ATKINS

Pine Valley Sewer Service Area

Sewer Master Plan

January 2013

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Prepared For:

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Contents

APPENDICES

TABLES

FIGURES

Acronyms

ac	acre
ABS	acrylonitrile butadiene styrene pipe
CEQA	California Environmental Quality Act
CIP	Capital Improvement Program
d/D	depth to pipe diameter ratio
du	dwelling unit
EDUs	Equivalent Dwelling Units
EIR	Environmental Impact Report
gpcd	gallons per capita per day
gpd	gallons per day
gpd/ac	gallons per day per acre
gpd/du	gallons per day per dwelling unit
LAFCO	Local Area Formation Commission
Master Plan	Pine Valley SSA Sewer Master Plan Update
mgd	million gallons per day
NASSCO	National Association of Sewer Service Companies
PVWPCF	Pine Valley Water Pollution Control Facility
RDI&I	Rainfall derived inflow and infiltration
SANDAG	San Diego Association of Governments
SOI	Sphere of Influence
SSA	Sewer Service Area
SSMP	Sewer System Management Plan
SSO	Sanitary Sewer Overflows
SWRCB	State Water Resources Control Board
VCP	vitrified clay pipe
WDR	Waste Discharge Requirement

CHAPTER 1
INTRODUCTION

The County of San Diego (County) is updating Sewer Master Plans for its sewer service areas. Due to increased growth, system expansions, and aging infrastructure, the County is addressing its capacity needs and updates its 10-year Capital Improvement Program (CIP). This Sewer Master Plan Update addresses the Pine Valley Sewer Service Area (SSA).

This introductory chapter to the Pine Valley SSA Sewer Master Plan Update (Master Plan) provides a summary of the:

- master plan objectives,
- contents and organization of this report,
- background information on the District,
- overview of regulatory requirements, and
- environmental compliance and policy considerations.

1.1 Sewer Master Plan Objectives

The objectives of this Master Plan are to document the available treatment capacity and general facility operational assessment, evaluate the system capacity and provide an assessment of the condition of identified portions of the existing sewer collection system in order to develop a comprehensive 10-year CIP. The 10-year CIP includes pipeline condition and capacity improvement projects, long-range maintenance program enhancements and treatment needs. This recommended CIP forms the basis for capital facility needs, sewer rate evaluations, and long-range financial plans to be completed in separate financial studies.

1.2 Report Organization

This Master Plan provides a comprehensive review and evaluation of the SSA's wastewater collection, conveyance, and capacity requirements under existing and ultimate conditions. Based on findings of the evaluation, the Master Plan recommends facility improvements and capital cost requirements to ensure that aging infrastructure remains serviceable and to allow for the continued buildout of the County General Plan.

The Master Plan is presented in six (6) chapters:

- Chapter 1 provides an introduction to the project.
- Chapter 2 presents an overview of the study area and existing wastewater collection facilities.

- Chapter 3 presents an overview of the sewer basins and provides estimates of future wastewater generation rates and treatment capacity requirements.
- Chapter 4 presents the methodology and findings of the sewer capacity evaluation, including summaries of hydraulic calculations used to analyze flow conditions.
- Chapter 5 presents a condition assessment of identified SSA facilities and identifies specific condition deficiencies, as well as recommends enhancements to the County's ongoing Video Inspection Program.
- Chapter 6 presents a recommended 10-year CIP for the SSA's wastewater facilities.

1.3 Background

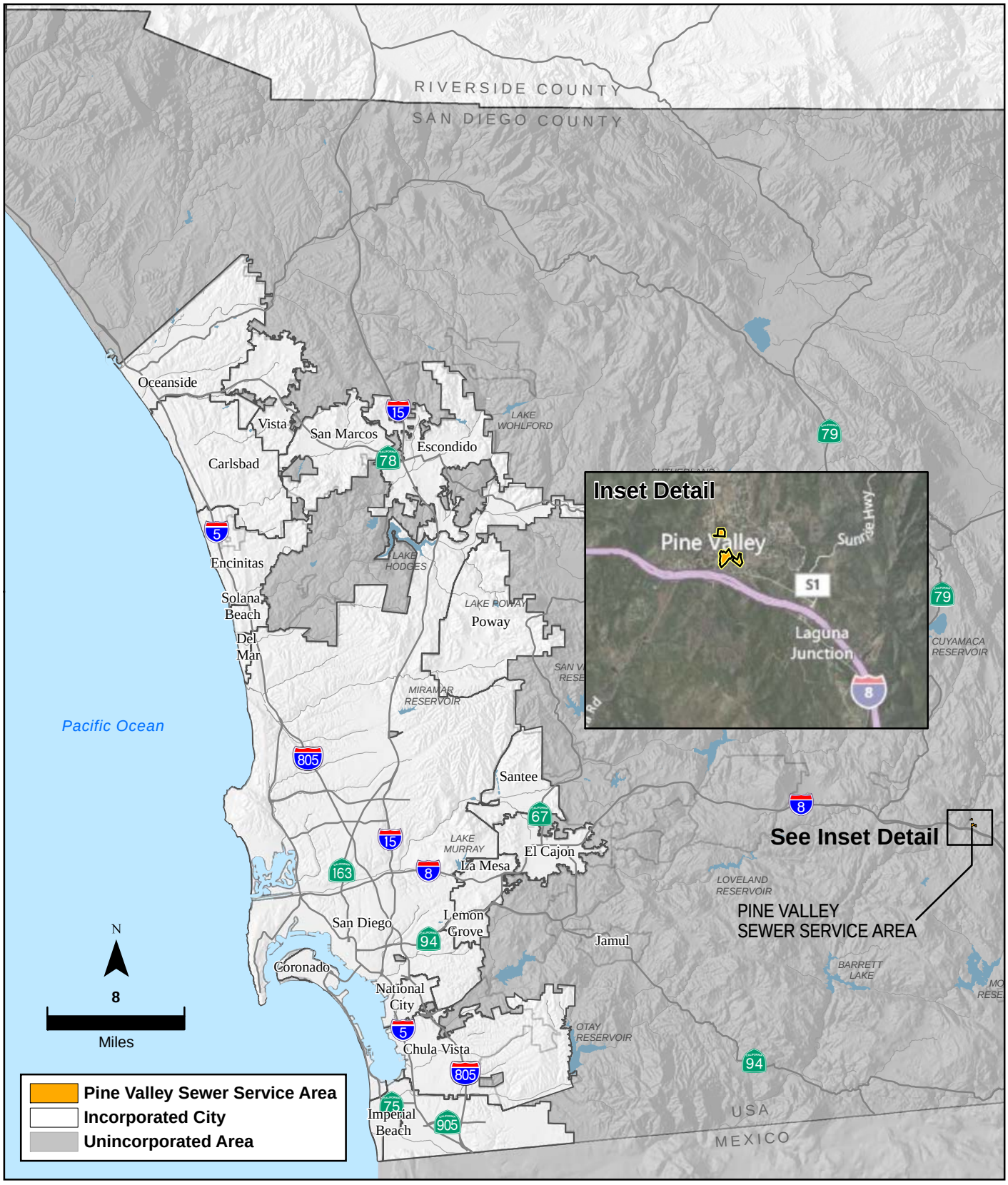
The County Board of Supervisors serves as the Sanitation District Governing Board for the County Sanitation District, of which the Pine Valley SSA is a part. The SSA serves the community of Pine Valley and is maintained by the County of San Diego Wastewater Management Section. Operation and maintenance costs required for the SSA is collected through connection and service fees assessed to each connection to the sewerage system. The location of the Pine Valley SSA is shown on Figure 1-1.

Sewer flows generated within the Pine Valley SSA are conveyed to the Pine Valley Water Pollution Control Facility (PVWPCF) for treatment and disposal. The PVWPCF operates under Statewide General Waste Discharge Requirements (WDRs) 94-161 with a permitted discharge capacity of 40,000 gallons per day (gpd). The PVWPCF has a secondary treatment process which consists of an oxidation pond and eight percolation ponds which discharge the plant effluent into the groundwater system.

The Pine Valley Sanitation District was formed in 1968 by the County Board of Supervisors and serves the community of Pine Valley. Based upon a County Board of Supervisors action, on July 1, 2011 the Pine Valley Sanitation District was officially reorganized and annexed into the Spring Valley Sanitation District and the Spring Valley Sanitation District was renamed the San Diego County Sanitation District.

1.4 Regulatory Requirements

On May 2, 2006, the State Water Resources Control Board (SWRCB) adopted Order 2006-0003, the Statewide General Waste Discharge Requirements (WDRs) for Sanitary Sewer Systems, which requires all federal and state agencies, municipalities, counties, districts, and other public entities that own or operate a sanitary sewer system greater than one mile in length to comply with the elements of the WDRs. The WDRs serve to provide a unified statewide approach for reporting and tracking Sanitary Sewer Overflows (SSO), establishing consistent and uniform requirements for Sewer System Management Plan (SSMP) development and implementation, establishing consistency in reporting, and facilitating consistent enforcement for violations.



PROJECT LOCATION
Figure 1-1

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26_ConsolidatedMasterPlan\mxd\19047_PV-ProjectLocation_Fig 1-1.mxd

The County's state mandated SSMP was initially approved July 2009 and encompassed all of the separate sanitation and sewer maintenance districts at the time. The SSMP documents include detailed information demonstrating the County's efforts to comply with each of the mandatory and applicable elements required. Revisions are currently being made to the SSMP document to reflect the reorganization of previously separated sanitation and sewer maintenance districts into the consolidated San Diego County Sanitation District.

1.5 Environmental Compliance

The Sewer Master Plan is statutorily exempt from the preparation of an Environmental Impact Report (EIR) or a Negative Declaration per Section 15262 of the California Environmental Quality Act (CEQA) guidelines. However, the approval or adoption of this Master Plan represents a discretionary action by the County, which is subject to review under CEQA.

1.6 Policy Considerations

The County of San Diego Board of Supervisors has adopted a number of policies which affect wastewater service in the County. These policies were reviewed for their applicability and impact to the SSAs. There currently are no policies that specifically apply to the Pine Valley SSA. Appendix A summarizes the policies reviewed.

CHAPTER 2
STUDY AREA

This chapter provides a description of the Master Plan study area including:

- existing and planned land uses,
- existing and projected populations,
- physical attributes of the collection system, and
- regional wastewater facilities serving the SSA.

