three (3) existing "non-clog" pumps with enclosed screw centrifugal pumps.
- Replace the 10-inch discharge piping, with 12-inch piping.
- Construct emergency storage

Pump Station No. 6

- Evaluate existing pump station capacity
- Replace the 8-inch discharge piping, with 12-inch piping.
- Construct 12-inch forcemain (2,850 feet), parallel to existing 12-inch forcemain.
- Construct emergency storage

Capital Improvement Program

District's comprehensive capital improvement program (CIP) will include the improvements recommended by this System Evaluation and Capacity Assurance Plan (SECAP) and by the Operation and Maintenance Program. The projects included in this SECAP are recommended to improve capacity deficient sewers, the pump stations, and forcemains. The projects recommended in the Operation and Maintenance Plan deal with improving the condition of the District's sewer system.

The CIP for this SECAP has been developed based upon the results of the hydraulic analyses and the priorities of Subsection 8-2. The recommended improvement project locations are illustrated on Figure 1-2. Sewer capacity improvement projects are listed in detail in Table 1-2 by priority, along with cost estimates.

Pump Station and forcemain improvement projects are listed in Table 1-3 by priority, along with cost estimates. Table 1-4 summarizes the complete CIP for this SECAP, including the sewer capacity improvement projects and the pump station and forcemain improvement projects. The estimates are based upon recent information for similar projects in the Southern California area, and include contingencies for this planning level study.

The cost estimates presented in Table 8-1 reflect replacement of the existing gravity sewer. The construction costs for gravity sewers are based upon the following:

8-18 inch diameter pipe	$40 / diameter inch / ft
21 inch diameter pipe and greater	$35 / diameter inch / ft

The total costs shown in Table 1-2 and Table 1-3 include engineering, administration and contingency costs, estimated at 35% of the construction cost.

The recommended priorities included in Table 1-4 have been based upon the best information currently available. It should be updated as new information becomes available from sources such as CCTV inspections and from maintenance staff observations. The project priorities may be revised to correspond to changed conditions, such as impending facility failures, or to take advantage of concurrent construction such as street paving projects or adjacent infrastructure work.

Some of the sewer improvement projects recommended are small and it may not be feasible to implement them as a single project. Therefore, several projects may be combined and bid as a package. Some of the projects may be broken down into smaller components to fit the District's budget and other obligations.

The sewer capacity improvement projects shown in Table 1-2 include a total of approximately $17.4 million dollars. The pump station and forcemain improvement projects detailed in Table 1-3 include a total of approximately $38.0 million dollars. The complete CIP for this SECAP is estimated to be $55.4 million dollars and includes the sewer capacity improvements, and pump station and forcemain improvements.

The improvement projects included in the CIP for the Operation and Maintenance Program includes approximately $16.9 million dollars for the rehabilitation and replacement of the sewer condition deficiencies identified through closed circuit television (CCTV). The District shall allocate $1 million (2009 dollars) annually for condition improvements (rehabilitation/replacement), increased for inflation at the same rate as the ENR Index for the Los Angeles area. Condition Improvement Projects shall be determined by the District based on CCTV inspections, and staff knowledge of the system.

In summary, the District's comprehensive capital improvement program is estimated as follows:

CIP for SECAP	$55.4	Million
CIP for Operation and Maintenance Program	$16.9	Million
Comprehensive CIP	$72.3	Million

The District's comprehensive capital improvement program consists of $72.3 million dollars in improvement projects which address gravity sewer capacity deficiencies, pump station facility deficiencies, forcemain deficiencies, and sewer condition deficiencies.

Project No.	Project Description
1	Construct 20-inch diameter forcemain along Pleasant Valley Rd, between PS. No. 3 and Calleguas Creek.
2	Replace 1,786 feet of sewer with 18-inch along Daily Dr, between Calle la Roda and the Rosewood Ave. easement.
3	Replace 5,333 feet of sewer with 18-inch along Ponderosa Dr. between Rosewood Ave easement and Mobile Ave. Replace 65 feet of sewer with 10-inch on Ponderosa Dr., west of Arneil Rd.
4	Replace three (3) "non-clog" pumps with enclosed screw centrifugal pumps at Pump Station No. 2. Replace 10-inch discharge piping with 12 inch piping.
5	Construct 12-inch diameter forcemain parallel to the existing 18-inch forcemain between Pump Station No. 5 and Las Posas Rd.
6	Replace 3,377 feet of sewer with 18-inch north of the Wastewater Treatment Plant
7	Verify deficiency. If necessary, replace 300 feet of sewer with 21-inch along Ponderosa Dr., east of Rosewood Ave.
8	Verify deficiency. If necessary, replace 366 feet of sewer with 18-inch along Dawson Dr., north of Magnolia St.
9	Verify deficiency. If necessary, replace 327 feet of sewer with 12-inch in the easement between Sharon Dr. and Lewis Rd.
10	Replace three (3) "non-clog" pumps with enclosed screw centrifugal pumps at Pump Station No. 5. Replace 10-inch discharge piping with 12 inch piping.
11	Replace Pump Station No. 3 with a submersible pump station. Provide emergency storage with the new pump station.

Project No.	Project Description
12	Construct 12-inch forcemain parallel to existing 12-inch forcemain between Pump Station No. 6 and Calleguas Creek. Replace 8-inch discharge piping with 12-inch piping.
13	Verify deficiency. If necessary, replace 1,701 feet of sewer with 21-inch and 24-inch along the Rosewood Ave. easement, between Ponderosa Dr. and Daily Dr..
14	Verify deficiency. If necessary, replace 1,942 feet of sewer with 18-inch aong Rosewood Ave., north of Ponderosa Dr..
15	Verify deficiency. If necessary, replace 415 feet of sewer with 15-inch along Lewis Rd. between Merrit Ave. and Barry St. and replace 1,558 feet of sewer with 18-inch from Lewis Rd and Daily Dr to Dawson Dr. and Petit St.
16	Verify deficiency. If necessary, replace 474 feet of sewer with 18-inch aong Dawson Dr., south of Petit St.
17	Verify deficiency. If necessary, replace 315 feet of sewer with 15-inch aong Las Posas Rd, east of Rosewood Ave.
18	Verify deficiency. If necessary, replace 375 feet of sewer with 10-inch aong Eston St., south of Stiles Ave.
19	Construct emergency storage at Pump Station No. 5
20	Construct emergency storage at Pump Station No. 2
21	Construct emergency storage at Pump Station No. 6
22	Construct 30-inch forcemain parallel to the existing 30-inch forcemain between Calleguas Creek and the Wastewater Treatment Plant

Legend

- Capital Improvement Priority No.
- CSD Gravity Sewer Improvements
- CSD Forcemain Improvements
- Pump Station Improvements
- Existing Pump Station
- CSD Sewer
- City Boundary
- Not Served by CSD

AKM

PROJECT NO: 1450763.00

DATE: July 2009

CAMARILLO SANITARY DISTRICT SECAP

Capital Improvement Projects

Figure 1-2

Table 1-2
Gravity Sewer Capacity Improvement Projects

General Information								Existing		Ultimate*		Recommendation		Cost		
Deficiency Location	Pipe ID	U/S MH	D/S MH	Location	Installation Date	Slope	Length (ft)	PDWF (mgd)	PDWF d/D	PDWF (mgd)	PDWF d/D	Existing Size (in)	Replacement Size (in)	Unit Cost ($/ft)	Construction Cost	Total Cost
2	F12-1069	F12-128	F12-124	Daily Drive, between of Calle la Roda and the easement east of Rosewood Avenue	9/15/1997	0.0059	350	1.84	1.00	2.24	1.00	12	18	720	252,000	340,200
2	F12-1019	F12-124	F12-122		9/15/1997	0.0079	350	1.84	0.74	2.24	1.00	12	18	720	252,000	340,200
2	F12-1068	F12-122	F12-119		9/15/1997	0.0079	350	1.84	0.74	2.24	1.00	12	18	720	252,000	340,200
2	F12-1022	F12-119	F12-115		9/15/1997	0.0079	350	1.84	0.74	2.24	1.00	12	18	720	252,000	340,200
2	F12-1021	F12-115	F12-110		9/15/1997	0.0079	386	1.84	0.74	2.24	1.00	12	18	720	277,668	374,852
						Subtotal	1,786						Subtotal		1,285,668	1,735,652
3	H11-1080	H11-126	H11-125	Ponderosa Drive, between Mobile Avenue and the Easement east of Rosewood Avenue	3/1/1964	0.0020	340	0.88	0.71	1.01	0.80	12	18	720	244,454	330,013
3	H11-1009	H11-125	H11-124			0.0022	274	0.92	0.71	1.05	0.79	12	18	720	197,366	266,445
3	H11-1008	H11-124	H11-131			0.0022	375	0.92	0.71	1.05	0.80	12	18	720	269,856	364,306
3	H11-1007	H11-131	H11-129			0.0022	375	0.92	0.71	1.05	0.79	12	18	720	270,000	364,500
3	H11-1005	H11-129	H11-127			0.0037	445	1.22	0.72	1.34	0.79	12	18	720	320,400	432,540
3	H11-1006	H11-127	G11-131			0.0037	450	1.22	0.72	1.34	0.79	12	18	720	324,000	437,400
3	G11-1105	G11-131	G11-130		5/1/1966	0.0044	130	1.25	0.69	1.38	0.74	12	18	720	93,600	126,360
3	G11-1142	G11-130	G11-124		5/1/1966	0.0033	300	1.60	1.00	1.76	1.00	12	18	720	216,000	291,600
3	G11-1143	G11-124	G11-125		5/1/1966	0.0052	455	1.61	0.79	1.77	1.00	12	18	720	327,600	442,260
3	G11-1044	G11-125	G11-126		5/1/1966	0.0053	440	1.61	0.79	1.77	1.00	12	18	720	316,800	427,680
3	G11-1011	G11-126	G11-127		5/1/1966	0.0053	85	1.61	0.78	1.77	1.00	12	18	720	61,452	82,960
3	G11-1010	G11-127	G11-129		5/1/1966	0.0052	355	1.61	0.79	1.77	1.00	12	18	720	255,564	345,011
3	G11-1013	G11-129	G11-128		5/1/1966	0.0052	440	1.61	0.79	1.77	1.00	12	18	720	316,800	427,680
3	G11-1012	G11-128	G11-123		5/1/1966	0.0052	430	1.61	0.79	1.77	1.00	12	18	720	309,600	417,960
3	G11-1034	G11-123	F11-133		5/1/1966	0.0053	430	1.61	0.79	1.77	1.00	12	18	720	309,600	417,960
3	F11-1025	F11-133	F11-132			0.0052	10	0.72	0.46	0.79	0.49	15	18	720	6,986	9,431
3	I11-1046	I11-137	I11-136	Ponderosa Drive, west of Arneil Road		0.0060	65	0.45	0.64	0.47	0.66	8	10	400	26,000	35,100
						Subtotal	5,398						Subtotal		3,866,079	5,219,207
6	M14-1001	M14-101	L14-102	Agricultural Field, north of Wastewater Treatment Plant		0.0007	41	0.37	0.55	0.62	0.81	12	18	720	29,462	39,774
6	L14-1013	L14-102	L14-107			0.0004	210	0.37	0.69	0.62	1.00	12	18	720	151,200	204,120
6	L14-1008	L14-107	L15-100			0.0004	380	0.37	0.68	0.62	1.00	12	18	720	273,600	369,360
6	L15-1005	L15-100	L15-101			0.0004	317	0.37	0.65	0.62	1.00	12	18	720	228,319	308,231
6	L15-1011	L15-101	L15-108			0.0004	317	0.37	0.65	0.62	1.00	12	18	720	228,312	308,221
6	L15-1006	L15-108	L15-110			0.0004	317	0.37	0.65	0.62	1.00	12	18	720	228,312	308,221
6	L15-1010	L15-110	L15-112			0.0004	330	0.37	0.66	0.62	1.00	12	18	720	237,427	320,527
6	L15-1009	L15-112	L15-115			0.0005	334	0.37	0.65	0.62	1.00	12	18	720	240,214	324,288
6	L15-1008	L15-115	L15-117			0.0004	401	0.37	0.65	0.62	1.00	12	18	720	289,015	390,171
6	L15-1007	L15-117	L16-104			0.0004	360	0.37	0.65	0.62	1.00	12	18	720	259,200	349,920
6	L16-1003	L16-104	L16-800			0.0004	370	0.37	0.66	0.62	1.00	12	18	720	266,400	359,640
						Subtotal	3,377						Subtotal		2,431,462	3,282,473
7**	F11-1038	F11-130	F11-132	Ponderosa Drive, east of Rosewood Avenue	7/30/1970	0.0012	300	1.36	0.76	1.91	1.00	15	21	735	220,500	297,675
						Subtotal	300						Subtotal		220,500	297,675

* Ultimate Conditions include flows from the Sphere of Influence (SOI)

** Verify gravity sewer deficiency with flow monitoring

Table 1-2
Gravity Sewer Capacity Improvement Projects (Continued)

General Information								Existing		Ultimate*		Recommendation		Cost		
Deficiency Location	Pipe ID	U/S MH	D/S MH		Installation Date	Slope	Length (ft)	PDWF (mgd)	PDWF d/D	PDWF (mgd)	PDWF d/D	Existing Size (in)	Replacement Size (in)	Unit Cost ($/ft)	Construction Cost	Total Cost
8**	I13-1027	I13-104	I13-109	Dawson Drive, north of Magnolia Street	5/1/1957	0.0059	366	1.49	0.70	1.60	0.74	12	18	720	263,520	355,752
						Subtotal	**366**						**Subtotal**		**263,520**	**355,752**
9**	J11-1035	J11-122	J11-125	Easement between Sharon Drive and Lewis Road	10/13/1959	0.0044	327	0.43	0.69	0.44	0.70	8	12	480	156,902	211,818
						Subtotal	**327**						**Subtotal**		**156,902**	**211,818**
13**	F11-1034	F11-132	F11-150	Easement east of Rosewood Avenue between Ponderosa Drive and Daily Drive		0.0016	445	2.18	1.00	2.78	1.00	15	21	735	327,075	441,551
13**	F11-1067	F11-150	F11-162			0.0038	315	2.19	0.71	2.80	1.00	15	21	735	231,525	312,559
13**	F11-1054	F11-162	F11-168			0.0016	119	2.19	1.00	2.80	1.00	15	21	735	87,465	118,078
13**	F11-1030	F11-168	F11-170			0.0015	13	2.19	1.00	2.80	1.00	15	21	735	9,555	12,899
13**	F11-1069	F11-170	F11-173		6/29/1981	0.0036	14	3.28	1.00	4.01	1.00	15	24	840	11,760	15,876
13**	F11-1068	F11-173	F12-103		6/29/1981	0.0028	391	3.28	1.00	4.01	1.00	15	24	840	328,818	443,904
13**	F12-1045	F12-103	F12-126		6/29/1981	0.0027	404	3.28	1.00	4.01	1.00	15	24	840	339,293	458,045
						Subtotal	**1,701**						**Subtotal**		**1,335,491**	**1,802,913**
14*	F10-1009	F10-123	F10-139	Rosewood Avenue, north of Ponderosa Drive		0.0065	400	1.30	0.62	1.85	0.81	12	18	720	288,000	388,800
14*	F10-1010	F10-139	F10-149			0.0054	400	1.30	0.66	1.85	1.00	12	18	720	288,000	388,800
14*	F10-1011	F10-149	F11-100			0.0059	403	1.30	0.64	1.85	1.00	12	18	720	290,160	391,716
14*	F11-1101	F11-100	F11-114			0.0060	400	1.30	0.63	1.85	1.00	12	18	720	288,000	388,800
14*	F11-1102	F11-114	F11-130			0.0059	339	1.30	0.63	1.85	1.00	12	18	720	244,080	329,508
						Subtotal	**1,942**						**Subtotal**		**1,398,240**	**1,887,624**
15**	I12-1088	I12-107	I12-120	Lewis Road, between Merritt Avenue and Barry Street		0.0056	415	1.32	0.66	1.40	0.68	12	15	600	248,814	335,899
15**	I12-1012	I12-139	I12-143	Lewis Road and Daily Drive to Dawson Drive and Petit Street	5/1/1957	0.0020	428	1.39	0.64	1.48	0.67	15	18	720	308,196	416,065
15**	I12-1075	I12-143	I12-149		5/1/1957	0.0043	396	1.46	0.52	1.55	0.54	15	18	720	285,120	384,912
15**	I12-1080	I12-149	I12-158		5/1/1957	0.0072	290	1.49	0.65	1.59	0.68	12	18	720	208,800	281,880
15**	I12-1079	I12-158	I13-102		5/1/1957	0.0080	400	1.49	0.63	1.59	0.66	12	18	720	288,000	388,800
15**	I13-1026	I13-102	I13-104		5/1/1957	0.0093	44	1.49	0.60	1.60	0.63	12	18	720	31,680	42,768
						Subtotal	**1,973**						**Subtotal**		**1,370,610**	**1,850,324**
16**	I13-1004	I13-109	I13-116	Dawson Drive, south of Petit Street	2/1/1957	0.0080	285	1.53	0.64	1.64	0.67	12	18	720	205,200	277,020
16**	I13-1003	I13-116	I13-123		2/1/1957	0.0080	189	1.53	0.64	1.64	0.67	12	18	720	136,080	183,708
						Subtotal	**474**						**Subtotal**		**341,280**	**460,728**
17**	F10-1056	F9-161	F10-101	Las Posas Road, east of Rosewood Avenue	11/1/1999	0.0059	315	1.30	0.64	1.85	1.00	12	15	600	188,766	254,834
						Subtotal	**315**						**Subtotal**		**188,766**	**254,834**
18**	J10-1052	J10-132	J10-143	Eston Street, south of Stiles Avenue	6/27/1960	0.0036	375	0.34	0.63	0.35	0.64	8	10	Impending Project		
						Subtotal	**375**						**Subtotal**	Impending Project		
					Grand Total		**17,959**						**Grand Total**			**17,359,000**

* Ultimate Conditions include flows from the Sphere of Influence (SOI)

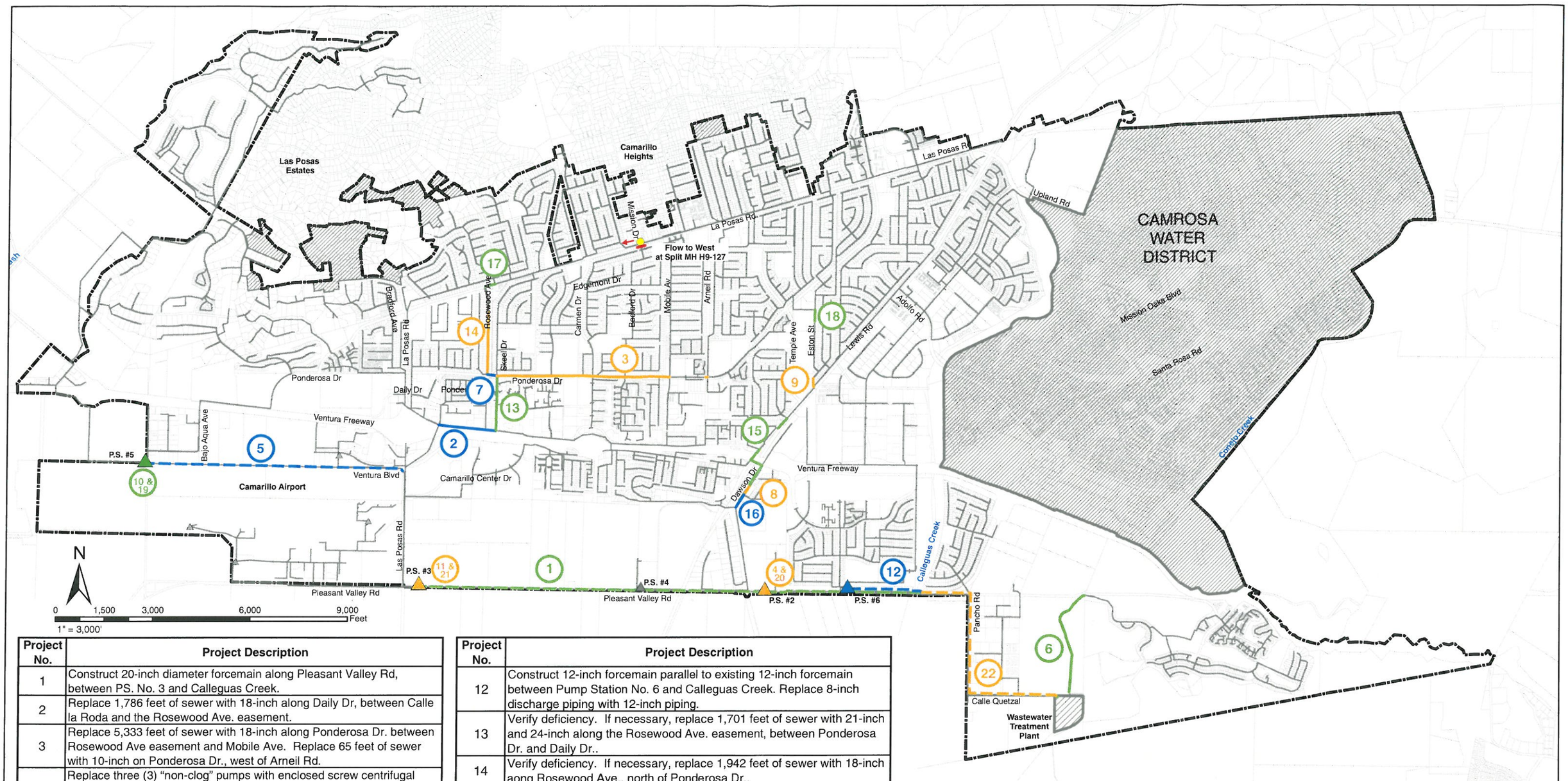
** Verify gravity sewer deficiency with flow monitoring

Table 1-3
Pump Station and Forcemain Improvement Projects

Project No	Pump Station	Recommended Improvements	Quantity	Unit	Unit Cost	Total Cost
1	PS No. 3	Construct 20-inch forcemain along Pleasant Valley Road from Pump Station No. 3 to east side of Calleguas Creek Crossing, parallel to existing 30-inch forcemain	15,418	LF	$900	**$13,876,200**
4	PS No. 2	Replace "non-clog" pumps with enclosed screw centrifugal pumps	3	LS	$675,000	$675,000
	PS No. 2	Replace 10-inch PVC discharge piping with 12-inch piping	3	LS	$135,000	$135,000
					Total Project Cost	**$810,000**
5	PS No. 5	Construct parallel 12-inch forcemain parallel to existing 18-inch forcemain between Pump Station No. 5 and Las Posas Road, north of the Camarillo Airport	7,981	LF	$500	**$3,990,500**
10	PS No. 5	Replace "non-clog" pumps with enclosed screw centrifugal pumps	3	LS	$675,000	$675,000
	PS No. 5	Replace 10-inch PVC discharge piping with 12-inch piping	3	LS	$135,000	$135,000
					Total Project Cost	**$810,000**
11	PS No. 3	Construct new submersible pump station, convert existing pump station to emergency storage	1	LS	$6,000,000	**$6,000,000**
12	PS No. 6	Construct parallel 12-inch forcemain parallel to existing 12-inch forcemain on Pleasant Valley Road Between Pump Station No. 3 and Calleguas Creek	2,850	LF	$650	$1,852,500
	PS No. 6	Replace 8-inch PVC discharge piping with 12-inch piping.	3	LS	$270,000	$270,000
					Total Project Cost	**$2,122,500**
19	PS No. 5	Construct emergency storage	40,000	GAL	$21	**$840,000**
20	PS No. 2	Construct emergency storage	50,000	GAL	$21	**$1,050,000**
21	PS No. 6	Construct emergency storage	55,000	GAL	$21	**$1,155,000**
22	PS No. 3	Construct 30-inch forcemain parallel to the existing 30-inch forcemain along Pleasant Valley Road, Rancho Road, and Calle Quetzal, between Calleguas Creek and the Wastewater Treatment Plant	7,007	LF	$1,050	**$7,357,350**
					Grand Total	**$38,011,550**

Table 1-4
Gravity Sewer Capacity, Pump Station and Forcemain Improvement Projects

Project No.	Project Description	Cost
1	Construct 20-inch diameter forcemain along Pleasant Valley Road, between PS. No. 3 and Calleguas Creek. Existing 30-inch forcemain shall be the back up.	$13,876,200
2	Replace 1,786 feet of sewer with 18-inch along Daily Drive, between Calle la Roda and the easement east of Rosewood Avenue.	$1,735,652
3	Replace 5,333 feet of sewer with 18-inch along Ponderosa Drive between the easement east of Rosewood Avenue and Mobile Avenue. Replace 65 feet of sewer with 10-inch sewer on Ponderosa Drive, west of Arneil Road.	$5,219,207
4	Replace three (3) "non-clog" pumps with enclosed screw centrifugal pumps at Pump Station No. 2. Replace 10-inch discharge piping with 12-inch piping.	$810,000
5	Construct 12-inch diameter forcemain parallel to the existing 18-inch forcemain between Pump Station No. 5 and Las Posas Road, north of the Camarillo Airport	$3,990,500
6	Replace 3,377 feet of sewer with 18-inch north of the Wastewater Treatment Plant	$3,282,473
7	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 300 feet of sewer with 21-inch along Ponderosa Drive, east of Rosewood Avenue.	$297,675
8	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 366 feet of sewer with 18-inch along Dawson Drive, north of Magnolia Street	$355,752
9	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 327 feet of sewer with 12-inch in the easement between Sharon Drive and Lewis Road	$211,818
10	Replace three (3) "non-clog" pumps with enclosed screw centrifugal pumps at Pump Station No. 5. Replace 10-inch discharge piping with 12-inch piping.	$810,000
11	Replace Pump Station No. 3 with a submersible pump station. Provide emergency storage with the new pump station.	$6,000,000
12	Construct 12-inch forcemain parallel to existing 12-inch forcemain along Pleasant Valley Road between Pump Station No. 6 and Calleguas Creek. Replace 8-inch discharge piping with 12-inch piping.	$2,122,500
13	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 1,701 feet of sewer with 21-inch and 24-inch along the easement east of Rosewood Avenue, between Ponderosa Drive and Daily Drive.	$1,802,913
14	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 1,942 feet of sewer with 18-inch aong Rosewood Avenue, north of Ponderosa Drive.	$1,887,624
15	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 415 feet of sewer with 15-inch along Lewis Road between Merritt Avenue and Barry Street and replace 1,558 feet of sewer with 18-inch from the intersection of Lewis Road and Daily Drive to the intersection of Dawson Drive and Petit Street.	$1,850,324
16	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 474 feet of sewer with 18-inch aong Dawson Drive, south of Petit Street	$460,728
17	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 315 feet of sewer with 15-inch aong Las Posas Road, east of Rosewood Avenue.	$254,834
18	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 375 feet of sewer with 10-inch aong Eston Street, south of Stiles Avenue.	Improvements in Process
19	Construct emergency storage at Pump Station No. 5	$840,000
20	Construct emergency storage at Pump Station No. 2	$1,050,000
21	Construct emergency storage at Pump Station No. 6	$1,155,000
22	Construct 30-inch forcemain parallel to the existing 30-inch forcemain along Pleasant Valley Road, Rancho Road, and Calle Quetzal, between Calleguas Creek and the Wastewater Treatment Plant	$7,357,350
	Grand Total	**$55,370,550**



Project No.	Project Description
1	Construct 20-inch diameter forcemain along Pleasant Valley Rd, between PS. No. 3 and Calleguas Creek.
2	Replace 1,786 feet of sewer with 18-inch along Daily Dr, between Calle la Roda and the Rosewood Ave. easement.
3	Replace 5,333 feet of sewer with 18-inch along Ponderosa Dr. between Rosewood Ave easement and Mobile Ave. Replace 65 feet of sewer with 10-inch on Ponderosa Dr., west of Arneil Rd.
4	Replace three (3) "non-clog" pumps with enclosed screw centrifugal pumps at Pump Station No. 2. Replace 10-inch discharge piping with 12 inch piping.
5	Construct 12-inch diameter forcemain parallel to the existing 18-inch forcemain between Pump Station No. 5 and Las Posas Rd.
6	Replace 3,377 feet of sewer with 18-inch north of the Wastewater Treatment Plant
7	Verify deficiency. If necessary, replace 300 feet of sewer with 21-inch along Ponderosa Dr., east of Rosewood Ave.
8	Verify deficiency. If necessary, replace 366 feet of sewer with 18-inch along Dawson Dr., north of Magnolia St.
9	Verify deficiency. If necessary, replace 327 feet of sewer with 12-inch in the easement between Sharon Dr. and Lewis Rd.
10	Replace three (3) "non-clog" pumps with enclosed screw centrifugal pumps at Pump Station No. 5. Replace 10-inch discharge piping with 12 inch piping.
11	Replace Pump Station No. 3 with a submersible pump station. Provide emergency storage with the new pump station.

Project No.	Project Description
12	Construct 12-inch forcemain parallel to existing 12-inch forcemain between Pump Station No. 6 and Calleguas Creek. Replace 8-inch discharge piping with 12-inch piping.
13	Verify deficiency. If necessary, replace 1,701 feet of sewer with 21-inch and 24-inch along the Rosewood Ave. easement, between Ponderosa Dr. and Daily Dr..
14	Verify deficiency. If necessary, replace 1,942 feet of sewer with 18-inch aong Rosewood Ave., north of Ponderosa Dr..
15	Verify deficiency. If necessary, replace 415 feet of sewer with 15-inch along Lewis Rd. between Merrit Ave. and Barry St. and replace 1,558 feet of sewer with 18-inch from Lewis Rd and Daily Dr to Dawson Dr. and Petit St.
16	Verify deficiency. If necessary, replace 474 feet of sewer with 18-inch aong Dawson Dr., south of Petit St.
17	Verify deficiency. If necessary, replace 315 feet of sewer with 15-inch aong Las Posas Rd, east of Rosewood Ave.
18	Verify deficiency. If necessary, replace 375 feet of sewer with 10-inch aong Eston St., south of Stiles Ave.
19	Construct emergency storage at Pump Station No. 5
20	Construct emergency storage at Pump Station No. 2
21	Construct emergency storage at Pump Station No. 6
22	Construct 30-inch forcemain parallel to the existing 30-inch forcemain between Calleguas Creek and the Wastewater Treatment Plant

Legend

- Capital Improvement Priority No.
- CSD Gravity Sewer Improvements
- CSD Forcemain Improvements
- Pump Station Improvements
- Existing Pump Station
- CSD Sewer
- City Boundary
- Not Served by CSD

AKM

PROJECT NO: 1450763.00

DATE: July 2009

CAMARILLO SANITARY DISTRICT SECAP

Capital Improvement Projects

Figure 8-1

Section 2

INTRODUCTION

2-1 PURPOSE

This section provides an overview and outline for the Camarillo Sanitary District's System Evaluation and Capacity Assurance Plan (SECAP). A brief background description, objectives and scope of work, acknowledgments, and a list of abbreviations used throughout the report are provided.

2-2 HISTORY AND BACKGROUND

During the middle 1950's, the Ventura Freeway (Highway 101) was built northerly from Los Angeles through Camarillo. While orange, lemon, and walnut trees covered the landscape, Camarillo's growth was very slow prior to the completion of the freeway. In general, workers came to cultivate the fields. There was very little private industry and residential population. Oxnard Air Force Base, the Navy facility at Point Mugu, and the Seabee base at Port Hueneme brought many service employees to Camarillo. Other than agriculture and service employment, the State Mental Hospital was the largest industry in Camarillo before the freeway was completed.

However, once the freeway was completed, the number of travelers through the area rapidly increased. Soon, large companies began to settle in the area which helped bring about large population growth. In 1962, the 3M Corporation based its Mincom and Magnetic Tape Division in Camarillo. Other residents that settled in Camarillo included those who worked in the San Fernando Valley and were willing to compromise a longer work commute for a smog-free semi-rural environment to raise their families.

Camarillo was incorporated in 1964. The original General Plan for the City of Camarillo was completed in 1969. Although the major developments were expected south of Ventura Boulevard, it was actually the northern area that experienced the major growth. The southern area remains highly agricultural to the present day.

In 1962, prior to its incorporation, the population in Camarillo was estimated at approximately 7,500 residents. By 1970, the City's population jumped to 19,219. Between 1970 and 1990, the City experienced rapid growth; however, during 1990's, the population growth slowed down. As of January 1, 2008, the California Department of Finance estimated the population at 65,453.

The Camarillo Sanitary District (District) was established in 1955 to provide service to most of the current City areas. The Wastewater Treatment Plant was built in the southeast portion of the City, south of Calle Quetzal and west of Conejo Creek. The treated water is either utilized for irrigation, or it is discharged to Conejo Creek, which confluences with Calleguas Creek and then flows to the Pacific Ocean.

The District became a subsidiary district of the City of Camarillo when the City was incorporated. The District provides wastewater collection, treatment, and disposal service to a population of approximately 42,000 within the City's corporate boundaries, as well as several small unincorporated Ventura County areas. The District's Sphere of Influence includes a significant portion of unincorporated Ventura County located to the north of the

City. If this area were incorporated by the City of Camarillo, the District's ultimate service population would be approximately 70,000. The majority of the unincorporated area is currently on septic systems.

The portion of the City east of Calleguas Creek and north of Ventura Freeway is served by Camrosa Water District.

2-3 PREVIOUS STUDIES AND WORK COMPLETED

1999 Wastewater System Master Plan Update

The City's latest Master Plan was prepared in December 1999 by Parsons Engineering Science. It evaluated the Wastewater Treatment Plant, the pump stations, the forcemains, and the larger gravity sewers. Approximately 44 miles of 10-inch to 30-inch diameter gravity collection system pipe was included in the capacity analysis. The remaining 97 miles of 6-inch and 8-inch diameter sewers were not included in the previous study.

The average wastewater flow was estimated by the 1998 water meter data. The agricultural, landscaping, and fire hydrant meter readings were not included in the District's total water use calculation because this water does not enter into the sewer system. The remaining water use was multiplied by a factor of 0.67, which represented the average wastewater flow through the sewer system. This factor was calibrated by matching the flows measured at the Wastewater Treatment Plant to the total flow estimated using the 1998 water meter data.

The dry weather peaking formula was created from the historic flows observed at the treatment facility. The relationship between the peak dry weather flows and average dry weather flows was $Q_{peak(mgd)} = 2.0 * Q_{ave(mgd)}$.

The model developed for the 1999 Master Plan calculated the depth of flow using peak dry weather flows and Manning's Equation.

The District's standard specifications were utilized when determining the depth to diameter criteria. The criteria limited the peak dry weather flow to a depth to diameter ratio of 0.50 for pipes 15-inches or smaller in diameter. Pipes greater than 15-inches in diameter were limited to a depth to diameter ratio of 0.75. The District's standard specifications also stated that the sewer force mains should have a velocity between 2 feet per second and 6 feet per second.

The 1999 Master Plan recommended that two gravity sewers be monitored for potential capacity deficiencies. Based on the report criteria, the pump stations and force mains were sufficient, and the Wastewater Treatment Plant also had adequate capacity to support the expected population through 2010.

2007 Sewer Pump Station Testing and Analysis

Studies of the District's sewer Pump Station No. 2, 3, 5 and 6 were conducted in 2007 by AKM Consulting Engineers. The study included flow measurements at the pump stations which were necessary to formulate improvements.

