



FINAL

CITY OF HEMET
WATER AND SEWER MASTER PLAN UPDATE
MARCH 30, 2021

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CITY OF HEMET WATER AND SEWER MASTER PLAN UPDATE

**PREPARED FOR THE CITY OF HEMET
PUBLIC WORKS DEPARTMENT
3777 INDUSTRIAL AVE
HEMET, CA 92545**

MARCH 30, 2021

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ABBREVIATIONS/ACRONYMS

Abbreviation	Description
MP	Water and Sewer Master Plan
GPD	Gallons Per Day
ADF	Average Daily Flows
MGD	Million Gallons per Day
SSMP	Sewer System Management Plan
O&M	Operation and Maintenance
EMWD	Eastern Municipal Water District
LHMWD	Lake Hemet Municipal Water District
H₂S	Hydrogen Sulfide
TCP	Trichloropropane
CIP	Capital Improvement Plan
FOGs	Fats, Oils and Greases
ACP	Asbestos-Cement Pipe
CIPP	Cured In Place Pipe
NPDES	National Pollution Discharge Elimination Standards
UWMP	Urban Water Management Plan
WADSY	Water Distribution System Analysis (Hydraulic Study)
MCL	Maximum Contaminant Level
PPM	Parts Per Million
PPT	Parts Per Trillion

INTRODUCTION

Objectives

This report presents findings and recommendations to update the current Water and Sewer Master Plan (Master Plan) for the City of Hemet Water and Wastewater Division, dated January 1991, and to provide recommendations for a comprehensive 10-year plan of operational and managerial activities, and capital improvements necessary to assure reliable and economical water and sewer service to the Department's customers now and in the foreseeable future.

The primary purposes of the Water and Sewer Master Plan update are:

1. Assure that the City of Hemet Water and Wastewater Division has adequate water distribution and sewage conveyance capacity within their service area to address their current and future demands and capacity requirements;
2. Review existing reports and documentation regarding water and sewer capacity and the condition of existing infrastructure, and evaluate the current Capital Improvement Plan to assure it adequately addresses water production and supply issues as well as any deficiencies identified in the water and sewer system;
3. Evaluate staff records and reports regarding the condition and reliability of the current infrastructure. Review maintenance practices and repair history. Make recommendations on rehabilitation and improvements to the City's water and sewer infrastructure and Capital Improvement Plan.

Water and Wastewater

Executive Summary

Water System Capacity – With few exceptions noted later within this Master Plan, the City’s water distribution system has adequate capacity to meet Peak Day demand. Individual projects are required to upgrade undersized four-inch pipes – primarily in residential neighborhoods – which are too small to meet peak demands or current fire flow standards. Other projects are necessary to allow system operators to remove contaminants through treatment to help meet water quality standards, or to allow for more efficient, cost-effective use of the City’s wells.

Reservoir capacity meets most of the City’s storage needs however it is lacking relating to providing storage which would allow staff to utilize off-peak pumping. Accordingly, staff has recommended the addition of a new storage tank and related transmission piping.

This Master Plan deals primarily with system capacity and not water supply reliability. For information regarding adequacy of water supply and production the City has prepared a comprehensive Urban Water Management Plan; please refer to that plan for additional information relating to water supply.

However, it bears note that recent changes in the regulatory environment are endangering the City’s continued reliance on groundwater as a primary source of supply. The City has experienced levels of Nitrate in exceedance of limits; this has resulted in the loss of several source supply wells. In addition, recently adopted regulations relating to the contaminant 1,2,3-Trichloropropane – a carcinogen – will require the City to add costly treatment devices to some wells. During the first quarter of 2018 the City’s water quality failed to meet the new 1,2,3 TCP regulations and had to remove two of their remaining four wells as a source of supply.¹

Water System Condition – The distribution system contains about 132.3 miles of pipe. Considering that portions of the system were constructed nearly 100 years ago the water system is in relatively sound condition. However, much of the pipelines and appurtenances have exceeded their planned service life and require rehabilitation and/or replacement in order to maintain system reliability. Additionally, newer portions of the system are approaching the age where they also require rehabilitation and/or extensive maintenance to prevent them from slipping into a state of disrepair.