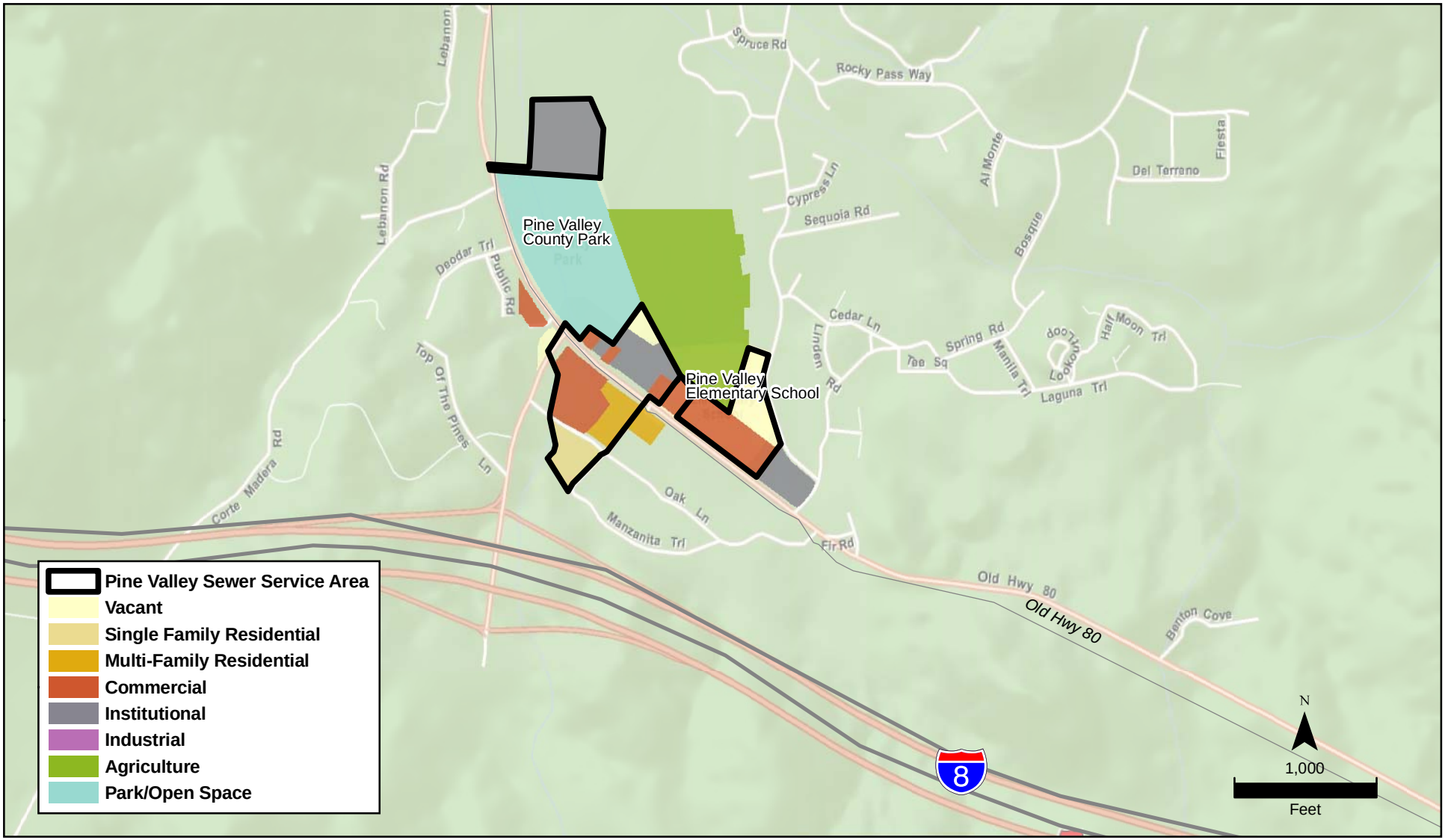
2.1 Study Area Description

The Pine Valley SSA is located in the eastern portion of San Diego County off of Interstate 8, Pine Valley Road and Old Highway 80, approximately 45 miles east of San Diego. The rural area consists of residential homes and the commercial business area along Old Highway 80.

The community of Pine Valley consists of predominately rural residences surrounding the commercial center along Old Highway 80. The Pine Valley SSA provides sewer service to the mostly built out commercial center. The Local Agency Formation Commission (LAFCO) Sphere of Influence (SOI) boundary, adopted September 2, 2010, has been included as part of the study area in the likely event that the existing sewer collection and treatment systems are expanded to service the area.

2.2 Land Uses

In August of 2011, the County of San Diego Board of Supervisors adopted an updated General Plan. The General Plan establishes future growth and development thresholds for the unincorporated areas of the County and concentrated population growth in the western areas of the County where infrastructure and services are more readily available. The Pine Valley SSA is not anticipated to see any significant growth according to the adopted General Plan. Figure 2-1 presents the existing land use within the SSA SOI boundary (study area). As shown on the figure, there are limited vacant parcels that are zoned for commercial development. Table 2-1 summarizes the existing and planned land use within the study area. Appendix B includes the General Plan Map for the Pine Valley area. Appendix C includes the land use files provided by SANDAG.



EXISTING AND PROPOSED LAND USE

Figure 2-1

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Table 2-1 Existing and Planned Land Use

Land Use	Existing Area	Planned Area
Residential	3 acres	3 acres
Commercial	11 acres	11 acres
Institutional	12 acres	12 acres
Parks/Recreation/Open Space	17 acres	17 acres
Agricultural	21 acres	21 acres
Undeveloped Land/Vacant	0 acres	0 acre
Total	**64 acres**	**64 acres**

2.3 Existing and Forecasted Populations

Residential and employment population estimates for the study area were provided by the San Diego Association of Governments (SANDAG) for years 2010, 2015, 2020, 2025, and 2030 at the parcel level and are based on the Series 11 - 2030 San Diego Regional Growth Forecast Update, completed in April 2008. Table 2-2 summarizes the residential and employment population projections through 2030 for the study area. As the table shows, SANDAG does not anticipate any growth in the study area over the next 20 years. Appendix D includes the population files provided by SANDAG.

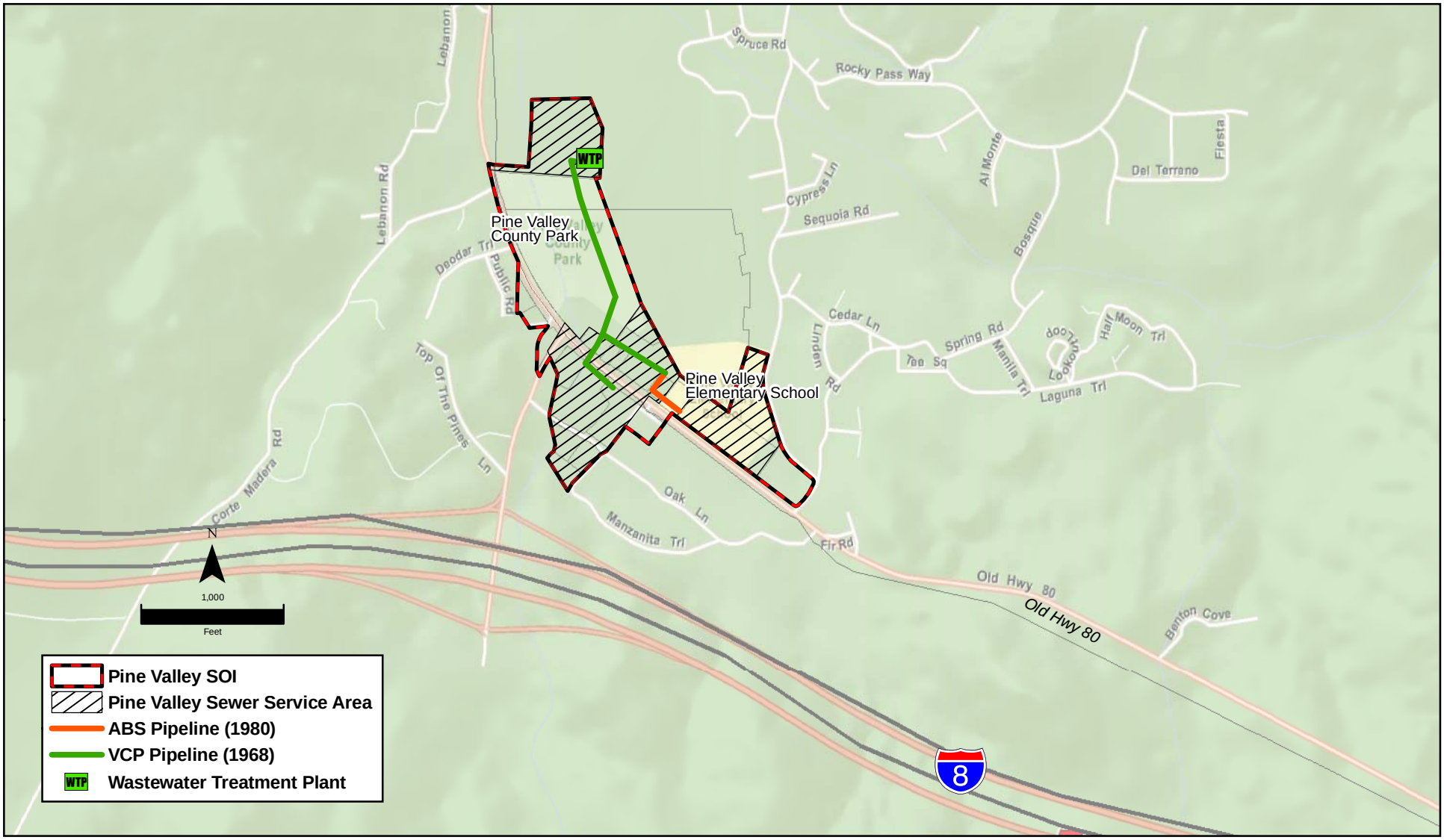
Table 2-2 Pine Valley SSA Existing and Forecasted Populations

Year	Residential	Employment
2010	0	153
2015	0	153
2020	0	153
2025	0	153
2030	0	153

There are 43 units in Pine Valley that are used as secondary or vacation residences due to a conversion of a motel commercial property to residential. Based on land use, these units are not categorized as residential but as commercial. As such, SANDAG data does not provide a residential population. However, based on tax data received from County staff, this Master Plan will assume 43 residential units with a household density of 1.0 to determine appropriate wastewater generation flows.