The analysis verified that Pump Station No.'s 2 and 5 had adequate capacity, and Pump Station No. 3 required two (2) pumps of 3,100 gpm capacity to be in operation during peak wet weather flow. During the time of the pump station site visit, one of the three (3) pumps had been damaged due to a failed bearing. Therefore, Pump Station No. 3 did not have a standby pump to operate if one of the two (2) functioning pumps had to be taken out of service. The District has replaced the damaged pump, which has improved the firm capacity at this pump station to handle the peak wet weather flows.

The District experienced ragging problems at Pump Station No. 6. To temporarily reduce the frequency of ragging, the District operated these pumps at full motor speed, and diverted a portion of the Pump Station No. 6 flow to Pump Station No. 2. The three "non-clog" pumps were replaced with screw-centrifugal pumps in 2009, which eliminated the ragging problem.

Sewer GIS and Atlas Books

The District's sewer system is available as a GIS shapefile and database. The sewer data was captured from improvement plans, hand-drafted atlas maps, and field reviews. It is updated regularly as additional data, corrections, and new projects are identified. In November 2006, detailed sewer atlas books were created showing manhole numbers, cleanout numbers, facility ID of sewer mains, pipe diameters, pipe materials, pipe lengths, and drawing numbers.

2-4 OBJECTIVES AND SCOPE OF WORK

The objective of this System Evaluation and Capacity Assurance Plan (SECAP) is to evaluate the capacity of the District's sewer facilities to provide a framework for undertaking the construction of new and replacement facilities for the service area in an efficient and cost effective manner. As a planning document, it is general in nature and is predicated upon the best information available at this time.

The scope of work for the System Evaluation and Capacity Assurance Plan (SECAP) consists of the following tasks:

1. Provide Project Management, Communication and Meetings

2. Data Collection and Modeling Review

   The primary sources of information used during the course of this study are as follows:
   - GIS database information (parcels, land use, zoning, street centerlines, sewers)
   - Sewer atlas maps
   - Sewer As-built drawings
   - Sanitary sewer flow monitoring
   - 2004 General Plan and zoning map
   - Aerial Photographs
   - 1-Foot Contour Map
   - Water meter records
   - Facility visits
   - City staff interviews

3. Sewer System Computer Hydraulic Model Development

The sewer GIS was used as the basis of the hydraulic model geometry. The model includes all City sewer pipes, manholes, pump stations, large point source flows, and tributary area boundaries. The model was developed utilizing MWH Soft's H2OMap Sewer software.

Unit flow factors and a dry weather peaking relationship were developed from flow monitoring conducted during this study. The flow monitoring results were also used to calibrate the model. Water meter records were utilized to identify high water users and estimate an appropriate sewage load to be added to the hydraulic model. Water meter records were also used to develop unit flow factors for areas where the land use could not be isolated by flow meters.

4. Flow Monitoring

Flow monitoring locations were selected to develop unit flow factors for land uses with large tributary areas that could be isolated with monitors. The locations were also chosen to quantify the amount of flow that is tributary to the four (4) sewer pump stations. Originally, ten (10) monitors were installed throughout the study area and collected data for twelve (12) weeks in an attempt to capture wet weather flows. The flow monitors collected data during the expected rainy season, between January 25, 2007, and April 23, 2007; however, no meaningful wet weather flow data was collected due to minimal rainfall.

Four (4) sites were selected for flow monitoring to verify the hydraulic deficiencies indicated by the hydraulic model analysis. Additionally, review of the original flow monitoring data indicated that the measured flow at two (2) original sites were abnormally low and required additional inspection. Flow monitors were installed at these six (6) sites on July 16, 2008 and retrieved on August 13, 2008.

5. Sewer System Analyses

The hydraulic model was used to analyze and evaluate the capacity of the gravity sewer system under the following three conditions:

1. Calibration Scenario with existing system, current land use and flow conditions, showing and proving areas of adequacy
2. Ultimate Scenario with existing system, ultimate build-out land use and flow conditions, showing deficiencies and proving areas of adequacy
3. Ultimate Scenario with improved system, existing land use and flow conditions,

6. System Evaluation and Capacity Assurance Plan (SECAP)

The capital improvement program was developed based upon the results of the hydraulic model analyses, and pump station analyses.

The work effort and results are presented in this report. It includes documentation of the methodology used throughout the project. It also includes the study area description, criteria, existing sewer system description, sewer system hydraulic model description, analysis results and a recommended capital improvement program that will address the identified capacity deficiencies

2-5 STATEWIDE GENERAL WASTE DISCHARGE REQUIREMENTS

The State Water Resources Control Board (SWRCB), which oversees all wastewater permitting and enforcement, adopted Resolution 2004-80 requiring staff to work with stakeholders in developing a regulatory program that will provide a consistent approach for reducing SSOs. To assist in the development of the regulatory program, a statewide SSO Guidance Committee composed of representatives from the Regional Water Quality Control Boards, county environmental health departments, environmental groups, U.S. EPA, local public collection system owners and other collection system experts was formed. SWRCB staff and the SSO Guidance Committee drafted Statewide General Waste Discharge Requirements (WDR) for Sewage Collection System Agencies.

The State Water Resources Control Board adopted the Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems and the associated monitoring and reporting program by issuing Order No. 2006-0003 on May 2, 2006.

The WDR and reporting program addresses SSO reporting and proper collection system management and operation necessary to protect the public health, water quality, the environment, and the public's investment in the sewer system infrastructure.

The completion schedule varies by the population of the service area. For a collection system agency with a population between 10,000 and 100,000, the proposed full compliance schedule is currently set on August 2, 2009. The Statewide WDR is essentially California's equivalent of the proposed Federal regulation, Capacity, Management, Operation, and Maintenance (CMOM), and includes all elements of CMOM.

The fifth paragraph of the preamble to the Waste Discharge Requirements is:

"To facilitate proper funding and management of sanitary sewer systems, each Enrollee must develop and implement a system-specific Sewer System Management Plan (SSMP). To be effective, SSMPs must include provisions to provide proper and efficient management, operation, and maintenance of sanitary sewer systems, while taking into consideration risk management and cost benefit analysis. Additionally, an SSMP must contain a spill response plan that establishes standard procedures for immediate response to an SSO in a manner designed to minimize water quality impacts and potential nuisance conditions."

The Sewer System Management Plan must address the following elements:

- Goals
- Organization Structure
- Legal Authority
- Operation and Maintenance Program, including a Preventive Maintenance Program and a Rehabilitation and Replacement Program
- Design and Performance Provisions
- Overflow Emergency Response Plan
- Fats, Oils, and Grease (FOG) Control Program
- System Evaluation and Capacity Assurance Plan (SECAP) – *Completed as a part of this Report*

- Monitoring, Measurement, and Program Modifications
- Sewer System Management Plan Program Audits
- Communication Program

The Waste Discharge Requirements define a sanitary sewer system as, "Any system of pipes, pump stations, sewer lines, or other conveyances, upstream of a Wastewater Treatment Plant headworks used to collect and convey wastewater to the publicly owned treatment facility. Temporary storage and conveyance facilities (such as vaults, temporary piping, construction trenches, wet wells, impoundments, tanks, etc.) are considered to be part of the sanitary sewer system, and discharges into these temporary storage facilities are not considered to be SSOs" The District's Wastewater Treatment Plant is not included in the Sewer System Management Plan.

As currently planned, the following completion schedules apply to the Camarillo Sanitary District (population between 10,000 and 100,000):

Application for Permit Coverage	November 2, 2006 (Completed)
Reporting Program	November 2, 2006 (Completed)
SSMP Development Plan and Schedule	November 2, 2007 (Completed)
Goal	November 2, 2007 (Completed)
Organization	November 2, 2007 (Completed)
Overflow Emergency Response Plan	May 2, 2009
Legal Authority	May 2, 2009
Operation and Maintenance Program	May 2, 2009
Fats, Oils and Grease Control Program	May 2, 2009
Design and Performance Provisions	August 2, 2009
System Evaluation and Capacity Assurance Plan	August 2, 2009
Monitoring and Program Modifications	August 2, 2009
Program Audits	August 2, 2009
Communication Program	August 2, 2009
Final Sewer System Management Plan	August 2, 2009

Enrollees are required to certify that the final SSMP and its constituent subparts are in compliance with the Sanitary Sewer Order within the time frame above. Enrollees are also required to obtain their governing board's approval of the SSMP Development Plan and Schedule and final SSMP at a public hearing prior to certification as complete and in compliance. Enrollees do not send their SSMP to the State or Regional Water Boards for review or approval, but need to make them available upon request.

2-6 FUTURE REGULATIONS – CAPACITY, MANAGEMENT, OPERATIONS AND MAINTENANCE (CMOM)

Concerned over the disturbing trend of frequent and large sanitary sewer overflows (SSOs), their environmental and health impacts, and the condition of the infrastructure, President Clinton directed the Environmental Protection Agency (EPA) on May 29, 1999 to develop, within one year, new national regulations to prevent sanitary sewer overflows. The EPA worked to develop draft National Pollutant Discharge Elimination System (NPDES) regulations for sanitary sewers and sanitary sewer overflows (SSOs).

The purpose of the proposed regulation is to improve collection systems' capacity, management, operation and maintenance (CMOM) programs, prevent avoidable sewer spills, improve treatment facility performance, and reduce health and environmental risks.

Under the proposed regulations, an NPDES permit would be required for all publicly-owned collection systems to develop a written summary of the CMOM program and make it, with audits, available to the public upon request.

The proposed regulation has not been enacted, and it is currently not known how the regulation and permitting process will be implemented. However, compliance with the Statewide WDR is expected to be sufficient to bring the District into compliance with CMOM.

2-7 ORGANIZATION OF SYSTEM EVALUATION AND CAPACITY ASSURANCE PLAN (SECAP) REPORT

This System Evaluation and Capacity Assurance Plan (SECAP) report presents the methodology, findings, and recommendations of a comprehensive capacity assessment of the Camarillo Sanitary District's sewer collection facilities. A brief outline of the report follows:

- Section 1: Executive Summary provides an overview of the key findings and recommendations of this report
- Section 2: Introduction provides an overview and outline for the System Evaluation and Capacity Assurance Plan (SECAP).
- Section 3: Study Area describes the physical features, land use characteristics and population of the District's service area.
- Section 4: Criteria discuses the standards and procedures utilized in developing the wastewater flows, assessing the existing system, and selecting the recommended improvements.
- Section 5: Existing Sewer Collection System describes the City's existing system, drainage regions, and the regional facilities that receive flows from the study area.
- Section 6: Sewer System Hydraulic Model describes the methodology used in the construction of the computer model of the gravity sewer system. Base data and assumptions used are described in detail in this section.

- Section 7: System Analysis describes the hydraulic analyses conducted with the use of the model and identifies the hydraulically deficient segments of the system.

- Section 8: Capital Improvement Program presents a prioritized list of capital improvement projects for the recommended improvements.

- The Appendices contain background information and are referred to in the text as the location of supplementary facts and figures.

2-8 ACKNOWLEDGMENTS

AKM Consulting Engineers would like to express their sincere appreciation to the following individuals for their valuable assistance and support throughout the preparation of this study:

Lucia McGovern, Deputy Director/Environmental Engineer
Douglas Frost, Jr., Water Reclamation Superintendent
Mark Richardson, Water Reclamation Supervisor
Ken Wilson, Collection System Lead

2-9 ABBREVIATIONS

To conserve space and improve readability, abbreviations have been used in this report. Each abbreviation has been spelled out in the text the first time it is used in each section. Subsequent usage of the term is usually identified by its abbreviation. The list of abbreviations utilized in this report is contained in Table 2-1.

Table 2-1
Abbreviations

Abbreviations	Explanation
AC, Ac	Acres
ACP	Asbestos Cement Pipe
ADWF	Average Dry Weather Flow
amsl	Above Mean Sea Level
BMP	Best Management Practices
CCTV	Closed Circuit Television
cfs	Cubic Feet per Second
CI	Cast Iron Pipe
CIP	Capital Improvement Program
City	City of Camarillo
CMOM	Capacity, Management, Operation and Maintenance
CWD	Camrosa Water District
CWEA	California Water Environment Association
d/D	Depth to Diameter Ratio
Dia	Diameter
DIP	Ductile Iron Pipe
District	Camarillo Sanitary District
DU, du	Dwelling Unit
D/S	Downstream
EDU	Equivalent Dwelling Unit
EPA	US Environmental Protection Agency

Abbreviations	Explanation
FAR	Floor Area Ratio
FOG	Fats, Oil, and Grease
fps	Feet per Second
GIS	Geographic Information System
gpcd	Gallons per Capita per Day
GPD, gpd	Gallons per Day
gpm	Gallons per Minute
HP	Horsepower
ID	Identification
I/I	Inflow and Infiltration
LF	Linear Feet
Mat	Material
mg	Million Gallons
MGD, mgd	Million Gallons per Day
MH	Manhole
NCPI	National Clay Pipe Institute
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
OSHA	Occupational Safety & Health Administration
PDWF	Peak Dry Weather Flow
PMP	Preventative Maintenance Program
PS	Pump Station
PVC	Polyvinyl Chloride
PWWF	Peak Wet Weather Flow
RFP	Request for Proposal
RP	Regional Plant
RPM	Revolutions per Minute
SAMP	Sub-Area Master Plan
SSO	Sanitary Sewer Overflow
SECAP	System Evaluation and Capacity Assurance Plan
SSMP	Sewer System Management Plan
SWRCB	State Water Resources Control Board
TDH	Total Dynamic Head
TSF	Thousand Square Feet
U/S	Upstream
VCP	Vitrified Clay Pipe
WDR	Waste Discharge Requirements

Section 3

STUDY AREA

3-1 PURPOSE

This section describes the study area of the System Evaluation and Capacity Assurance Plan (SECAP), discusses the land uses within the study area, and population estimates.

3-2 LOCATION

The study area is located approximately 50 miles northwest of downtown Los Angeles, and 40 miles south of Santa Barbara. The Pacific Ocean is approximately 10 miles to the south. The major highway crossing through the District's study area is the Ventura Freeway (US-101). Major roads within the City include Ventura Boulevard, Lewis Road, Las Posas Road, Mission Oaks Boulevard, Ponderosa Drive, Arneill Road, and Pleasant Valley Road.

Existing Service Area

The District's existing and ultimate service areas are shown on Figure 3-1. The existing service area includes the majority of the City of Camarillo and several small portions of unincorporated Ventura County in the Las Posas Estates community. The study area encompasses approximately 15.3 square miles (9,777 acres) of residential, agricultural, commercial, and industrial lands. It is bordered by unincorporated Ventura County to the north, west, and south. A small portion of the study area is bordered by Thousand Oaks at Old Conejo Road to the east, and the City of Oxnard is less than a mile west of the District's western boundary.

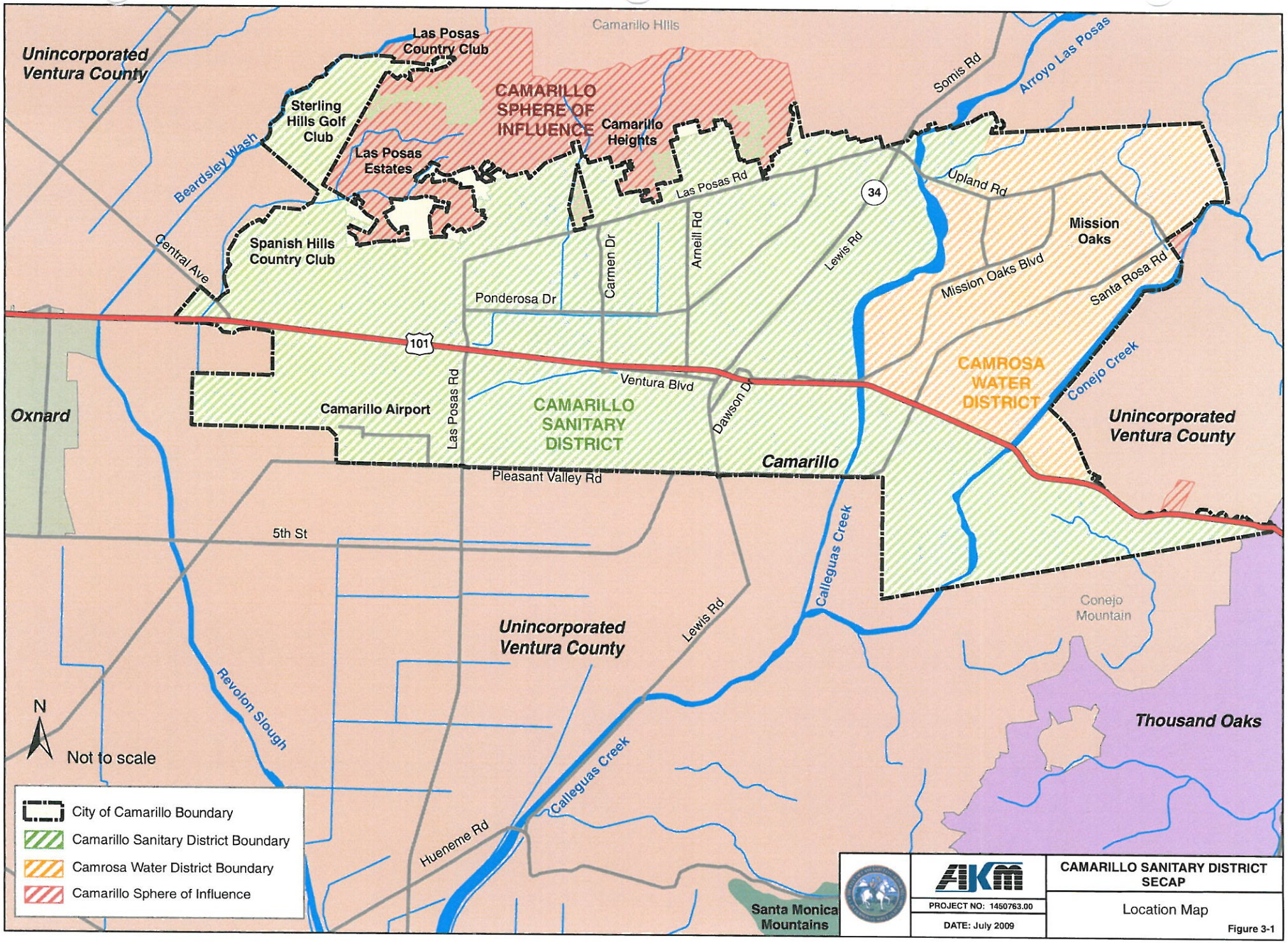
Ultimate Service Area

The District's ultimate service area includes the City of Camarillo's Sphere of Influence. In general, the Sphere of Influence is the maximum boundary that may eventually be incorporated by the City of Camarillo. Development beyond the City's Sphere of Influence is limited by the desire to comply with the State of California's Open Space and Conservation Element. To help preserve the open space land and control future development, the City of Camarillo amended the City's General Plan in 1998, which includes the Save Open Space and Agricultural Resources (SOAR) Ordinance. This ordinance created the Camarillo Urban Restriction Boundary (CURB), which limited the development within the City's Sphere of Influence to help protect agriculture and natural resources, and promote efficient future developments. When extended to its fullest, the District's ultimate service area will encompass approximately 18.6 square miles.

Camrosa Water District

The area east of Calleguas Creek and north of Ventura Boulevard is part of the Camrosa Water District's service area. The wastewater is conveyed by the Camrosa Water District's sewer system, to its Water Reclamation Facility, near South Lewis Road and West Potrero Road. The Camrosa Water District treats the wastewater and then distributes the recycled water to mainly agricultural users.

The Camarillo Sanitary District and Camrosa Water District have the ability to divert wastewater into each other's systems. The agencies have a mutual agreement to divert raw sewage to either plant for operation and maintenance purposes or in times of emergency.


Unincorporated Ventura County
Las Posas Country Club
Camarillo Hills
Somis Rd
Arroyo Las Posas
Sterling Hills Golf Club
CAMARILLO SPHERE OF INFLUENCE
Camarillo Heights
Las Posas Estates
Beardsley Wash
Las Posas Rd
34
Upland Rd
Mission Oaks
Central Ave
Spanish Hills Country Club
Carmen Dr
Arneill Rd
Lewis Rd
Mission Oaks Blvd
Santa Rosa Rd
Ponderosa Dr
101
Ventura Blvd
CAMROSA WATER DISTRICT
Conejo Creek
Oxnard
Camarillo Airport
Las Posas Rd
CAMARILLO SANITARY DISTRICT
Dawson Dr
Unincorporated Ventura County
Camarillo
Pleasant Valley Rd
5th St
Calleguas Creek
Conejo Mountain
Unincorporated Ventura County
Lewis Rd
Revolon Slough
Thousand Oaks
N
Not to scale
Calleguas Creek
Hueneme Rd
Santa Monica Mountains
City of Camarillo Boundary
Camarillo Sanitary District Boundary
Camrosa Water District Boundary
Camarillo Sphere of Influence
AKM
CAMARILLO SANITARY DISTRICT SECAP
PROJECT NO: 1450763.00
DATE: July 2009
Location Map
Figure 3-1

3-3 TOPOGRAPHY AND GEOLOGY

General Area

Camarillo is located in the eastern Oxnard Plain, between the Santa Susana Mountains to the north, the Camarillo Hills to the northwest, the Conejo Mountain and Conejo Valley to the east, and the Santa Monica Mountains to the south. The Santa Monica Mountains rise to approximately 1,814 feet above mean sea level (amsl). Camarillo Hills rise to approximately 884 feet amsl. The Oxnard Plains are relatively mild in slope with the highest elevations at the surrounding mountains and the lowest elevations at the corresponding valleys. There is a strong desire for residential development within the City's limits, especially on the higher elevation lots with scenic views. However, the development is restricted by the moderate to steep slopes and by the desire to utilize the fertile soils in the area for agricultural purposes.

Elevations within the study area range from 518 feet amsl at the northern District boundary near Via Con Dios and Vista Del Cima Estates to 55 feet amsl at the Camarillo Airport. The terrain slopes generally from north to south and east to west.

Geology

The City is part of the large Ventura Basin which is bound by the San Ynez and Big Pine Faults to the north, by the San Andreas Fault to the east and north east, by the Pacific Ocean to the west, and by the Santa Monica-Malibu Coast fault to the south. Camarillo is located near several smaller faults that run in the east-west direction. The Simi Santa Rosa Fault is the most prominent fault that extends from the Oxnard plain to the Santa Rosa Valley. Other nearby faults include Springville Fault, Camarillo Fault, Bailey Fault, and an unnamed fault. The City is susceptible to damage if an earthquake along any of these faults were to occur.

Landslide

Landslide zones are also prominent within the City boundary near the Camarillo Hills, Santa Rosa Hills, and the Santa Monica Mountains where the slopes are greater than 10%.

Drainage Channels

There are four (4) major drainage channels located within the City boundaries: Calleguas Creek, Conejo Creek, Revolon Slough, and Beardsley Wash.

Calleguas Creek is the largest channel within the City limits. It enters the City at the intersection of Lewis Road and Upland Road and flows southerly to Pleasant Valley Road, east of Pancho Road where it exits the City limit. Calleguas Creek continues southerly and exits to the Pacific Ocean through Mugu Lagoons.

Conejo Creek is located on the eastern border of the City and flows southwest to confluence with Calleguas Creek in unincorporated Ventura County, near Howard Road. The District's Wastewater Treatment Plant discharges treated water into Conejo Creek.

Beardsley Wash is located on the west side of the City and is tributary to Revolon Slough. Revolon Slough flows southeasterly to confluence with Calleguas Creek south of the City limits, near the intersection of Pacific Coast Highway and Las Posas Road.

Soils

Native soils consist of the following:

Pico-Metz-Anacapa Association:

- Level to moderate sloping
- Very deep well drained sandy loams
- Very deep somewhat drained loamy sands

Mocho-Sorrento-Garretson Association

- Level to moderately sloping
- Very Deep, well drained loams to silty clay loams

Camarillo-Hueneme-Pacheco Association

- Level to nearly level
- Very deep, poorly drained loam sands to silty clay loams.

Rincon Huerhuero Azule

- Level to moderately steep
- Very deep well drained and moderately well drained
- Fine sandy loams to silty clay loams
- Slowly and very slowly permeable sandy clay subsoil

Calleguas-Arnold Association:

- Strongly sloping to steep
- Shallow well drained shaley loams over shale or sandstone
- Deep excessively drained sands over sandstone

Hambright-Igneous Rock Land-Gilroy Association

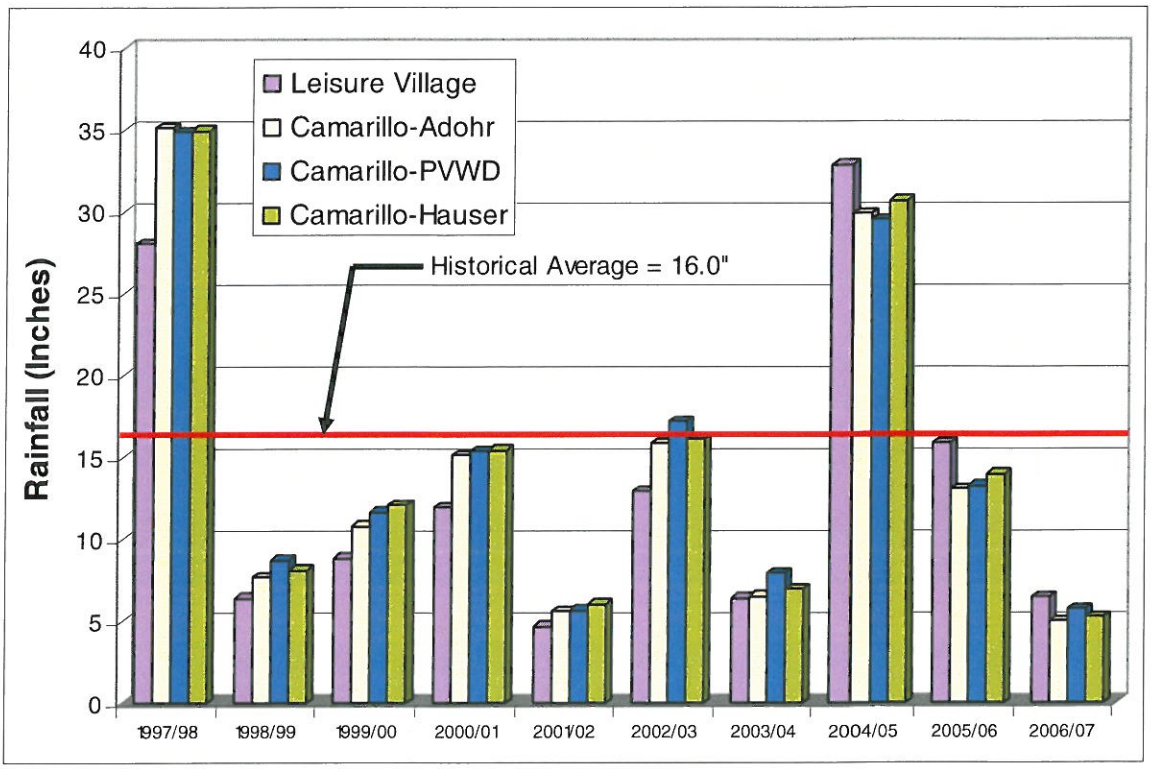
- Strongly Sloping to very Steep
- Shallow to moderate well drained clay loams over basic igneous rock.

3-4 CLIMATE

The climate in the study area is Mediterranean-like with generally moderate temperatures and low humidity year-round. The average year-round temperatures are in the low seventies, with over 300 days of sunshine.

The historical average annual rainfall is about 16 inches. Most of the rainfall typically occurs between November and February. Figure 3-2 shows the seasonal rainfall from 1998 to 2007 as measured by the Ventura County Rain Gauge Stations 194A, 219A, 259, and 263. Station 194A, the Camarillo-Adohr Sanitation Plant, is located near Pleasant Valley Road and Santa Rosa Road. Station 219A, Camarillo-Hauser, is located south of Las Posas Road and east of Dwight Avenue. Station 259, Camarillo-PVWD, is near Camarillo Center Drive and Los Posas Road. Station 263, Leisure Village, is located north of Adolfo Road and west of Cortez Circle. The total rainfall for 2006-2007, the period of this study, was well below the historical average at about 5-inches.

Figure 3-2
Seasonal Rainfall 1998-2007



3-5 LAND USE

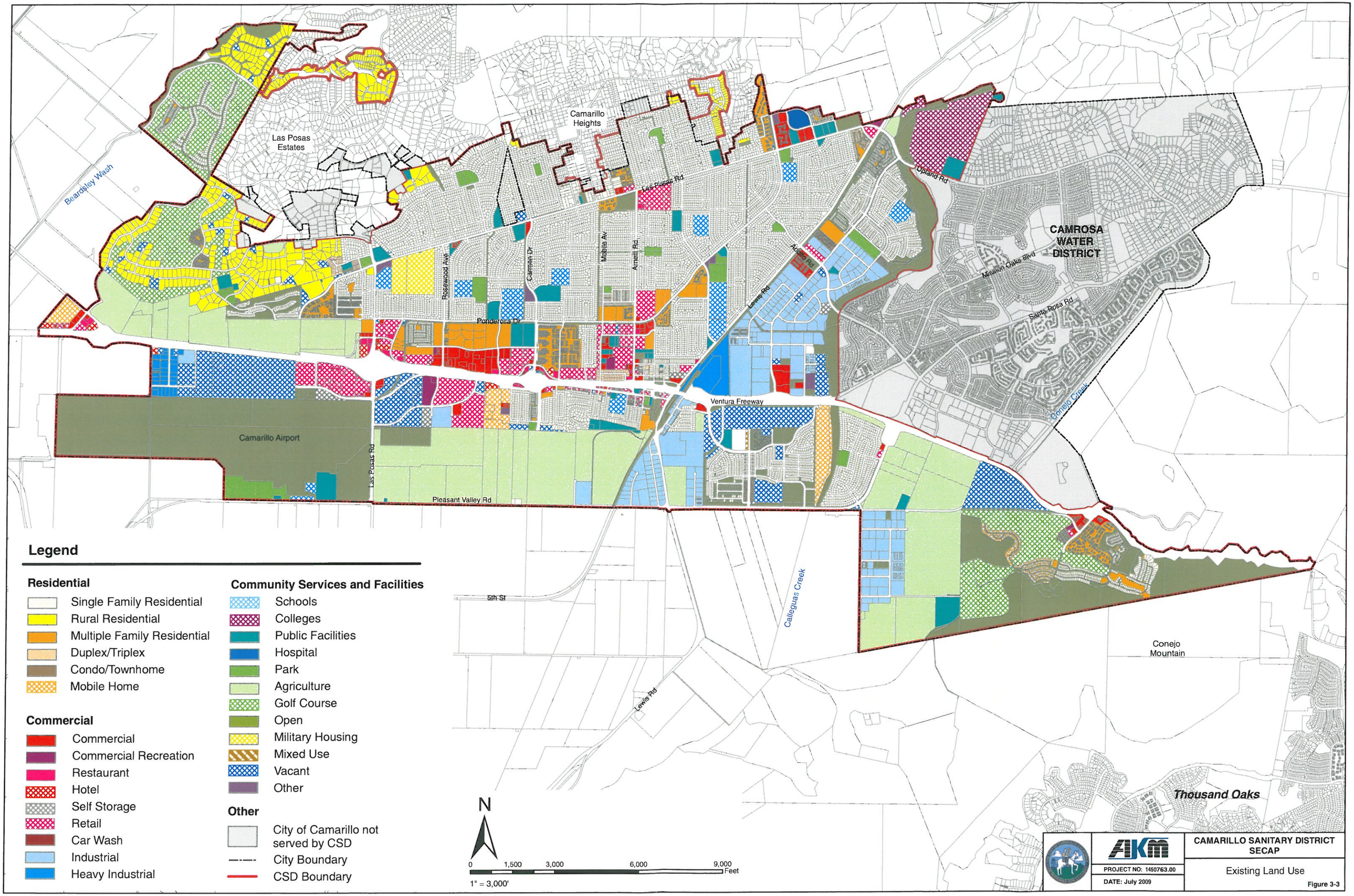
The land use information utilized in the preparation of the Camarillo Sanitary District's System Evaluation and Capacity Assurance Plan (SECAP) is primarily based upon the City's Geographic Information System (GIS) parcel land use data and General Plan Map. This information was supplemented by aerial photographs, field reviews, and information provided by District staff.

Existing Conditions

Camarillo is a well planned community with a balance of residential, commercial, agricultural, and industrial land uses. The District serves the majority of the City. The area east of Calleguas Creek and north of the Ventura Freeway (US-101) is tributary to the Camrosa Water District. The primary land use in the District's

service area is residential (2,860 Ac or 29.3 %). Agricultural use also makes up a significant portion of the total existing land use (1,270 Ac or 13.0%). The total acreage of the District's service area, including streets and right-of-way, is about 9,777 acres (15.3 square miles).

Table 3-1 provides a summary of the District's existing land uses. Figure 3-3 shows the locations of these land uses.



Legend

Residential
- Single Family Residential
- Rural Residential
- Multiple Family Residential
- Duplex/Triplex
- Condo/Townhome
- Mobile Home

Commercial
- Commercial
- Commercial Recreation
- Restaurant
- Hotel
- Self Storage
- Retail
- Car Wash
- Industrial
- Heavy Industrial

Community Services and Facilities
- Schools
- Colleges
- Public Facilities
- Hospital
- Park
- Agriculture
- Golf Course
- Open
- Military Housing
- Mixed Use
- Vacant
- Other

Other
- City of Camarillo not served by CSD
- City Boundary
- CSD Boundary

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CAMARILLO SANITARY DISTRICT SECAP

PROJECT NO: 1450763.00

DATE: July 2009

Existing Land Use

Figure 3-3

Table 3-1
Existing Land Uses within Camarillo Sanitary District

Property Use Code	Property Use Description	Net Area (Ac)	Percentage of Total
Residential Uses			
10	Rural Residential	457.12	4.68%
11	Single Family Residential	1,871.91	19.15%
12,13	SFR - Duplex	30.18	0.31%
14	SFR - Triplex	0.39	0.00%
17,19	MFR	259.93	2.66%
15	MFR - Condo/Townhome	78.50	0.80%
16,18	Mobile Home	109.87	1.12%
96	Military Housing	51.43	0.53%
	Subtotal Residential Uses	**2,859.32**	**29.25%**
Commercial Uses			
20,21,22,22.1, 22.4,23,33	Commercial	144.20	1.47%
23.1	Carwash	0.81	0.01%
24	Restaurant	18.81	0.19%
25	Hotel	14.54	0.15%
25.1	Mixed Use	1.71	0.02%
26,27,28	Retail	250.50	2.56%
27.1	Self Storage	17.16	0.18%
29,29.1,29.2	Commercial Recreation	17.20	0.18%
	Subtotal Commercial Uses	**464.92**	**4.76%**
Industrial Uses			
30,32,34	Industrial	530.04	5.42%
31	Heavy Industrial	73.31	0.75%
	Subtotal Industrial Uses	**603.35**	**6.17%**
Public Uses			
41,46,47,48,49, 49.1,49.2,50,98	Public and Quai-Public Uses	173.46	1.77%
42,43,44	Schools	117.78	1.20%
49.3,55,56	Colleges	126.41	1.29%
45	Hospital	10.00	0.10%
	Subtotal Public Uses	**427.66**	**4.37%**
Other Uses			
82	Golf Course	484.84	4.96%
40	Park	112.65	1.15%
58,59,60,61,64, 65,66,67,80,81, 90,92,93,94	Open Space	1,567.90	16.04%
91	Vacant	431.53	4.41%
70,71,72,73,74,75	Agriculture	1,268.90	12.98%
99	Other	49.52	0.51%
	Subtotal Other Uses	**3,915.33**	**40.05%**
	Streets and Right of Way	**1,506.41**	**15.41%**
	Service Area Total	**9,777.00**	**100.00%**

Ultimate Build-Out Conditions

The ultimate land use is primarily based upon the zoning as described in City's latest General Plan completed in 2004. The City identified two (2) future major developments that differ from the land use included in the General Plan. One of these is the existing agricultural area south of Ponderosa Drive and west of Las Posas Road, which is planned as the Springview Residential Development, not rural residential use as it was planned in the 2004 General Plan. The area south of the Ventura Freeway (US-101) and east of Aviador Street will be planned for commercial use instead of limited manufacturing and professional office land uses as it was categorized in the 2004 General Plan.