2.4 Existing Wastewater Collection System

Wastewater flows generated in the Pine Valley SSA are conveyed to the County-owned and maintained PVWPCF, where flows are treated to secondary standards and disposed via percolation ponds. The existing wastewater collection system consists of approximately 2,830 feet of 8-inch diameter gravity main, as shown in Figure 2-2. Approximately 2,400 feet of VCP pipeline was constructed in 1968 along with the PVWPCF and 430 feet of ABS pipeline extension were added in 1980.



EXISTING WASTEWATER SYSTEM

Figure 2-2

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CHAPTER 3
WASTEWATER GENERATION ANALYSIS

This chapter provides descriptions of the wastewater generation including:

- methodology for developing unit generation rates,
- recommended unit generation rates, and
- estimated future wastewater flows.

3.1 Treatment Plant Flows

As described in Chapter 2, wastewater generated within the Pine Valley SSA is collected by County-owned facilities and conveyed to the County-owned and maintained PVWPCF, where flows are treated to secondary standards and sent to the groundwater system via percolation ponds. The County records daily effluent flow readings for the PVWPCF and the 2010 readings were used for flow calibration. The PVWPCF has an average annual flow of 0.01 million gallons per day (mgd). Flow meter data used for calibration is included in Appendix E.

3.2 Wastewater Generation Rates

The purpose of establishing wastewater generation rates is to characterize the existing unit use by either population or land use, and for use in forecasting wastewater flows. The existing metered flows were compared with land use data and population estimates to develop unit wastewater generation rates. Unit generation rates were estimated using two sources for comparison purposes: 1) population estimates compiled by SANDAG (Series 12 for existing, Series 11 for forecasts), and 2) the County's current land use data (Referral Map, May 2008). Based on the findings of the unit generation rate analysis by land use and population, recommended unit rates will be established for forecasting future wastewater flows.

The unit generation rate calibration of the SSA is described in the following sections and summarized in Table 3-1 and Table 3-2.

3.2.1 Generation Rates Using SANDAG Population

The purpose of estimating population based unit generation rates is to establish the amount of wastewater a typical residential person and non-residential employee generate over a given day in order to assist in forecasting the amount of wastewater that the SSA can expect through 2030. Per capita unit generation rates are determined through a comparison of the existing SANDAG population data within a given meter basin against the average wastewater flows observed at that flow meter, and industry standard ranges.

SANDAG provided 2010 residential and employment population projections by basin for the SSA based on Series 12 data. Through an iterative process, per capita generation rates for employment populations were estimated. Table 3-3 summarizes the estimated unit generation rates by population through the flow calibration process. Per capita unit generation rates were calibrated to within 16 percent of existing flows.

SANDAG population forecasts do not include student populations, such as the Pine Valley Elementary School. The Pine Valley Elementary School Annual Report Card noted a 2010-2011 student population of 553 students, which will be used to estimate wastewater generation from the school.

There are 43 units in Pine Valley that are used as secondary or vacation residences. Based on land use, these units are not categorized as multi-family residential but as commercial. However, based on tax data received from County staff, the calibration will assume 43 residential units to determine appropriate wastewater generation rates.

Typically, design and planning standards for agencies in San Diego County assume per capita wastewater generation rates between 15 to 35 gpcd for employment populations. Table 3-1 summarizes the flows and calibration for the Pine Valley SSA. Pine Valley has an estimated employment per capita unit generation rate of 30 gpcd.

Table 3-1 Wastewater Unit Generation Rate Calibration Based on Population

Land Use	Existing Population	Unit Generation Rate	Estimated Wastewater Generation
Residential	43	80 gpcd	3,440 gpd
Employment	139	25 gpcd	3,478 gpd
Student	553	10 gpcd	5,530 gpd
Total			**12,448 gpd**
		Existing Flows =	10,694 gpd
		Calibration =	16.4 %

gpcd = gallons per capita per day; gpd = gallons per day

3.2.2 Generation Rates Using County Land Use Data

The purpose of estimating land use based unit generation rates is to establish the amount of wastewater generated in a day over an acre of land by general land use types in order to assist in estimating the amount of wastewater that the SSA can expect at the buildout of the study area. Land use based unit generation rates are determined through a comparison of the existing area per land use type within a given meter basin against the average wastewater flows observed at that flow meter, and industry standard ranges.

As shown in Figure 2-3 of the previous chapter, existing land uses include industrial, commercial, and institutional. When the GIS land use coverage is overlaid with the County's permitted parcel database, it was possible to calculate industrial, commercial, and institutional acreage for the Pine Valley SSA. There are 43 units in Pine Valley that are used as secondary or vacation residences. Based on land use, these units are not categorized as multi-family residential but as commercial. However, based on tax data received from County staff, the

calibration will assume 43 residential units to determine appropriate wastewater generation rates.

Table 3-2 summarizes the calibration of sewer flows for the Pine Valley SSA with estimated unit wastewater generation rates summarized by land use. Unit wastewater generation rates were calibrated to within 20 percent of existing flows measured at the PVWPCF.

Table 3-2 Wastewater Unit Generation Rate Calibration Based on Land Use

Basin	Units	Unit Generation Rate	Estimated Wastewater Generation
Residential	43 units	80 gpd/du	3,440 gpd
Commercial	11.4 ac	250 gpd/ac	2,148 gpd
Institutional	11.2 ac	250 gpd/ac	2,798 gpd
Total			**8,385 gpd**
		Existing Flows =	10,694 gpd
		Calibration =	-21.6 %

ac = acre; du = dwelling unit; gpd = gallons per day

Non-residential land use unit generation rates were set equal to each other and then were adjusted through an iterative process to reasonably match the estimated employment and student wastewater generation, as presented previously in Table 3-1.

Typically, design standards for agencies in San Diego County assume wastewater flows between 500 to 1,500 gallons per day per acre (gpd/ac) for non-residential land uses. When compared to typical design standards, the calibrated unit generation rates suggest that the Pine Valley SSA is on the low end of typical generation rates.

3.2.3 Recommended Unit Generation Rates

For future development, it is typical to develop uniform unit generation rates. The County has relatively uniform wastewater generation rates for land use and population projections based on our unit generation rate analyses. Therefore, for the existing system analysis, the calibrated unit generation rates shown above will be used. For future wastewater generation, more conservative generation rates will be used. The wastewater generation rates used to estimate future flows are summarized in Table 3-3. The County utilizes Equivalent Dwelling Units (EDUs) for non-single family residential land uses and equates an EDU to 240 gpd, respectively.

3.3 Wastewater Flow Projections

Wastewater flow projections were developed through 2030 and for buildout. Flow projections through 2030 were estimated by applying the recommended population unit generation rates to the anticipated forecasted population. Buildout wastewater flow projections were determined by applying the land use based unit generation rates to the land use acreages and allowable densities (Referral Map, May 2008). These projections form the basis for sewer input flows to the hydraulic model, and analyses of future capacity needs in the wastewater collection system. Table 3-4 summarizes the estimated future flows based on population through 2030 and Table

3-5 summarizes the estimated buildout flow based on the land use for ultimate conditions in each SSA.

Table 3-3 Recommended Unit Generation Rates

Land Use / Population	Recommended Unit Generation Rate
Land Use	
Residential	180 gpd/du
Commercial	250 gpd/ac
Industrial	250 gpd/ac
Institutional	250 gpd/ac
Population	
Residential	60 gpcd
Employment	25 gpcd
Student	10 gpcd

gpcd = gallons per capita per day
gpd/ac = gallons per day per acre
gpd/du = gallons per day per dwelling unit

Table 3-4 Pine Valley Wastewater Flow Projections through 2030 (by Population)

	Population					Estimated Wastewater Generation (mgd)				
Basin	**2010**	**2015**	**2020**	**2025**	**2030**	**2010**	**2015**	**2020**	**2025**	**2030**
Residential	43	43	43	43	43	0.003	0.003	0.003	0.003	0.003
Employment	139	139	139	139	139	0.004	0.004	0.004	0.004	0.004
Student	553	553	553	553	553	0.006	0.006	0.006	0.006	0.006
Total						**0.013**	**0.013**	**0.013**	**0.013**	**0.013**

mgd = million gallons per day

Table 3-5 Pine Valley Buildout Wastewater Flow Projections (by Land Use)

Land Use	Units/Acres	Recommended Unit Generation Rate	Estimated Wastewater Generation (mgd)
Residential	43 units	180 gpd/du	0.008
Commercial	11 ac	250 gpd/ac	0.003
Institutional	12 ac	250 gpd/ac	0.003
Total			**0.014**

ac = acre; du = dwelling unit; gpd = gallons per day; mgd = million gallons per day

3.4 Conclusions

Existing average wastewater flows generated within the Pine Valley SSA are approximately 0.011 mgd. Based on SANDAG population projections, the total Pine Valley SSA average flow rate at 2030 is estimated to be 0.013 mgd. Assuming the buildout of the entire study area, the average flow rate is estimated at approximately 0.014 mgd, which will likely not occur until beyond 2050.

The PVWPCF has a treatment and discharge capacity of 0.040 mgd. Based on the estimated wastewater flow projections, the discharge capacity at the PVWPCF will be sufficient through 2030 and buildout. The County should continue to monitor flows into the PVWPCF over the next five to ten years to determine whether the recommended phased populations are consistent with future flow projections.

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CHAPTER 4
CAPACITY EVALUATION

This chapter provides a description of the capacity analysis performed as part of the Master Plan, and includes:

- evaluation criteria,
- model selection, development and calibration,
- capacity analysis, and
- potential phased recommended improvements.

4.1 Background

A capacity evaluation of the Pine Valley SSA existing wastewater collection system was completed to identify sewer reaches that may be deficient under recommended design criteria and to identify any upgrades needed to accommodate existing and projected dry and wet weather wastewater flows. Based on the capacity evaluation, no improvements were identified.

4.2 Methodology

The principal tool utilized in the capacity analysis was a hydraulic analysis spreadsheet using the Manning formula to evaluate flow conditions, such as wastewater flow depth, flow rate, and velocity, within pipes and manholes in the SSA wastewater collection system.

The spreadsheet model was developed using the physical collection system data, existing and forecasted populations, and per capita unit generation rates. The model was utilized to evaluate the existing collection system under existing and projected wet weather flow conditions in order to identify potential recommended improvements to the existing collection system.

4.3 Flow Monitoring

The Pine Valley SSA has one flow meter that records daily effluent flows from the PVWPCF. Flow data from August 2010 at the PVWPCF was used to develop initial average wastewater generation estimates. The month of January 2010 was identified as having a rainfall event typical of a 5-year return storm, and was used to evaluate wet weather events.