The existing land use and General Plan Map were compared to the zoning map, and for increased refinement, the ultimate land use was adjusted to include the school, park, public facility, restaurant, hotel, carwash, and hospital land use designations. Developed areas zoned for a different land use code were assigned the land use with the higher unit flow factor.

Table 3-2 provides a summary of the District's ultimate land uses and Figure 3-4 shows the locations of these land uses. The ultimate service area includes the unincorporated Ventura County regions that are part of Camarillo's Sphere of Influence. It is probable that the Sphere of Influence will be added to the existing City boundary in the future; therefore, the ultimate land use includes this area. Properties in the Las Posas Estates and Camarillo Heights communities, located north of the existing City boundary, are included in the Sphere of Influence. The total ultimate service area of the District, including streets and right-of-way, is about 11,928 acres (18.6 square miles).

The residential area will increase significantly and make up about 55 percent of the total ultimate District service area when the entire Sphere of Influence area is incorporated into the City.

Residential Land Uses

1. **Rural Exclusive Zone** (RE) consists of housing with lots varying in size from 10,000 square feet to over one acre. Rural Exclusive uses are heavily located on the west side of the City, in the Las Posas Country Club, Sterling Hills Golf Club, and Spanish Hills Country Club. Rural Excusive uses are also located near the Camarillo Springs Golf Club in the east side of the District's service area.
2. **Low Density Residential** is comprised of the City's R-1 Zone and a portion of the RPD Zone. The R-1 Zone is the City's typical single family residential zone. The RPD zone is the Residential Planned Development, which was set up to promote creative residential design. The Low Density Residential land use will have a density no greater than 5 dwelling units (DU) per acre.

   The 2004 General Plan categorizes the area south of Ponderosa Drive, west of Las Posas Road, north of Ventura Freeway (U.S. 101), and east of a Bajo Agua Street extension as rural residential. However, according to the District, this area will be developed as the Springview Residential Development.
3. **Low Medium Density Residential** is classified under the City's RPD Zone. The Low Medium Density Residential land use will have a density no greater than 10 DU per acre.

Camarillo Hills
Arroyo Las Posas
Camarillo Heights
Las Posas Estates
Beardsley Wash
Las Posas Rd
Temple Ave
Mobile Av
Arneill Rd
Carmen Dr
Rosewood Ave
Ponderosa Dr
Adolfo Rd
Lewis Rd
Upland Rd
CAMROSA WATER DISTRICT
Mission Oaks Blvd
Santa Rosa Rd
Springview Residential Development
Commercial Development
Camarillo Airport
Las Posas Rd
Pleasant Valley Rd
Ventura Freeway
Conejo Creek
Calleguas Creek
Lewis Rd
Conejo Mountain

Legend

Boundary
- Camarillo Sphere of Influence
- City Boundary
- Camrosa Water District Service Area

Residential
- Rural Exclusive (Rural Residential)
- Low Density Residential
- Low-Medium Density Residential
- Medium Density Residential
- High Density Residential
- Mobile Home Park Development

Industrial
- Limited Manufacturing
- Light Manufacturing
- Heavy Manufacturing

Commercial
- Commercial
- Professional Office
- Restaurant
- Carwash
- Hospital
- Hotel

Other
- School
- Public Facilities
- Agricultural
- Park
- Open Space

N

0 1,500 3,000 6,000 9,000 Feet

1" = 3,000'

AKM

CAMARILLO SANITARY DISTRICT
SECAP

PROJECT NO: 1450763.00

DATE: July 2009

Ultimate Land Use

Figure 3-4

Table 3-2
Ultimate Camarillo Sanitary District Zoning

Zoning Category	Zoning Density	Zoning Use Description	Density (DU/Ac)	Net Area (Ac)	Percentage of Total
Residential Uses					
R-E		Rural Exclusive	1-2.5	2,618.63	21.95%
RE10AC	10 acre min				
RE-15	15,000 sq ft min				
RE-1AC	1 acre min				
RE-20	20,000sq ft min				
RE-3AC	3 acre min				
RE30AV	30,000 sq ft ave				
RE40AC	40 acre min				
RE-5AC	5 acre min				
R-1		Low Density Residential	1-5	2,363.86	19.82%
R-1-10	10,000sq ft min				
R-1-15	15,000 sq ft min				
R-1-8	8,000 sq ft min				
RPD					
RPD-2U	2DU/acre				
RPD-3U	3DU/acre				
RPD-4U	4DU/acre				
RPD-5U	5 DU/acre				
PRD7U	7 DU/acre	Low-Medium Density Residential	6-10	320.01	2.68%
RPD8U	8DU/acre				
RPD10U	10 DU/acre				
RPD12U	12 DU/acre	Medium Density Residential	11-18	51.46	0.43%
RPD15U	15 DU/acre				
RPD17U	17 DU/acre				
RPD18U	18 DU/acre				
RPD20U	20 DU/acre	High Density Residential	19-30	123.81	1.04%
RPD24U	24 DU/acre				
RPD25U	25 DU/acre				
RPD30U	30 DU/acre				
MHPD		Mobile Home Park Development	1-7	119.74	1.00%
		Subtotal Residential Uses		**5,597.52**	**46.93%**
Commercial Uses					
COT		Camarillo Old Town		15.93	0.13%
CPD		Commercial Planned Development		526.14	4.41%
SC		Service Commercial Zone		4.23	0.04%
P-O		Professional Office		85.48	0.72%
Restaurant		Restaurant		18.81	0.16%
Carwash		Carwash		0.81	0.01%
Hotel		Hotel		14.54	0.12%
		Subtotal Commercial Uses		**665.94**	**5.58%**
Industrial Uses					
L-M		Limited Manufacturing		244.53	2.05%
M-1		Light Manufacturing		534.79	4.48%
Airport		Camarillo Airport		678.79	5.69%
M-2		Heavy Manufacturing		67.59	0.57%
		Subtotal Industrial Uses		**1,525.70**	**12.79%**
Public Uses					
Public		Public Facilities		127.93	1.07%
School		Schools		137.08	1.15%
Seminary College		Schools		125.53	1.05%
Hospital		Hospital		10.00	0.08%
		Subtotal Public Uses		**400.54**	**3.36%**
Other Uses					
A-E		Agricultural		1,089.32	9.13%
O-S		Open Space		821.95	6.89%
Park		Park		170.94	1.43%
		Subtotal Other Uses		**2,082.21**	**17.46%**
		Streets and Right of Way		**1,656.09**	**13.88%**
		Service Area Total		**11,928.00**	**100.00%**

4. **Medium Density Residential** is classified under the City's RPD Zone. The Medium Density Residential land use will have a density no greater than 18 DU per acre.
5. **High Density Residential** is classified under the City's RPD Zone. The High Density Residential land use will have a density no greater than 30 DU per acre.
6. **Mobile Home Park Development Zone** (MHPD) focuses on mobile home parks. The Casa Del Norte Mobile Home Community, the Camarillo Mobile Home Park, the Camarillo Springs Mobile Home Village, and the Lamp Lighter Mobile Home Village reside within the District's study area. The Mobile Home Park Development land use will have a density no greater than 7 DU per acre.

Commercial Uses

Commercial land uses are primarily located near the Ventura Freeway (US-101). Camarillo Premium Outlets, the Camarillo Town Center, and Camarillo Old Town are located in this vicinity. There are also several commercial developments along Las Posas Road.

Commercial land use designations include the General Commercial and Professional Office uses. Aside from the freeway commercial areas along the Ventura Freeway, neighborhood commercial convenience centers are accessible to serve the needs of the residents throughout the City.

The 2004 General plan categorizes the area north of the Camarillo Airport, west of West Ventura Boulevard, south of the Ventura Freeway (US-101), and east of Aviador Street as limited manufacturing and professional office land uses. However, according to the District, this area is planned for commercial development.

The existing land use designations for restaurant, hotel, hospital, and carwash were included in the ultimate land use categories for further refinement in developing wastewater flow estimates.

Industrial Uses

Industrial land uses are mostly located east of Lewis Road, which include the Flynn Road area, Mission Oaks Business Park, and the Lewis Road/Dawson Drive area. There are also significant industrial uses at the Camarillo Airport (CMA).

The Camarillo Airport is on the south-west end of the City. It was originally constructed as an auxiliary landing field in 1942 by the California State Highway Department. Currently the airport has one runway, which serves privately-operated general aviation and executive aircraft. There are no current plans to begin commercial services through CMA.

Open Space

Open Space land use designations include agricultural lands, hillsides, and waterways.

Public Facilities

Public Facilities land use designation includeS libraries, police facilities, fire stations, and paramedic facilities.

Schools

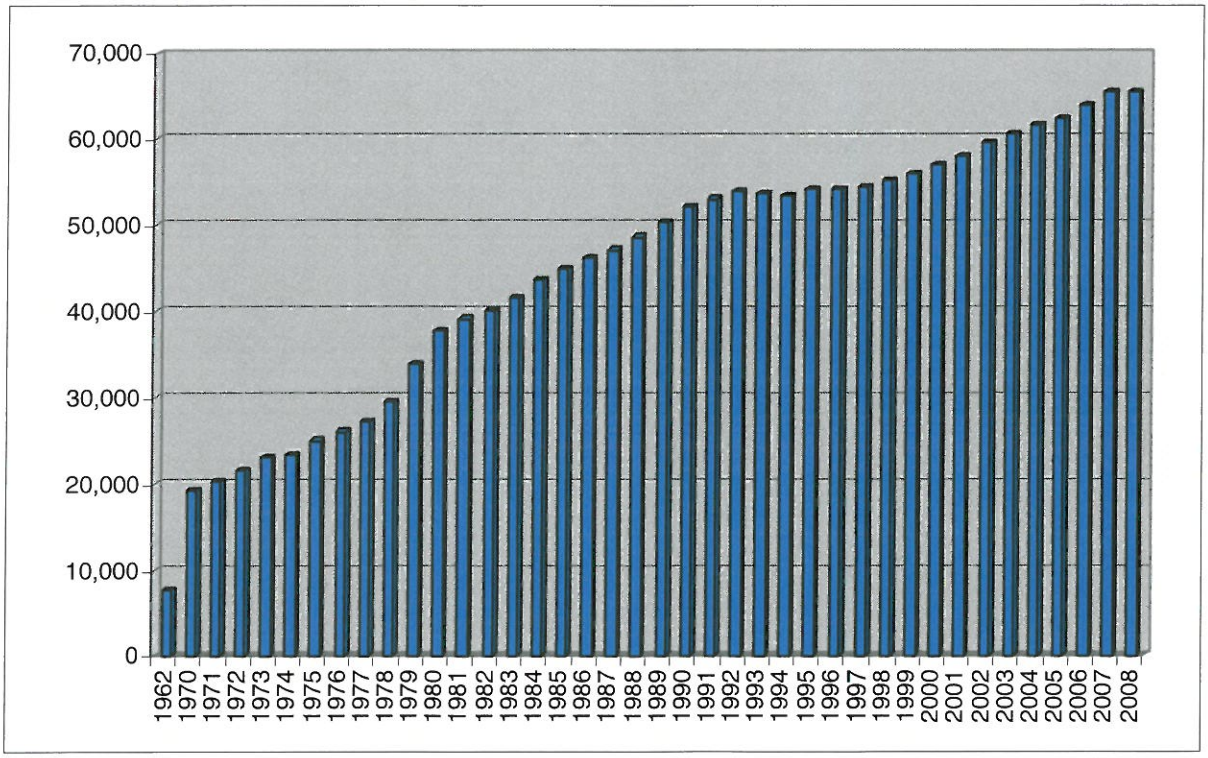
Although schools are categorized as Public Facilities, they are separated out because the wastewater flows are higher than the wastewater flows from other Public Facilities.

Population

Since its incorporation in 1964, the City of Camarillo has grown from a population of 7,500 to approximately 65,453 in 2008 (*Ref: California Department of Finance*). The historical population increase from 1962 to 2008 is depicted on Figure 3-5.

With the total number of housing units at approximately 24,903 and a 2.2 percent vacancy rate, the population per household is estimated to be 2.630 (*Ref: California Department of Finance*).

Figure 3-5
City of Camarillo Population History



**Ref: Population data from the California State Department of Finance, Demographic Research Unit. Population estimates represent January 1 of each year.*

Currently, the District serves a population of approximately 42,000. The ultimate population is estimated to be approximately 70,000 when the City's Sphere of Influence is incorporated.

Section 4

CRITERIA

4-1 GENERAL

Establishing performance standards is an important part of evaluating existing wastewater collection systems, as it forms the basis for system analysis and system improvement recommendations. These standards include methodology for estimating wastewater design flows and minimum design standards for the collection system pipes, pump stations, and force mains.

Average wastewater flows can be reasonably estimated from land use and their corresponding unit flow factors. The results are then compared to measured flows to verify their appropriateness. Peaking factors are needed for estimating peak dry weather and peak wet weather flows. Peak wet weather flows include an allowance for inflow and infiltration (I/I).

Collection system design standards include minimum pipe size, minimum flow velocity, and depth of flow to pipe diameter ratio (d/D). Pump station criteria include the capacity and number of pumps, wet well and force main sizes, redundancy, emergency power, remote monitoring capabilities, as well as safety and regulatory agency requirements. Finally, facility useful lives are needed for use in scheduling replacement of the aging infrastructure, along with condition assessment of the accessible facilities.

4-2 FLOW MONITORING

Data collection and review is essential in developing unit flow factors, calibrating the system model, estimating the ultimate average day and peak flows, and estimating average and maximum flow depth in the gravity sewer system. The flow monitoring locations selected for this study are shown on Figure 4-1, and the results are included in Table 4-1. The measured flows are graphically depicted on Figure 4-2.

In order to estimate the residential, commercial, and industrial wastewater flows in the study area, a temporary flow monitoring study was conducted by GEOtivity from January 23, 2007 to March 28, 2007 at ten (10) locations. Two (2) rain gauges were also installed during this time period. However, because there was very little precipitation, data collected was not adequate for development of wet weather flows.

The flow monitoring sites were strategically selected to aid in the development of unit flow factors, to calibrate the model, and to determine the flows tributary to each of the four (4) pump stations. Sites were selected in an attempt to get a good sampling of data across the study area. At the same time, the areas tributary to each site must be large enough to generate measurable depths, which are used in calculating the flow rates.

Sites 1 and 2 were selected to measure the flow tributary to Pump Station No. 5, north of the Camarillo Airport at South Wood Road. Sites 3 and 4 were chosen to measure the flows into Pump Station 3 at Pleasant Valley Road and Las Posas Road. The flows tributary to Pump Station 2 at Pleasant Valley Road and South Lewis Road were measured at Site 5. Sites 6 and 7 were selected to measure the flows into Pump Station No 6, located north of Pleasant Valley Road, near Village Commons Boulevard. Sites 6 and 8 were selected with the intent of developing a unit flow factor for industrial land uses. Sites 8, 9, and 10 were selected for calibration purposes.

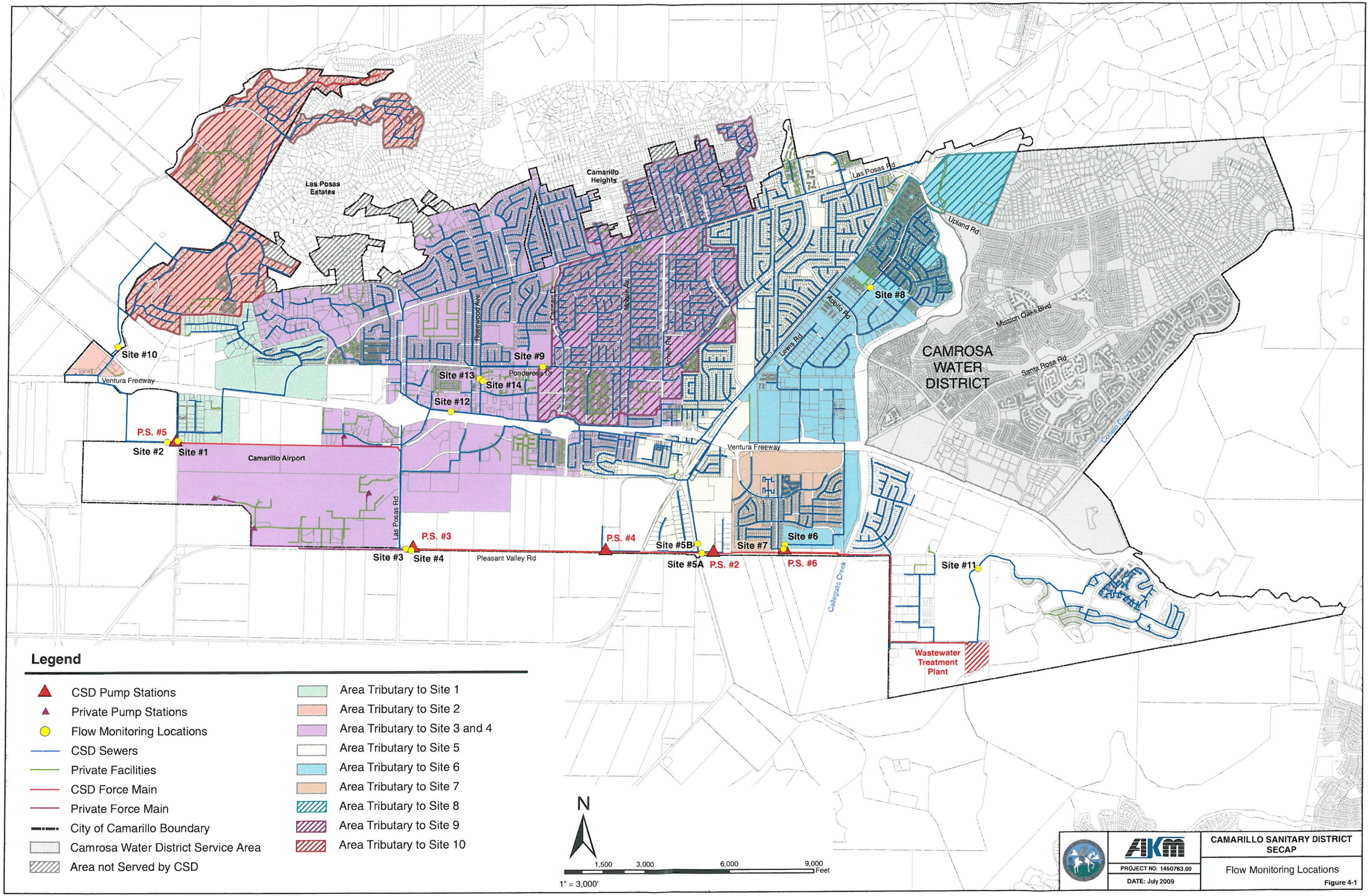

Las Posas Estates
Camarillo Heights
Las Posas Rd
Upland Rd
Site #8
Site #10
Site #9
Site #13
Site #14
Site #12
Ventura Freeway
Rosewood Ave
Carmen Dr
Poquito Av
Arneill Rd
Lewis Rd
Adolfo Rd
Mission Oaks Blvd
Santa Rosa Rd
CAMROSA WATER DISTRICT
Conejo Creek
P.S. #5
Site #2
Site #1
Camarillo Airport
Ventura Freeway
Las Posas Rd
P.S. #3
P.S. #4
Site #5B
Site #7
Site #6
Site #3
Site #4
Pleasant Valley Rd
Site #5A
P.S. #2
P.S. #6
Calleguas Creek
Site #11
Wastewater Treatment Plant
Legend
CSD Pump Stations
Private Pump Stations
Flow Monitoring Locations
CSD Sewers
Private Facilities
CSD Force Main
Private Force Main
City of Camarillo Boundary
Camrosa Water District Service Area
Area not Served by CSD
Area Tributary to Site 1
Area Tributary to Site 2
Area Tributary to Site 3 and 4
Area Tributary to Site 5
Area Tributary to Site 6
Area Tributary to Site 7
Area Tributary to Site 8
Area Tributary to Site 9
Area Tributary to Site 10
N
1,500 3,000 6,000 9,000 Feet
1" = 3,000'
AKM
CAMARILLO SANITARY DISTRICT
SECAP
PROJECT NO: 1450763.00
DATE: July 2009
Flow Monitoring Locations
Figure 4-1

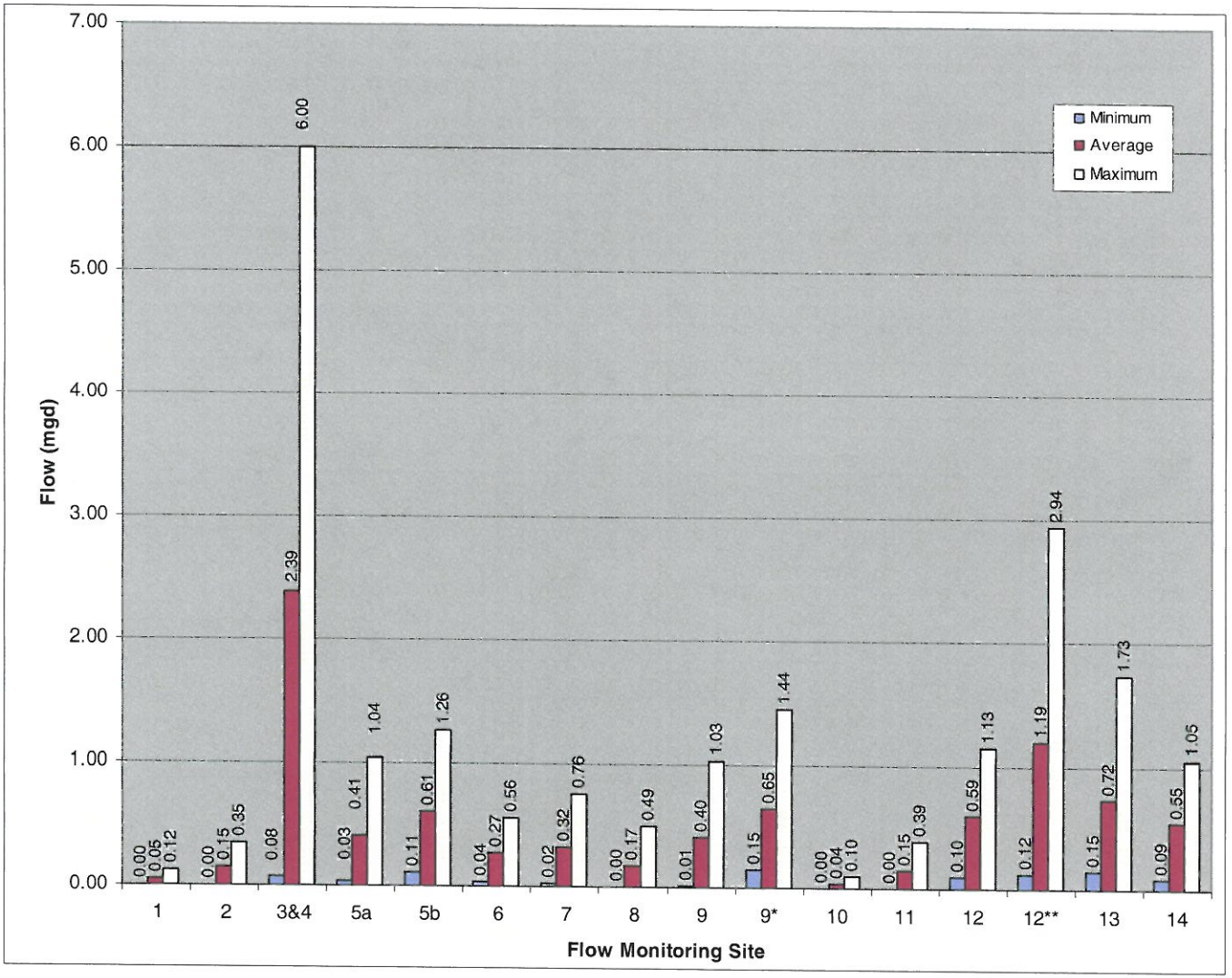
Table 4-1
Flow Monitoring Results

Site No.	MH ID	Upstream Pipe ID	Pipe Size (in)	Location	Reason	Flow Monitoring Period	Depth (in)			Velocity (ft/s)			Flow (MGD)		
							Min	Ave	Max	Min	Ave	Max	Min	Ave	Max
1	C12-129	C12-1006	18"	Wood Rd south of Verdulera St.	Inlet to Pump Station No. 5	1/23/07 to 3/28/07	1.40	2.55	4.17	0.00	0.51	1.14	0.00	0.05	0.12
2	C12-132	C12-1030	18"	Easement west of Wood Rd.	Inlet to Pump Station No. 5	1/23/07 to 3/28/07	2.04	3.53	5.84	0.00	0.89	1.74	0.00	0.15	0.35
3	F14-103	F14-1001	24"	Pleasant Valley Rd. east of Las Posas Rd.	Inlet to Pump Station No. 3	1/23/07 to 3/28/07	0.00	2.21	6.18	0.00	1.02	3.91	0.08	2.39	6.00
4	F14-103	F14-1003	36"	Pleasant Valley Rd. east of Las Posas Rd.	Inlet to Pump Station No. 3	1/23/07 to 3/28/07	3.00	6.82	10.97	0.01	3.52	4.87			
5a	I14-136	I14-1001	15"	Pleasant Valley Rd. east of Lewis Rd.	Inlet to Pump Station No. 2	1/23/07 to 3/28/07	2.26	3.98	6.70	0.29	1.70	2.67	0.03	0.41	1.04
5b	I14-113	I14-1022	15"	Lewis Rd., north of Pleasant Valley Rd.	Inlet to Pump Station No. 2	7/16/08 to 8/13/08	2.52	4.94	6.93	0.64	2.58	3.53	0.11	0.61	1.26
6	J14-146	J14-1007	27"	Easement north of Pleasant Valley Rd., north of PS No. 6	Inlet to Pump Station No. 6	1/23/07 to 3/28/07	2.91	5.02	6.98	0.24	0.76	1.12	0.04	0.27	0.56
7	J14-153	J14-1056	12"	Easement from Village Commons Blvd. to PS No. 6	Inlet to Pump Station No. 6	1/23/07 to 3/28/07	1.81	2.44	5.07	0.48	4.45	5.86	0.02	0.32	0.76
8	K10-100	K9-1052	18"	Flynn Rd. at Calle Tesoro	Unit Flow Factor/Calibration	1/23/07 to 3/28/07	0.96	3.96	6.11	0.02	0.81	1.82	0.00	0.17	0.49
9*	G11-125	G11-1143	12"	Ponderosa Dr. east of Lantana St.	Unit Flow Factor/Calibration	1/23/07 to 3/28/07	1.28	4.17	7.06	0.16	2.30	3.31	0.01	0.40	1.03
						7/16/08 to 8/13/08	3.04	6.29	8.51	0.81	2.40	3.83	0.15	0.65	1.44
10	B11-100	B10-1018	15"	Easement north of intersection of Avenida de Aprisa & Central Ave.	Unit Flow Factor/Calibration	1/23/07 to 3/28/07	0.96	2.34	3.84	0.00	0.41	0.70	0.00	0.04	0.10
11	L15-100	L14-1008	12"	Near Ridgeview St. and Adohr Ln.	Deficiency verification	7/16/08 to 8/13/08	4.02	6.12	8.59	0.02	0.54	1.05	0.00	0.15	0.39
12**	F12-119	F12-1068	12"	Daily Dr, west of Rosewood Ave	Deficiency verification	7/16/08 to 7/30//08	2.68	5.53	7.88	1.11	1.16	3.41	0.10	0.59	1.13
						7/30/08 to 8/13//08	2.84	7.68	10.31	1.29	3.25	5.99	0.12	1.19	2.94
13	F11-150	F11-1034	15"	Northeast of Rosewood Ave. and Paseo Camarillo	Deficiency verification	7/16/08 to 8/13/08	3.16	5.25	8.19	1.16	2.75	4.08	0.15	0.72	1.73
14	F11-152	F11-1036	15"	Northeast of Rosewood Ave. and Paseo Camarillo	Deficiency verification	7/16/08 to 8/13/08	2.72	5.00	6.79	0.02	2.24	3.19	0.09	0.55	1.05

* Flow monitored the same location in January 2007 and July 2008

** Flow monitoring results show two distinct patterns during the same period.

Figure 4-2
Measured Flow Data



* *Flow monitored at the same location in January 2007 and July 2008*

** *Flow monitoring results show two distinct patterns during the same period*

The measured flows at Site 5 and Site 9 of the original flow monitoring study appeared significantly lower than those expected to be generated from their tributary areas. Flow monitors were reinstalled at these two locations from July 16, 2008 to August 13, 2008. During this period, flow monitors were also installed at four (4) other locations to verify hydraulic deficiencies indicated by the District's existing sewer model analysis. Site No. 11 monitored the peak dry weather flows and depths through the 12-inch sewer north of the Wastewater Treatment Plant. Site No. 12 monitored the peak dry weather flows in the 12-inch sewer on Daily Drive. Site No. 13 and Site No. 14 were installed in the parallel sewers east of Rosewood Drive to measure the amount of flow that is split at manhole F11-133 located at Rosewood Drive and Ponderosa Drive.

4-3 UNIT FLOW FACTORS

Existing Conditions

Unit flow factors utilized in this study were developed based upon the existing land uses obtained from the City's GIS and the results of the flow monitoring studies discussed in Section 4-2. Water use records, aerial photographs and field reviews supplemented this information.

The average daily flow recorded at each flow monitoring site was utilized in determining calibrated existing unit flow factors for each land use, which are shown in Table 4-2. The flow factors were developed in units of gallons per day per acre.

Table 4-2
Calibrated Unit Flow Factors

Property Code	Existing Landuse Code	Existing Flow Factor (GPD/AC)
Residential Uses		
10	RURAL RESIDENTIAL	200
11	SINGLE FAMILY RESIDENCE	1,350
12,13,14	SFR - DUPLEX/TRIPLEX	1,200
17,19	MULTIPLE FAMILY RESIDENTIAL	1,500
15	MFR-CONDO/TOWNHOME	1,900
16,18	MOBILE HOME	820
96	MILITARY HOUSING	1,900
Commercial Uses		
20,21,22,22.1, 22.4,23,33	COMMERCIAL	800
23.1	CAR WASH	6,000
24	RESTAURANT	1,500
25	HOTEL	3,000
25.1	MIXED USE	1,500
26,27,28	RETAIL	400
27.1	SELF STORAGE	50
29,29.1,29.2	COMMERCIAL RECREATION	400
Industrial Uses		
30,32,34	INDUSTRIAL	400
31	HEAVY INDUSTRIAL	800
Public Uses		
41,46,47,48,49, 49.1,49.2,50,98	PUBLIC FACILITIES	800
42,43,44	SCHOOLS	1,200
49.3,55,56	COLLEGES	600
45	HOSPITAL	2,800
Other Uses		
40	PARK	200
58,59,60,61,64,65,6 6,67,70,71,72,73, 74,75,80,81,82,90, 91,92,93,94,99	OPEN/AGRICULTURE/GOLF COURSE/	0

Ultimate Conditions

The ultimate land use was primarily based on City's 2004 General Plan the zoning. The ultimate flow factors were classified by the General Plan zoning categories as shown in Table 4-3. The ultimate unit flow factors were increased to account for the current vacancies, future densification, and inconsistencies in the measured flow data. The ultimate tributary area includes Camarillo's Sphere of Influence area in unincorporated Ventura County, consisting of residential communities north of the City Boundary. This area currently utilizes septic systems. The Ultimate Land Use will also account for new developments such as the Springview Residential Center and the Commercial Development, north of the Camarillo Airport.

Table 4-3
Ultimate Unit Flow Factors

Zoning Category	Zoning Use Description	Density (DU/Ac)	Ultimate Unit Flow Factor (GPD/AC)
Residential Use			
R-E, RE10AC, RE-15, RE-1AC, RE-20, RE-3AC, RE40AC, RE-5AC	Rural Exclusive	1-2.5	200
R-1, R-1-10, R-1-15, R-1-8, RPD, RPD-2U, RPD-3U, RPD-4U, RPD-5U	Low Density Residential	1-5	1,350
RPD7R, RPD8U, RPD10U	Low-Medium Density Residential	6-10	1,500
RPD12U, RPD15U, RPD17U, RPD18U	Medium Density Residential	11-18	1,700
RPD-20U, RPD24U, RPD25U, RPD30U	High Density Residential	19-30	1,900
MHPD	Mobile Home Park Development	1-7	820
Commercial Uses			
COT	Camarillo Old Town		880
CPD	Commercial Planned Development		880
SC	Service Commercial Zone		880
P-O	Professional Office		880
Restaurant	Restaurant		1,500
Carwash	Carwash		6,000
Hotel	Hotel		3,000
Industrial Uses			
L-M	Limited Manufacturing		440
M-1	Light Manufacturing		440
M-2	Heavy Manufacturing		880
Public Uses			
Public	Public Facilities		880
School	School		1,200
Hospital	Hospital		2,800
Other Uses			
A-E	Agricultural		0
O-S	Open Space		0
Park	Park		200

4-4 PEAKING FACTORS

Peak Dry Weather

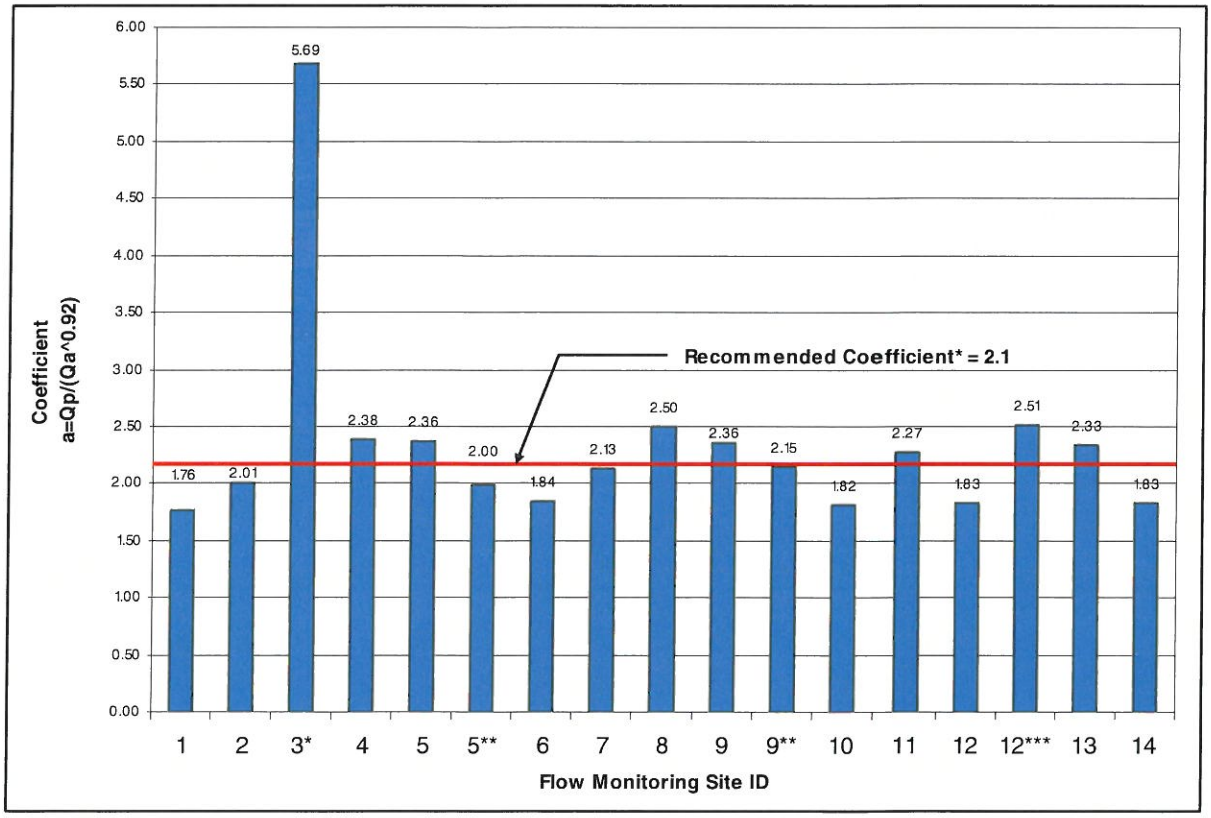
The wastewater unit flow factors discussed in Section 4-3 are used to generate average dry weather flows (ADWF) entering the collection system. However, the adequacy of a sewage collection system is based upon its ability to convey the peak flows. At any individual point in the system, the peak dry weather flow (PDWF) is estimated by converting the total average flow upstream of that point to the peak dry weather flow by an empirical peak-to-average relationship.

The peaking formula commonly used in sewerage studies is of the following form:

$Q_{peak} = a \times Q_{ave}^{\ b}$ where Q_{peak} = Peak Dry Weather Flow
Q_{ave} = Average Dry Weather Flow
a, b = Peaking Formula Coefficients

The temporary flow monitoring data was reviewed to develop peaking relationships at each site. As expected, these relationships varied from site to site depending upon the makeup and size of the tributary land use. Coefficient "b" is typically found to be in the range of 0.91 to 0.92 based on empirical studies. Using a coefficient "b" of 0.92, the resulting coefficient "a" can be calculated from the measured flow data. The calculated coefficient "a" for each flow monitoring site is shown graphically on Figure 4-3.

Figure 4-3
Peaking Formula Coefficient "a"



* *Disregarding the High Peaking Coefficient at Flow Monitoring Site #3*
** *Flow Monitoring performed in January 2007 and July 2008*
****Two Distinct patterns at the same flow monitoring site*

The following peaking relationship was selected for this study:

$$Q_{peak}\ (mgd) = 2.1 \times Q_{ave}(mgd)^{0.92}$$

The measured flow at Site No 3 was disregarded in establishing the peak flow coefficient. While the sum of the measured flows at Site No. 3 and Site No. 4 appear reasonable, the flow data at Site No. 3 includeed sudden extreme highs and lows which would result in a peaking factor that is overly conservative and not practical for planning purposes.

Peak Wet Weather

The peak wet weather flow (PWWF) has two components: peak dry weather flow (PDWF) and rainfall dependent inflow/infiltration (I/I) as expressed by the following equation:

$$PWWF = PDWF + I/I$$

Inflow and infiltration is discussed further in Subsection 4-5.

There were not any significant rainfall events during the flow monitoring effort that could be used in developing a data based wet weather peaking criterion. Until sufficient wet weather flow data can be collected, it is recommended that the peak wet weather flow be estimated as follows:

Peak Wet Weather Flow = 1.40 x Peak Dry Weather Flow

Although the PWWF/PDWF factor of 1.40 may not cover all situations, it is not reasonable or feasible to design the sewer system to carry the flows that would result from the use of a larger ratio. Instead, it is recommended that the City concentrate on projects such as replacing manhole covers, installing plugs in manhole covers, and replacing or relining cracked pipes to reduce inflow and infiltration.

4-5 INFLOW AND INFILTRATION

Inflow is the surface water that typically gains entry into the sewer system through perforated or unsealed manhole covers during rainfall events. Infiltration is defined as water entering the collection system from the ground through defective pipes, pipe joint connections, or manhole walls. The sewer system design capacity must include allowances for these extraneous flow components, which inevitably become a part of the total wastewater flow. The amount of inflow and infiltration (I/I) that enters the system typically depends upon the availability and location of the storm water drainage facilities, age and condition of structures, materials and methods of construction, the location of the groundwater table, and the characteristics of the soil. In the absence of flow monitoring data, many regulating agencies utilize commonly accepted practices for estimating I/I. For example, I/I is often estimated based on the diameter and length of pipeline (100 to 400 gpd/ in. dia/ mile) or as a percentage of the peak flow or pipeline capacity.

AKM's experience from other master planning studies and review of limited flow monitoring information available during severe rainfall events indicate that the peak wet weather flow can vary from 10 percent of average dry weather flows in steeper areas with adequate drainage facilities, to over 400 percent of average dry weather flows in flat areas that lack significant drainage facilities.

For this study, extraneous flow due to inflow and infiltration is included in the peak wet weather flow formula previous described. If better data becomes available subsequently for specific areas, the analysis should be updated based upon that information.

4-6 SEWER DESIGN CRITERIA

Design criteria are established to ensure that the wastewater collection system can operate effectively under all flow conditions. Each pipe segment must be capable of carrying peak wet weather flows in the hydraulically stable zone of the pipe. Low flows must be conveyed at a velocity that will prevent solids from settling and blocking the system.

The design capacity of a gravity pipeline is the calculated capacity of the pipeline based on the Manning formula:

$$Q = 1.486\ AR^{2/3} S^{1/2} / n$$

where, **Q** = flow in cubic feet per second
R = hydraulic radius in feet = A / P
A = cross-sectional area of the pipe in square feet
P = wetted perimeter in feet
S = slope of pipe in feet of rise per foot of length
n = Manning's friction factor

Sewer system capacity is established using a Manning's friction factor of 0.013 for vitrified clay pipe.

The analysis of the existing gravity sewer system was based upon the calculated peak dry weather flows. Any segment of existing sewer pipe with a depth to diameter ratio (d/D) of 0.62 or more was considered to be hydraulically deficient. This allows for approximately 40 percent capacity above the peak dry weather flow for inflow and infiltration based on the assumption that the maximum capacity of a circular pipe will occur when d/D = 0.82 rather than the theoretical maximum that occurs at d/D = 0.938.

The extra pipeline capacity allows for the possibility that actual wastewater flows may be slightly higher than anticipated, especially during the hours when instantaneous or intermittent peaks may occur. These peaks are generally observed between the hours of 6:00 a.m. and 9:00 a.m. and 7:00 p.m. and 9:00 p.m. during weekdays and somewhat later in the morning hours during weekends. They may also be observed during rainfall events due to inflow and infiltration. Additionally, the area above the water surface helps to keep the sewage aerated, reducing the possibility of septic conditions and odors.

For **new construction**, the design and analysis of gravity sewer pipes should be based on the following depth to diameter ratios:

- Pipes **15-inches and smaller** in diameter shall be designed to flow at a maximum **d/D of 0.50** under peak dry weather flows
- Pipes **18-inches and greater** in diameter shall be designed to flow at a maximum **d/D of 0.62** under peak dry weather flows
- For either group, the depth of flow to diameter ratio shall not exceed 0.82 with peak wet weather flows

At a minimum, all pipes should be 8 inches or larger in diameter and the velocity of flow in the pipe should be greater than 2 feet per second at average dry weather flow (ADWF). This velocity will prevent deposition of solids in the sewer and help to resuspend any materials that may have already settled in the pipe. The minimum corresponding slopes for various pipe sizes are shown in Table 4-4.

Table 4-4
Minimum Sewer Sizes

Sewer Size	2 ft/s Velocity Slope
8"	0.0033
10"	0.0025
12"	0.0019
15"	0.0014
18"	0.0011
21"	0.0008
24"	0.0007
27"	0.0006
30"	0.0005
33"	0.0004
36" & larger	0.0004

The maximum velocity for vitrified clay pipe should be 10 fps. For PVC pipe, the maximum velocity should be less than 5 fps. It is important to note that the slopes listed above assume the depth of flow in the pipe is 50 or 62 percent full. If there is insufficient flow to create this condition, greater slopes than those shown may be required.

4-7 PUMP STATION DESIGN CRITERIA

It is desirable to develop a sewer collection system with as few pump stations as possible due to the associated cost and maintenance required. Pump stations must be designed to be reliable, and sized with sufficient capacity. They must contain redundant equipment, emergency power supply, bypass pumping capability, sufficient wet well storage, and be able to notify the appropriate personnel in the event of failure.

The primary components of a typical pump station are the wet well, motors, valves, dry well, pumps, ventilation, electrical, controls and the force main. The following general criteria will be used:

The wet well stores the incoming wastewater until a pump is activated to discharge it to a gravity facility for further conveyance. It must be designed with sufficient capacity to prevent short cycles whereby the pumps frequently start and stop, yet small enough that it will regularly evacuate sewage from the wet well to prevent the wastewater from becoming septic. Generally, the desired number of pump cycles must be limited to no more that 6 per hour for motors up to 10 horsepower. Motors 15 to 75 horsepower must start no more than 4 times per hour. Larger motors should cycle less frequently. Pump stations should also have sufficient volume to store sewage in the event of mechanical or electrical failures, until the District can respond to the failure and prevent overflows. The necessary emergency storage is dependent upon how rapidly the District can respond to a failure and mitigate it. A minimum emergency storage of 30 minutes at peak wet weather flow must be provided unless significant constraints preclude it.

The pumps must be sized to efficiently handle the peak wet weather flows. A minimum of two pumps sized at the peak wet weather flow to the station must be provided so that sufficient standby capacity is available when one pump is removed for repairs or experiences a mechanical failure. The pumps must be able to pass a minimum solid size of 3 inches without clogging. The shafts, seals and impellers must be constructed of wear resistant material to provide long life. Tungsten Carbide seals, Ni-Hard impellers, and 316 stainless steel pump shafts are recommended. For services where aggressive agents may be found in the sewage, such as at golf courses, complete stainless steel construction must be used including the pump bowl, shaft, impeller, and motor housing.

The dry well houses the valves, pumps, motors and electrical equipment and controls. It must be well ventilated and provide unobstructed access to all equipment. A minimum 3-foot clearance from all obstructions must be provided. Greater clearances may be required for equipment with special maintenance needs. Provisions for equipment removal including hatches, large door openings, and hoists must also be provided.

The forcemains shall be selected to operate within a 3 feet per second to 5 feet per second velocity range, but shall not be smaller than 4-inches in diameter. Each pump station shall have two force mains that can be used individually to convey the entire pump station capacity. To the extent possible, they shall rise from the pump station to the terminal manhole or other facility. They shall have pig launching and retrieval facilities to allow cleaning.

Either submersible or wet well/dry well type pump stations can be used, depending upon the space available and the staff's preference. They must be designed with easy access to all equipment. The National Electric Code classifies the wet wells of wastewater pumping stations as Class I, Group D, Division 1 facilities if ventilated at less than 12 air changes per hour, and Division 2 if continuously ventilated at 12 or more air changes per hour. Dry wells, which are physically separated from wet wells, if ventilated at less than 12 air changes per hour, are classified as Class I, Group D, Division 2 locations. Wet wells, and under certain circumstances dry wells, are considered confined spaces and should be entered in accordance with the corresponding requirements of Occupational Safety and Health Administration (OSHA).

All sewer pump stations must incorporate redundant control systems for operation of the pumps. A float system shall be used as a backup for a primary control system that utilizes an ultrasonic device, transducer, or a bubbler system for level measurement and pump operation.

Telemetry equipment, which includes a telephone dialer as a minimum, must be provided at all sewer pump stations. When an alarm or failed condition occurs, the dialer shall call pre-programmed telephone numbers in sequence until the call is acknowledged, indicating response will be provided by District staff. If the alarm or failed condition is not corrected within a set time, the dialer will call the pre-programmed numbers again. The dialer can also be used to remotely check the status of the station if desired. A summary of sewer system design criteria is listed in Table 4-5.

Table 4-5
Sewer System Criteria

Collection System	
Minimum Pipe Size	8-inch
Minimum Velocity	2.0 ft/sec at average flow 3.0 ft/sec at peak dry weather flow
Pipe Depth to Diameter Ratio for *Existing Pipes*	0.62 for all pipe sizes at peak dry weather flow 0.82 for all pipe sizes at peak wet weather flow
Pipe Depth to Diameter Ratio for *New Construction*	0.50 for pipes 15-inches and smaller at peak dry weather flow 0.62 for pipes 18-inches and larger at peak dry weather flow 0.82 for all pipe sizes at peak wet weather flow
Pump Stations	
Pumps	▪ Minimum 2 each sized at peak wet weather flow ▪ Minimum solids handling capacity 3"
Wet Wells	▪ Sized to limit pump cycling to less than 4 to 6 times/hr ▪ Provide sufficient storage at peak wet weather flow to allow response to a failure-minimum 30 minutes ▪ Equipment to be maintained must be accessible without entering structure
Ventilation	▪ 12 -air changes/hour minimum in dry well and as required by NFPA 820 ▪ 30-air changes/hour minimum in wet well if not operated continuously ▪ 12-air changes/hour minimum in wet well if operated continuously
Controls	Redundant system. Float operated back-up controls.
Emergency Power	Stationary source with automatic transfer switch
Telemetry	Dialer system at all pump stations to alert personnel in the event of a station failure.
Force Mains	▪ Minimum velocity 3.0 ft/sec ▪ Maximum velocity 5.0 ft/sec for PVC pipe ▪ Maximum velocity 6.0 ft/sec for ceramic epoxy lined DIP ▪ Minimum size 4" ▪ Two force mains, each to convey full firm pumping capacity
	▪ Air/Vacs installed in vaults

4-8 SERVICE LIFE OF PIPE AND LIFT STATION EQUIPMENT

In addition to the design criteria discussed in previous sections, the useful lives for which one can expect relatively trouble-free service is also of great importance when assessing an existing or future sewer system.

Once the service life of a facility is exceeded, it becomes subject to failure and is often expensive to maintain. The determination of useful life can be difficult and depends on many different considerations including the following:

- Type of materials used and recorded performance of similar installations
- Velocities and flow rates expected in the system
- Chemical and biological conditions of the wastewater
- Construction methods and installation

The values listed in Table 4-6 are generally accepted as prudent planning criteria and are used as benchmarks for replacement recommendations in this study.

Table 4-6
Planning Criteria for Facility Useful Life

Facility	Description	Useful Life (Years)
Gravity Sewers:	Cast Iron Pipe (CIP)	20
	Plastic Pipe	65
	Vitrified Clay Pipe (VCP)	75
Force Mains:	Asbestos-Cement Pipe (ACP)	40
	Ductile Iron Pipe (DIP)	40
	Plastic Pipe	30
Pump Stations:	Structure	60
	Piping	30
	Valving	20
	Mechanical	15
	Electrical	15

4-9 CRITERIA FOR SPECIFIC PLANS AND DEVELOPMENT SUBAREAS

Each party wishing to pursue development of a tract or area within the District's study area shall develop a Sub-Area Master Plan (SAMP). The developer's plans for providing adequate sewer service to all users within the proposed development, how the local sewer system will connect to the backbone and regional system, and the impact of the proposed development to the downstream facilities (extending to the regional system) shall be fully described in the SAMP. The local sub-area sewers shall meet the sewer design criteria provided in this document and the District Standard Drawings for Sewer Construction. At a minimum, sewage flow calculations shall be based upon the unit flow factors contained in Table 3-2 or higher factors if specific conditions require it. A typical Sub-Area Sewer Master Plan Report shall include, but not be limited to the following:

- Map showing project boundaries and drainage areas
- Detailed land use description and map
- Average dry weather, peak dry weather, and peak wet weather flow calculations
- Exhibit showing all proposed sewer facilities and connections to the downstream regional system

- Phasing of development and wastewater flows
- Hydraulic calculations for phased and fully developed ultimate conditions, from the development to the regional system, meeting all sewer design criteria

Section 5

EXISTING SEWER SYSTEM

5-1 GENERAL DESCRIPTION

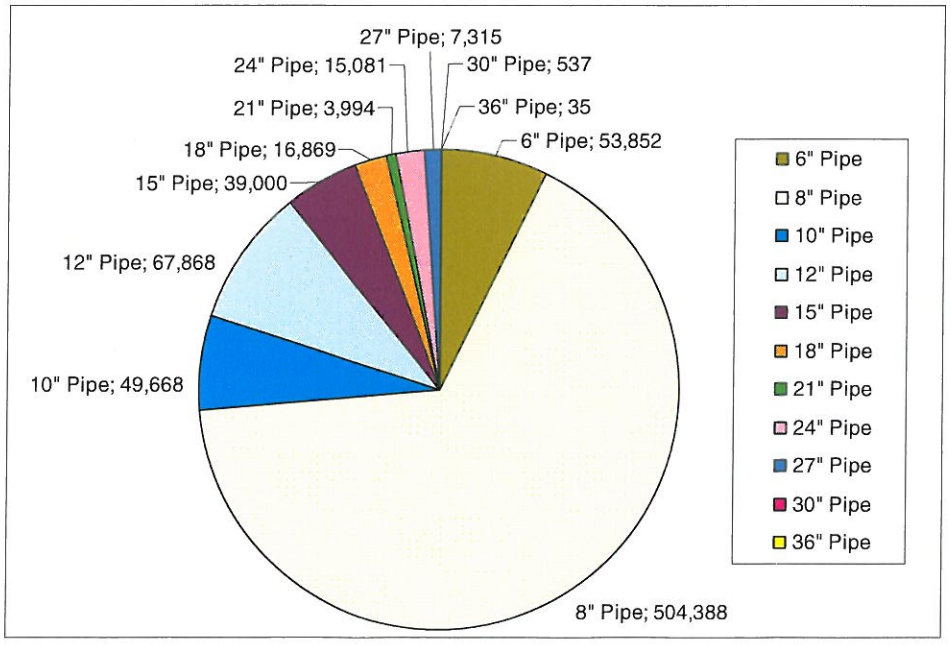
The District's existing sewer collection system is made up of a network of gravity sewers, pump stations, and forcemains. The gravity system consists of approximately 143.7 miles (758,607 ft) of pipe and 2,947 manholes and cleanouts.

The system includes four (4) major existing pump stations and 33,660 feet of associated forcemains, as well as several smaller pump facilities. Pump Stations 2, 3, 5, and 6 are the larger pumping facilities and are discussed in further detail in Subsection 5-5. Pump Station No. 4 is a small pump station, located on Pleasant Valley Road, west of Lewis Road. This facility pumps minimal flow from areas of irrigational land use to an old forcemain that conveys the flow by gravity to Pump Station No. 3. From Pump Station No. 3, the flow is pumped east to the Wastewater Treatment Plant. There are also 20 individual residential parcels located along Ramona Drive in the northwest portion of the City that pump sewage into a common forcemain on Ramona Drive. The sewage is pumped west uphill and is discharged to the District's gravity sewer on Calle de Debesa.

The general direction of gravity flow is from north to south and east to west. However, the pump stations redirect the flow from the west to the Wastewater Treatment Plant located in the southeast portion of the City.

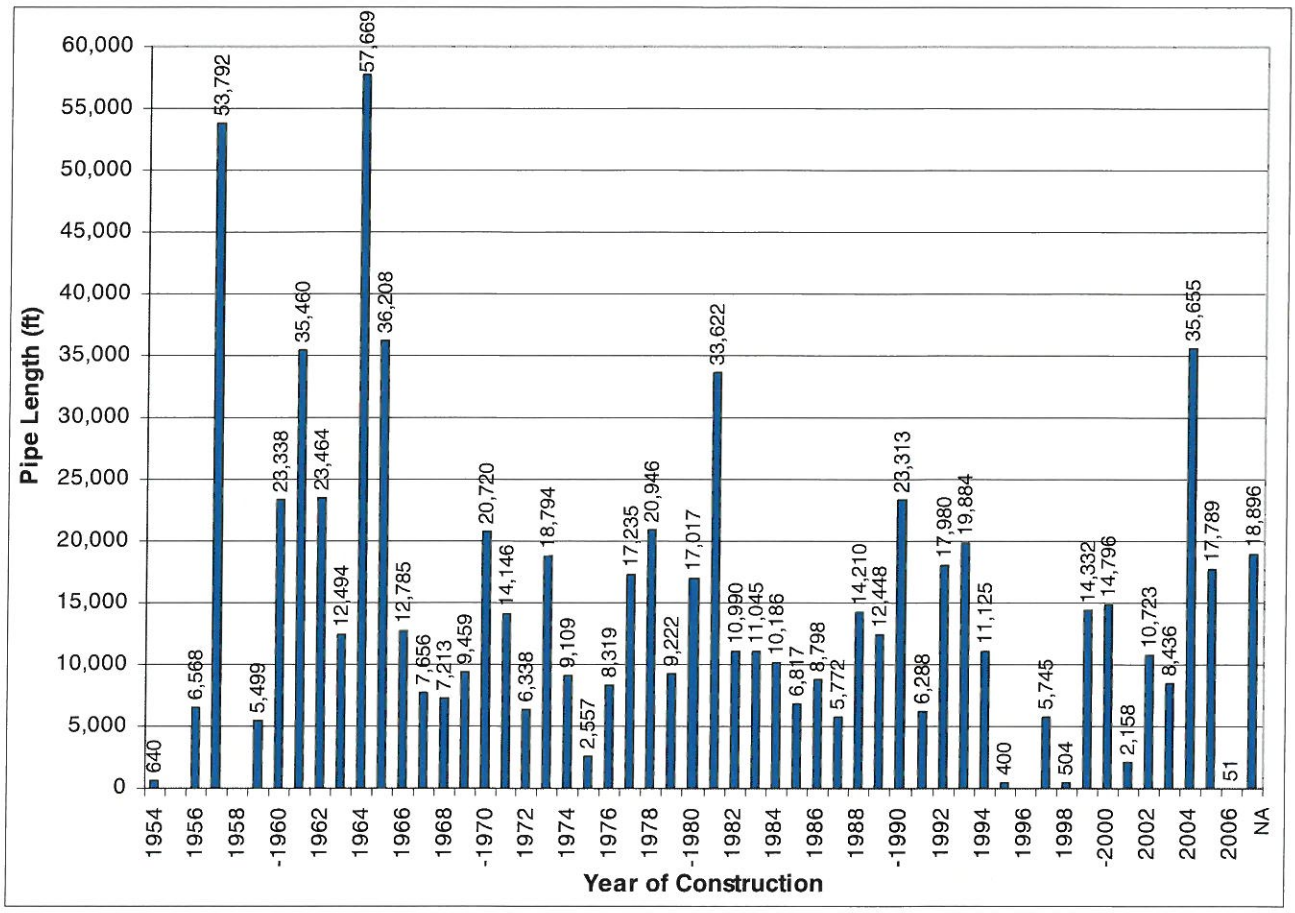
The sewers are primarily constructed of vitrified clay pipe with sizes ranging from 6-inches to 36-inches in diameter. Approximately 67 percent of the pipes are 8-inches in diameter. Figure 5-1 shows the length of gravity sewers in the existing system by pipe size.

Figure 5-1
Total Length (feet) of Gravity Sewer by Size



The lengths of gravity sewers by year of construction are shown on Figure 5-2. Major sewer construction occurred in the 1960's, when roughly 30 percent of the District's sewers were built.

Figure 5-2
Total Length of Gravity Sewer by Year of Construction



5-2 TRIBUTARY AREAS

The District's sewers are generally tributary to Pump Station No. 5, Pump Station No. 3, Pump Station No. 2, Pump Station No. 6, the Wastewater Treatment Plant, or to the major flow split located near Lewis Road and Adolfo Road. The existing and ultimate tributary areas are shown on Figure 5-3 and Figure 5-4 respectively.

Pump Station No. 5 Tributary Area

The Pump Station No. 5 Tributary Area currently covers approximately 1,330 acres located on the west portion of the service area. This tributary area consists of primarily rural residential communities which surround the Sterling Hills Golf Club and the Spanish Hills Country Club. Including the Camarillo Sphere of Influence, the ultimate tributary area will increase to approximately 1,640 acres. The Camarillo Sphere of Influence consists of primarily rural residential land use, which is currently part of unincorporated Ventura County. Sewage is collected by the District's sewer system and generally flows from north to south and east to west to Pump Station No. 5. The flow is pumped east to Ventura Boulevard and Las Posas Road, where it is discharged to a 24-inch gravity sewer that conveys the flow south and east to Pump Station No. 3.

Individual Pumps
Calle de Debesa
Ramona Dr
Las Posas Estates
Camarillo Heights
Las Posas Rd
Upland Rd
CAMROSA WATER DISTRICT
Beardsley Wash
Flow Split MH K10-101
Acoma Rd
Mission Oaks Blvd
Santa Rosa Rd
Rosewood Ave
Carmen Dr
Mobile Av
Arnell Rd
Lewis Rd
Ponderosa Dr
Camero Creek
P.S. #5
Camarillo Airport
Ventura Freeway
Pleasant Valley Rd
P.S. #3
P.S. #4
P.S. #2
P.S. #6
Las Posas Rd
Calleguas Creek
5th St
Wastewater Treatment Plant
Lewis Rd

Legend

- CSD Pump Stations
- Private Pump Stations
- Flow Split MH K10-101
- CSD Sewers
- Private Facilities
- CSD Force Mains
- Private Force Mains
- City Boundary
- Pump Station No. 5 Tributary Area
- Pump Station No. 3 Tributary Area
- Pump Station No. 2 Tributary Area
- Pump Station No. 6 Tributary Area
- Flow Split (MH K10-101) Tributary Area
- Water Treatment Facility Tributary Area (Direct)
- Not Served by Camarillo Sanitary District

N

0 1,500 3,000 6,000 9,000 Feet

1" = 3,000'

AKM

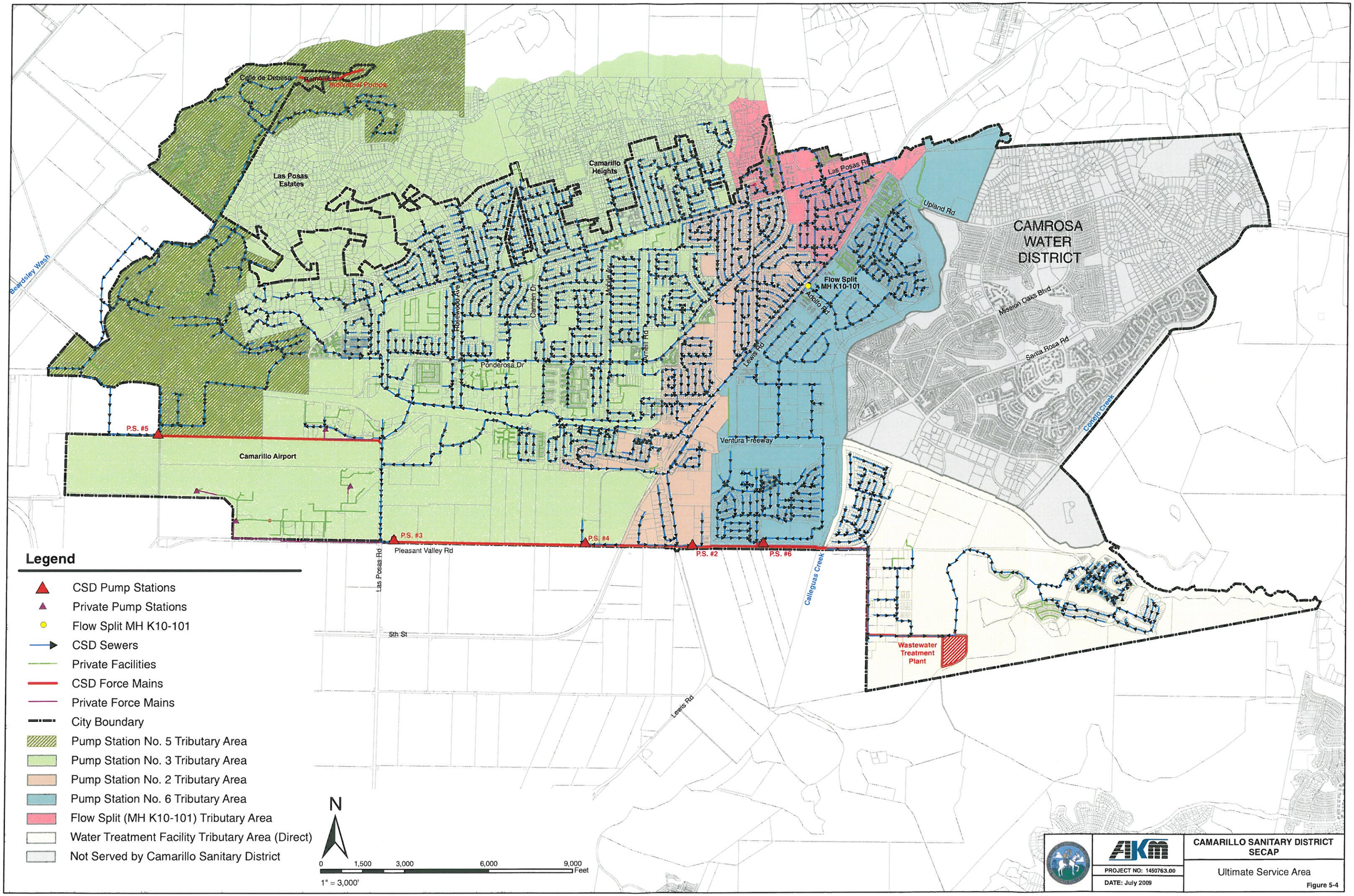
CAMARILLO SANITARY DISTRICT
SECAP

PROJECT NO: 1450763.00

DATE: July 2009

Existing System and Service Area

Figure 5-3


Calle de Debesa
Ramona Dr
Individual Pumps
Las Posas Estates
Camarillo Heights
Las Posas Rd
Upland Rd
CAMROSA WATER DISTRICT
Beardsley Wash
Flow Split MH K10-101
Adolfo Rd
Mission Oaks Blvd
Santa Rosa Rd
Rosewood Ave
Carmen Dr
Jacque Av
Arneill Rd
Lewis Rd
Ponderosa Dr
Conejo Creek
P.S. #5
Camarillo Airport
Ventura Freeway
P.S. #3
P.S. #4
P.S. #2
P.S. #6
Pleasant Valley Rd
Las Posas Rd
Calleguas Creek
5th St
Wastewater Treatment Plant
Lewis Rd
Legend
CSD Pump Stations
Private Pump Stations
Flow Split MH K10-101
CSD Sewers
Private Facilities
CSD Force Mains
Private Force Mains
City Boundary
Pump Station No. 5 Tributary Area
Pump Station No. 3 Tributary Area
Pump Station No. 2 Tributary Area
Pump Station No. 6 Tributary Area
Flow Split (MH K10-101) Tributary Area
Water Treatment Facility Tributary Area (Direct)
Not Served by Camarillo Sanitary District
N
0
1,500
3,000
6,000
9,000
Feet
1" = 3,000'
AKM
PROJECT NO: 1450763.00
DATE: July 2009
CAMARILLO SANITARY DISTRICT
SECAP
Ultimate Service Area
Figure 5-4

Pump Station No. 3 Tributary Area

At approximately 4,320 acres in size, the existing Pump Station No. 3 Tributary Area is the largest within the District boundary. This acreage does not include the Pump Station No. 5 Tributary Area, which also contributes flows to Pump Station No. 3. The majority of the Pump Station No. 3 Tributary Area consists of single family residential land use; however, there are large commercial developments such as the Camarillo Premium Outlets within its boundaries. Approximately 1,750 acres of predominately rural residential land use, which is currently part of unincorporated Ventura County, will be added to the ultimate tributary area when the sphere of influence area is incorporated into the City. In general, the sewers flow from north to south and east to west. The Camarillo Airport also conveys flow to Pump Station No. 3, via private pumping facilities. The wastewater at Pump Station No. 3 is pumped east to the Wastewater Treatment Plant via a 30-inch and 24-inch forcemain. Wastewater flows from Pump Station No. 2 are discharged directly into this same forcemain on Pleasant Valley Road between Lewis Road and Constitution Avenue.

Flow Split (MH K10-101) Tributary Area

The flow split at manhole K10-101, located at the intersection of Lewis Road and Adolfo Road, divides the flow to Pump Station No. 2 and Pump Station No. 6. The District may plug either of the outlet sewers to divert the total flow to either pump station. The District normally operates the system without plugging either outlet, and the flow is divided based on the sizes of the outlet sewers, the difference in invert elevations, and the quantity of flow. Since the outlet to Pump Station No. 2 is a larger sewer (15-inches) and is at a lower elevation (176.84 feet) than the outlet sewer to Pump Station No. 6 (12-inch, 177.00 feet), a larger percentage (approximately 60%) of flow is tributary to Pump Station No. 2.

Approximately 305 gross acres of single family residential, multifamily residential, commercial, and hospital land uses are tributary to manhole K10-101. Following incorporation of the sphere of influence area, the ultimate tributary area will increase to approximately 381 acres. The Flow Split (MH K10-101) tributary area is analyzed independently since the wastewater is distributed to two pump stations.

Pump Station No. 2 Tributary Area

Pump Station No. 2 Tributary Area covers approximately 890 gross acres of predominantly single family residential and industrial land use. Approximately 60% of the total flow from the Flow Split (MH K10-101) Tributary Area normally flows into this tributary area. The collection system generally extends from north to south and east to west to Pump Station No. 2. The wastewater is pumped through a short reach of 12-inch diameter forcemain directly into the 30-inch diameter forcemain on Pleasant Valley Road that originates at Pump Station No. 3.

Pump Station No. 6 Existing Tributary Area

The Pump Station No. 6 Tributary Area is located west of Calleguas Creek and adjacent to the Camrosa Water District service area. It is approximately 1,370 acres and consists of mainly industrial and single family residential land uses. Roughly 40% of the total flow from the Flow Split (MH K10-101) Tributary Area normally flows into this tributary area. The wastewater is generally conveyed south and west via the District's gravity system to Pump Station No. 6. It is then pumped in 2,800 feet of 12-inch diameter forcemain east along Pleasant Valley Road to the Calleguas Creek overpass, where the flow is discharged into a gravity sewer that conveys it south and east to the Wastewater Treatment Plant.

Wastewater Treatment Plant Tributary Area

The Wastewater Treatment Plant Tributary Area covers approximately 1,565 acres located in the southeast portion of the City. The land use is a mixture of agricultural, industrial, open space and residential. Sewage is collected by the District's sewer system, which generally flows from north to south and east to west directly to the Wastewater Treatment Plant.

5-3 FLOW SPLITS

Multiple flow splits exist within the District's sewer collection system. During this capacity analysis study, the flows at the "major" flow splits were evaluated in depth. Major flow splits were identified at locations with larger tributary areas, where the flows are diverted into multiple reaches. If the flow split occurs at the upstream end of a system, it was not considered "major". Details of the "major" flow splits and the results of the field investigations are listed in Table 5-1. Flow split locations are shown on Figure 5-5.