4.4 Evaluation Criteria

Recommended criteria were developed to evaluate the capacity of the existing collection system under existing and projected dry and wet weather flow conditions. The recommended evaluation criteria were developed by comparing existing County criteria to criteria for similar Southern California sewer agencies. The recommended evaluation criteria are presented in

Table 4-1 and will be utilized to identify deficient facilities and size replacement infrastructure. The evaluation criteria presented in this master plan is not intended to replace the County's existing criteria, which shall continue to be utilized for the design of new infrastructure.

Table 4-1 Recommended Evaluation Criteria

Gravity Main Criteria	Recommended Evaluation Criteria
Minimum Pipe Diameter	8 inches
Minimum Velocity	2 fps at peak flow rate
Manning's Roughness Coefficient	0.013
Maximum Peak d/D Ratio for Existing Sewers	0.50 Peak Dry Weather Flow for dia. ≤ 15-inch
	0.75 Peak Dry Weather Flow for dia. > 15-inch
	0.92 Peak Wet Weather Flow for a 2-year storm
Maximum Peak d/D Design Criteria for New Sewers	0.50 Peak Wet Weather Flow for dia. ≤ 15-inch
	0.75 Peak Wet Weather Flow for dia. > 15-inch

4.5 Model Development

The spreadsheet model was developed with the physical collection system data, existing and forecasted populations, and per capita unit generation rates. Details regarding the collection system and the application of sewage loading factors and rainfall events are described below.

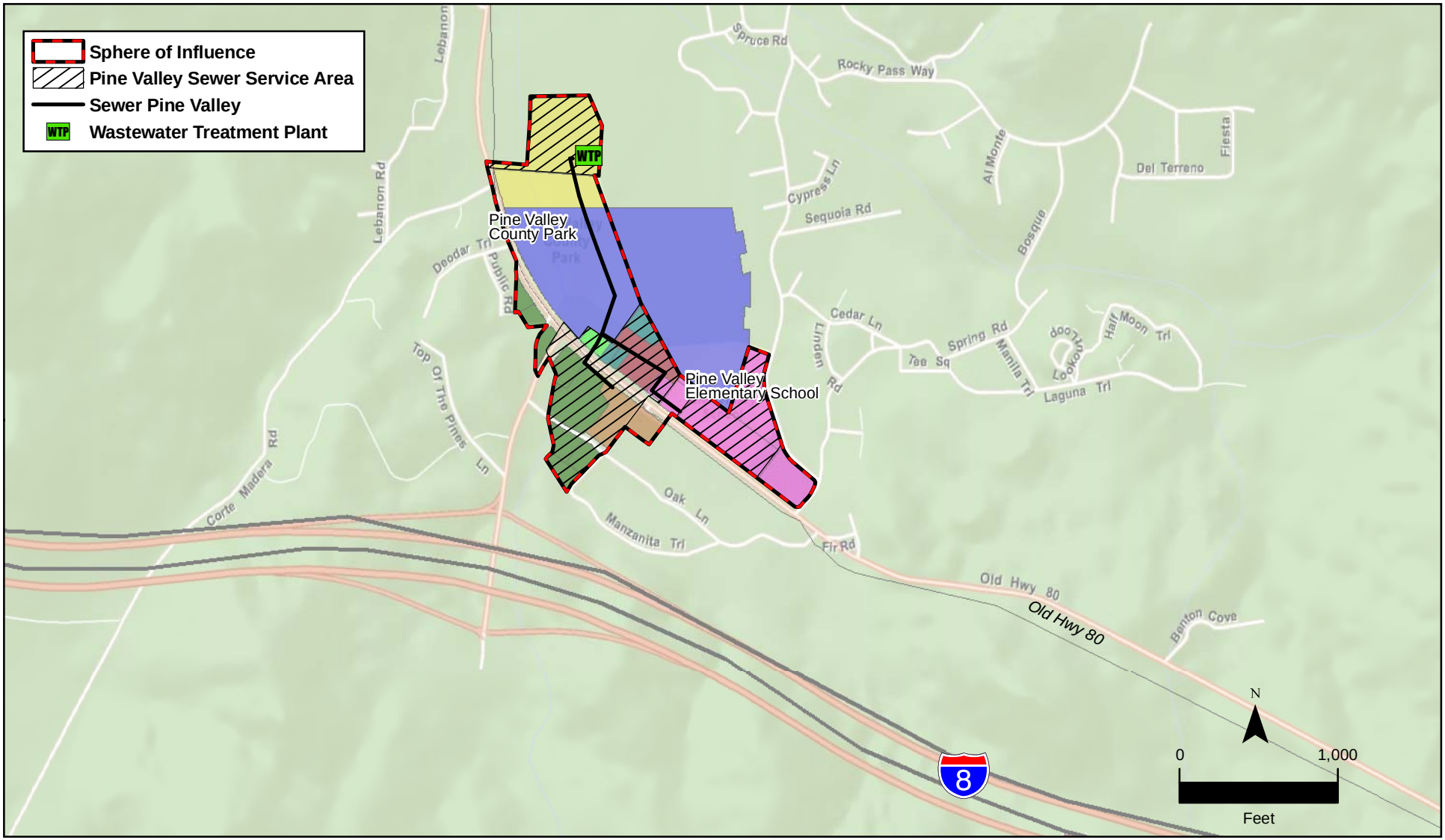
4.5.1 Collection System Attributes

Data required to create the spreadsheet model includes information describing the physical wastewater collection system, such as physical location, pipe diameters and reach lengths, manhole invert elevations, and estimated pipe roughness coefficients. Model connectivity was reviewed and verified against County as-built records. The physical parameters of the system, including pipe diameter, slope, and roughness coefficients were based principally on the County's GIS records. Where the data appeared to be inaccurate or unclear, data was inferred.

4.5.2 Model Loading

Wastewater flows are generated in the model by applying basin populations to per capita unit generation rates at the basin's identified tributary node. Populations were applied for existing and 2030 conditions at the parcel level. Each parcel was assigned a corresponding tributary model node based on available lateral information and topography. Model basins were then formed by merging parcels with identical tributary nodes. Appendix F includes model basin population projections and diurnal patterns.

The parcel's existing and 2030 residential and employment populations were summed and input into the model at the basin level. Residential and employment population estimates for the existing and 2030 conditions were provided by SANDAG. Figure 4-1 presents the location of the model basins.



PINE VALLEY MODEL BASINS

Figure 4-1

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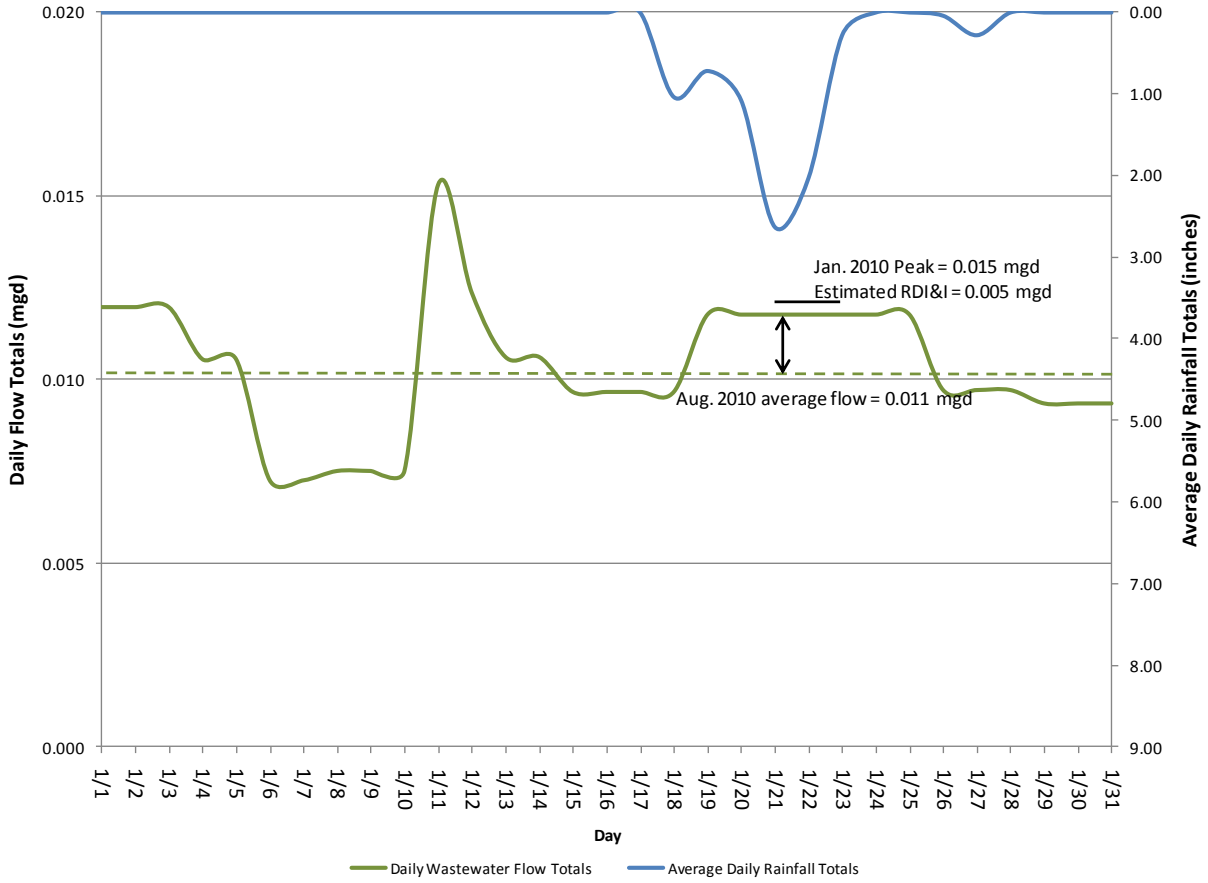
Task_26_CMP\mxd\19047_Pine Valley_ModelBASINS_Fig 4-1.mxd

4.5.3 Rainfall Events

Rainfall events were evaluated to identify their potential impacts on the collection system. Rainfall derived inflow and infiltration (RDI&I) flows into the system were included in the spreadsheet model as an assumed ten percent of flow. Figure 4-2 presents a comparison of the average daily flows recorded at the PVWPCF to the average daily rainfall totals at the Descanso rain gauge. Rainfall totals for the Descanso rain gauge are summarized in Appendix G.

Figure 4-2 Pine Valley SSA Wet Weather Flow Assessment



As shown on Figure 4-2, the January storm event produced a peak increase of approximately 5,000 gpd, or a 45 percent increase over average flow, at the PVWPCF from a storm event that averaged over an inch of rain during its 5 day period.

4.6 Capacity Analysis

A capacity analysis of the existing collection system was performed under peak future flow conditions. Calculations were performed for the recommended 2030 wastewater generation, discussed in Chapter 3, in order to identify potential improvement projects. Under dry weather flow conditions pipeline capacity projects were identified if the peak flows exceeded a flow depth to pipe diameter (d/D) ratio of 0.50 for pipeline diameters 15 inch and smaller and 0.75 for

pipelines greater than 15 inches in diameter. Under wet weather flow conditions pipeline capacity projects were identified if the peak flows exceeded a d/D ratio of 0.92 for all pipeline diameters.

Under peak 2030 flow conditions, no capacity deficiencies were identified for the gravity sewer system. A detailed summary of the gravity pipeline capacity analysis is provided in Appendix H.

The PVWPCF has a treatment capacity of 0.040 mgd and existing average flows of 0.011 mgd. However, based on average weekend flows of 0.020 mgd, the PVWPCF may not be able to accommodate increased peak flows due to additional growth in the Pine Valley SSA due to limited peak wet weather capacity on the weekend.

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CHAPTER 5
CONDITION ASSESSMENT

This chapter provides a description of the condition assessment performed as part of the Master Plan, and includes:

- collection system characteristics,
- current maintenance goals and practices,
- video inspection and assessment process,
- inspection and assessment results, and
- recommended rehabilitation program.

5.1 Background

A wastewater system condition assessment provides agencies and municipalities with valuable information used to determine the funding required to repair and rehabilitate an aging collection system and to prioritize the allocation of funds. An assessment of existing facilities serves to identify the existing system conditions and defects which may contribute to potential overflows and excessive infiltration. Such conditions include root intrusion at misaligned joints or cracks, breaks in pipe, inflow and infiltration entering into the system through cracks in pipes or manholes or via illegal storm drain connections, which affect pipe capacity and treatment costs. The condition assessment of the existing Pine Valley SSA collection system was based on the physical inspection of approximately 2,800 linear feet of 8-inch sewer mains which accounts for nearly 100 percent of the entire SSA. The pipeline segments selected for inspection and assessment included pipelines primarily of VCP and two (2) segments of ABS.

5.2 Collection System Characteristics

The Pine Valley SSA collection system was constructed in the 1960s when VCP was the most common pipe material used for construction. According to County data, approximately 430 feet of ABS pipe was installed in the 1980s. A breakdown of the total pipeline length in the Pine Valley SSA by length of material and age is provided in Table 5-1 and presented graphically in Figure 5-1.

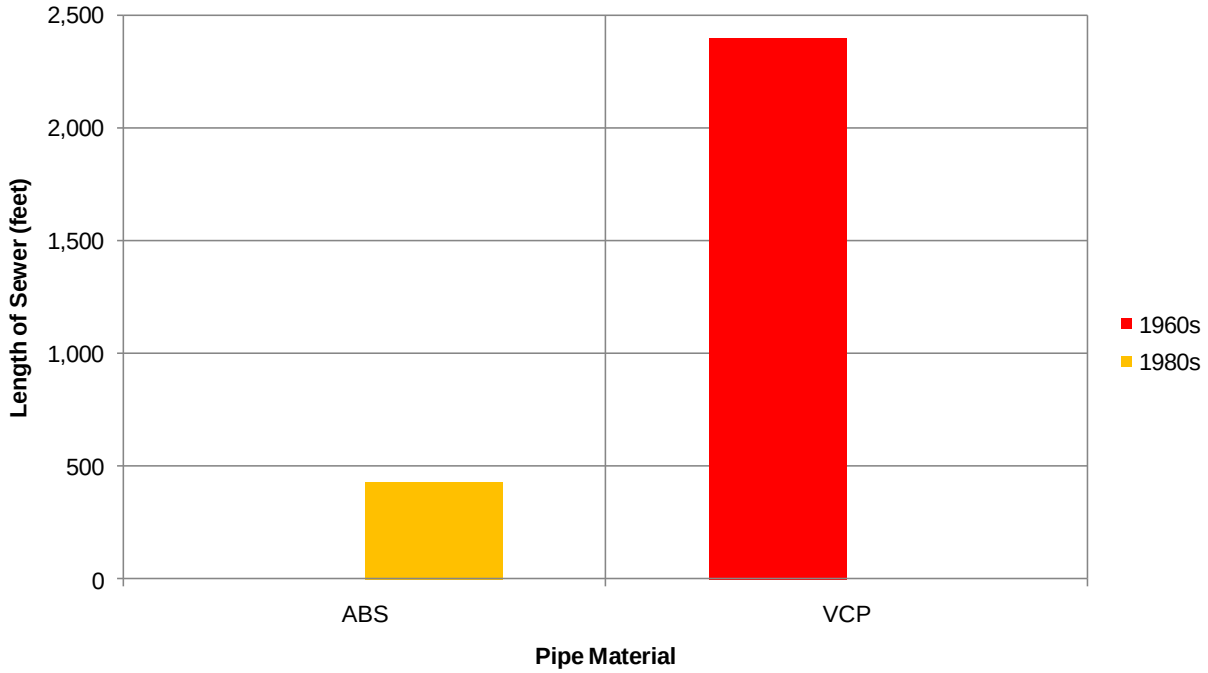
The wastewater collection system data presented in this chapter, including length, material and pipe sizes, are based on information obtained from the County's database. The database has not been updated to reflect any corrections and/or discrepancies noted through the CCTV inspection findings. Based upon the CCTV data, the County's GIS and mapbooks should be

updated to reflect more accurate information obtained through the inspection and assessment process.

Table 5-1 Pine Valley SSA Gravity Pipeline Length of Material by Age

Age	Material		Total
	ABS	VCP	
1960	0	2,400	2,400
1980	430	0	430
Total	**430**	**2,400**	**2,830**

Figure 5-1 Pine Valley SSA Gravity Pipeline Length of Material by Age



As may be determined from Table 5-1 and Figure 5-1, approximately 85 percent of the Pine Valley SSA system was constructed of VCP pipe in the 1960s. Historically, VCP pipe has a life span ranging from 50-70 years. Based on the information presented above, 85 percent of the VCP pipe has reached the initial years of the pipe material life cycle. Therefore, as the wastewater collection system continues to age, routine inspection is critical for monitoring and establishing the condition of the pipelines and identifying methods to extend its service life.

5.3 Current Maintenance Practices

The County's Facility Operations staff conducts routine cleaning and inspection of pipelines within the Pine Valley SSA, as well as the additional eight (8) SSAs within the County's jurisdiction. The County's goal is to clean the Pine Valley SSA pipelines on a yearly basis.

Additionally, crews clean Special Maintenance locations on a quarterly basis. Currently, there are no Special Maintenance locations identified in the Pine Valley SSA.

5.4 Inspection and Assessment

Closed circuit television cameras offer valuable insight to the structural and maintenance condition of underground infrastructure. Video inspection of sewer pipelines is used to identify and evaluate the existence and severity of defects including cracks, misaligned joints, accumulation of roots or silt, and potential sources of infiltration. Figure 5-2 shows the pipelines in the Pine Valley SSA that were inspected and assessed.

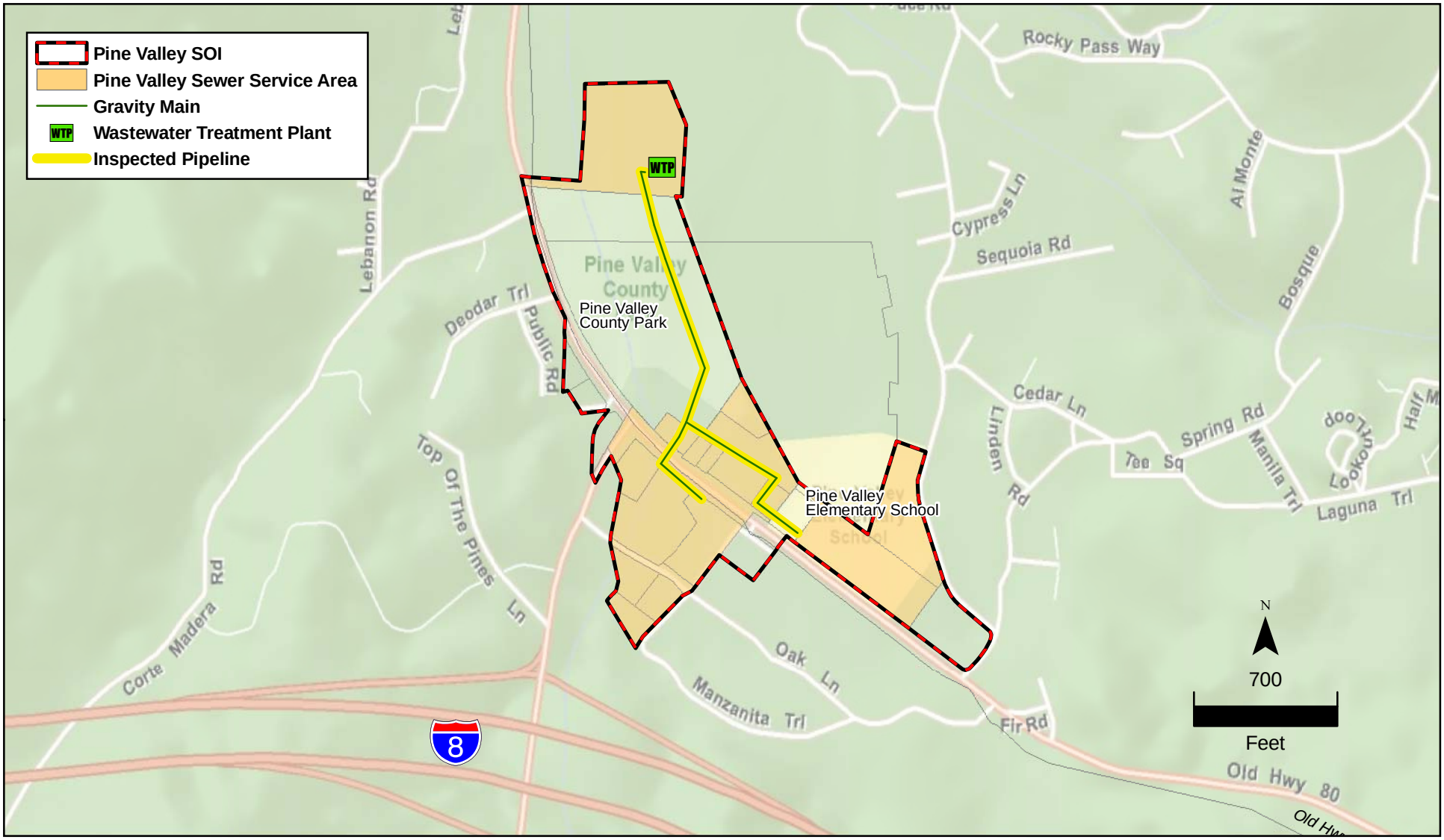
The video inspection for the Pine Valley SSA was performed by Houston and Harris, PCS, Inc. Standard observations and severity ratings were documented on video inspection logs, which included various locations of sewer mains with deficiencies including broken or cracked pipe, misaligned joints, debris, and root intrusion. Inspection log reports are provided in Appendix I. The inspection logs were independently reviewed by Atkins and each observation was assessed for its criticality to assist in determining the final sewer rehabilitation recommendations. The following sections describe the criteria and procedures performed during the inspection and assessment process.