Table 5-1
Flow Splits

Manhole ID	Location	Flow Direction from Split Manhole	Comment
C12-108	Bajo Aqua Avenue, East of Aviador Street and South of Ventura Boulevard	South and Southwest	Per field verification, all flow is diverted south through C12-1038, the eastern 15" parallel sewer.
C12-113	Alley, East of Aviador St and south of Ventura Blvd	South and Southwest	Per field verification, all flow is diverted south through C12-1016, the eastern 15" parallel sewer.
E12-118	Ventura Boulevard, west of Los Posas Road	West and South	All flow is diverted south to private 8" sewer (E12-1024)
E14-128	Las Posas Road, between Camarillo Center Drive and Pleasant Valley Road	South and Southeast	Flow is split by invert elevations. Per field verification, approximately 80% of the wastewater flows south through the 21" western parallel pipe (E14-1030). 20% goes through the 24" eastern sewer (C12-1016).
F9-154	Avenida Del Manzano and Calle Portilla	South and Southwest	There is a dam to the west which force flows south through the 8" sewer (F9-1054). Only when flowing at high levels will the wastewater go to the west.
F10-101	Las Posas Road and Rosewood Avenue	West and South	Dam diverts flow to 12" sewer on the south (F10-1002). Only when there are high flows will the wastewater overflow to parallel system on the west.
F11-133	Ponderosa Drive, between Rosewood Avenue and Lantana Street	South and Southwest	Per flow monitoring results, approximately 60% of the wastewater flows to the 15" eastern sewer (F11-1071). 40% of the wastewater flows to the 12" western line (F11-1025).
F11-170	Paseo Camarillo east of Rosewood Avenue	South and Southwest	Flow is diverted southwest through 15" sewer (F11-1069).
F12-126	Daily Drive, between Rosewood Avenue and Lantana Street	West and Southwest	Per Field verification, approximately 50% of the wastewater flows to the southern 12" sewer (F12-1050). 50% flows to the northern 15" sewer (F12-1061)
F13-101	Las Posas Road, north of Camarillo Center Drive	South and Southeast	There is no connection to the east. Flow is diverted south to 24" sewer (F13-1009).
F13-107	Las Posas Road and Camarillo Center Drive	South and Southeast	No connection to the east. All the flow is diverted south to 24" sewer (F13-1012).
G11-127	Lan Tana Street and Ponderosa Drive	North and West	All flow is diverted west to the 12" sewer (G11-1010).
G9-170	Cerro Vista Way and Las Posas Road	South and Southwest	All flow is diverted west to 12" sewer (G9-1063)
G9-178	Euclid Avenue and Harris Avenue	South and West	There is a dam on pipe G10-1060. All flow is diverted west to the 8" sewer (G9-1072).
H9-127	Las Posas Road and Mission Drive	West and South	Dam on Sewer H9-1084, diverts all the flow south to the 8" sewer H9-1004.
J10-112	Stiles Avenue and Durkin Street	West and South	There is a dam All flow is diverted south to the 8" sewer (J10-1051).
J11-110	Sharon Drive and Durkin Street	Southwest and Southeast	All flow is diverted southeast to the 10" sewer (J11-1049.)
K10-101	Lewis Road and Adolfo Road	Southwest and Southeast	Per field verification, approximately 60% of the wastewater flows to 15" sewer to the southwest (K10-1010). 40% of the wastewater flows to the 12" sewer to the southeast (K10-1030).
K9-128	Marco Drive and Germain Street	West and Southeast	All flow is diverted southeast to 8" sewer (K9-1053).
K9-151	Jose Avenue and Almendro Way	West and East	Flow is split by invert elevations through a 8" sewer to the west (G9-1072), and a 15" sewer to the east (K9-1056). When the 15" sewer is approximately 50% full, the wastewater overflows to the 8" sewer.

CAMROSA WATER DISTRICT

D7-100
Calle de Debesa
Ramona Dr
Individual Pumps
E6-121
E6-101
F6-101
D6-102
D9-104
D10-106
D9-300
G8-101
H8-107
H8-300
H9-151
H8-300
I7-103
I7-102
I7-117
J8-104
Las Posas Rd
Upland Rd
Location 3
J9-1093
H9-127
K9-128
K9-151
K10-101
J10-112
Mission Oaks Blvd
Santa Rosa Rd
Apollo Rd
Location 4
J11-1003
J11-110
Lewis Rd
Conejo Creek
Beardsley Wash
G9-170
F9-154
G9-178
F10-101
Rosewood Ave
Carmen Dr
Mobile Av
Carmen Rd
G11-127
Ponderosa Dr
F11-133
F11-170
F12-126
Location 2
B11-1003
B11-1004
C12-108
C12-113
P.S. #5
E12-118
Camarillo Airport
F13-101
F13-107
Ventura Freeway
P.S. #3
P.S. #4
P.S. #2
P.S. #6
Pleasant Valley Rd
Las Posas Rd
Calleguas Creek
Location 1
M14-1006
M14-1007
5th St
Wastewater Treatment Plant
Lewis Rd

Legend

- CSD Pump Stations
- Private Pump Stations
- Split Manholes
- CSD Siphons
- CSD Sewers
- Private Facilities
- CSD Force Mains
- Private Force Mains
- City Boundary
- Camarillo Sanitary District Service Area
- D7-100 — Camarillo Sphere of Influence with Septic Systems Tributary Area

N

0 1,500 3,000 6,000 9,000 Feet

1" = 3,000'

AKM

PROJECT NO: 1450763.00

DATE: July 2009

CAMARILLO SANITARY DISTRICT SECAP

Siphons and Split Manhole Locations

Figure 5-5

5-4 SIPHONS

The District's sewer collection system includes inverted siphons (siphons) at four locations. Each was constructed to go under a major flood control channel or a conflicting utility. The primary concern with siphons is the fact that grease and debris can often build up in them, requiring frequent maintenance to prevent sewer spills. The existing siphon locations and descriptions are listed in Table 5-2, and illustrated on Figure 5-5.

Table 5-2
Existing Siphons

Location	Pipe ID	U/S MH ID	D/S MH ID	Location	Dia (in)	Length (ft)	Year Installed	Mat	U/S Invert (ft)	D/S Invert (ft)	Plan No.	Comment
1	M14-1007	M14-102	M14-100	South of Ridgeview Street and Adohr Lane	10	276	11/1/1971	VCP	102.97	98.60	C-282	Crosses Conejo Creek
	M14-1006	M14-102	M14-100	South of Ridgeview Street and Adohr Lane	8	276	11/1/1971	VCP	102.97	98.60	C-282	
2	B11-1004	B11-113	B11-114	Ventura Boulevard, West of Central Avenue	8	57.5	4/1/1994	PVC	53.50	52.75	C-7382	Crosses local RCP Storm Drain
	B11-1003	B11-113	B11-114	Ventura Boulevard, West of Central Avenue	8	57.5	4/1/1994	PVC	53.50	52.75	C-7382	
3	J9-1093	J9-138	J9-139	Kendal Avenue and Corby Avenue	8	22	4/20/1964	CIP	176.27	175.67	VC-40693	Crosses 14" Water Line
4	J11-1003	J11-300	J11-301	Lewis Road, Northeast of Durkin Street	12	15	NA	VCP	160.10	160.02	Field Verification	Crosses Local Storm Drain

5-5 SEPTIC SYSTEMS

Currently, the District has identified approximately 107 septic systems within the City boundary near the Las Posas Estates and Las Posas Country Club in the northwest portion of Camarillo. Including the Camarillo Sphere of Influence, there are possibly 1,895 septic systems within the District's ultimate service area. It is assumed that parcels that are not currently connected to a sewer system are on septic systems. The future system analysis did not include the flows from these areas since it is not known when the upstream sewer improvements will be implemented to convey their flows to the District's system. The Sphere of Influence area can be divided into 19 smaller tributary areas, assuming that sewage would ultimately be collected from each area and be conveyed to one of the District's existing manholes.

Many assumptions were made when delineating the ultimate tributary areas. Additional sewer pump stations may be required to convey the wastewater from these areas into the existing District facilities. Further analysis will be required during the incorporation process. The details of these tributary areas are shown on Figure 5-5 and in Table 5-3.

Table 5-3
Areas with Septic Systems

Location No.	Possible Discharge Manhole	Location of Possible Discharge Manhole	Number of Parcels on Septic Systems Tributary to Possible Discharge Manhole	Acreage of Parcels on Septic Systems Tributary to Possible Discharge Manhole
1	D10-106	On Sereno Pl	376	352
2	D7-100	CLL Corva and Ramona Dr	59	32
3	D9-104	Coorte Corrida Pl. & Via Aracena	4	15
4	E6-121	In golf course close to CLL Del Norte	17	10
5	E9-300	CLL Bella Vista and Crestview Ave	246	350
6	E6-114	In golf course close to CLL Del Norte	2	2
7	F6-101	Deseo Ave and Country View Pl	252	126
8	G8-101	Camarillo Ave and Glenbrook Ave	37	105
9	H8-107	Mission Dr and Catalina Dr	265	238
10	H8-117	Loop Dr and Lemon Dr	17	4
11	H8-300	Loop Dr and Brentford Ct	255	164
12	H8-302	Mission Dr and Nancy St	44	12
13	H9-113	Las Posas Rd and Anacapa Dr	85	37
14	I7-102	Mesa Dr and Beverly Dr	24	13
15	I7-103	Loop Dr and Mesa Dr	41	62
16	I7-117	Tanglewood Dr and Amber Dr	44	11
17	I7-134	Charter Oak Dr and Parkway Dr	6	2
18	J8-104	Loop Dr and Sanysidro St	113	64
19	J8-138	Loma Dr and Las Posas Rd	14	6
		Total	**1,901**	**1,607**

5-6 SEWER PUMP STATIONS

Pump Station No. 5

Location and Tributary Area

Pump Station No. 5 is located north of Camarillo Airport, west of South Wood Road. It serves a tributary area, shown on Figure 5-6, of approximately 1,330 gross acres. When the Sphere of Influence area is incorporated, the ultimate tributary area will be approximately 1,640 gross acres. Pump Station No. 5 was constructed in 1992 as a submersible pump station with three pumps.

Tributary Flows

The existing average dry weather flow is estimated at 0.260 mgd (181 gpm). The corresponding peak dry and wet weather flows are 0.608 mgd (422 gpm) and 0.851 mgd (591 gpm), respectively. The existing tributary land uses and average wastewater flow estimates are shown in Table 5-4.

The flow monitoring data at Sites 1 and 2 shows average dry weather flows of 0.054 mgd from the tributary on the east, and 0.148 mgd from the west. The total measured flow of 0.202 mgd is somewhat lower than the calculated existing average dry weather flow of 0.260 mgd, which takes into account the vacancies. The calculated flows were used in conducting the analyses for this System Evaluation and Capacity Assurance Plan study.

The ultimate average dry weather flow tributary to Pump Station No. 5 is estimated at 0.617 mgd (429 gpm). The ultimate peak dry and wet weather flows are 1.348 mgd (936 gpm), and 1.887 mgd (1,311 gpm), respectively. The ultimate tributary land uses and average wastewater flow estimates are detailed in Table 5-5.

Existing Land Use

Residential
- Single Family Residential
- Rural Residential
- Multiple Family Residential
- Duplex/Triplex
- Condo/Townhome
- Mobile Home

Commercial
- Commercial
- Commercial Recreation
- Restaurant
- Hotel
- Self Storage
- Retail
- Car Wash
- Industrial
- Heavy Industrial

Community Services and Facilities
- Schools
- Colleges
- Public Facilities
- Hospital
- Park
- Agriculture
- Golf Course
- Open
- Military Housing
- Mixed Use
- Vacant
- Other

Legend
- Pump Station
- District Boundary
- Pump Station No. 5 Tributary Area
- Pump Station No. 3 Tributary Area
- District Gravity Sewer
- Private Gravity Sewer
- District Forcemain
- Private Forcemain

Unincorporated Ventura County

Unincorporated Ventura County

Las Posas Estates

Calle de Debesa

Ramona Dr

Individual Pumps

Beardsley Rd

Diamond Dr

Avenida De Aotlan

Beardsley Wash

Avenida de Arnisa

Calle Tierra Vista

Crestview Ave

Crestview Ave

Las Posas Rd

Rosewood Ave

Carmen Dr

Ponderosa Dr

Ventura Freeway

Wood Rd

Aviator St

PS No. 5

Pump Station No. 3 Tributary Area

Camarillo Airport

Las Posas Rd

N

0 750 1,500 3,000 Feet

1" = 1,500'

AKM

CAMARILLO SANITARY DISTRICT
SECAP

Pump Station No. 5
Existing Tributary Area

PROJECT NO: 1450763.00

DATE: July 2009

Figure 5-6

Table 5-4
Existing Land Use and Estimated Flows
Pump Station No. 5

Existing Land Use Code	Property Use Description	Net Area (Ac)*	Flow Factor (gpd/Ac)	Total Average Flow (mgd)
Rural Residential	10	284.85	200	0.057
Single Family Residential	11	84.67	1,350	0.114
Multiple Family Residential	17,19	2.63	1,500	0.004
MFR - Condo/Townhome	15	8.08	1,900	0.015
Mobile Home	16,18	15.99	820	0.013
Restaurant	24	2.40	1,500	0.004
Hotel	25	5.19	3,000	0.016
Retail	26,27,28	4.03	400	0.002
Commercial	20,21,22,22.1,22.4, 23,33	4.46	800	0.004
Industrial	30,32,34	6.05	400	0.002
Heavy Industrial	31	29.98	800	0.024
Public Facilities	41,46,47,48,49,49.1, 49.2,50,98	5.40	800	0.004
Park	40	4.89	200	0.001
Open/Agriculture/Golf Course	58,59,60,61,64,65,66, 67,80,81,90,92,93,94, 91,70,71,72,73,74,75,99	727.70	0	0.000
Streets and Right of Ways		143.69		
Totals		**1,330**	**ADWF (mgd)**	**0.260**
			PDWF (mgd)	**0.608**
			PWWF (mgd)	**0.851**

* Acreage does not include adjacent streets and right of way

Wet Well

The wet well is a circular T-Loc PVC lined reinforced concrete structure, 20 feet in diameter. The bottom and top elevations are 32.5 feet and 66.75 feet, respectively. A 24-inch diameter influent sewer enters the wet well with an invert elevation of 50.42 feet from the east. An 18-inch diameter influent sewer discharges into the wet well from the west with an invert elevation of 43.93 feet. A concrete fillet, with a maximum height of 11.25 feet slopes from the north to the south of the wet well.

The emergency storage volume is approximately 6,530 gallons, which provides 11 minutes of storage for the existing peak wet weather flow of 591 gpm, and 5 minutes of storage with the ultimate peak wet weather flow of 1,311 gpm. Based on the field investigations of the pump station, the wet well is in good condition.

Pumps

The pump station contains three slide rail submersible "non-clog" pumps (Chicago Pump Company Pump SS 8817, Impeller 4012) rated at 2,100 GPM and a total dynamic head of 78 feet at 1160 revolutions per minute (RPM). The manufacturer's pump curve shows 4-inch maximum solids handling capability. The pumps are driven by 60 HP submersible motors.

Table 5–5
Ultimate Land Use and Estimated Flows
Pump Station No. 5

Zoning Category	Zoning Use Description	Net Area (Ac)*	Ultimate Unit Flow Factor (gpd)	Total Average Flow (mgd)
Residential Use				
R-E, RE10AC, RE-15, RE-1AC, RE-20, RE-3AC, RE40AC, RE-5AC	Rural Exclusive	716.35	200	0.143
R-1, R-1-10, R-1-15, R-1-8, RPD, RPD-2U, RPD-3U, RPD-4U, RPD-5U	Low Density Residential	198.50	1350	0.268
RPD7R, RPD8U, RPD10U	Low-Medium Density Residential	20.94	1500	0.031
MHPD	Mobile Home Park Development	15.99	820	0.013
Commercial Uses				
CPD	Commercial Planned Development	108.87	880	0.096
Restaurant	Restaurant	2.40	1500	0.004
Hotel	Hotel	5.19	3000	0.016
Industrial Uses				
M-2	Heavy Manufacturing	29.86	880	0.026
Public Uses				
Public	Public	5.40	880	0.005
Other Uses				
A-E	Agricultural	120.32	0	0.000
O-S	Open Space	174.11	0	0.000
Park	Park	78.67	200	0.016
Streets and Right of Ways		160.13		
Totals		**1637**	**ADWF (mgd)**	**0.617**
			PDWF (mgd)	**1.348**
			PWWF (mgd)	**1.887**

* Acreage does not include adjacent streets and right of way

The pump station was designed with two duty pumps and one standby pump. The lead pump is set to start at elevation 40.50 feet, and stop at 37.00 feet, while the lag pump is set to start at elevation 43.5 feet and stop at 37.5 feet. The high and low level alarms are set at elevation 44.00 and 36.50 feet, respectively. The operating volume of approximately 7150 gallons provides a minimum cycling time of 13.6 minutes with only one pump. The cycling time would be 27.2 minutes with two pumps, and 41.8 minutes with three pumps alternated. The normal operation involves alternating the three pumps as lead pump, which results in less than 1.5 starts per hour per pump. The wastewater level in the wet well is determined by a bubbler system, which is currently being replaced by an ultrasonic level sensor.

One pump can deliver over 2,000 gpm, even with a Hazen Williams friction factor (C value) of 100. Therefore, the pump station has ample capacity to handle the ultimate peak wet weather flow of 1,311 gpm.

The District staff indicates occasional ragging at Pump Station No. 5. When the pump station is upgraded, the existing "non clog" pumps should be replaced with enclosed screw centrifugal pumps to minimize the possibility of ragging.

Discharge Pipes and Forcemain

Each pump has an 8-inch, 90° discharge elbow, an 8x10 reducer, and 10-inch diameter PVC discharge pipe inside the wet well, which exits the structure with an invert elevation of 61.33 feet. The above ground ductile

iron discharge pipe for each pump has a lever and weight check valve and a plug isolation valve (centerline elevation at 68.65 feet). They connect to a 14-inch discharge header through 45° wyes. The discharge header connects to a 14-inch tee, extends below ground, increases to 18-inch diameter, and then connects to an 18-inch tee. One branch of the tee is the forcemain which extends to South Wood Road and then further east. The other branch reduces to 10-inch diameter, extends back to the wet well for use in draining the forcemain.

The 18-inch diameter forcemain is mostly of PVC C-905 material, except for a 100-foot reach of Class 50 Ductile iron pipe (DIP) from Station 65+80 to 66+80, and 129.5 feet of Class 52 DIP at the downstream end of the forcemain. As-built plans do not indicate the PVC pipe thickness. The forcemain extends 7,981 feet easterly from the pump station, primarily in a 20-foot wide easement along the north property line of Camarillo Airport. .

Near its downstream end, the forcemain emerges from the ground to cross over the Camarillo Hills Box Culvert at Las Posas Road, south of Ventura Boulevard. This reach, which is of Class 52 DIP, is attached to the top of the 38-foot wide box culvert. The invert elevation of the forcemain is 94.5-feet, which is also the highest elevation along the entire reach. This high point has a 6-inch air release and vacuum relief valve, and a 45° vertical bend at the downstream end of the box culvert crossing, where it goes below ground. The flow will go through critical depth at this location, which makes it the hydraulic downstream control. The forcemain discharges to the terminal manhole E12-127 at the intersection of Ventura Boulevard and Las Posas Road. The pipe invert elevation at the terminal manhole is 82.5 feet. In this steep section, the velocities may exceed 10 feet per second if normal depth is reached. This portion of the pipe should be inspected to assess its condition.

The velocity in the 10-inch pump discharge pipes is approximately 9 feet per second, which is higher than the recommended velocity of 5 feet per second for PVC pipe. The velocity in the 18-inch forcemain is approximately 2.7 feet per second with one pump in operation, which is less than the recommended minimum velocity of 3 feet per second to minimize the possibility of debris settlement in the forcemain. When Pump Station No. 5 is upgraded, the pump discharge pipes and the forcemain should be sized for the recommended velocities.

Telemetry

The pump station's status and alarm conditions are transmitted to the Central SCADA unit at the Wastewater Treatment Plant through a remote telemetry unit (RTU), and spread spectrum radio. The original leased telephone line is still available but is not used.

Electric Service

Power to the pump station is provided by the Southern California Edison Company, through an underground vault directly east of the facility on South Wood Road. The transformer is located to the west of the wet well. The main switchboard, automatic transfer switch, and the pump control panel are housed in a NEMA 3R enclosure north of the wet well. The service is 400 Amp, 277/480 volt, 3 phase, 4 wire.

Redundant Facilities

The pump station has an on-site 400 KW emergency generator with a diesel fuel storage tank, and an automatic transfer switch to operate the pump station in case of commercial power outage. It incorporates a float switch to start all available pumps in sequence when the level in the wet well reaches the high water

level, if the primary level controller fails to operate the pumps. Facilities for connection to the discharge header are provided for bypass pumping for access to the wet well.

Pump Station No. 3

Location and Tributary Area

Pump Station No. 3 is located to the north of Pleasant Valley Road, approximately 450 feet east of Las Posas Road. It serves a tributary area, shown on Figure 5-7, of approximately 5,650 acres, which includes 1,330 acres that are tributary to Pump Station No. 5. When the Sphere of Influence Area is incorporated, the ultimate tributary area will be approximately 7,700 gross acres, including 1,640 acres tributary to Pump Station No. 5. It was constructed in 1992 as a wet well-dry well pump station with three "non-clog" pumps, and space and facilities for a fourth pump.

Tributary Flows

The existing average dry weather flow is estimated at 2.579 mgd (1,791 gpm). The corresponding peak dry and wet weather flows are 5.021 mgd (3,487 gpm) and 7.030 mgd (4,882 gpm), respectively. The existing tributary land uses and average wastewater flow estimates are shown in Table 5-6.

The flow monitoring data at Sites 3 and 4 showed an average flow of 2.39 mgd, which is very close to the calculated average dry weather flow of 2.579 mgd, especially when vacancies are considered. The calculated flows were used in conducting the analyses for this study.

The ultimate average dry weather flow tributary to Pump Station No. 3 is estimated at 3.827 mgd (2,658 gpm), including 0.617 mgd from Pump Station No. 5. The ultimate peak dry and wet weather flows are 7.219 mgd (5,013 gpm), and 10.106 mgd (7,018 gpm), respectively. The ultimate tributary land uses and average wastewater flow estimates are detailed in Table 5-7.

Wet Well

The wet well is a 40 feet wide and 11 feet long rectangular T-Loc PVC lined reinforced concrete structure. The bottom and top elevations are 50.00 feet and 76.25 feet, respectively. The influent sewer is 36 inch in diameter, and enters the wet well with an invert elevation of 62.40 feet from the south. A concrete fillet, with a height and width of 6 feet slopes from the west to east of the wet well, as well as from south and north to the middle. Its volume between the influent sewer invert and the first pump start elevation is 7,075 gallons, which provides less than two minutes of emergency storage. The wet well is reported to be in good condition.

The wet well has an exhaust fan sized at 1,840 cubic feet per minute (cfm), which provides approximately 15 air changes per hour.

Dry Well

The dry well is a 40 feet wide, 23 feet long, and 24 feet high reinforced concrete structure that houses three "non-clog: pumps and space for a fourth pump. Access to the dry well is through stairs located along the north and west walls of the dry well. A float switch is provided to notify the District of flooding in the dry well. Based on field reviews, the dry well is in good condition.

An exhaust fan of 4,800 cfm capacity provides approximately 13 air changes per hour.

Existing Land Use

Residential

- Single Family Residential
- Rural Residential
- Multiple Family Residential
- Duplex/Triplex
- Condo/Townhome
- Mobile Home
- Military Housing

Commercial

- Commercial
- Commercial Recreation
- Restaurant
- Hotel
- Self Storage
- Retail
- Car Wash
- Industrial
- Heavy Industrial

Community Services and Facilities

- Schools
- Colleges
- Public Facilities
- Hospital
- Park
- Agriculture
- Golf Course
- Open
- Military Housing
- Mixed Use
- Vacant
- Other

Legend

- Pump Station
- District Boundary
- Pump Station No. 3 Tributary Area
- Pump Station No. 5 Tributary Area
- Pump Station No. 2 Tributary Area
- Pump Station No. 6 Tributary Area
- District Gravity Sewer
- Private Gravity Sewer
- District Forcemain
- Private Forcemain

Las Posas Estates

Inincorporated Ventura County

Camarillo Heights

Pump Station No. 5 Tributary Area

PS No. 5

Includes Flow from Pump Station No. 5

Camarillo Airport

PS No. 3

Pump Station No. 2 Tributary Area

PS No. 6 Tributary Area

Las Posas Rd

Calle Portilla

Earl Joseph Dr

Golden Lawn Ave

Rosewood Ave

Coe St

Cerro Vista Way

Mission Dr

Carmen Dr

Rowland Ave

Mobil Av

Ameill Rd

Temple Ave

Eston St

Mesa Dr

Charter Oak Dr

Las Posas Rd

Ponderosa Dr

Paseo Camarillo

Brenly Ave

Ventura Freeway

Ventura Blvd

Camarillo Center Dr

Pleasant Valley Rd

N

0 750 1,500 3,000 Feet

1" = 1,500'

AKM

CAMARILLO SANITARY DISTRICT
SECAP

Pump Station No. 3
Existing Tributary Area

PROJECT NO: 1450763.00

DATE: July 2009

Figure 5-7

Table 5–6
Existing Land Use and Estimated Flows
Pump Station No. 3

Existing Land Use Code	Property Use Description	Net Area (Ac)*	Flow Factor (gpd/Ac)	Total Average Flow (mgd)
Rural Residential	10	171.15	200	0.034
Single Family Residential	11	1056.05	1350	1.426
SFR - Duplex/Triplex	12,13,14	24.08	1200	0.029
Multiple Family Residential	17,19	173.19	1500	0.260
MFR - Condo/Townhome	15	35.11	1900	0.067
Mobile Home	16,18	26.83	820	0.022
Commercial	20,21,22,22.1,22.4, 23,33	82.45	800	0.066
Car wash	23.1	0.81	6000	0.005
Restaurant	24	16.00	1500	0.024
Retail	26,27,28	228.55	400	0.091
Self Storage	27.1	11.25	50	0.001
Commercial Recreation	29,29.1,29.2	14.58	400	0.006
Industrial	30,32,34	22.43	400	0.009
Heavy Industrial	31	0.08	800	0.000
Hotel	25	9.35	3000	0.028
Military Housing	96	51.43	1900	0.098
Public Facilities	41,46,47,48,49,49.1, 49.2,50,98	95.26	800	0.076
Schools	42,43,44	53.29	1200	0.064
Colleges	49.3,55,56	0.84	600	0.001
Park	40	71.84	200	0.014
Open/Agriculture/Golf Course	58,59,60,61,64,65,66, 67,80,81,90,92,93,94, 91,70,71,72,73,74,75,99	1505.87	0	0.000
Streets and Right of Ways		667.18		
Pump Station No. 5 Tributary ADWF	**NA**	1330		**0.260**
Totals		**5,648**	**ADWF (mgd)**	**2.579**
			PDWF (mgd)	**5.021**
			PWWF (mgd)	**7.030**

* Acreage does not include adjacent streets and right of way

Table 5–7
Ultimate Land Use and Estimated Flows
Pump Station No. 3

Zoning Category	Zoning Use Description	Net Area (Ac)*	Ultimate Unit Flow Factor (gpd)	Total Average Flow (mgd)
Residential Use				
R-E, RE10AC, RE-15, RE-1AC, RE-20, RE-3AC, RE40AC, RE-5AC	Rural Exclusive	1604.39	200	0.321
R-1, R-1-10, R-1-15, R-1-8, RPD, RPD-2U, RPD-3U, RPD-4U, RPD-5U	Low Density Residential	1323.63	1,350	1.787
RPD7R, RPD8U, RPD10U	Low-Medium Density Residential	127.06	1,500	0.191
RPD12U, RPD15U, RPD17U, RPD18U	Medium Density Residential	33.38	1,700	0.057
RPD-20U, RPD24U, RPD25U, RPD30U	High Density Residential	74.80	1,900	0.142
MHPD	Mobile Home Park Development	26.83	820	0.022
Commercial Uses				
COT	Camarillo Old Town	6.98	880	0.006
CPD	Commercial Planned Development	366.86	880	0.323
P-O	Professional Office	69.63	880	0.061
Restaurant	Restaurant	16.00	1,500	0.024
Carwash	Carwash	0.81	6,000	0.005
Hotel	Hotel	9.35	3,000	0.028
Industrial Uses				
L-M	Limited Manufacturing	63.29	440	0.028
M-1	Light Manufacturing	1.76	440	0.001
Airport	Airport	678.79	Point Source	0.056
M-2	Heavy Manufacturing	0.08	880	0.000
Public Uses				
Public	Public	80.00	880	0.070
School	School	62.65	1,200	0.075
Other Uses				
A-E	Agricultural	539.69	0	0.000
O-S	Open Space	121.31	0	0.000
Park	Park	64.98	200	0.013
Streets and Right of Ways		794.10		
Pump Station No. 5 Tributary		1637		0.617
Totals		**7700**	**ADWF (mgd)**	**3.827**
			PDWF (mgd)	**7.219**
			PWWF (mgd)	**10.106**

* Acreage does not include adjacent streets and right of way

Main Pumps

The pump station contains three close coupled vertical "non clog" dry pit submersible pumps (Chicago Pump Company VCCS 10821 pump with 505184 impeller) operated by variable frequency drives. The pumps are rated at 3,100 GPM and a total dynamic head of 126.0 feet at 1160 RPM. The certified pump curve shows 5-inch maximum solids handling capability. The pumps are driven by 165 HP motors.

The lead pump is set to start at elevation 60.25 feet, and stop at 57.25 feet; the first lag pump is set to start at elevation 61.00 feet and stop at 58.00 feet; and the second lag pump is set to start at 61.5 feet and stop at 58.5 feet. The high and low level alarms are set at elevation 61.50 and 56.75 feet, respectively. The

operating volume of approximately 9,875 gallons provides a minimum cycling time of 12.7 minutes with only one pump in operation at full motor speed. The cycling time would be 25.5 minutes with two pumps, and 38.2 minutes with three pumps alternated. The normal operation involves alternating the three pumps as lead pump, which results in less than 1.6 starts per hour per pump. If only two pumps were available, the pumps would start about 2.4 times per hour, which indicates that the operating volume is adequate for the existing pumps. The wastewater level in the wet well is measured by an ultrasonic level sensor.

One pump can deliver approximately 4,800 gpm at full speed, which is nearly the estimated peak wet weather flow (4,882 gpm). Two pumps can deliver approximately 7,000 gpm. Therefore, the existing pump station has more than adequate firm capacity for the existing flows.

The existing pumps experience cavitation, and had been replaced frequently in the past. This appears to have been due to lower losses in the forcemain than anticipated during the design of the facility, which results in the pumps operating out of the preferred operating range when running at full speed. Staff reports that failure frequency has dropped since the incoming electric power quality has been improved. A detailed study of the existing and future flow patterns should be performed prior to the replacement of this facility to select the proper pumps.

Suction Pipes

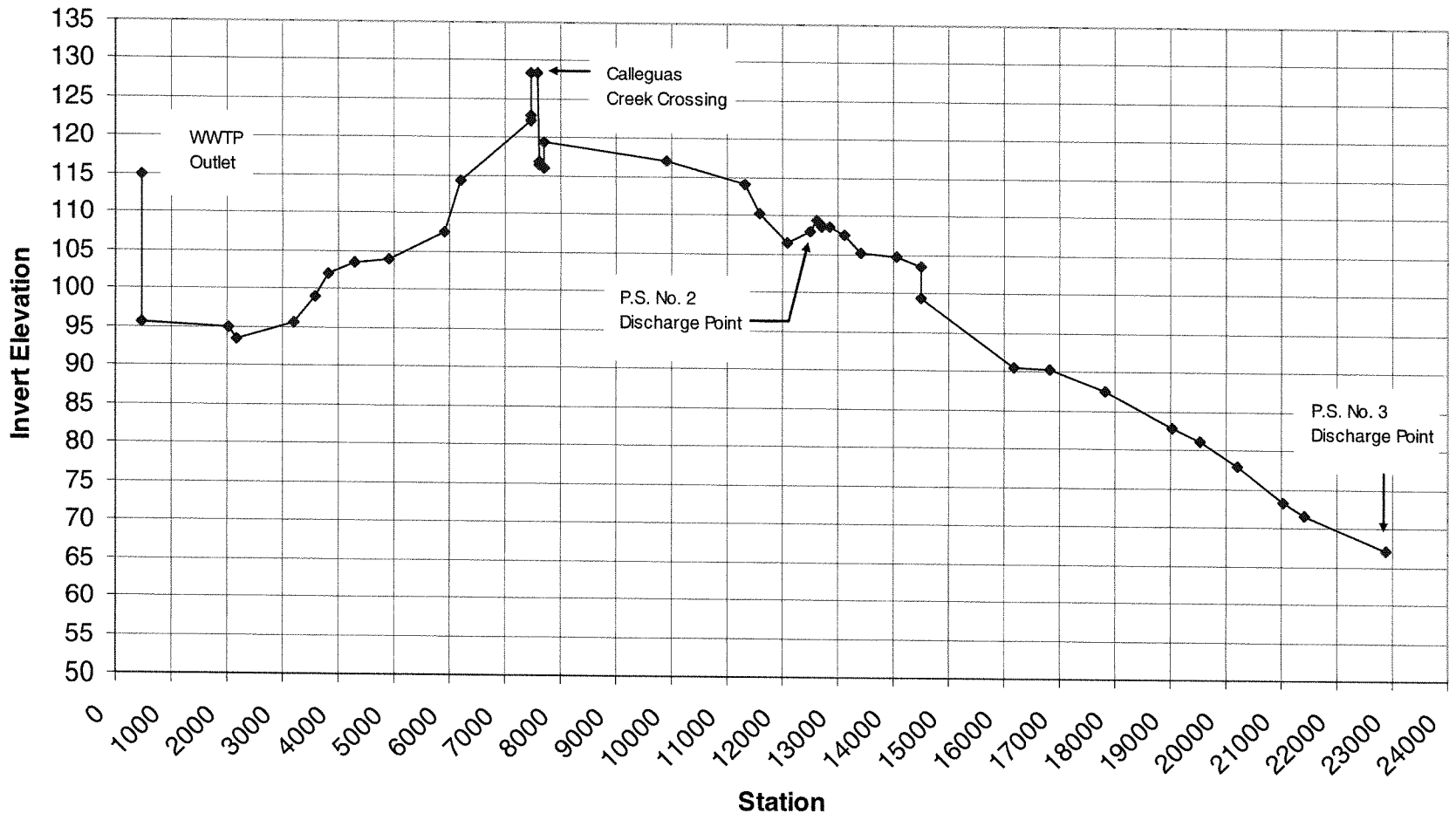
The pump suction piping starts with a 90° flared bell elbow at the wet well, with the inlet 1-foot above the wet well floor elevation of 50.0 feet. It goes through the dividing wall as an 18-inch wall pipe, which is followed by an 18-inch plug isolation valve (centerline elevation 53.92 feet). It decreases to 12-inch diameter through an eccentric reducer, and enters the pump through its bottom with a 90° ell. Victaulic couplings or sleeve type flexible couplings are provided to allow dismantling of the pump.