5.4.1 Inspection Criteria and Procedures

For the purposes of this project, NASSCO inspection codes and ratings were used. Implementation of the NASSCO codes provides a consistent method in the manner with which the inspection was conducted and the observations noted. A summary of the observation codes used for the CCTV inspection are included in Appendix J. The numeric severity rating (1-5) assigned to the specific structural and/or maintenance observations are also defined. A NASSCO severity rating of one (1) is minor while a severity rating of five (5) is severe. The severity ratings, as noted, are automatically assigned based on the structural and/or maintenance observation noted by the CCTV operator.

5.4.2 Assessment Criteria and Procedures

For each sewer pipeline inspection conducted, the video record and log was independently reviewed as a quality check of the noted observations and respective ratings included in the database results and as confirmation that the data provided for performing the condition assessment was acceptable. The video inspection log for each pipeline segment was analyzed and ranked to indicate the criticality of the asset condition using a scale of “A” through “E” to indicate the severity of the pipeline’s condition, with “E” being the worst condition. Table 5-2 provides a summary of the general criticality ranking associated with the severity of the overall condition of the asset, as well as a general response time. The response time may be to reevaluate the condition of the asset and/or complete the recommended action. It should be noted that the actual response time for implementing a recommended action is dependent upon several factors. Therefore, assets with rankings of B or C should be re-inspected and reassessed prior to implementing the recommended action as further deterioration may occur or the pipe may remain in stable condition and thus can be reprioritized.



INSPECTED
AND ASSESSED PIPELINES

Figure 5-2

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Task_26_CMP\mxd\19047_Pine Valley_InspectedPipes_Fig 5-2.mxd

Table 5-2 Condition Severity Ranking

A	B	C	D	E
Good	Adequate	Moderate	Poor	Failing
Maintenance	5+ years	3 to 5 years	1 to 2 years	Immediate

The severity assigned to each sewer pipeline is based on the criteria listed in Table 5-3 to ensure consistency and uniformity in the process.

Table 5-3 Condition Assessment Criteria – Severity

Observation	Condition Criticality Ranking				
	A	B	C	D	E
Cracks • Circular • Longitudinal • Multiple	None	Very small hair line crack(s)	Hair line crack(s) <50% of ID in length	Cracks ≤1/8" wide or >50% of ID in length	Cracks >1/8" wide
Broken Pipe	None	Connecting cracks, no displacement	Connecting cracks, displacement ≤1/4"	Connecting cracks, displacement >1/4"	Collapsed pipe, impassable
Joints - Offset	Minimal	Up to 1/2 of the pipe thickness	1/2 to thickness of the pipe	Thickness of the pipe to 1½ times	> 1½ times the thickness of the pipe
Joints – Separation	None	Gasket exposed	Bell exposed	Dirt exposed at top	Dirt exposed at invert
Roots	Minimal	10% to 35% Fine roots	35% to 60% Fine/medium roots	60% to 80% Medium roots	80% to 100% Tap root(s) visible
Debris Accumulation	Minimal	Sporadic deposits (no rocks)	≤10% of ID (no rocks)	10% to 25% of ID and/or rocks	>25% of ID or impassable
Erosion (typical concrete pipe)	None	Rough surface	Exposed aggregate	Exposed rebar	Missing concrete
Mineral Deposits	None	Minimal (possible infiltration)	≤10% ID thickness	>10% ID thickness	Impassable, heavy mineral deposits
Infiltration	None	Dripping	Seeping	Constant stream	Gushing water
Sag	None	Minimal (probably not perceptible)	≤25% of ID	25% to 75% of ID	>75% of ID
Flow Capacity	Minimal	2/5 or less full	2/5 to 1/2 full	1/2 to 3/4 full	3/4 to totally full

Using the applicable observation and severity, a preliminary recommendation for each pipeline segment was determined. Table 5-4 summarizes the preliminary recommendations for each observed condition and severity ranking.

Table 5-4 Preliminary Pipeline Recommendation Criteria

Observation	Condition Criticality Ranking				
	A	B	C	D	E
Cracks • Circular • Longitudinal • Multiple	No Action	No Action or Rehabilitate	No Action or Rehabilitate	Rehabilitate	Rehabilitate or Replace
Broken Pipe	No Action	No Action or Rehabilitate	Point Repair or Rehabilitate/ Replace	Point Repair or Replace	Immediate Point Repair
Joints – Offset	No Action	No Action or Rehabilitate	Point Repair and/or Rehabilitate	Point Repair and/or Rehabilitate/ Replace	Point Repair and/or Rehabilitate/ Replace
Joints – Separation	No Action	Rehabilitate	Rehabilitate	Point Repair and/or Rehabilitate/ Replace	Rehabilitate or Replace
Roots	No Action	Clean and Rehabilitate	Clean and Rehabilitate	Clean and Rehabilitate	Clean and Rehabilitate/ Replace
Debris Accumulation	No Action	Clean	Clean	Clean	Clean
Erosion (typical concrete pipe)	No Action	Rehabilitate	Rehabilitate or Replace	Rehabilitate or Replace	Replace
Mineral Deposits	No Action	No Action or Rehabilitate	Point Repair or Rehabilitate	Rehabilitate	Rehabilitate
Infiltration	No Action	No Action or Rehabilitate	Point Repair or Rehabilitate	Rehabilitate	Rehabilitate
Sag	No Action	No Action	Any Option	Replace	Replace
Flow Capacity	No Action	No Action	No Action	Evaluate Capacity	Evaluate Capacity

5.5 Sewer Pipeline Inspection and Assessment Results

The sewer pipelines inspected were initially evaluated using the NASSCO Rating System and were subsequently more thoroughly assessed by conducting a comprehensive review of the videos, still images, and any additional data available. Prior to scheduling maintenance efforts and/or implementing repair and rehabilitation improvements, information included in the appendices should be further reviewed for additional detailed information pertaining to the specific condition of the pipelines inspected and assessed.

Overall, the pipe segments inspected are generally in fair to poor condition. Approximately 85 percent of the pipelines inspected were identified as requiring some form of repair or rehabilitation while approximately 15 percent were identified as requiring No Action. Table 5-5 includes a summary of the recommended actions based on the number of pipe segments and pipe length inspected and assessed while Table 5-6 includes a summary of the criticality ratings

based on the number of pipe segments and pipe length inspected and assessed. Figure 5-3 graphically presents the pipeline inspection and assessment findings by the length of pipe inspected.

Although Table 5-5 illustrates that approximately 85 percent of the system requires some form of repair or rehabilitation, Table 5-6 illustrates that the deficiencies documented for 65 percent (1,783 linear feet) of the system should be further evaluated for implementation within the next 5 years.

Table 5-5 Recommended Actions by Segment and Length

Description	No Action	Repair/Rehabilitate	Total
Number of Segments	2	10	12
Length (feet)	439	2,370	2,809
Percentage by Length	15.6%	84.4%	100.0%

Table 5-6 Summary of Criticality Ratings by Segment and Length

Description	Criticality					Total
	A	B	C	D	E	
No of Pipeline Segments	2	3	3	4	0	12
Length (feet)	439	587	775	1,008	0	2,809
Percentage by Length	15.6%	20.9%	27.6%	35.9%	0.0%	100.0%

Figure 5-3 Pipeline Inspection and Assessment Findings by Percentage of Length

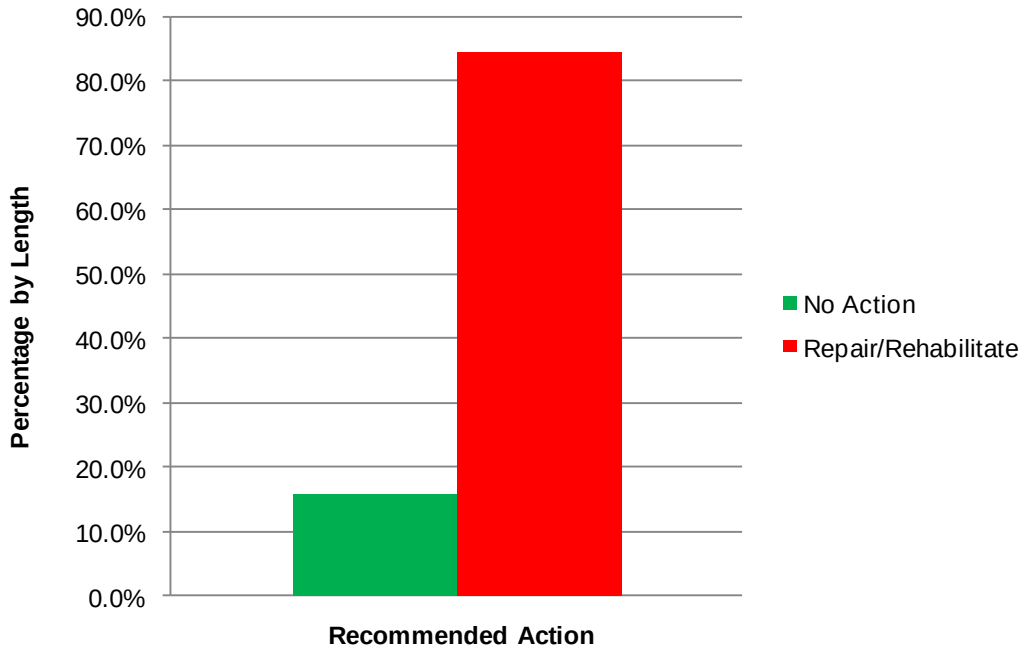


Figure 5-4 illustrates the recommendations for the pipelines within the SSA that were inspected as assessed based on age. It should be noted that according to the information included in the County GIS information, only two (2) of the pipelines inspected and assessed were constructed in the 1980s and consist of ABS pipe. The remaining pipelines inspected and assessed were constructed in the 1960s and have been in service for over 50 years.