Discharge Pipes and Forcemain

Each pump has a 10-inch discharge flange, and a 10"x14" concentric reducer followed by two 14-inch spools connected with a Victaulic coupling. The upstream spool has a 2-inch combination sewage air release valve. The discharge piping continues with a 14-inch 90° vertical elbow and a plug isolation valve, followed by two spools connected by a Victaulic coupling and another 90° ell. It connects to the discharge header at a 24"x14" 45° wye. The discharge header (centerline elevation 67.8 feet) extends southerly along the east wall and exits the drywell. It has a flexible coupling, a plug valve, and another flexible coupling before it enters the meter vault. Inside the vault, it reduces to 16-inch, has a Victaulic coupling, and a magnetic flow meter, followed by a 16"x24" reducer. It continues further south outside the vault, has a flexible coupling, a plug isolation valve, and a 24"x30" reducer as it extends to Pleasant Valley Road.

The forcemain extends 22,425 feet along Pleasant Valley Road, Adohr Lane, Pancho Road, and Calle Quetzal to the Wastewater Treatment Plant, where it enters the headworks through a riser with its top at elevation 115.0 feet. Figure 5-8 illustrates a condensed profile of the forcemain. The forcemain is a 30-inch diameter Class 50 DIP, except for 140 feet of 24-inch diameter Class 52 DIP where it crosses Calleguas Creek. Pump Station No. 2 forcemain discharges into the Pump Station No. 3 forcemain at Station 122+06, directly across Pump Station No. 2. The invert elevation of the 12-inch forcemain is 108.3 feet. This connection point is 10,685 feet east of Pump Station No. 3, and 4,733 feet west of the Calleguas Creek crossing.

Figure 5-8
Pump Station No.3 Force Main Profile



The Pump Station No. 3 forcemain has its highest point at the Calleguas Creek crossing (invert elevation of 128.5 feet). Because of the steep downstream slope at the creek crossing, the large pipe size, relatively short distance to the Wastewater Treatment Plant, and the low outlet elevation (115 feet), the portion of the forcemain downstream of the Calleguas Creek crossing is hydraulically separated from the Pump Station No. 3 and Pump Station No. 2 for up to the expected ultimate peak wet weather flows. The short section of pipe downstream of the high point experiences high velocities. This portion of the pipe should be inspected to assess its condition.

The velocity in the 30-inch forcemain is approximately 2.2 feet per second with the existing peak wet weather flow of 4,882 gpm, which is less than the recommended minimum velocity of 3 feet per second to minimize the possibility of debris settlement in the forcemain. The discharge pipes and forcemain should be sized for the recommended velocities. A parallel forcemain should be constructed to provide redundancy for this critical facility.

Electric Service

Power to the pump station is provided by the Southern California Edison Company from a power pole located on the south side of Pleasant Valley Road, and a transformer located at the east of the pump station structure. The service is 277/480 volt, 4 wire three phase. The 1,200 Amp switchboard, the variable frequency drives, pump controls, and telemetry equipment are housed in an above ground building directly north of the pump station wet well/dry well structure.

Telemetry

The pump station's status and alarm conditions are transmitted to the Central SCADA unit at the Wastewater Treatment Plant through a remote telemetry unit (RTU), and spread spectrum radio. The original leased telephone line is still available but is not used.

Redundant Facilities

The pump station has an on-site 700 KW emergency generator with a diesel fuel storage tank, and a 1,200 Amp automatic transfer switch to operate the pump station in case of commercial power outage. It incorporates a float switch to operate start all available pumps in sequence when the level in the wet well reaches the high water level, if the primary level controller fails to operate the pumps. Facilities for connection to the discharge header are provided for bypass pumping for access to the wet well.

Surge Tank

The pump station includes a surge tank located to the east of the wet well/dry well structure.

With one pump on standby, the firm capacity of Pump Station No. 3 is approximately 7,000 gpm, which is nearly the same as the estimated ultimate peak wet weather flow (7,018 gpm).

Pump Station No. 2

Location and Tributary Area

Pump Station No. 2 is located north of Pleasant Valley Road between Lewis Road and Village Commons Boulevard. It directly serves an area of approximately 890 gross acres. About 60% of the total flow from the Flow Split (MH K10-101) Tributary Area is included with this tributary area flow. It was constructed in 1992 as a submersible pump station with three "non-clog" pumps. The pump station tributary area is illustrated on Figure 5-9.

Tributary Flows

The existing average dry weather flow is estimated at 0.796 mgd (553 gpm). The corresponding peak dry and wet weather flows are 1.703 mgd (1,183 gpm) and 2.384 mgd (1,656 gpm), respectively. The existing tributary land uses and average wastewater flow estimates are shown in Table 5-8.

Table 5–8
Existing Land Use and Estimated Flows to Pump Station No. 2

Existing Land Use Code	Property Use Description	Net Area (Ac)*	Flow Factor (gpd/Ac)	Total Average Flow (mgd)
Rural Residential	10	1.12	200	0.000
Single Family Residential	11	343.03	1350	0.463
SFR - Duplex/Triplex	12,13,14	0.67	1200	0.001
Multiple Family Residential	17,19	16.08	1500	0.024
MFR - Condo/Townhome	15	0.74	1900	0.001
Commercial	20,21,22,22.1,22.4, 23,33	3.36	800	0.003
Restaurant	24	0.41	1500	0.001
Retail	26,27,28	8.68	400	0.003
Self Storage	27.1	2.74	50	0.000
Industrial	30,32,34	121.52	400	0.049
Heavy Industrial	31	23.94	800	0.019
Public Facilities	41,46,47,48,49,49.1, 49.2,50,98	16.43	800	0.013
Schools	42,43,44	45.99	1200	0.055
Park	40	16.33	200	0.003
Open/Agriculture/Golf Course	58,59,60,61,64,65,66, 67,80,81,90,92,93,94, 91,70,71,72,73,74,75,99	63.36	0	0.000
Streets and Right of Ways		228.07		
Observed 60% of ADWF from Split MH K10-101				0.161
Totals		**892**	**ADWF (mgd)**	**0.796**
			PDWF (mgd)	**1.703**
			PWWF (mgd)	**2.384**

* Acreage does not include adjacent streets and right of way

Existing Land Use

Residential

- Single Family Residential
- Rural Residential
- Multiple Family Residential
- Duplex/Triplex
- Condo/Townhome
- Mobile Home

Commercial

- Commercial
- Commercial Recreation
- Restaurant
- Hotel
- Self Storage
- Retail
- Car Wash
- Industrial
- Heavy Industrial

Community Services and Facilities

- Schools
- Colleges
- Public Facilities
- Hospital
- Park
- Agriculture
- Golf Course
- Open
- Military Housing
- Mixed Use
- Vacant
- Other

Legend

- Pump Station
- District Boundary
- Pump Station No. 2 Tributary Area
- Pump Station No. 3 Tributary Area
- Pump Station No. 6 Tributary Area
- Split MH Tributary Area
- District Gravity Sewer
- Private Gravity Sewer
- District Forcemain
- Private Forcemain

Camarillo Heights
Pump Station No. 3 Tributary Area
Split MH Tributary Area
Las Posas Rd
Kendall Ave
Corby Ave
Ponderosa Dr
Upland Rd
Mission Oaks Blvd
Mobile Av
Arneill Rd
Eston St
Dara St
Adolfo Rd
Lewis Rd
Jennie Ave
Ponderosa Dr
Hartnell St
Walker Ave
Merritt Ave
Pump Station No. 6 Tributary Area
Ventura Freeway
Alan Dr
Glen Dr
Grandview Dr
Las Posas Rd
Springville Rd
Calle San Pablo
Dawson Dr
Lewis Rd
Constitution Ave
PS No. 3
PS No. 2
PS No. 6
Pleasant Valley Rd

N

0 750 1,500 3,000 Feet

1" = 1,500'

CAMARILLO SANITARY DISTRICT
SECAP

Pump Station No. 2
Existing Tributary Area

PROJECT NO: 1450763.00

DATE: June 2009

Figure 5-9

Wastewater flows into Pump Station No. 2 were approximately 0.703 mgd based upon pump start and stop times, and wet well levels on April 28, 2009. This is close to the calculated average dry weather flow of 0.796 mgd, especially when vacancies are considered. The calculated flows were used in conducting the analyses for this master plan study.

The ultimate average dry weather flow tributary to Pump Station No. 2 is estimated at 0.868 mgd (603 gpm), Corresponding ultimate peak dry and wet weather flow estimates are 1.844 mgd (1,281 gpm), and 2.582 mgd (1,793 gpm), respectively. The ultimate tributary land uses and average wastewater flow estimates are detailed in Table 5-9.

Table 5–9
Ultimate Land Use and Estimated Flows
Pump Station No. 2

Zoning Category	Zoning Use Description	Net Area (Ac)*	Ultimate Unit Flow Factor (gpd)	Total Average Flow (mgd)
Residential Use				
R-E, RE10AC, RE-15, RE-1AC, RE-20, RE-3AC, RE40AC, RE-5AC	Rural Exclusive	9.09	200	0.002
R-1, R-1-10, R-1-15, R-1-8, RPD, RPD-2U, RPD-3U, RPD-4U, RPD-5U	Low Density Residential	350.74	1350	0.474
RPD7R, RPD8U, RPD10U	Low-Medium Density Residential	3.40	1500	0.005
RPD-20U, RPD24U, RPD25U, RPD30U	High Density Residential	15.27	1900	0.029
Commercial Uses				
COT	Camarillo Old Town	8.95	880	0.008
CPD	Commercial Planned Development	7.71	880	0.007
P-O	Professional Office	0.58	880	0.001
Restaurant	Restaurant	0.41	1500	0.001
Industrial Uses				
M-1	Light Manufacturing	174.17	440	0.077
M-2	Heavy Manufacturing	18.34	880	0.016
Public Uses				
School	School	45.99	1200	0.055
Public	Public	9.75	880	0.009
Other Uses				
A-E	Agricultural	1.93	0	0.000
Park	Park	18.08	200	0.004
Streets and Right of Ways		228.07		
Observed 60% of ADWF from Split MH K10-101		N.A.		0.183
Totals		**892**	**ADWF (mgd)**	**0.868**
			PDWF (mgd)	**1.844**
			PWWF (mgd)	**2.582**

* Acreage does not include adjacent streets and right of way

Wet Well

The wet well is a circular T-Loc PVC lined reinforced concrete structure, 20 feet in diameter. The bottom and top elevations are 96.25 feet and 121.50 feet, respectively. The 30-inch influent sewer enters the wet well from the south with an invert elevation of 105.80 feet. An 8.92 feet high fillet with 37° angle from a horizontal line extends from the south of the wet well towards the north.

The emergency storage volume is approximately 3,640 gallons, which provides slightly over 2 minutes of response time before the water level reached the invert of the influent sewer with both the existing and ultimate peak wet weather flows. Based on the field investigations of the pump station, the wet well is in good condition.

Pumps

The pump station contains three slide rail submersible "non-clog" pumps (Chicago Pump Company Pump SS 8615, Impeller 4706525) rated at 1,325 gpm and a total dynamic head of 53 feet at 1160 revolutions per minute (RPM). The test pump curve shows 4-inch maximum solids handling capability. They are driven by 40 HP submersible motors.

The pump station was designed with two duty pumps and one standby pump. The lead pump is set to start at elevation 104.25 feet, and stop at 100.75 feet, while the lag pump is set to start at elevation 105.50 feet and stop at 101.25 feet. The high and low level alarms are set at elevation 105.75 and 100.25 feet, respectively. The operating volume of approximately 7,475 gallons provides a minimum cycling time of 22.6 minutes with only one pump. The cycling time would be 45.2 minutes with two pumps, and 67.8 minutes with three pumps alternated. The normal operation involves alternating the three pumps as lead pump, which results in less than one start per hour per pump. The wastewater level in the wet well is determined by an ultrasonic level sensor.

One pump can deliver about 1,800 gpm, even with a Hazen Williams friction factor (C value) of 100, which is adequate for the existing and ultimate peak wet weather flows.

The District staff indicates occasional ragging at Pump Station No. 2. When the pump station is upgraded, the existing "non clog" pumps should be replaced with enclosed screw centrifugal pumps to minimize the possibility of ragging.

Discharge Pipes and Forcemain

Each pump has an 8-inch, 90° discharge elbow, an 8"x10" reducer, and 10-inch diameter PVC discharge pipe inside the wet well, which exits the structure with an invert elevation of 115.58 feet. Following a flexible coupling just outside the wet well, the discharge pipe is Class 52 DIP. It extends easterly, turns 90° up, then 90° horizontally in a southwest direction. Each discharge pipe has a lever and weight check valve, two spools connected with a Victaulic coupling, and then a plug isolation valve (centerline elevation 123.25 feet). The discharge pipes connect to the 12-inch diameter discharge header at 45' wyes, which extends southerly and connects to a vertical tee. It extends below ground and turns at a 90° bend, continuing southerly to Pleasant Valley Road.

As shown on Figure 5-8, the Pump Station No. 2 forcemain discharges into the Pump Station No. 3 forcemain at Station 122+06, directly across Pump Station No. 2. The invert elevation of the 12-inch forcemain is 108.3

feet. This connection point is 10,685 feet east of Pump Station No. 3, and 4,733 feet west of the Calleguas Creek crossing.

The velocity in the 10-inch pump discharge pipes is approximately 7.4 feet per second, which is higher than the recommended velocity of 5 feet per second for PVC pipe. They should be replaced with 12-inch pipes. The velocity in the 12-inch forcemain is approximately 5.2 feet per second with one pump in operation, which is acceptable.

Electric Service

Power to the pump station is provided by the Southern California Edison Company, through an underground vault on Pleasant Valley Road, east of the facility. The transformer is located near the northwest corner of the property. The main switchboard, automatic transfer switch, and the pump control panel are housed in a NEMA 3R enclosure north of the transformer pad. The service is 225 Amp, 277/480 volt, 3 phase, 4 wire.

Telemetry

The pump station's status and alarm conditions are transmitted to the Central SCADA unit at the Wastewater Treatment Plant through a remote telemetry unit (RTU), and spread spectrum radio. The original leased telephone line is still available but is not used.

Redundant Facilities

The pump station has an on-site 100 KW emergency generator with a diesel fuel storage tank, and a 260 Amp automatic transfer switch to operate the pump station in case of commercial power outage. It incorporates a float switch to start all available pumps in sequence when the level in the wet well reaches the high water level, if the primary level controller (ultrasonic level sensor) fails to operate the pumps. Facilities for connection to the discharge header are provided for bypass pumping for access to the wet well.

Pump Station No. 6

Location and Tributary Area

Pump Station No. 6 is located north of Pleasant Valley Road between Village Commons Boulevard and Breezy Drive. It serves an area of approximately 1,370 gross acres. Approximately 40 percent of the total flow from the Flow Split (MH K10-101) Tributary Area is included with this tributary area flow. The pump station drainage area is shown on Figure 5-10. It was constructed in 2006 as a submersible pump station with three pumps.

Tributary Flows

The existing average dry weather flow is estimated at 0.645 mgd (448 gpm). The corresponding peak dry and wet weather flows are 1.404 mgd (975 gpm) and 1.965 mgd (1,365 gpm), respectively. The existing tributary land uses and average wastewater flow estimates are shown in Table 5-10.

The ultimate average dry weather flow tributary to Pump Station No. 6 is estimated at 0.879 mgd (610 gpm). The ultimate peak dry and wet weather flows are 1.866 mgd (1,296 gpm) and 2.612 mgd (1,814 gpm), respectively. The tributary land uses and average wastewater flow estimates are detailed in Table 5-12.

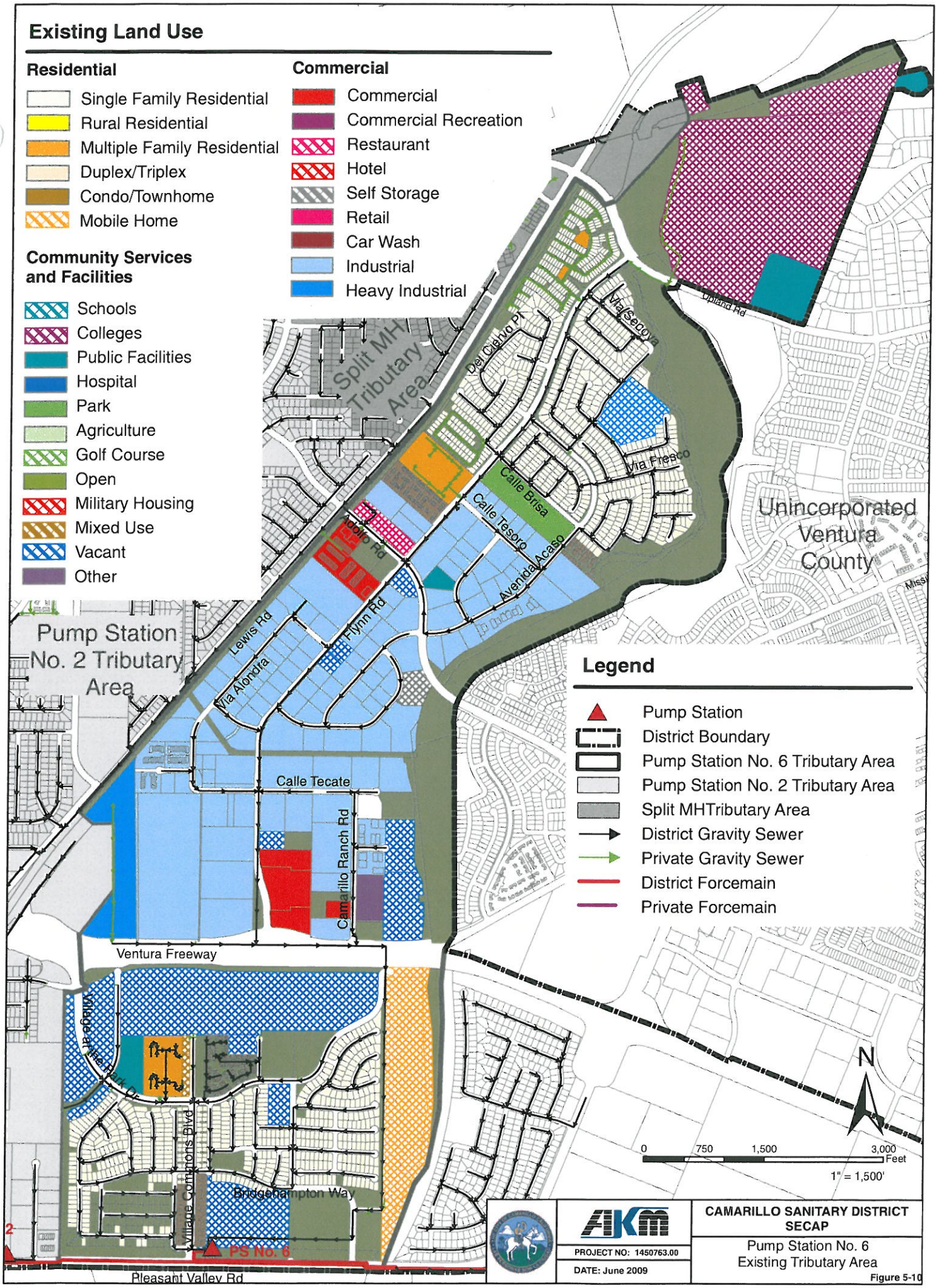

Existing Land Use
Residential
Single Family Residential
Rural Residential
Multiple Family Residential
Duplex/Triplex
Condo/Townhome
Mobile Home
Community Services and Facilities
Schools
Colleges
Public Facilities
Hospital
Park
Agriculture
Golf Course
Open
Military Housing
Mixed Use
Vacant
Other
Commercial
Commercial
Commercial Recreation
Restaurant
Hotel
Self Storage
Retail
Car Wash
Industrial
Heavy Industrial
Split MH Tributary Area
Pump Station No. 2 Tributary Area
Unincorporated Ventura County
Upland Rd
Del Cielo Pl
Via Segovia
Via Fresco
Calle Brisa
Calle Tesoro
Avenida Acaso
Idillio Rd
Flynn Rd
Lewis Rd
Via Alondra
Calle Tecate
Camarillo Ranch Rd
Ventura Freeway
Village Green Park Dr
Village Commons Blvd
Bridgehampton Way
PS No. 6
Pleasant Valley Rd
Legend
Pump Station
District Boundary
Pump Station No. 6 Tributary Area
Pump Station No. 2 Tributary Area
Split MHTributary Area
District Gravity Sewer
Private Gravity Sewer
District Forcemain
Private Forcemain
N
0
750
1,500
3,000
Feet
1" = 1,500'
CAMARILLO SANITARY DISTRICT
SECAP
Pump Station No. 6
Existing Tributary Area
PROJECT NO: 1450763.00
DATE: June 2009
Figure 5-10

Table 5–10
Existing Land Use and Estimated Flows
Pump Station No. 6

Existing Land Use Code	Property Use Description	Net Area (Ac)*	Flow Factor (gpm/Ac)	Total Average Flow (mgd)
Single Family Residential	11	183.47	1350	0.248
Multiple Family Residential	17,19	18.75	1500	0.028
MFR - Condo/Townhome	15	15.80	1900	0.030
Mobile Home	16,18	39.42	820	0.032
Commercial	20,21,22,22.1,22.4, 23,33	26.15	800	0.021
Mixed Use	25.1	1.71	1800	0.003
Industrial	30,32,34	281.94	400	0.113
Heavy Industrial	311	19.31	800	0.015
Retail	26,27,28	4.32	400	0.002
Self Storage	27.1	3.17	50	0.000
Public Facilities	41,46,47,48,49,49.1, 49.2,50,98	21.19	800	0.017
Schools	42,43,44	10.08	1200	0.012
Colleges	49.3,55,56	122.77	----	0.015
Park	40	10.44	200	0.002
Open/Agriculture/Golf Course	58,59,60,61,64,65,66, 67,80,81,90,92,93,94, 91,70,71,72,73,74,75,99	407.09	0	0.000
Streets and Right of Ways		200.11		
Observed 40% of ADWF from Split MH K10-101				0.107
Totals		**1,366**	**ADWF (mgd)**	**0.645**
			PDWF (mgd)	**1.404**
			PWWF (mgd)	**1.965**

* Acreage does not include adjacent streets and right of way

Table 5–11
Ultimate Land Use and Estimated Flows
Pump Station No. 6

Zoning Category	Zoning Use Description	Net Area (Ac)*	Ultimate Unit Flow Factor (gpd)	Total Average Flow (mgd)
Residential Use				
R-E, RE10AC, RE-15, RE-1AC, RE-20, RE-3AC, RE40AC, RE-5AC	Rural Exclusive	6.79	200	0.001
R-1, R-1-10, R-1-15, R-1-8, RPD, RPD-2U, RPD-3U, RPD-4U, RPD-5U	Low Density Residential	258.72	1,350	0.349
RPD7R, RPD8U, RPD10U	Low-Medium Density Residential	49.55	1,500	0.074
RPD12U, RPD15U, RPD17U, RPD18U	Medium Density Residential	2.97	1,700	0.005
RPD-20U, RPD24U, RPD25U, RPD30U	High Density Residential	33.74	1,900	0.064
MHPD	Mobile Home Park Development	39.40	820	0.032
Commercial Uses				
CPD	Commercial Planned Development	20.38	880	0.018
Industrial Uses				
L-M	Limited Manufacturing	2.94	440	0.001
M-1	Light Manufacturing	358.85	440	0.158
M-2	Heavy Manufacturing	19.31	880	0.017
Public Uses				
School	School	20.01	1,200	0.024
Seminary	St John Seminary College	122.77	Point Source	
Public	Public	14.45	880	0.013
Other Uses				
O-S	Open Space	215.60	0	0.000
Streets and Right of Ways		200.11		
Observed 40% of ADWF from Split MH K10-101		N.A.		0.122
Totals		**1,366**	**ADWF (mgd)**	**0.879**
			PDWF (mgd)	**1.866**
			PWWF (mgd)	**2.612**

* Acreage does not include adjacent streets and right of way

Wet Well

The wet well is a circular T-Loc PVC lined reinforced concrete structure, 18 feet in diameter. The bottom and top elevations are 91.4 feet and 120.73 feet, respectively. The 27-inch influent sewer enters the wet well from the west with an invert elevation of 101.4 feet.

The emergency storage volume is approximately 3,800 gallons, which provides slightly over 2 minutes of response time before the water level reaches the invert of the influent sewer starting at the lead pump start level, with both the existing and ultimate peak wet weather flows. Based on the field investigations of the pump station, the wet well is in good condition.

Pumps

The pump station was originally constructed with three Fairbanks Morse D5434MV, three vane angle flow pumps rated at 1,333 gpm capacity, 43 feet of TDH, at 1,154 rpm. Due to a history of ragging problems, the pumps at this facility were replaced with three 8x6 Model F6K-S-FE4A6-23 Wemco Hidrostal screw

centrifugal pumps in December 2008. The new pumps are rated at 1,500 gpm and a TDH of 47 feet at 1,155 rpm (13-7/8" impellers). They are driven by 30 HP submersible motors. District has not experienced ragging problems since the new pump were installed. The field measured capacity is approximately 1,170 gpm.

The pump station was designed with two duty pumps and one standby pump. The lead pump is set to start at elevation 99.4 feet, and stop at 96.4 feet, while the lag pump is set to start at elevation 101.00 feet and stop at 97.00 feet. The high and low level alarms are set at elevation 101.10 and 96.00 feet, respectively. The operating volume of approximately 7,475 gallons provides a minimum cycling time of 22.6 minutes with only one pump. The cycling time would be 45.2 minutes with two pumps, and 67.8 minutes with three pumps alternated. The normal operation involves alternating the three pumps as lead pump, which results in less than one start per hour per pump. The wastewater level in the wet well is determined by an ultrasonic level sensor.

Discharge Pipes and Forcemain

Each pump has a 6-inch, 90° discharge elbow, a 6x8 reducer, and 8-inch diameter PVC discharge pipe inside the wet well. The discharge pipes exit the wet well structure with an invert elevation of 115.0 feet. The above ground ductile iron discharge pipe for each pump has a lever and weight check valve and a plug isolation valve. They connect to an 8-inch discharge header through 45° wyes. The discharge header turns westerly through a 90° ell and has a magnetic flow meter. It then increases to 12-inch diameter through a vertical reducing ell.

With the existing pump capacity of approximately 1,170 gpm, the velocity in the 8-inch pipe is over 7 feet per second, which is higher than the recommended velocity of 5 feet per second for PVC pipe.

The forcemain is a 12-inch diameter ductile iron pipe that extends 2,850 feet east from the pump station to the terminal manhole K14-139 on Pleasant Valley Road near Calleguas Creek. Gravity sewers convey the wastewater from the forcemain to the Wastewater Treatment Plant. With one pump in operation, the velocity in the force main is about 3.2 feet per second, which is in the acceptable range. With the ultimate peak wet weather flow of 1,814 gpm, the force main velocity would be 5.2 feet per second, which is also acceptable.

Electric Service

Power to the pump station is provided by the Southern California Edison Company, through an underground service. The main switchboard, 400 Amp automatic transfer switch, and the pump control panel are housed in a NEMA 3R enclosure along the east wall of the pump station property. The service is 400 Amp, 480 volt, 3 phase, 3 wire.

Telemetry

The pump station's status and alarm conditions are transmitted to the Central SCADA unit at the Wastewater Treatment Plant through a remote telemetry unit (RTU), and spread spectrum radio.

Redundant Facilities

The pump station has a 100 KW on-site emergency generator with a diesel fuel storage tank, and a 400 Amp automatic transfer switch to operate the pump station in case of commercial power outage. It incorporates float switches to operate the pump station when the primary level controller (ultrasonic level sensor) fails. Facilities for connection to the discharge header are provided for bypass pumping to allow access to the wet well. A parallel pipe and valves are provided to bypass the magnetic flow meter.

5-7 WASTEWATER TREATMENT PLANT

The Wastewater Treatment Plant is located at the terminus of Howard Road, west of Conejo Creek. The treatment plant occupies a 20 acre site and has a current capacity of 7.25 mgd. The summary of the daily flows for 2007 is detailed in Table 5-12. According to the daily records, the flow into the Wastewater Treatment Plant range from approximately 3.15 mgd to 5.10 mgd. The average flow rate into the Wastewater Treatment Plant is 3.82 mgd, which is well below the current capacity of the plant.

Table 5-12
2007 Wastewater Treatment Plant Daily Flow Summary

	Minimum Daily Flow (Million Gallons)	Maximum Daily Flow (Million Gallons)	Average Daily Flow (Million Gallons)
January	**3.15**	4.87	3.78
February	3.50	3.82	3.60
March	3.34	3.75	3.55
April	3.38	3.81	3.55
May	**3.15**	3.64	3.39
June	3.27	4.16	3.76
July	3.69	4.11	3.95
August	3.52	4.07	3.93
September	3.68	4.27	4.06
October	3.88	4.24	4.05
November	3.99	4.44	4.12
December	3.94	**5.10**	4.14
		2007 Average	**3.82**

Evaluation of the District's Wastewater Treatment Plant is not required for the Statewide Waste Discharge Requirements (WDR). The sewer collection system that is upstream of the Wastewater Treatment Plant has been analyzed for the WDR.

SECTION 6

HYDRAULIC SEWER MODEL

6-1 HYDRAULIC MODEL SOFTWARE

To perform a detailed analysis of the sewer collection system, it is essential to create a mathematical model that is capable of simulating the operating characteristics of the system. The simulations for this study were performed utilizing software designed for the analysis of sewer systems. The software selected for this study is H2OMap Sewer. It is a GIS based computer program with the ability to perform steady state analyses of the flows in sanitary sewer systems. The program also manages and maintains the database that stores the sewer analysis input and output results. Manning's Equation is used for depth of flow calculations in the gravity sewer pipes.

The sewer system is modeled by entering data for pipe diameters, lengths, grades, and roughness coefficients as well as land use classifications. The developed sewer model includes all of the District's manholes, sewer pipes (excluding laterals and private sewers). It is important to include all pipes in the model to comply with the Statewide Waste Discharge Requirements that requires a complete map of the entire collection system. The model identifies points of connection to the District's four (4) major pump stations, and the pump stations and forcemains are included in the model.

The model uses the average dry weather flows and determines peak flows based upon relationships specified by the user (see Section 4).

At the completion of a modeling run, output data is created for viewing on the screen or for printing. Output data for pipes include average and peak flow rate, velocity, pipe capacity, and ratio of flow depth to diameter (d/D).

6-2 CONSTRUCTION OF MODEL GEOMETRY

Information gathered from the District's sewer GIS files, atlas sheets, as-built drawings and interviews with District staff were used to create the model geometry of the existing system.

The District's existing sewer GIS information was utilized to build the geometry of the hydraulic model. Table 6-1 is a list of the information that was imported into the model from the GIS. Only active sewers owned by the Camarillo Sanitary District were included in the hydraulic model. Private sewers and laterals were not modeled.

Table 6-1
Data Imported from GIS Files to Hydraulic Model

Node Data	Manhole Shapefile Field Title
Unique ID	MHNO
Rim Elevation (ft)	RIMELEVATI
Invert Elevation (ft)	INELEVATIO
Pipe Data	**Gravity Mains Shapefile Field Title**
Unique ID	FACILITYID
Upstream Node ID	UPMANH
Upstream Invert Elevation (ft)	INELEVATIO
Downstream Node ID	DNMANH
Downstream Invert Elevation (ft)	OUTELEVATI
Pipe Size (in)	DIAMETER
Pipe Length (ft)	FLD_CHK_LE

6-3 MISSING INFORMATION

The sewer GIS data was not 100 percent complete. Approximately 420 study reaches were found to be missing invert elevations, the length of the pipe, and/or the slope of the pipe. There were also several reaches that had discrepancies between the as-built slope and the slope calculated based on the invert elevations and pipe lengths. Several steps were taken to fill in the data gaps with the most accurate information available:

1. Missing invert elevations were calculated when there was enough available information (slope, pipe length, and one invert elevation)
2. Missing slopes were calculated when there was enough available information (pipe length and two invert elevations)
3. The missing invert elevations were measured by the District's field crew when there was not enough information to calculate a slope.
4. For the remaining sewers, data had to be assumed. If possible, the slope of an adjacent upstream or downstream pipe was used. Sometimes the street slope was used (based on the GIS contours).

6-4 SPLIT MANHOLES AND FLOW PATTERNS

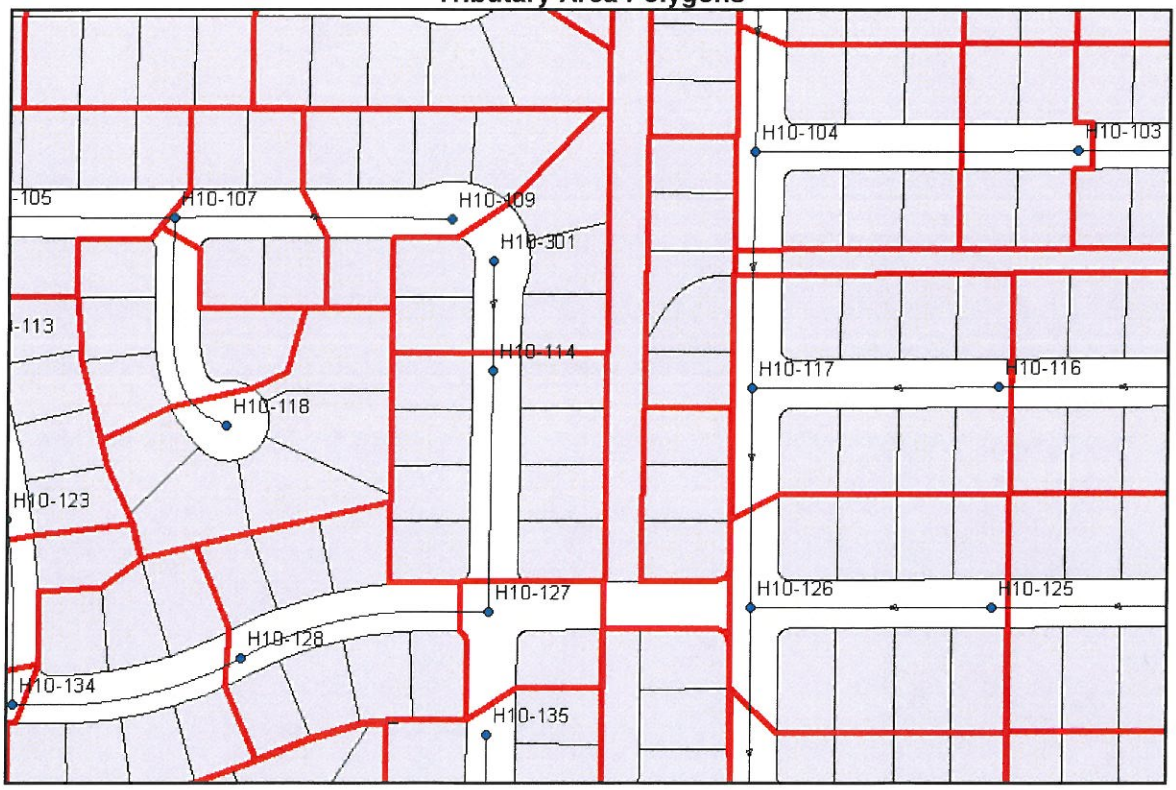
From the existing sewer GIS and sewer atlas sheets, 50 split manholes (more than one pipe exiting the manhole) were identified in the collection system. Many of these are either located at summits in the upstream portions of the system or divert flow to a stub-out, which are not currently in operation. Twenty (20) split manholes were identified for further investigation due to their potential significance on the hydraulic model results. The District researched the flow behavior at these 20 split manholes. In general, the flows at these locations were diverted based on field reviews. Some of the conditions found in the field are as follows:

1. One of the outlets acts as an overflow because the elevation leaving the manhole is much higher than the other outlet. In this case the model generally assumes the normal flow condition. .
2. Flow to one of the outlets is obstructed by a dam. Only under heavy flows, will this outlet be used for overflow purposes.
3. Flow to one of the outlets is intentionally plugged, so that all the flow will be diverted into the opposite outlet.

6-5 TRIBUTARY AREAS

For accuracy, a polygon was manually created around individual sewer nodes (manholes) in the model. Approximately 2,650 polygons were created for the existing system analysis, and 2,700 polygons were created for the ultimate conditions. A sample area, displaying the tributary area polygons is shown on Figure 6-1. Most manholes have a tributary area assigned to it unless there are multiple manholes in the same area.

Figure 6-1
Tributary Area Polygons



6-6 MODEL LOADS

The existing land uses (discussed in Subsection 3-5) and the calibrated unit flow factors (see Table 4-2) were utilized to apply the average dry weather sewage loads to the existing system model for the existing conditions. The ultimate land uses (discussed in Subsection 3-5) and the ultimate unit flow factors (see Table 4-3) were utilized to apply the average loads to evaluate the existing system model under ultimate conditions.

Peak dry weather flows are calculated in the model by a user defined relationship. The peaking formula used in the District's sewer model is as follows:

$$Q_{peak}\ (mgd) = 2.1 \times Q_{ave}(mgd)^{0.92}$$

6-7 SCHOOLS

The City's existing land use map and General Plan Map were used to designate land uses for the model. Schools are given a distinct land use designation in the GIS shapefile. The existing and ultimate public facility unit flow factors are both 1,200 gpd/ac. The estimated flows based on these unit flow factors at the schools within the District's study area were similar to the flows calculated with the student enrollment from 2007 and a unit flow factor of 25 gpd per student. Therefore, it is reasonable to generate the loads from schools with the land use unit flow factor.

St John's Seminary College is a private institution located on the north-east corner of Lewis Road and Upland Road. It consists of approximately 125 acres of highly agricultural land use. Since much of St. John's Seminary College consists of open space, a specific point source flow of 15,000 gpd was chosen based on water records to represent the flows from this private college. The Camrosa Water District serves the California State University Channel Islands which is located northeast of the Potrero Road and Lewis Road intersection, south of the City's boundaries.

6-8 HIGH WATER USERS

High water users (non-irrigation) will typically contribute large volumes of sewage to the sewer system. From previous master planning efforts, AKM Consulting Engineers has observed that many of the agencies are not capable of establishing unit flow factors that accurately represent these high sewage volumes. The City's land use designations are very detailed. A wide variety of unit flow factors are generally capable of accurately accounting for the high flows produced by different high water users. The sewage volumes for land uses such as carwash and hospitals are estimated with unique high unit flow factors. The unit flow factors for these areas have been calibrated with the City's water use records and flow monitoring data.

The Camarillo Airport and the St. John's Seminary College have large open space or agricultural areas which do not generate wastewater flows. The wastewater generated by these areas were developed from non-irrigation water use records, and these flows are represented by point sources in the model.

6-9 PUMP STATIONS

The District's four (4) major pump stations and respective forcemains are included in the system hydraulic model.

Most of the gravity sewers are tributary to the four (4) major pump stations. The wastewater accumulated at the wet wells is pumped through forcemains that terminate at either other gravity sewers or the Wastewater Treatment Plant. Wastewater flows pumped by Pump Station No.2 discharge into the Pump Station No.3 Forcemain. The forcemains are long, ranging from approximately 2,850 feet to 23,000 feet. Consequently, the pumped flows are attenuated in these facilities. While the model is set up with the firm capacity at each pump station through its corresponding forcemain; the discharge manhole is allocated the average dry

weather flow calculated upstream of the pump station, which is then peaked utilizing the peaking relationship developed for determining the peak dry weather flows.

The existing flows tributary to the pump stations were estimated by the model utilizing the unit flow factors developed for this study the tributary land uses, and accounting for high water users as appropriate. These estimates were verified by flow monitoring. In nearly all cases, the two were close, with the wastewater flows calculated being higher than the monitoring results.

Pump Station No. 5 is located northwest of the Camarillo Airport. Its tributary area is illustrated on Figure 5-6. The estimated existing and ultimate flows are detailed in Tables 5-5 and 5-6 respectively. The existing average dry weather flow to the pump station is approximately 181 gpm (0.26 mgd). The ultimate average dry weather flow to the pump station is expected to be approximately 429 gpm (0.617 mgd). Sewage collected at Pump Station No. 5 is pumped to a gravity sewer on Las Posas Road at Ventura Boulevard. The tributary dry weather loads to Pump Station No. 5 were transferred in the model to the discharge manhole E12-127.

Pump Station No. 3 is located on the northeast corner of Pleasant Valley Road and Las Posas Road. Its tributary area is shown on Figure 5-7. The estimated existing and ultimate flows are detailed in Tables 5-7 and 5-8 respectively. The existing average dry weather flow is approximately 1,791 gpm (2.579 mgd). The ultimate average dry weather flow to the pump station is expected to be approximately 2,658 gpm (3.827 mgd). Sewage collected at Pump Station No. 3 is pumped directly to the Wastewater Treatment Plant. Additional flows from Pump Station No. 2 are pumped directly into the forcemain on Pleasant Valley Road, east of Lewis Road.

Pump Station No. 2 is located north of Pleasant Valley Road between Lewis Road and Village Commons Boulevard. Its tributary area is shown on Figure 5-8, and its estimated existing and ultimate flows are detailed in Tables 5-9 and 5-10 respectively. The existing average dry weather flow is approximately 553 gpm (0.796 mgd). The ultimate average dry weather flow to the pump station is expected to be approximately 603 gpm (0.868 mgd). Sewage from Pump Station No. 2 is pumped directly to the Wastewater Treatment Plant via the forcemain between Pump Station No. 3 and the Wastewater Treatment Plant.

Pump Station No. 6 is located north of Pleasant Valley Road between Village Commons Boulevard and Breezy Drive. Its tributary area is illustrated on Figure 5-9. The estimated existing and ultimate flows are detailed in Tables 5-11 and 5-12 respectively. The existing average dry weather flow to the pump station is approximately 448 gpm (0.645 mdg). The ultimate average dry weather flow to the pump station is expected to be approximately 610 gpm (0.879 mgd). Sewage collected at Pump Station No. 6 is pumped to a gravity sewer at Pleasant Valley Road near Calleguas Creek. The tributary dry weather loads to Pump Station No. 6 were transferred in the model to the discharge manhole K14-139.

Hydraulic capacities of the pump stations were determined through studies of each pump station, its force main, and the terminal manhole.

Section 7

SYSTEM ANALYSIS

7-1 HYDRAULIC SYSTEM ANALYSIS

The analysis of the District's sewer collection system was based upon the calculated **existing** and **ultimate** peak dry weather flows. The hydraulic analysis results can be found in the appendix of this report, which is bound separately. Existing pipes are considered hydraulically deficient if the depth to diameter ratio (d/D) exceeds 0.62.

While the District's sewer system was analyzed under the existing and ultimate conditions, this report will only include the recommended improvement projects for the existing deficiencies. The deficiencies identified by the model under the ultimate conditions were due to the increased flows generated by the Sphere of Influence (SOI). In the future, the City of Camarillo will incorporate the SOI is into the City limits. At that time, the Camarillo Sanitary District shall address the ultimate deficiency improvements.

Current System Operations

The District's sewer model was set up based on the current sewer system operations. The twenty (20) flow splits were modeled to represent the current operations that were determined from the flow split analysis, detailed in Section 6-4. The existing and ultimate hydraulic deficiencies, based upon the criteria above, are listed in Table 7-1. The locations of these deficiencies are shown on Figure 7-1.

The total length of sewer found to be capacity deficient with the existing and ultimate conditions are 17,443 feet and 29,195 feet respectively. This is about 2.3 (17,443 / 758,607) percent of the total system length for the existing conditions.

As illustrated on Figure 7-1, Deficiencies Nos. 23, 24, 25, 26, 27, 28, and 29 are strictly deficient under ultimate conditions. The improvement projects for these reaches shall be determined when more information regarding the incorporation of the SOI become available.

Las Posas Estates

Camarillo Heights

CAMROSA WATER DISTRICT

Beardsley Wash

Las Posas Rd

Upland Rd

Mission Oaks Blvd

Santa Rosa Rd

Conejo Creek

Divert Flow to West at Split MH H9-127

Edgemont Dr

Carmen Dr

Bedford Dr

Mobile Av

Arneil Rd

Temple Ave

Eston St

Lewis Rd

Adolfo Rd

Rosewood Ave

Skeel Dr

Bradbury Ave

La Posas Rd

Ponderosa Dr

Daily Dr

See Detail A

Ventura Freeway

Bajo Aqua Ave

P.S. #5

Camarillo Airport

Ventura Blvd

Camarillo Center Dr

Dawson Dr

Ventura Freeway

P.S. #3

Pleasant Valley Rd

P.S. #4

Pleasant Valley Dr

P.S. #2

P.S. #6

Las Posas Rd

Calleguas Creek

Pancho Rd

Calle Quetzal

Wastewater Treatment Plant

5th St

17 28 24 14 23 3 3 18 9 29 26 15 16 8 25 6

Detail A

Skeel Dr

7 13 27 2

1" = 1,000'

Legend

- Beginning/End of Deficiency Location
- Pump Stations
- Existing Deficiencies
- Ultimate Deficiencies (Including Sphere of Influence)
- CSD Sewers
- City Boundary
- Not Served by Camarillo Sanitary District

N

0 1,500 3,000 6,000 9,000 Feet

1" = 3,000'

AKM

CAMARILLO SANITARY DISTRICT
SECAP

PROJECT NO: 1450763.00

DATE: July 2009

Capacity Deficiencies

Figure 7-1

Table 7-1
Hydraulic Deficiencies

General Information								Existing Conditions				Ultimate Conditions (Including SOI Flows*)			
Deficiency Location	Pipe ID	U/S MH	D/S MH	Diameter (in)	Length (ft)	Installation Date	Slope	PDWF (mgd)	ADWF (mgd)	PDWF d/D	PDWF Water Depth (ft)	PDWF (mgd)	ADWF (mgd)	PDWF d/D	PDWF Water Depth (ft)
2	F12-1069	F12-128	F12-124	12	350	9/15/1997	0.0059	1.84	0.86	1.00	1.00	2.24	1.07	1.00	1.00
2	F12-1019	F12-124	F12-122	12	350	9/15/1997	0.0079	1.84	0.86	0.74	0.74	2.24	1.07	1.00	1.00
2	F12-1068	F12-122	F12-119	12	350	9/15/1997	0.0079	1.84	0.86	0.74	0.74	2.24	1.07	1.00	1.00
2	F12-1022	F12-119	F12-115	12	350	9/15/1997	0.0079	1.84	0.86	0.74	0.74	2.24	1.07	1.00	1.00
2	F12-1021	F12-115	F12-110	12	386	9/15/1997	0.0079	1.84	0.86	0.74	0.74	2.24	1.07	1.00	1.00
3	H11-1080	H11-126	H11-125	12	340	3/1/1964	0.0020	0.88	0.39	0.71	0.71	1.01	0.45	0.80	0.80
3	H11-1009	H11-125	H11-124	12	274		0.0022	0.92	0.41	0.71	0.71	1.05	0.47	0.79	0.79
3	H11-1008	H11-124	H11-131	12	375		0.0022	0.92	0.41	0.71	0.71	1.05	0.47	0.80	0.80
3	H11-1007	H11-131	H11-129	12	375		0.0022	0.92	0.41	0.71	0.71	1.05	0.47	0.79	0.79
3	H11-1005	H11-129	H11-127	12	445		0.0037	1.22	0.55	0.72	0.72	1.34	0.62	0.79	0.79
3	H11-1006	H11-127	G11-131	12	450		0.0037	1.22	0.55	0.72	0.72	1.34	0.62	0.79	0.79
3	G11-1105	G11-131	G11-130	12	130	5/1/1966	0.0044	1.25	0.57	0.69	0.69	1.38	0.63	0.74	0.74
3	G11-1142	G11-130	G11-124	12	300	5/1/1966	0.0033	1.60	0.74	1.00	1.00	1.76	0.82	1.00	1.00
3	G11-1143	G11-124	G11-125	12	455	5/1/1966	0.0052	1.61	0.75	0.79	0.79	1.77	0.83	1.00	1.00
3	G11-1044	G11-125	G11-126	12	440	5/1/1966	0.0053	1.61	0.75	0.79	0.79	1.77	0.83	1.00	1.00
3	G11-1011	G11-126	G11-127	12	85	5/1/1966	0.0227	1.61	0.75	0.78	0.78	1.77	0.83	1.00	1.00
3	G11-1010	G11-127	G11-129	12	355	5/1/1966	0.0005	1.61	0.75	0.79	0.79	1.77	0.83	1.00	1.00
3	G11-1013	G11-129	G11-128	12	440	5/1/1966	0.0052	1.61	0.75	0.79	0.79	1.77	0.83	1.00	1.00
3	G11-1012	G11-128	G11-123	12	430	5/1/1966	0.0052	1.61	0.75	0.79	0.79	1.77	0.83	1.00	0.00
3	G11-1034	G11-123	F11-133	12	430	5/1/1966	0.0052	1.61	0.75	0.79	0.79	1.77	0.83	1.00	1.00
3	I11-1046	I11-137	I11-136	8	65		0.0060	0.45	0.19	0.64	0.43	0.47	0.20	0.66	0.44
6	M14-1001	M14-101	L14-102	12	41		0.0007	0.37	0.15	0.55	0.55	0.62	0.26	0.81	0.81
6	L14-1013	L14-102	L14-107	12	210		0.0004	0.37	0.15	0.69	0.69	0.62	0.26	1.00	1.00
6	L14-1008	L14-107	L15-100	12	380		0.0004	0.37	0.15	0.68	0.68	0.62	0.26	1.00	1.00
6	L15-1005	L15-100	L15-101	12	317		0.0004	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L15-1011	L15-101	L15-108	12	317		0.0004	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L15-1006	L15-108	L15-110	12	317		0.0004	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L15-1010	L15-110	L15-112	12	330		0.0004	0.37	0.15	0.66	0.66	0.62	0.26	1.00	1.00
6	L15-1009	L15-112	L15-115	12	334		0.0004	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L15-1008	L15-115	L15-117	12	401		0.0003	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L15-1007	L15-117	L16-104	12	360		0.0006	0.37	0.15	0.65	0.65	0.62	0.26	1.00	1.00
6	L16-1003	L16-104	L16-800	12	370		0.0002	0.37	0.15	0.66	0.66	0.62	0.26	1.00	1.00
7	F11-1038	F11-130	F11-132	15	300	7/30/1970	0.0005	1.36	0.62	0.76	0.95	1.91	0.90	1.00	1.25
8	I13-1027	I13-104	I13-109	12	366	5/1/1957	0.0059	1.49	0.69	0.70	0.70	1.60	0.74	0.74	0.74
9	J11-1035	J11-122	J11-125	8	327	10/13/1959	0.0037	0.43	0.18	0.69	0.46	0.44	0.18	0.70	0.47
13	F11-1034	F11-132	F11-150	15	445		0.0016	2.18	1.04	1.00	1.25	2.78	1.36	1.00	1.25
13	F11-1067	F11-150	F11-162	15	315		0.0038	2.19	1.04	0.71	0.89	2.80	1.36	1.00	1.25
13	F11-1054	F11-162	F11-168	15	119		0.0016	2.19	1.04	1.00	1.25	2.80	1.36	1.00	1.25
13	F11-1030	F11-168	F11-170	15	13		0.0015	2.19	1.04	1.00	1.25	2.80	1.36	1.00	1.25
13	F11-1069	F11-170	F11-173	15	14	6/29/1981	0.0036	3.28	1.62	1.00	1.25	4.01	2.02	1.00	1.25
13	F11-1068	F11-173	F12-103	15	391	6/29/1981	0.0028	3.28	1.62	1.00	1.25	4.01	2.02	1.00	1.25
13	F12-1045	F12-103	F12-126	15	404	6/29/1981	0.0027	3.28	1.63	1.00	1.25	4.01	2.02	1.00	1.25
14	F10-1009	F10-123	F10-139	12	400		0.0065	1.30	0.59	0.62	0.62	1.85	0.87	0.81	0.81
14	F10-1010	F10-139	F10-149	12	400		0.0054	1.30	0.59	0.66	0.66	1.85	0.87	1.00	1.00
14	F10-1011	F10-149	F11-100	12	403		0.0059	1.30	0.59	0.64	0.64	1.85	0.87	1.00	1.00
14	F11-1101	F11-100	F11-114	12	400		0.0060	1.30	0.59	0.63	0.63	1.85	0.87	1.00	1.00
14	F11-1102	F11-114	F11-130	12	339		0.0059	1.30	0.59	0.63	0.63	1.85	0.87	1.00	1.00
15	I12-1080	I12-149	I12-158	12	290	5/1/1957	0.0072	1.49	0.69	0.65	0.65	1.59	0.74	0.68	0.68
15	I12-1079	I12-158	I13-102	12	400	5/1/1957	0.0080	1.49	0.69	0.63	0.63	1.59	0.74	0.66	0.66
15	I13-1026	I13-102	I13-104	12	44	5/1/1957	0.0093	1.49	0.69	0.60	0.60	1.60	0.74	0.63	0.63
15	I12-1012	I12-139	I12-143	15	428	5/1/1957	0.0020	1.39	0.64	0.64	0.80	1.48	0.68	0.67	0.84
15	I12-1088	I12-107	I12-120	12	415		0.0056	1.32	0.61	0.66	0.66	1.40	0.64	0.68	0.68
16	I13-1004	I13-109	I13-116	12	285	2/1/1957	0.0080	1.53	0.71	0.64	0.64	1.64	0.76	0.67	0.67
16	I13-1003	I13-116	I13-123	12	189	2/1/1957	0.0080	1.53	0.71	0.64	0.64	1.64	0.76	0.67	0.67
17	F10-1056	F9-161	F10-101	12	315	11/1/1999	0.0059	1.30	0.59	0.64	0.64	1.85	0.87	1.00	1.00
18	J10-1052	J10-132	J10-143	8	375	6/27/1960	0.0036	0.34	0.14	0.63	0.42	0.35	0.14	0.64	0.43
23	D11-1004	D11-131	D11-133	8	390	9/1/1993	0.0047	0.09	0.03	0.28	0.19	0.40	0.17	0.65	0.43

*Ultimate Conditions include flows from the Sphere of Influence (SOI)

Table 7-1
Hydraulic Deficiencies (Continued)

General Information								Existing Conditions				Ultimate Conditions (Including SOI Flows*)			
Deficiency Location	Pipe ID	U/S MH	D/S MH	Diameter (in)	Length (ft)	Installation Date	Slope	PDWF (mgd)	ADWF (mgd)	PDWF d/D	PDWF Water Depth (ft)	PDWF (mgd)	ADWF (mgd)	PDWF d/D	PDWF Water Depth (ft)
24	E10-1027	E10-142	E10-148	8	250	9/1/1973	0.0048	0.15	0.06	0.36	0.24	0.54	0.23	0.81	0.54
24	E10-1044	E10-148	E11-101	8	250	9/1/1973	0.0048	0.16	0.06	0.37	0.25	0.55	0.23	1.00	0.67
24	E11-1002	E11-101	E11-117	8	255	5/25/1961	0.0017	0.17	0.07	0.52	0.35	0.56	0.24	1.00	0.67
24	E11-1008	E11-117	E11-126	8	250	5/25/1961	0.0034	0.19	0.07	0.44	0.30	0.57	0.24	1.00	0.67
24	E11-1047	E11-126	E11-125	10	260	5/25/1961	0.0025	0.19	0.07	0.35	0.30	0.58	0.25	0.69	0.57
25	F12-1034	F12-143	F13-100	24	415	7/16/1973	0.0022	4.39	2.23	0.58	1.16	5.75	2.99	0.70	1.40
25	F13-1006	F13-100	F13-106	24	400	7/16/1973	0.0022	4.39	2.23	0.58	1.16	5.75	2.99	0.70	1.40
25	F13-1007	F13-106	F13-108	24	87	7/16/1973	0.0057	4.39	2.23	0.57	1.14	5.75	2.99	0.69	1.38
25	F13-1005	F13-108	F13-115	24	400	7/16/1973	0.0014	4.55	2.32	0.60	1.21	6.04	3.15	0.74	1.48
25	F13-1014	F13-115	F13-117	21	400	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	F13-1001	F13-117	F13-119	21	400	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	F13-1002	F13-119	F14-100	21	400	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	F14-1010	F14-100	E14-109	21	400	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	E14-1021	E14-109	E14-123	21	400	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	E14-1035	E14-123	E14-128	21	200	2/1/1957	0.0040	4.55	2.32	0.62	1.08	6.04	3.15	0.76	1.34
25	E14-1030	E14-128	E14-131	21	196	2/1/1957	0.0040	4.01	2.06	0.57	1.00	5.70	3.02	0.73	1.27
26	F12-1059	F12-110	F12-134	18	450	7/16/1973	0.0084	4.34	2.20	0.61	0.92	5.55	2.88	0.73	1.10
26	F12-1071	F12-134	F12-137	24	396	7/16/1973	0.0012	4.34	2.20	0.58	1.15	5.55	2.88	0.68	1.36
26	F12-1070	F12-137	F12-139	24	402	7/16/1973	0.0022	4.34	2.20	0.58	1.15	5.57	2.88	0.68	1.37
26	F12-1063	F12-139	F12-143	24	483	7/16/1973	0.0027	4.34	2.20	0.54	1.08	5.57	2.88	0.63	1.26
27	F12-1061	F12-126	F12-123	15	328	7/16/1973	0.0051	1.74	0.86	0.55	0.69	2.12	1.07	0.62	0.78
28	G9-1045	G9-155	G9-159	12	294	2/14/1961	0.0051	0.79	0.34	0.49	0.49	1.30	0.59	0.67	0.67
28	G9-1029	G9-159	G9-161	12	181	2/14/1961	0.0051	0.91	0.40	0.53	0.53	1.47	0.68	0.73	0.73
28	G9-1001	G9-161	G9-164	12	350	2/14/1961	0.0051	0.91	0.40	0.53	0.53	1.48	0.68	0.74	0.74
28	G9-1002	G9-164	G9-170	12	349	2/14/1961	0.0051	0.91	0.40	0.53	0.53	1.48	0.68	0.74	0.74
28	G9-1049	G9-166	G9-170	12	231	8/10/2000	0.0022	0.19	0.07	0.28	0.28	0.19	0.07	0.28	0.28
28	G9-1063	G9-170	G9-172	12	283	11/1/1999	0.0050	1.06	0.48	0.59	0.59	1.62	0.75	0.82	0.82
28	G9-1040	G9-172	G9-176	12	400	11/1/1999	0.0057	1.06	0.48	0.56	0.56	1.62	0.75	0.76	0.76
28	G9-1010	G9-176	G9-180	12	254	11/1/1999	0.0060	1.20	0.54	0.60	0.60	1.75	0.82	0.80	0.80
28	F9-1041	G9-180	F9-161	12	257	11/1/1999	0.0059	1.20	0.54	0.60	0.60	1.75	0.82	0.81	0.81
29	J11-1040	J11-126	J11-128	12	334		0.0056	1.16	0.53	0.60	0.60	1.23	0.56	0.62	0.62
29	J11-1039	J11-128	J11-133	12	332		0.0055	1.16	0.53	0.61	0.61	1.23	0.56	0.63	0.63
29	J11-1027	J11-133	J11-141	12	336		0.0056	1.16	0.53	0.60	0.60	1.23	0.56	0.62	0.62
29	I11-1031	J11-141	I12-107	12	253		0.0056	1.16	0.53	0.60	0.60	1.23	0.56	0.62	0.62
			Total		29,195										

*Ultimate Conditions include flows from the Sphere of Influence (SOI)

Pump Stations

The City currently owns and operates four sewer pump stations. Detailed evaluations of each pump station can be found in Section 5-6.

Pump Station No. 5 is a submersible pump station with three pumps, each rated at 2,100 GPM. The estimated existing and ultimate peak wet weather flows are 591 gpm and 1,311 gpm respectively. The firm capacity of the pump station (one pump out of service) is estimated at 2,500 gpm. Therefore, the pump station capacity is adequate for the existing and ultimate peak wet weather flows. However, because of the ragging problems experienced, the existing pumps should be replaced with enclosed screw centrifugal pumps with sufficient capacity to convey the ultimate peak wet weather flow (1400 gpm).

The District is currently replacing the bubbler system at Pump Station No. 5 with an ultrasonic level sensor to determine the wastewater levels in the wet well.

The velocity in the 10-inch pump discharge pipes is approximately 9 feet per second, which is higher than the recommended velocity of 5 feet per second for PVC pipe. The velocity in the 18-inch forcemain is

approximately 2.7 feet per second with one pump in operation, which is less than the recommended minimum velocity of 3 feet per second to reduce the possibility of debris settlement in the forcemain. When Pump Station No. 5 is upgraded, the pump discharge pipes should be sized as 12-inch pipes to operate within the recommended velocities. Dual 12-inch forcemains should also be constructed to operate within the recommended velocities and to provide redundancy.

Pump Station No. 3 is a wet well dry well pump station with three pumps, each rated at 3,100 gpm. The existing and ultimate peak wet weather flows are 4,882 gpm and 7,018 gpm respectively. The existing firm capacity is approximately 7,000 gpm, which nearly equals the estimated ultimate peak wet weather flow.

The existing pumps experience cavitation, and had been replaced frequently in the past. This appears to have been due to lower losses in the forcemain than anticipated during the design of the facility, which results in the pumps operating out of the preferred operating range when running at full speed. Staff reports that failure frequency has dropped since they have been operated with the variable frequency drives. However, the pumps will have to operate at the higher speeds and higher flows during the wet weather flows, resulting in cavitation.

The velocity in the 10-inch pump discharge pipe is approximately 9 feet per second, which is higher than the recommended velocity of 5 feet per second for PVC pipe. The velocity in the 30-inch forcemain is approximately 2.2 feet per second with the existing peak wet weather flow of 4,882 gpm, which is less than the recommended minimum velocity of 3 feet per second to minimize the possibility of debris settlement in the forcemain.

Pump Station No.3 should be replaced with a new submersible pump station, meeting all the criteria at the end of its useful life. To convey the existing peak dry weather flows, the new facility should have the firm capacity of 5,000 gpm; however, it shall be planned to include an expansion to 7,100 gpm to convey the ultimate peak wet weather when the SOI is incorporated.

The pump discharge pipes should be sized as 18-inch pipes to operate within the recommended velocities. To provide redundancy and to operate within the recommended velocities, a 20-inch forcemains should be constructed parallel to the existing 30-inch forcemain, between Pump Station No. 3 to the Calleguas Creek crossing (10,685 feet). An additional 30-inch forcemain shall be constructed parallel to the existing 30-inch forcemain between the Calleguas Creek crossing to the Wastewater Treatment Plant, along Pleasant Valley Road, Pancho Road, and Calle Quetzal (7,007 feet).

Pump Station No. 2 is a submersible pump station with three pumps each rated at 1,325 gpm. The estimated existing and ultimate peak wet weather flows are 1,655 gpm and 1,793 gpm respectively. One pump can deliver approximately 1,800 gpm with a force main Hazen Williams C factor of 100. Therefore, Pump Station No. 2 is sufficiently sized to handle the existing and ultimate peak wet weather flows. The District staff indicates occasional ragging at Pump Station No. 2. When the pump station is upgraded, the existing "non clog" pumps should be replaced with enclosed screw centrifugal pumps to minimize the possibility of ragging.

The velocity in the 10-inch pump discharge pipes is approximately 7.4 feet per second, which is higher than the recommended velocity of 5 feet per second for PVC pipe. They should be replaced with 12-inch pipes.

Pump Station No. 6 is a submersible pump station with three pumps, each rated at 1,500 gpm. However, field measured capacity is approximately 1,170 gpm.

The estimated existing and ultimate peak wet weather flows are 1,364 gpm and 1,814 gpm respectively. The existing firm capacity of the pump station determined by field testing is 1,700 gpm. The existing firm capacity is significantly greater than the estimated existing peak wet weather flow. When the upstream tributary area is further developed, the ultimate peak wet weather flow should be reevaluated and the need to increase the firm capacity of the pump station should be determined.

With the existing pump capacity of approximately 1,170 gpm, the velocity in the 8-inch discharge pipes is over 7 feet per second, which is higher than the recommended velocity of 5 feet per second for PVC pipe. They should be replaced with 12-inch pipes. An additional 12-inch forcemain should also be constructed parallel to the existing 12-inch forcemain to provide redundancy.

Section 8

CAPITAL IMPROVEMENT PROGRAM

8-1 GENERAL

The primary goal of the Capital Improvement Program (CIP) is to provide the Camarillo Sanitary District with a long-range planning tool for implementing its sewer infrastructure improvements in an orderly manner and a basis for financing these improvements.

8-2 CAPITAL IMPROVEMENT PROJECT PRIORITIES

The capital improvement projects were selected primarily with consideration of the health and safety of the public and protection of the environment by minimizing the possibility of overflows.

Sewer Capacity Improvement Projects

The gravity sewer capacity improvement projects were chosen to eliminate the hydraulic deficiencies identified by the existing system model, which include the existing general plan land uses and existing service area. The deficiencies under ultimate conditions were evaluated with the Camarillo Sphere of Influence (SOI) incorporated into the City.

For the gravity sewer deficiencies under the existing conditions, the capacity improvements are recommended to convey the ultimate peak dry weather flows. Improvements shall be planned to accommodate the additional flows that the SOI area will generate when incorporated into the City limits.

The projects that will eliminate the existing capacity deficiencies in the gravity collection system are prioritized as follows:

1. Facilities with verified existing dry weather capacity deficiencies.

2. The facilities that have shown calculated capacity deficiencies but are currently adequate. Flow monitoring is recommended prior to project implementation. When the measured peak flows exceed the pipe capacity (d/D = 0.62 during peak dry weather conditions), the projects should be reprioritized.

In some cases, larger sewers are given higher priorities than small sewers because they serve larger areas and a future spill is expected to be larger in quantity, resulting in greater damage to public health and the environment. When segments of sewers with lower priorities are located in the same vicinity as a higher priority project, an exception is made to include these lower priority sewers in that project to provide a more economically feasible Capital Improvement Program.

Pump Station and Forcemain Improvement Projects

The functionality of District's sewer system heavily depends on the reliability of the four (4) main pump stations and corresponding force mains to convey the wastewater to the Wastewater Treatment Plant. The District relies on a single forcemain system, which transports the wastewater from the pump stations to the

Wastewater Treatment Plant (Pump Stations No.3 and 2) and to gravity sewers (Pump Station No. 5 and 6). These forcemains range from 2,850 feet to 23,000 feet in length. In the event of a forcemain failure, the District would not have the means to convey the wastewater to the Wastewater Treatment Plant. The District may be accountable for severe sanitary sewer overflows and will have to handle the wastewater from the pump stations upstream of a failure during the period that a deficient force main is under repair. It is recommended that the District build parallel force mains to provide redundancy.

The following improvements are recommended for the District's pump stations and forcemains.

Pump Station No. 5

- Replace the three (3) existing "non clog" pumps (rated at 2,100 gpm) with three (3) enclosed screw centrifugal pumps (rated at 1,400 gpm).
- Replace the 10-inch discharge piping, with 12-inch piping.
- Construct a 12-inch forcemain (7,981 feet) parallel to the existing 18-inch facility.
- Construct emergency storage

Pump Station No. 3

- Construct new submersible pump station with firm capacity of 5,000 gpm. Include plans to expand to 7,100 gpm when the SOI is incorporated.
- Construct a 20-inch forcemain (15,418 feet) parallel to the existing 30-inch facility, between Pump Station No. 2 and the Calleguas Creek crossing..
- Construct 30-inch forcemain (7,007 feet) parallel to the existing 30-inch facility, between the Calleguas Creek crossing and the Wastewater Treatment Plant.

Pump Station No. 2

- Replace three (3) existing "non-clog" pumps with enclosed screw centrifugal pumps.
- Replace the 10-inch discharge piping, with 12-inch piping.
- Construct emergency storage

Pump Station No. 6

- Replace the 8-inch discharge piping, with 12-inch piping.
- Construct 12-inch forcemain (2,850 feet), parallel to existing 12-inch forcemain.
- Construct emergency storage

8-3 CAPITAL IMPROVEMENT PROGRAM

The District's comprehensive capital improvement program (CIP) will include the improvements recommended by this System Evaluation and Capacity Assurance Plan (SECAP) and by the Operation and Maintenance Program. The projects included in this SECAP are recommended to improve capacity deficient sewers, the pump stations, and forcemains. The projects recommended in the Operation and Maintenance Program deal with improving the condition of the District's sewer system.

The CIP for this SECAP has been developed based upon the results of the hydraulic analyses and the priorities of Subsection 8-2. The recommended improvement project locations are illustrated on Figure 8-1. Sewer capacity improvement projects are listed in detail in Table 8-1 by priority, along with cost estimates.