Figure 5-4 Pipeline Inspection and Assessment Findings by Age

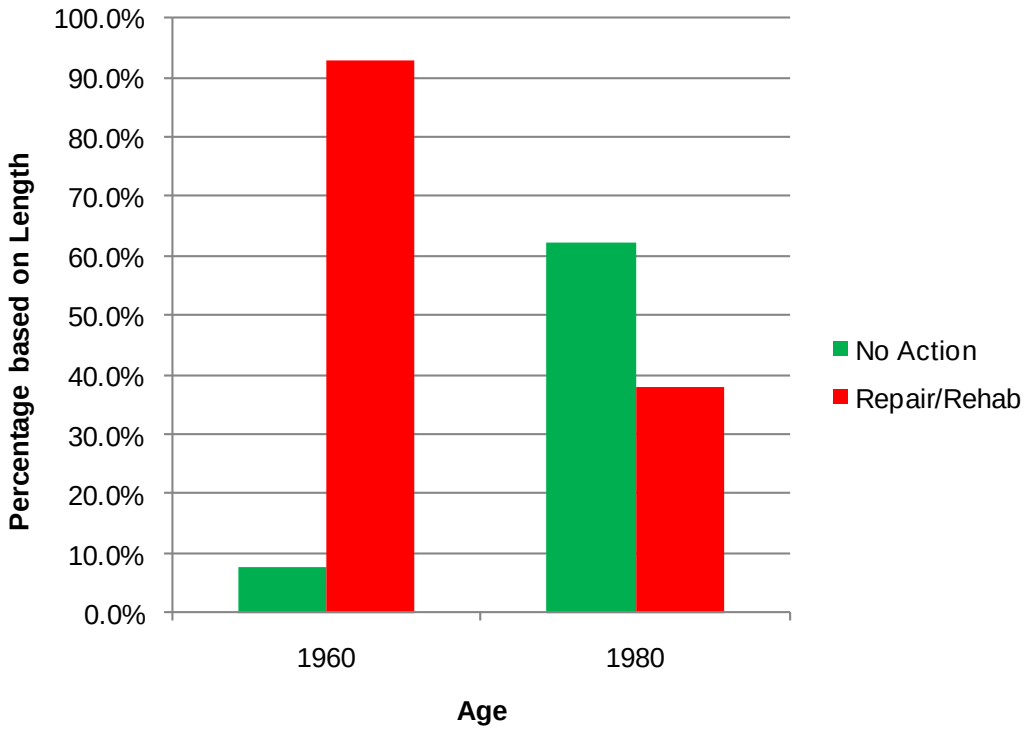


Table 5-7 summarizes the number of pipe segments and length of pipe inspected and assessed by material type while Figure 5-5 illustrates the recommendations for the pipelines that were inspected and assessed based on material type.

Table 5-7 Pipeline Inspections by Segment and Material

Description	Material		
	ABS	VCP	Total
Number of Segments	2	10	12
Length (feet)	431	2,378	2,809
Percentage by Length	15.3%	84.7%	100.0%

Figure 5-5 Pipeline Inspection and Assessment Findings by Material

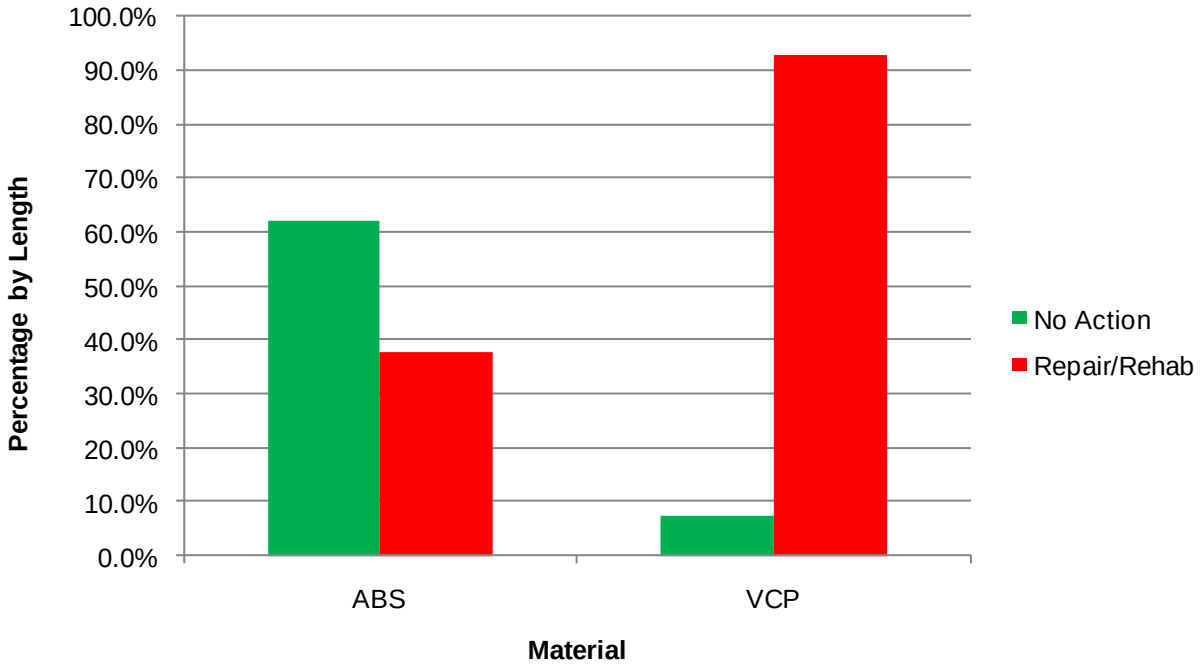


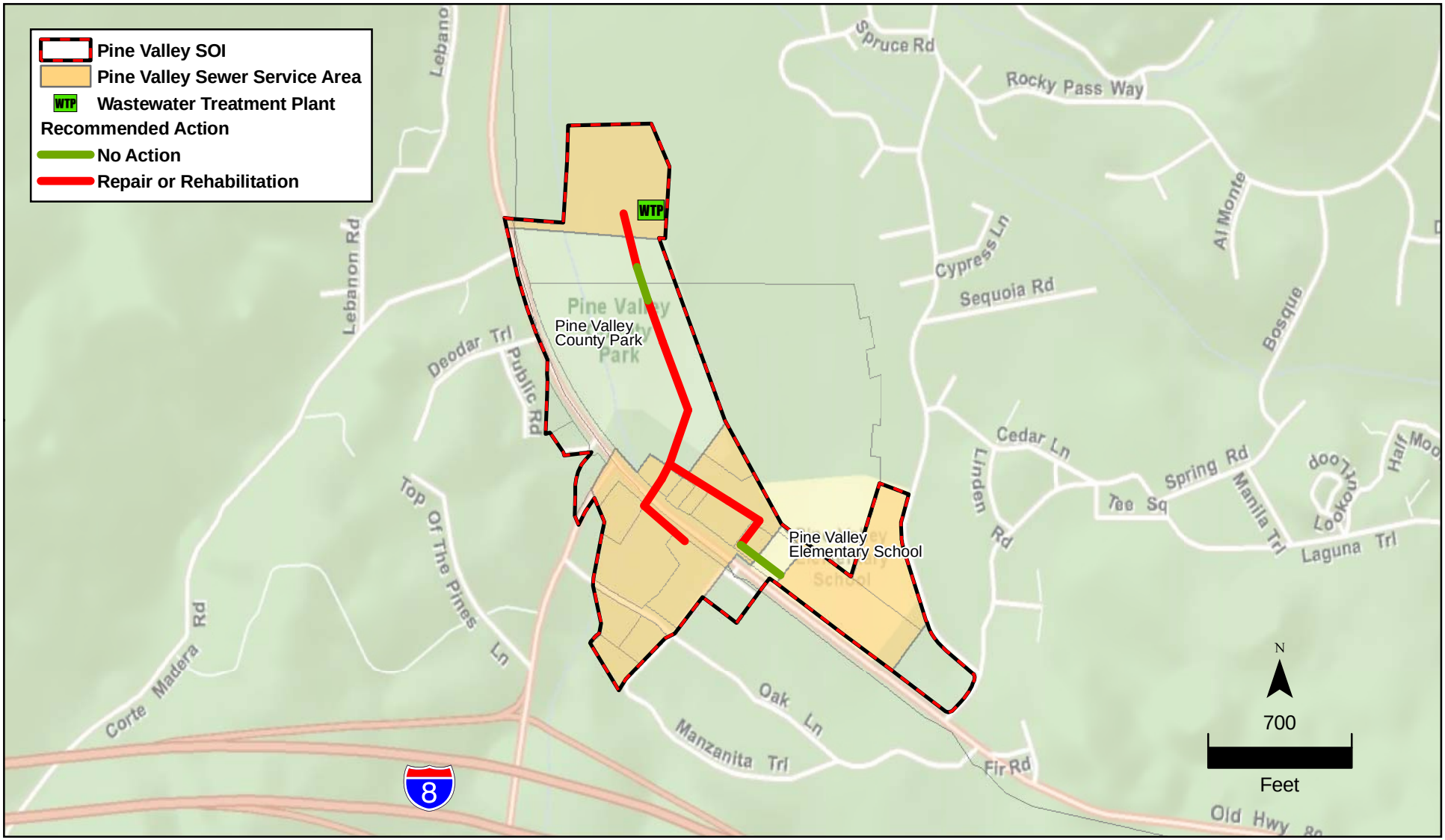
Figure 5-6 illustrates the locations of the recommended actions for the pipelines inspected in the Pine Valley SSA. The recommendations include No Action and Repair/Rehabilitate. Detailed pipeline recommendations are included in Appendix K.

Based on the results of the inspection and assessment of nearly the entire wastewater collection system within the Pine Valley SSA, it is estimated that approximately 2,400 linear feet (0.45 miles) requires a form of repair or rehabilitation over the next 10-15 years.

5.6 County Condition Assessment Procedures

As part of the County's assessment process, pipelines identified as requiring repair, rehabilitation, or replacement are reviewed and prioritized in compliance with the County's Major Maintenance Project Program. Inspection videos and photos captured during the inspection process, of pipelines which were identified to contain noted defects, are reviewed and assessed by staff in the County's Major Maintenance Project Program. The defects are scored according to defined criteria and then ranked to indicate the criticality of the asset condition. The scoring procedure is based on the type of defects noted and defined severity criteria. Points assigned range from 0 to 3, with 3 being the most severe for each criterion.