Table 8-1
Gravity Sewer Capacity Improvement Projects

General Information								Existing		Ultimate*		Recommendation		Cost		
Deficiency Location	Pipe ID	U/S MH	D/S MH	Location	Installation Date	Slope	Length (ft)	PDWF (mgd)	PDWF d/D	PDWF (mgd)	PDWF d/D	Existing Size (in)	Replacement Size (in)	Unit Cost ($/ft)	Construction Cost	Total Cost
2	F12-1069	F12-128	F12-124	Daily Drive, between of Calle la Roda and the easement east of Rosewood Avenue	9/15/1997	0.0059	350	1.84	1.00	2.24	1.00	12	18	720	252,000	340,200
2	F12-1019	F12-124	F12-122		9/15/1997	0.0079	350	1.84	0.74	2.24	1.00	12	18	720	252,000	340,200
2	F12-1068	F12-122	F12-119		9/15/1997	0.0079	350	1.84	0.74	2.24	1.00	12	18	720	252,000	340,200
2	F12-1022	F12-119	F12-115		9/15/1997	0.0079	350	1.84	0.74	2.24	1.00	12	18	720	252,000	340,200
2	F12-1021	F12-115	F12-110		9/15/1997	0.0079	386	1.84	0.74	2.24	1.00	12	18	720	277,668	374,852
						Subtotal	**1,786**						**Subtotal**		**1,285,668**	**1,735,652**
3	H11-1080	H11-126	H11-125	Ponderosa Drive, between Mobile Avenue and the Easement east of Rosewood Avenue	3/1/1964	0.0020	340	0.88	0.71	1.01	0.80	12	18	720	244,454	330,013
3	H11-1009	H11-125	H11-124			0.0022	274	0.92	0.71	1.05	0.79	12	18	720	197,366	266,445
3	H11-1008	H11-124	H11-131			0.0022	375	0.92	0.71	1.05	0.80	12	18	720	269,856	364,306
3	H11-1007	H11-131	H11-129			0.0022	375	0.92	0.71	1.05	0.79	12	18	720	270,000	364,500
3	H11-1005	H11-129	H11-127			0.0037	445	1.22	0.72	1.34	0.79	12	18	720	320,400	432,540
3	H11-1006	H11-127	G11-131			0.0037	450	1.22	0.72	1.34	0.79	12	18	720	324,000	437,400
3	G11-1105	G11-131	G11-130		5/1/1966	0.0044	130	1.25	0.69	1.38	0.74	12	18	720	93,600	126,360
3	G11-1142	G11-130	G11-124		5/1/1966	0.0033	300	1.60	1.00	1.76	1.00	12	18	720	216,000	291,600
3	G11-1143	G11-124	G11-125		5/1/1966	0.0052	455	1.61	0.79	1.77	1.00	12	18	720	327,600	442,260
3	G11-1044	G11-125	G11-126		5/1/1966	0.0053	440	1.61	0.79	1.77	1.00	12	18	720	316,800	427,680
3	G11-1011	G11-126	G11-127		5/1/1966	0.0053	85	1.61	0.78	1.77	1.00	12	18	720	61,452	82,960
3	G11-1010	G11-127	G11-129		5/1/1966	0.0052	355	1.61	0.79	1.77	1.00	12	18	720	255,564	345,011
3	G11-1013	G11-129	G11-128		5/1/1966	0.0052	440	1.61	0.79	1.77	1.00	12	18	720	316,800	427,680
3	G11-1012	G11-128	G11-123		5/1/1966	0.0052	430	1.61	0.79	1.77	1.00	12	18	720	309,600	417,960
3	G11-1034	G11-123	F11-133		5/1/1966	0.0053	430	1.61	0.79	1.77	1.00	12	18	720	309,600	417,960
3	F11-1025	F11-133	F11-132			0.0052	10	0.72	0.46	0.79	0.49	15	18	720	6,986	9,431
3	I11-1046	I11-137	I11-136	Ponderosa Drive, west of Arneil Road		0.0060	65	0.45	0.64	0.47	0.66	8	10	400	26,000	35,100
						Subtotal	**5,398**						**Subtotal**		**3,866,079**	**5,219,207**
6	M14-1001	M14-101	L14-102	Agricultural Field, north of Wastewater Treatment Plant		0.0007	41	0.37	0.55	0.62	0.81	12	18	720	29,462	39,774
6	L14-1013	L14-102	L14-107			0.0004	210	0.37	0.69	0.62	1.00	12	18	720	151,200	204,120
6	L14-1008	L14-107	L15-100			0.0004	380	0.37	0.68	0.62	1.00	12	18	720	273,600	369,360
6	L15-1005	L15-100	L15-101			0.0004	317	0.37	0.65	0.62	1.00	12	18	720	228,319	308,231
6	L15-1011	L15-101	L15-108			0.0004	317	0.37	0.65	0.62	1.00	12	18	720	228,312	308,221
6	L15-1006	L15-108	L15-110			0.0004	317	0.37	0.65	0.62	1.00	12	18	720	228,312	308,221
6	L15-1010	L15-110	L15-112			0.0004	330	0.37	0.66	0.62	1.00	12	18	720	237,427	320,527
6	L15-1009	L15-112	L15-115			0.0005	334	0.37	0.65	0.62	1.00	12	18	720	240,214	324,288
6	L15-1008	L15-115	L15-117			0.0004	401	0.37	0.65	0.62	1.00	12	18	720	289,015	390,171
6	L15-1007	L15-117	L16-104			0.0004	360	0.37	0.65	0.62	1.00	12	18	720	259,200	349,920
6	L16-1003	L16-104	L16-800			0.0004	370	0.37	0.66	0.62	1.00	12	18	720	266,400	359,640
						Subtotal	**3,377**						**Subtotal**		**2,431,462**	**3,282,473**
7**	F11-1038	F11-130	F11-132	Ponderosa Drive, east of Rosewood Avenue	7/30/1970	0.0012	300	1.36	0.76	1.91	1.00	15	21	735	220,500	297,675
						Subtotal	**300**						**Subtotal**		**220,500**	**297,675**

* Ultimate Conditions include flows from the Sphere of Influence (SOI)

** Verify gravity sewer deficiency with flow monitoring

Table 8-1

Gravity Sewer Capacity Improvement Projects (Continued)

General Information								Existing		Ultimate*		Recommendation		Cost		
Deficiency Location	Pipe ID	U/S MH	D/S MH		Installation Date	Slope	Length (ft)	PDWF (mgd)	PDWF d/D	PDWF (mgd)	PDWF d/D	Existing Size (in)	Replacement Size (in)	Unit Cost ($/ft)	Construction Cost	Total Cost
8**	I13-1027	I13-104	I13-109	Dawson Drive, north of Magnolia Street	5/1/1957	0.0059	366	1.49	0.70	1.60	0.74	12	18	720	263,520	355,752
						Subtotal	**366**						**Subtotal**		**263,520**	**355,752**
9**	J11-1035	J11-122	J11-125	Easement between Sharon Drive and Lewis Road	10/13/1959	0.0044	327	0.43	0.69	0.44	0.70	8	12	480	156,902	211,818
						Subtotal	**327**						**Subtotal**		**156,902**	**211,818**
13**	F11-1034	F11-132	F11-150	Easement east of Rosewood Avenue between Ponderosa Drive and Daily Drive		0.0016	445	2.18	1.00	2.78	1.00	15	21	735	327,075	441,551
13**	F11-1067	F11-150	F11-162			0.0038	315	2.19	0.71	2.80	1.00	15	21	735	231,525	312,559
13**	F11-1054	F11-162	F11-168			0.0016	119	2.19	1.00	2.80	1.00	15	21	735	87,465	118,078
13**	F11-1030	F11-168	F11-170			0.0015	13	2.19	1.00	2.80	1.00	15	21	735	9,555	12,899
13**	F11-1069	F11-170	F11-173		6/29/1981	0.0036	14	3.28	1.00	4.01	1.00	15	24	840	11,760	15,876
13**	F11-1068	F11-173	F12-103		6/29/1981	0.0028	391	3.28	1.00	4.01	1.00	15	24	840	328,818	443,904
13**	F12-1045	F12-103	F12-126		6/29/1981	0.0027	404	3.28	1.00	4.01	1.00	15	24	840	339,293	458,045
						Subtotal	**1,701**						**Subtotal**		**1,335,491**	**1,802,913**
14*	F10-1009	F10-123	F10-139	Rosewood Avenue, north of Ponderosa Drive		0.0065	400	1.30	0.62	1.85	0.81	12	18	720	288,000	388,800
14*	F10-1010	F10-139	F10-149			0.0054	400	1.30	0.66	1.85	1.00	12	18	720	288,000	388,800
14*	F10-1011	F10-149	F11-100			0.0059	403	1.30	0.64	1.85	1.00	12	18	720	290,160	391,716
14*	F11-1101	F11-100	F11-114			0.0060	400	1.30	0.63	1.85	1.00	12	18	720	288,000	388,800
14*	F11-1102	F11-114	F11-130			0.0059	339	1.30	0.63	1.85	1.00	12	18	720	244,080	329,508
						Subtotal	**1,942**						**Subtotal**		**1,398,240**	**1,887,624**
15**	I12-1088	I12-107	I12-120	Lewis Road, between Merritt Avenue and Barry Street		0.0056	415	1.32	0.66	1.40	0.68	12	15	600	248,814	335,899
15**	I12-1012	I12-139	I12-143	Lewis Road and Daily Drive to Dawson Drive and Petit Street	5/1/1957	0.0020	428	1.39	0.64	1.48	0.67	15	18	720	308,196	416,065
15**	I12-1075	I12-143	I12-149		5/1/1957	0.0043	396	1.46	0.52	1.55	0.54	15	18	720	285,120	384,912
15**	I12-1080	I12-149	I12-158		5/1/1957	0.0072	290	1.49	0.65	1.59	0.68	12	18	720	208,800	281,880
15**	I12-1079	I12-158	I13-102		5/1/1957	0.0080	400	1.49	0.63	1.59	0.66	12	18	720	288,000	388,800
15**	I13-1026	I13-102	I13-104		5/1/1957	0.0093	44	1.49	0.60	1.60	0.63	12	18	720	31,680	42,768
						Subtotal	**1,973**						**Subtotal**		**1,370,610**	**1,850,324**
16**	I13-1004	I13-109	I13-116	Dawson Drive, south of Petit Street	2/1/1957	0.0080	285	1.53	0.64	1.64	0.67	12	18	720	205,200	277,020
16**	I13-1003	I13-116	I13-123		2/1/1957	0.0080	189	1.53	0.64	1.64	0.67	12	18	720	136,080	183,708
						Subtotal	**474**						**Subtotal**		**341,280**	**460,728**
17**	F10-1056	F9-161	F10-101	Las Posas Road, east of Rosewood Avenue	11/1/1999	0.0059	315	1.30	0.64	1.85	1.00	12	15	600	188,766	254,834
						Subtotal	**315**						**Subtotal**		**188,766**	**254,834**
18**	J10-1052	J10-132	J10-143	Eston Street, south of Stiles Avenue	6/27/1960	0.0036	375	0.34	0.63	0.35	0.64	8	10	Improvements In Process		
						Subtotal	**375**						**Subtotal**	Improvements In Process		
					Grand Total		**17,959**						**Grand Total**			**17,359,000**

* Ultimate Conditions include flows from the Sphere of Influence (SOI)

** Verify gravity sewer deficiency with flow monitoring

Pump Station and forcemain improvement projects are listed in Table 8-2 by priority, along with cost estimates. Table 8-3 summarizes the complete CIP for this report, including the sewer capacity improvement projects and the pump station and forcemain improvement projects. The estimates are based upon recent information for similar projects in the Southern California area, and include contingencies for this planning level study.

The cost estimates presented in Table 8-1 reflect replacement of the existing gravity sewer. The construction costs for gravity sewers are based upon the following:

8-18 inch diameter pipe	$40 / diameter inch / ft
21 inch diameter pipe and greater	$35 / diameter inch / ft

The total costs shown in Table 8-1 and Table 8-2 include engineering, administration and contingency costs, estimated at 35% of the construction cost.

The recommended priorities included in Table 8-3 have been based upon the best information currently available. It should be updated as new information becomes available from sources such as CCTV inspections and from maintenance staff observations. The project priorities may be revised to correspond to changed conditions, such as impending facility failures, or to take advantage of concurrent construction such as street paving projects or adjacent infrastructure work.

Some of the sewer improvement projects recommended are small and it may not be feasible to implement them as a single project. Therefore, several projects may be combined and bid as a package. Some of the projects may be broken down into smaller components to fit the District's budget and other obligations.

The sewer capacity improvement projects shown in Table 8-1 include a total of approximately $17.4 million dollars. The pump station and forcemain improvement projects detailed in Table 8-2 include a total of approximately $38.0 million dollars. The complete CIP for this SECAP is estimated to be $55.4 million dollars and includes the sewer capacity improvements, pump station, and forcemain improvements.

The improvement projects included in the CIP for the Operation and Maintenance Program includes approximately $16.9 million dollars for the rehabilitation and replacement of the sewer condition deficiencies identified through closed circuit television (CCTV). The District shall allocate $1 million (2009 dollars) annually for condition improvements (rehabilitation/replacement), increased for inflation at the same rate as the ENR Index for the Los Angeles area. Condition Improvement Projects shall be determined by the District based on CCTV inspections, and staff knowledge of the system.

In summary, the District's comprehensive capital improvement program is estimated as follows:

CIP for SECAP	$55.4	Million
CIP for Operation and Maintenance Program	$16.9	Million
Comprehensive CIP	$72.3	Million

The District's comprehensive capital improvement program consists of $72.3 million dollars in improvement projects which address gravity sewer capacity deficiencies, pump station facility deficiencies, forcemain deficiencies, and sewer condition deficiencies.

Table 8-2
Pump Station and Forcemain Improvement Projects

Project No	Pump Station	Recommended Improvements	Quantity	Unit	Unit Cost	Total Cost
1	PS No. 3	Construct 20-inch forcemain along Pleasant Valley Road from Pump Station No. 3 to east side of Calleguas Creek Crossing, parallel to existing 30-inch forcemain	15,418	LF	$900	**$13,876,200**
4	PS No. 2	Replace "non-clog" pumps with enclosed screw centrifugal pumps	3	LS	$675,000	$675,000
	PS No. 2	Replace 10-inch PVC discharge piping with 12-inch piping	3	LS	$135,000	$135,000
					Total Project Cost	**$810,000**
5	PS No. 5	Construct parallel 12-inch forcemain parallel to existing 18-inch forcemain between Pump Station No. 5 and Las Posas Road, north of the Camarillo Airport	7,981	LF	$500	**$3,990,500**
10	PS No. 5	Replace "non-clog" pumps with enclosed screw centrifugal pumps	3	LS	$675,000	$675,000
	PS No. 5	Replace 10-inch PVC discharge piping with 12-inch piping	3	LS	$135,000	$135,000
					Total Project Cost	**$810,000**
11	PS No. 3	Construct new submersible pump station, convert existing pump station to emergency storage	1	LS	$6,000,000	**$6,000,000**
12	PS No. 6	Construct parallel 12-inch forcemain parallel to existing 12-inch forcemain on Pleasant Valley Road Between Pump Station No. 3 and Calleguas Creek	2,850	LF	$650	$1,852,500
	PS No. 6	Replace 8-inch PVC discharge piping with 12-inch piping.	3	LS	$270,000	$270,000
					Total Project Cost	**$2,122,500**
19	PS No. 5	Construct emergency storage	40,000	GAL	$21	**$840,000**
20	PS No. 2	Construct emergency storage	50,000	GAL	$21	**$1,050,000**
21	PS No. 6	Construct emergency storage	55,000	GAL	$21	**$1,155,000**
22	PS No. 3	Construct 30-inch forcemain parallel to the existing 30-inch forcemain along Pleasant Valley Road, Rancho Road, and Calle Quetzal, between Calleguas Creek and the Wastewater Treatment Plant	7,007	LF	$1,050	**$7,357,350**
					Grand Total	**$38,011,550**

Table 8-3
Gravity Sewer Capacity, Pump Station and Forcemain Improvement Projects

Project No.	Project Description	Cost
1	Construct 20-inch diameter forcemain along Pleasant Valley Road, between PS. No. 3 and Calleguas Creek. Existing 30-inch forcemain shall be the back up.	$13,876,200
2	Replace 1,786 feet of sewer with 18-inch along Daily Drive, between Calle la Roda and the easement east of Rosewood Avenue.	$1,735,652
3	Replace 5,333 feet of sewer with 18-inch along Ponderosa Drive between the easement east of Rosewood Avenue and Mobile Avenue. Replace 65 feet of sewer with 10-inch sewer on Ponderosa Drive, west of Arneil Road.	$5,219,207
4	Replace three (3) "non-clog" pumps with enclosed screw centrifugal pumps at Pump Station No. 2. Replace 10-inch discharge piping with 12-inch piping.	$810,000
5	Construct 12-inch diameter forcemain parallel to the existing 18-inch forcemain between Pump Station No. 5 and Las Posas Road, north of the Camarillo Airport	$3,990,500
6	Replace 3,377 feet of sewer with 18-inch north of the Wastewater Treatment Plant	$3,282,473
7	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 300 feet of sewer with 21-inch along Ponderosa Drive, east of Rosewood Avenue.	$297,675
8	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 366 feet of sewer with 18-inch along Dawson Drive, north of Magnolia Street	$355,752
9	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 327 feet of sewer with 12-inch in the easement between Sharon Drive and Lewis Road	$211,818
10	Replace three (3) "non-clog" pumps with enclosed screw centrifugal pumps at Pump Station No. 5. Replace 10-inch discharge piping with 12-inch piping.	$810,000
11	Replace Pump Station No. 3 with a submersible pump station. Provide emergency storage with the new pump station.	$6,000,000
12	Construct 12-inch forcemain parallel to existing 12-inch forcemain along Pleasant Valley Road between Pump Station No. 6 and Calleguas Creek. Replace 8-inch discharge piping with 12-inch piping.	$2,122,500
13	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 1,701 feet of sewer with 21-inch and 24-inch along the easement east of Rosewood Avenue, between Ponderosa Drive and Daily Drive.	$1,802,913
14	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 1,942 feet of sewer with 18-inch aong Rosewood Avenue, north of Ponderosa Drive.	$1,887,624
15	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 415 feet of sewer with 15-inch along Lewis Road between Merritt Avenue and Barry Street and replace 1,558 feet of sewer with 18-inch from the intersection of Lewis Road and Daily Drive to the intersection of Dawson Drive and Petit Street.	$1,850,324
16	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 474 feet of sewer with 18-inch aong Dawson Drive, south of Petit Street	$460,728
17	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 315 feet of sewer with 15-inch aong Las Posas Road, east of Rosewood Avenue.	$254,834
18	Verify gravity sewer deficiency with flow monitoring. If necessary, replace 375 feet of sewer with 10-inch aong Eston Street, south of Stiles Avenue.	Improvements in Process
19	Construct emergency storage at Pump Station No. 5	$840,000
20	Construct emergency storage at Pump Station No. 2	$1,050,000
21	Construct emergency storage at Pump Station No. 6	$1,155,000
22	Construct 30-inch forcemain parallel to the existing 30-inch forcemain along Pleasant Valley Road, Rancho Road, and Calle Quetzal, between Calleguas Creek and the Wastewater Treatment Plant	$7,357,350
	Grand Total	**$55,370,550**

8-4 CAPITAL IMPROVEMENT PROJECT DESCRIPTIONS

The following projects, recommended in this System Evaluation and Capacity Assurance Plan, are listed in order of priority from high to low:

Project No. 1 (Pump Station No. 3 Forcemain to Calleguas Creek Crossing)

Project No. 1 includes constructing 15,418 feet of 20-inch diameter forcemain along Pleasant Valley Road between Pump Station No. 3 and the east side of Calleguas Creek. The existing 30-inch diameter forcemain shall be the back-up facility.

Project No. 2 (Daily Drive, north of Ventura Freeway, east of Calle la Roda)

Project No. 2 includes approximately 1,790 feet of 18-inch pipe on Daily Drive, east of Calle la Roda (MH F12-128 to MH F12-110). The recommendations are detailed on Figure 8-2. The hydraulic model shows that these sewers have depth to diameter ratios that range between 0.78 to full under peak dry weather conditions. The flow monitor along this reach recorded a peak dry weather depth to diameter ratio of 0.86. The existing pipe size is 12-inch. Downstream of this location, the pipe size is 18-inch. It is recommended that the deficient sewers be increased to 18-inch as well.

There is a split manhole located upstream at MH F12-126. Two (2) parallel facilities on Daily Drive, consisting of a 15-inch reach to the north and a 12-inch reach to the south, convey the wastewater westerly. The existing parallel sewer system is not capable of conveying the existing peak dry weather flow, and improvements to the 12-inch system will provide sufficient capacity.

Project No. 3 (Ponderosa Drive from Mobile Avenue to the Easement East of Rosewood Avenue & Ponderosa Drive and Arneil Road)

Project No. 3 includes 5,333 feet of pipe on Ponderosa Drive (MH H11-126 to MH F11-132) The recommendations are detailed on Figure 8-2. The hydraulic model showed that these sewers have depth to diameter ratios over 0.78 under peak dry weather conditions. The flow monitor along this reach recorded depth to diameter ratios of 0.71. The existing pipe is 12-inch, and the downstream system currently consists of parallel 15-inch diameter pipes. It is recommended that the deficient pipes be upsized to 18-inch.

There is a split manhole located upstream at MH G11-127. Two (2) parallel facilities on Ponderosa Drive, consisting of two (2) 12-inch pipes convey the wastewater to the west. The northerly parallel reach conveys the wastewater that is tributary to MH G11-118 on Lantana Street, north of Ponderosa Drive. The southerly reach conveys the wastewater that is tributary to MH G11-127 on Ponderosa Drive, east of Lantana Drive. In the event of high flow levels, the wastewater at split manhole G11-127 will overflow from sewer G11-1011 to sewer G11-1141 to the north. The existing parallel sewer system is not capable of conveying the existing peak dry weather flow, and improvements to the southerly sewer system will provide sufficient capacity.

Hacienda de Camarillo Apartment Complex

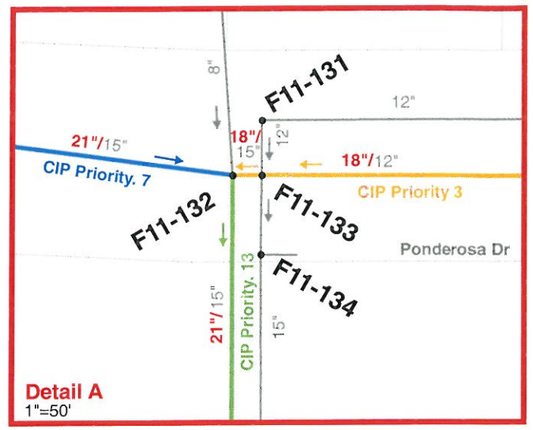
Ponderosa Dr
Paseo Camarillo
Rosewood Ave
Daily Dr
Ventura Blvd
Skeel Dr
Lantana St
Mardigras Ct
Carmen Dr
Overflow to North

CIP Project 14
CIP Project 7
CIP Project 3
CIP Project 13
CIP Project 2

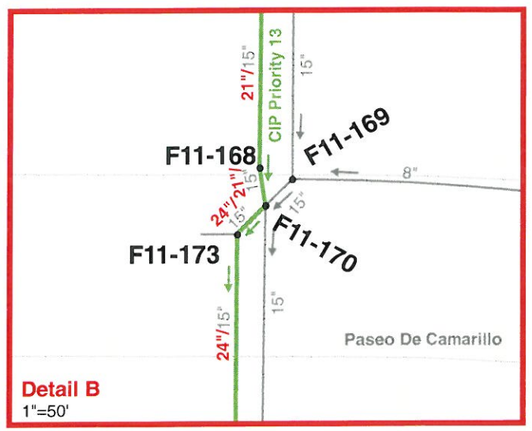
F11-125 F11-130 F11-131 F11-132 F11-133 F11-134 F11-150 F11-152 F11-162 F11-168 F11-169 F11-173 F11-170
G11-122 G11-123 G11-121 G11-128 G11-119 G11-129 G11-120 G11-118 G11-127 G11-126 G11-125 G11-124 G11-130
F12-100 F12-103 F12-109 F12-110 F12-113 F12-115 F12-117 F12-119 F12-120 F12-122 F12-123 F12-124 F12-126 F12-127 F12-128

Detail A
Detail B
Detail C

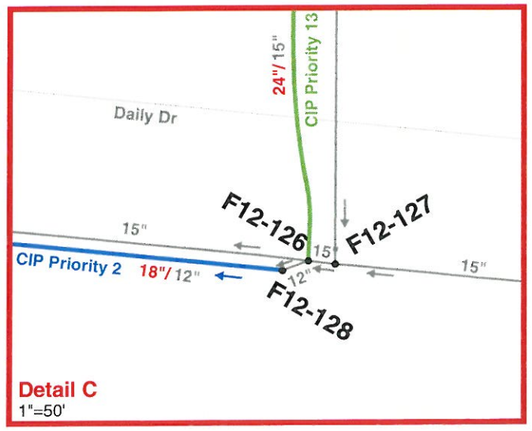
Detail A
1"=50'



Detail B
1"=50'



Detail C
1"=50'



Legend

- Manhole
- Flow Direction
- CSD Sewer
- CIP Project 1 & 5
- CIP Project 2 & 7
- CIP Project 8
- 18"/ Recommended Pipe Diameter
- 12" Existing Pipe Diameter

N

0 155 310 620 930 Feet

1" = 300'

AKM

CAMARILLO SANITARY DISTRICT
SECAP

PROJECT NO: 1450763.00

DATE: July 2009

Existing Capital Improvement Projects Details

Figure 8-2

Improvements to the sewer reach on Ponderosa Drive, west of Arneill Road are also included in Project No. 3. The existing pipe size is 8-inch, and this sewer is 65 feet long. Downstream of this location, the pipe size is 10-inch. The hydraulic model shows that this sewer has a depth to diameter ratio of 0.64 under peak dry weather flow conditions. The District should verify the gravity sewer deficiency with flow monitoring. It is recommended that the sewer be upsized to 10-inch, if it is determined to be deficient.

Project No. 4 (Pump Station No. 2 Pump Improvements)

Project No. 4 includes replacing the three (3) existing "non-clog" pumps with enclosed screw centrifugal pumps at Pump Station No. 2. The existing 10-inch discharge piping will be replaced with 12-inch piping.

Project No. 5 (Pump Station No. 5 Forcemain Construction)

Project No. 5 recommends the construction of 7,981 feet of 12-inch forcemain that will be parallel to the existing 18-inch forcemain between Pump Station No. 5 and Las Posas Road, north of the Camarillo Airport. The existing 18-inch forcemain shall be used as a back-up facility.

Project No. 6 (North of the Wastewater Treatment Plant)

Project No. 6 includes approximately 3,400 feet of pipe located in an agricultural field, north of the Wastewater Treatment Plant (MH L14-101 to MH L16-800). Project No. 5 is located downstream of parallel 8-inch and 10-inch siphons across Conejo Creek.

The deficient sewers at this location are characterized by flat slopes that are often as low as 0.004. The hydraulic model showed that these sewers have depth to diameter ratios over 0.68 under peak dry weather conditions. The flow monitor recorded depth to diameter ratios of 0.72. The existing sewers are 12-inch in diameter and are recommended to be increased to 18-inch.

The District may evaluate the possibility of constructing a pump station to increase the efficiency at these deficient reaches.

Project No. 7 (Ponderosa Drive, East of Rosewood Avenue)

Project No. 7 includes approximately 300 feet of pipe located on Rosewood Avenue (MH F11-130 to MH F11-132). The recommendations are detailed on Figure 8-2. The hydraulic model shows that these sewers have depth to diameter ratios greater than 0.75 under peak dry weather flow conditions. The District shall verify this gravity sewer deficiency with flow monitoring.

The existing deficient reach is 15-inch along Ponderosa Drive. The downstream system consists of two (2) parallel 15-inch sewer reaches. The recommended improvements include increasing the existing 15-inch sewer to 21-inch.

Project No. 8 (Dawson Drive, north of Magnolia Street)

Project No. 8 includes approximately 365 feet of pipe located on Dawson Drive (MH I13-104 to MH I13-109). The hydraulic model shows the depth to diameter ratio greater than 0.70 under peak dry weather flow

conditions. The District shall verify this gravity sewer deficiency with flow monitoring. The existing deficient sewer is 12-inch. The sewers upstream and downstream of these deficient sewers are also 12-inch. It is recommended that the deficient pipes be upsized to 18-inch.

There is a split manhole located upstream at MH K10-101. The existing and ultimate peak dry weather flows at this split manhole are 0.268 mgd and 0.305 mgd respectively. According to the District's field reviews, 60% of the flows are diverted to sewer K10-1010 to the southwest and 40% of the flows to sewer K10-1030 to the southeast. Project No. 8 improvements will provide the capacity to handle the ultimate peak dry weather flow, assuming the operations at split manhole K10-101 remain the same, as well as if 100% of the flows are diverted southwest to sewer K10-1010, which is upstream of Project No. 8.

Project No. 9 (Easement between Sharon Drive and Lewis Road)

Project No. 9 includes 327 feet of pipe on the easement between Sharon Drive and Lewis Road (MH J10-122 to MH J11-125) The hydraulic model shows a depth to diameter ratio greater than 0.68 along this reach, for existing peak dry weather flow conditions. The District shall verify this gravity sewer deficiency with flow monitoring. The existing pipe size is 8-inch. The downstream sewers are 12-inch in diameter. It is recommended to improve the existing deficiencies to 12-inch sewers as well.

Project No. 10 (Pump Station No. 5 Facility Improvements)

Project No. 10 includes replacing the three (3) "non-clog" pumps rated at 2,100 gpm at Pump Station No. 5, with enclosed screw centrifugal pumps rated at 1,400 gpm. The existing 10-inch PVC discharge piping will be replaced with 12-inch piping.

Project No. 11 (Pump Station No. 3 Construction)

Project No. 11 includes the construction of a new submersible pump station near the existing Pump Station No. 3. The facility shall be constructed with a firm capacity of 5,000 gpm, and shall have the capability of expanding to a firm capacity of 7,100 gpm when the Sphere of Influence area is incorporated into the City. The existing pump station will be utilized for emergency storage.

Project No. 12 (Pump Station No. 6 Forcemain and Facility Improvements)

Project No. 12 includes the construction of 2,850 feet of 12-inch forcemain that will be parallel to the existing 12-inch forcemain on Pleasant Valley Road between Pump Station No. 3 and the east side of Calleguas Creek. The dual 12-inch forcemain system is necessary to provide redundancy in the event of a forcemain failure. The existing 8-inch discharge piping shall be replaced with 12-inch piping.

Project No. 13 (Easement east of Rosewood Avenue, from Ponderosa Drive to Daily Drive)

Project No. 13 includes approximately 1,700 feet of pipe on the easement east of Rosewood Avenue (MH F11-132 to MH F12-126). The hydraulic model shows that these sewers become surcharged under peak dry weather conditions. The flow monitor along this reach recorded a peak dry weather depth to diameter ratio of 0.55, which is not considered deficient based on the criteria of this report. The District shall monitor this location as the area develops or when the Sphere of Influence is incorporated into the City.

There are two split manholes located along this reach. The upstream split manhole F11-133 is located on Ponderosa Drive and the easement east of Rosewood Avenue. Split manhole F11-170 is located on Paseo Camarillo and the easement east of Rosewood Avenue. There are two (2) parallel 15-inch facilities along the easement that run from Ponderosa Drive to split manhole F12-126 on Daily Drive. The existing facilities are located beneath the Hacienda de Camarillo Apartment Complex and an office complex. Based on the ultimate peak dry weather flows, the District shall improve the westerly sewer facility from 15-inch to 21-inch and 24-inch, if the existing facilities become unable of conveying the peak flows. At that time, a detailed study including utility research and field investigations shall be performed to analyze possible improvement projects.

Project No. 14 (Rosewood Avenue, north of Ponderosa Drive)

Project No. 14 includes approximately 1,940 feet of pipe located on Rosewood Avenue (MH F10-123 to MH F11-130). The hydraulic model shows that these sewers have depth to diameter ratios greater than 0.64 under peak dry weather flow conditions. The District shall verify this gravity sewer deficiency with flow monitoring.

There is a split manhole located upstream of these deficiencies at MH F10-101 at Las Posas Road and Rosewood Avenue. A parallel system conveys the flow on Rosewood Avenue from the split manhole toward Ponderosa Drive. According to the District's field review, there is a dam on sewer F10-1001 to the west, and all of the flow is diverted to sewer F10-1002 on the east. The downstream parallel sewer system was evaluated by adjusting the flows at split manhole F10-101 in the hydraulic model; however, the parallel system is not capable of conveying the existing peak dry weather flow.

The existing deficient reach is 12-inch in diameter along Rosewood Avenue. The downstream facility is currently 15-inch; however, it is recommended to be improved to 21-inch as part of Project No. 7. It is recommended to increase the Project No. 14 sewers from 12-inch to 18-inch.

Project No. 15 (Lewis Road between Merritt Avenue and Barry Street & Lewis Road and Daily Drive to Dawson Drive and Petit Street)

Project No. 15 includes approximately 1,975 feet of pipe located primarily on Dawson Drive (MH I12-139 to MH I13-104). The hydraulic model shows the depth to diameter ratio greater than 0.65 under peak dry weather flow conditions. The District shall verify this gravity sewer deficiency with flow monitoring. The existing deficient sewers are 12-inch and 15-inch. The downstream sewer is currently 12-inch; however, it is recommended to be improved to 18-inch as part of Project No. 8. The sewers included in Project No. 15 are recommended to be improved to 18-inch as well.

Project No. 15 also includes improvements to the sewer on Lewis Road (MH I12-107 to MH I 12-120). The existing sewer is 12-inch. The downstream sewers are 18-inch. The hydraulic model calculated the depth to diameter ratio to be greater than 0.65 under peak dry weather flow conditions. The District shall verify this gravity sewer deficiency with flow monitoring. It is recommended that the deficient sewer be improved to 15-inch.

There is a split manhole located upstream at MH K10-101. The existing and ultimate peak dry weather flows at this split manhole are 0.268 mgd and 0.305 mgd respectively. According to the District's field reviews, 60% of the flows are diverted to sewer K10-1010 to the southwest and 40% of the flows to sewer K10-1030 to the

southeast. Project No. 15 improvements will provide the capacity to handle the ultimate peak dry weather flow, assuming the operations at split manhole K10-101 remain the same, as well as if 100% of the flows are diverted southwest to sewer K10-1010, which is upstream of Project No. 15.

Project No. 16 (Dawson Drive, south of Petit Street)

Project No. 16 includes approximately 475 feet of pipe located primarily on Dawson Drive (MH I12-109 to MH I13-123). The hydraulic model shows the depth to diameter ratio greater than 0.63 under peak dry weather flow conditions. The District shall verify this gravity sewer deficiency with flow monitoring. The existing deficient sewers are 12-inch. The downstream sewers are 15-inch. It is recommended that the deficient pipes be upsized to 18-inch.

There is a split manhole located upstream at MH K10-101. The existing and ultimate peak dry weather flows at this split manhole are 0.268 mgd and 0.305 mgd respectively. According to the District's field reviews, 60% of the flows are diverted to sewer K10-1010 to the southwest and 40% of the flows to sewer K10-1030 to the southeast. Project No. 16 improvements will provide the capacity to handle the ultimate peak dry weather flow, assuming the operations at split manhole K10-101 remain the same, as well as if 100% of the flows are diverted southwest to sewer K10-1010, which is upstream of Project No. 16.

Project No. 17 (Las Posas Road, east of Rosewood Avenue)

Project No. 17 includes 315 feet of pipe on Las Posas Road (MH F9-161 to MH F10-101). The hydraulic model shows a depth to diameter ratio greater than 0.63, under existing peak dry weather flow conditions. The District shall verify this gravity sewer deficiency with flow monitoring. The existing pipe size is 12-inch. The downstream sewers are two (2) parallel 12-inch sewers, and its improvements are included in the Project No. 14 description. It is recommended to improve the Project No. 17 sewer to 15-inch.

Project No. 18 (Eston Street, south of Stiles Avenue)

Project No. 18 includes 375 feet of pipe on Eston Street (MH J10-132 to MH J11-143) The hydraulic model shows depth to diameters greater than 0.63 at several of the sewers along this reach, under existing peak dry weather flow conditions. The District shall verify this gravity sewer deficiency with flow monitoring. The existing pipe size is 8-inch. The downstream sewers are 8-inch in diameter. It is recommended to improve the existing deficiencies to 10-inch. The District is currently implementing this project.

Project No. 19 (Pump Station No. 5 Emergency Storage)

Project No. 19 includes providing an additional 40,000 gallons of emergency storage at Pump Station No. 5.

Project No. 20 (Pump Station No. 2 Emergency Storage)

Project No. 20 includes providing an additional 50,000 gallons of emergency storage at Pump Station No. 2.

Project No. 21 (Pump Station No. 6 Emergency Storage)

Project No. 21 includes providing an additional 55,000 gallons of emergency storage at Pump Station No. 6.

Project No. 22 (Pump Station No. 3 Forcemain, Calleguas Creek Crossing to Wastewater Treatment Plant)

Project No. 22 includes constructing 7,007 feet of 30-inch diameter forcemain Calleguas Creek crossing to the Wastewater Treatment Plant. The dual 30-inch forcemain system is necessary to provide redundancy in the event of a forcemain failure.