Table 5-8 includes a summary of the scores and severity rankings for the pipelines inspected and assessed in the Pine Valley SSA. Additionally, the score for each of the six (6) criterions used to prioritize projects for the Major Maintenance Project Program are summarized. For the purpose of this study, it was assumed that SSOs have not occurred at these facilities.



RECOMMENDED ACTION

Figure 5-6

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Table 5-8 Pipe Valley SSA Pipeline Assessment Scores and Rankings

Mainline ID No.	Recommended Action	Condition of Facility System	Age of Components, System and/or Facility	Pipe Flow ratio (peak dry weather)	Previous SSOs	Proximity to Watercourse	Blockage or Damage	Total Score	Ranking
PV0002	Sectional Line	0	3	0	0	0	2	5	2
PV0003	No Action	0	3	0	0	0	0	3	1
PV0004	Line & T-Liner	0	3	0	0	0	3	6	2
PV0005	Line	0	3	0	0	0	1	4	2
PV0006	Line	0	3	0	0	0	2	5	2
PV0007	Line	0	3	0	0	0	1	4	2
PV0008	Line	0	2	0	0	0	2	5	2
PV0009	Sectional Line	0	3	0	0	0	1	4	2
PV0010	Line	0	3	0	0	0	2	5	2
PV0011	Line & T-Liner	0	3	0	0	0	3	6	2
PV0012	Sectional Line	0	3	0	0	0	1	3	1
PV0013	No Action	0	2	0	0	0	0	2	1

The total score for each potential project is then ranked to establish the criticality of the project. Table 5-9 provides a summary of the general criticality ranking associated with the total score for each asset as well as the recommended response time to complete the recommended action for Major Maintenance Program projects.

Table 5-9 Condition Criticality Ranking-Major Maintenance Projects

Score/ Points	Ranking	Design/ Construction Schedule	Project Assessment	Assessment Description
15-13	5	Within 4 Months	Critical	Recent SSO; Exceeded Capacity; Known Failure/Blockage Points; Maintenance Intensive
12-10	4	4-6 Months	High Priority	Severe Deterioration; SSO History: Potential Blockage/SSO; Maintenance Intensive
9-7	3	6-12 Months	Serious	Severe Deterioration; Near Capacity; Maintenance Intensive
6-4	2	12-24 Months	Major	Visible Deterioration and Near Allowable Capacity
3-1	1	24 Months Plus	Discretionary	Functional; Minor Deterioration; Below Capacity

Based on the summary included in Table 5-8, the scores generally range from 2-6 and rankings consist primarily of 1s and 2s. Therefore, based on the County Major Maintenance Project Program assessment process, the rankings indicate that there are currently no repair or rehabilitation projects that require attention within the next 12 months.

For the pipelines identified as potential improvement projects, Table 5-10 includes a summary of the severity rating results based on the inspection and condition assessment criteria and process presented in Section 5.3 and the total score and ranking based on the County assessment procedures implemented as part of the Major Maintenance Program described above.

The Condition Severity Rankings included in Table 5-3 and the rankings summarized in Table 5-10 are each associated with a recommended response times. Although there is some correlation between the response times in the tables, the response time associated with the County assessment process serves to identify and schedule potential projects within a 24 month period while the response time associated with the severity rankings extends beyond a 5 year period. Therefore, as a project is confirmed for implementation, it is recommended that the project be reviewed in conjunction with the existing CIP and Major Maintenance Project Program as it may have already been identified and planned for construction or its proximity to scheduled projects may affect the actual response time. Additionally, the scores for each criterion used to determine the total score for each project should be further reviewed to verify the scores are appropriate (i.e., it was assumed that no previous SSOs occurred at the assets) as it may affect the overall score, project ranking, and thus the recommended response time. Further discussion regarding the timing of necessary improvements is included in Chapter 6.

Table 5-10 Summary of Severity Ratings and Major Maintenance Program Rankings

Mainline ID No.	Line Length (Feet)	Severity Rating	Recommended Action	Total Score	Ranking
PV0002	265	C	Sectional Line	5	2
PV0003	171	A	No Action	3	1
PV0004	212	D	Line & T-Liner	6	2
PV0005	345	B	Line	4	2
PV0006	347	C	Line	5	2
PV0007	346	D	Line	4	2
PV0008	180	D	Line	5	2
PV0009	79	B	Sectional Line	4	2
PV0010	163	C	Line	5	2
PV0011	270	D	Line & T-Liner	6	2
PV0012	163	B	Sectional Line	3	1
PV0013	268	A	No Action	2	1

5.7 Treatment Plant Assessment

A visual inspection was performed of the PVWPCF with County operations staff to assess the physical condition of the facility on October 10, 2011. The treatment plant's structure and condition were inspected and assessed. Recommended phased condition improvements were based on the visual inspection and current staff maintenance concerns.

Aeration ponds have tethered surface aerators and operate in serpentine fashion and exhibit an extensive duck weed problem. The bottoms of the aeration basins have a sludge layer that is approximately 6-inches deep. The ponds have not been dredged in several years and need to be re-dredged.

The percolation ponds require drying and "tilling" the pond bottom. Percolation rates decrease if annual maintenance is not performed on the percolation ponds. The existing percolation ponds have not had annual maintenance for the past 5-years. The bottoms of the percolation ponds may require a sand layer for improved percolation.

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CHAPTER 6
PROPOSED CAPITAL IMPROVEMENT PROGRAM

This chapter presents the proposed CIP based on the findings of the Master Plan and includes:

- development of unit costs,
- capital improvement project summary of cost and timing, and
- proposed condition upgrades and estimated costs.

6.1 Development of Unit Costs

The unit cost estimates reflect full capitalization inclusive of planning, engineering design, environmental, legal, construction, construction management and contract administration. The values are presented in mid-2010 dollars based on an anticipated ENR Construction Cost Index of 9969 for the Los Angeles/Orange County area. These estimates are based on representative available data from the County and Atkins' available data at the time of this report; however, since prices of materials and labor fluctuate over time, new estimates should be obtained at or near the time of construction of proposed facilities.

6.2 Recommended CIP Program

The CIP projects identify improvements needed to improve the condition and operation of the PVWPCF. Pine Valley SSA CIP projects are proposed for Phase II at an estimated cost of $235,000. Proposed CIP projects recommended for the Pine Valley SSA are listed in Table 6-1.

Table 6-1 Pine Valley Master Plan Capital Improvement Program

CIP #	Project	Description	CIP Cost
PV-1	Pine Valley WWTP Upgrades	Dredge aeration ponds and miscellaneous improvements to percolation beds	$235,000

6.3 Condition Related CIP Projects

The CCTV inspection and condition assessment of the pipelines within the Pine Valley SSA served to identify condition related defects in the wastewater collection system. The condition of the pipelines was used to determine the most effective method of repair or rehabilitation to restore the asset to its most efficient operating condition. Consequently, recommendations for improvements based on the noted defects assists in optimizing the expenditures for the wastewater collection system by targeting available funds to the pipelines that require attention with the most cost effective improvement method.

Specific recommendations were developed based on the results of the condition assessment for the pipelines televised and assessed. Detailed pipeline condition assessment and repair and/or rehabilitation recommendations are included in Appendix L.

6.3.1 Basis of Costs

The wastewater collection system within the Pine Valley SSA consists of 8-inch diameter pipeline and the recommended rehabilitation methods primarily include a form of lining including full-length lining, sectional lining, and T-Liners at various locations. The base unit costs for pipeline material and installation constitute the principal elements of the wastewater collection system facilities and reflect factors that include eighteen (18) percent to account for design and construction management costs and a twenty (20) percent contingency to account for potential unanticipated design and construction conditions, and traffic control issues. Special circumstances (e.g., jacking, trenchless installations, tunnels, etc.) are considered separately on a case-by-case basis. Unit costs ranging from approximately $205/LF to $215/LF were used for estimating potential improvement costs.

Table 6-2 summarizes the estimated cost to repair/rehabilitate the recommended pipelines within the Pine Valley SSA. The estimated costs are based on the documented length of the pipeline segments and the recommended actions. Recommended actions that included cleaning and/or televising/re-televising were not included in the estimate as the necessary effort is managed as part of the County's overall preventative maintenance program.

Table 6-2 Estimated Costs for Pipeline Rehabilitation Projects

Mainline ID No.	Line Length (ft)	Severity Rating	Recommended Action	Estimated Total
PV0012	163	B	Sectional Line	$1,631
PV0009	79	B	Sectional Line	$3,262
PV0005	345	B	Line	$70,347
PV0010	163	C	Line	$33,966
PV0006	347	C	Line	$72,942
PV0002	265	C	Sectional Line	$1,631
PV0008	180	D	Line	$38,161
PV0007	346	D	Line	$72,009
PV0011	270	D	Line & T-Liner	$57,199
PV0004	212	D	Line & T-Liner	$46,102
			Total	**$397,252**

The total cost for these condition related projects are approximately $397,300. Generally, the cost for an individual project identified for the Major Maintenance Project Program is approximately $50,000. Based on the summary included in Table 6-2, four of the ten projects (totaling $272,500) listed are large enough that they would warrant inclusion in the CIP program while the other projects may be included in the Major Maintenance Project Program (totaling $124,800) or combined to create a larger rehabilitation project.

Currently, the majority of the wastewater collection system within the Pine Valley SSA is approximately 50 years old and consists of VCP pipe which typically has a service life of 50-70 years when it is properly installed, not disturbed, and roots are controlled. Based on the findings presented in Chapter 5, consideration of the pipelines with rankings of D should be considered for implementation within the next 2 years while assets with initial rankings of B and C should be re-inspected and re-evaluated for implementation in 3-5 years and prior to implementing the recommended action to determine whether further deterioration occurred or the pipe remains in stable condition. Reassessment of the pipe condition will help determine whether rehabilitation should be implemented or deferred and reprioritized.

As the system ages and the condition of the pipelines deteriorate, improvement costs increase and often lining cannot be completed due to the condition of the pipeline. Proactive asset management will minimize costs by completing the necessary rehabilitation prior to pipe failure as response to emergencies generally result in significantly higher costs. Therefore, it is recommended that the projects identified be reviewed, prioritized, and subsequently included in the appropriate program. Additionally, as the County proceeds towards implementation of the projects presented in this Master Plan, it is recommended that the engineering cost estimates be further refined to reflect project costs due to inflation and/or increases in construction costs.

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