There are numerous instances of dead-end lines, missing or damaged valves, or pipes that were constructed from materials that are no longer considered acceptable, such as bare steel. The City expends considerable resources repairing and maintaining these substandard lines.

The City relies almost entirely on groundwater for its water supply, however over the last several decades the City has lost wells – either through expired leases, damaged equipment or decreasing water quality. Due to the considerable cost to replace these wells and a lack of available funding for the projects very little effort has been made to replace these vital assets. In order to prevent a situation where the City has to purchase more expensive water supplies every effort should be made to secure needed funding for the replacement of lost well capacity.

¹ A loss of approximately 55 percent of their production capacity.

Staff has prepared a comprehensive Capital Improvement Program to begin to address these deficiencies. The backlog of maintenance/rehabilitation is extensive and costly. Many of the projects identified in the CIP will require new sources of funding; staff is pursuing alternative methods to finance these projects.

Sewer System Capacity - The City of Hemet owns, operates and maintains the gravity portion of the wastewater collection system within 6.75 square miles of the developed portion of the City boundaries. Wastewater pumping, treatment and disposal is provided through agreement with the Eastern Municipal Water District (EMWD).

Although the population within the City limits is expected to increase substantially within the next 15 years most of that growth will occur outside the service area of the City's Wastewater Department. Accordingly, future growth within the sewer service area is not anticipated to have significant effect on sewer system capacity.

Previous flow monitoring and hydraulic modeling studies concluded that the City's sewer system has adequate capacity to build out, and that has been verified by the observation and experience of City staff. Therefore, no sewer system expansion is necessary to reach build out.

Sewer System Condition - The exact age of the City's sewer infrastructure is not known, and most record drawings prior to the 1970s are nonexistent. Due to the system age, construction defects and type of pipe material portions of the City's gravity sewer system is in an advanced state of disrepair and requires immediate attention in order to safeguard the asset and to protect public health and safety. As a result of sewer pipe degradation staff is unable to video inspect approximately 20 percent of the sewer system.

A considerable portion of the City's sewer system was constructed from concrete-based pipe materials. Concrete is prone to hydrogen sulfide corrosion and the City's sewer system has extensive damage in several locations, including numerous holes and missing sections of pipe. Staff has developed a multi-year, ongoing Capital Improvement Program to address these deficiencies. In addition, the CIP includes plans to rehabilitate existing pipe segments before they reach the point of failure.

Staff's efforts to minimize sewage overflows is commendable as evidenced by the relatively low number of sanitary sewer overflows recorded by the Regional Water Quality Control Board. However, the advanced state decay found throughout the City's sewer system could lead to collapse of pipes which, in turn, would undoubtedly result in sewer spills and could pose a threat to public health. In addition, the observation of numerous pipe segments containing holes in the sidewalls or missing bottoms contributes to groundwater contamination which could impact the City's water supply.

The City Council prudently adopted the necessary rate structure and approved budgets to accommodate funding of the CIP, and both Administrative and Operation staff have already started the process of implementing the CIP. The City should continue to seek other sources of funding, such as state and federal low interest loans or grants to help offset the considerable cost of needed rehabilitation.



Photo showing holes in pipe side walls

The City of Hemet sewage collection system has adequate capacity to meet the current demands, and for projected growth to planned build out. Staff should consider conducting additional flow monitoring studies as the system approaches build out in order to validate existing data and to provide a baseline for the built-out system.

The backlog of sewer system rehabilitation projects is extensive; however, with proper planning, adequate dedication of resources, and support from policy makers the process of improving the City's sewer system can be completed in a timely manner.

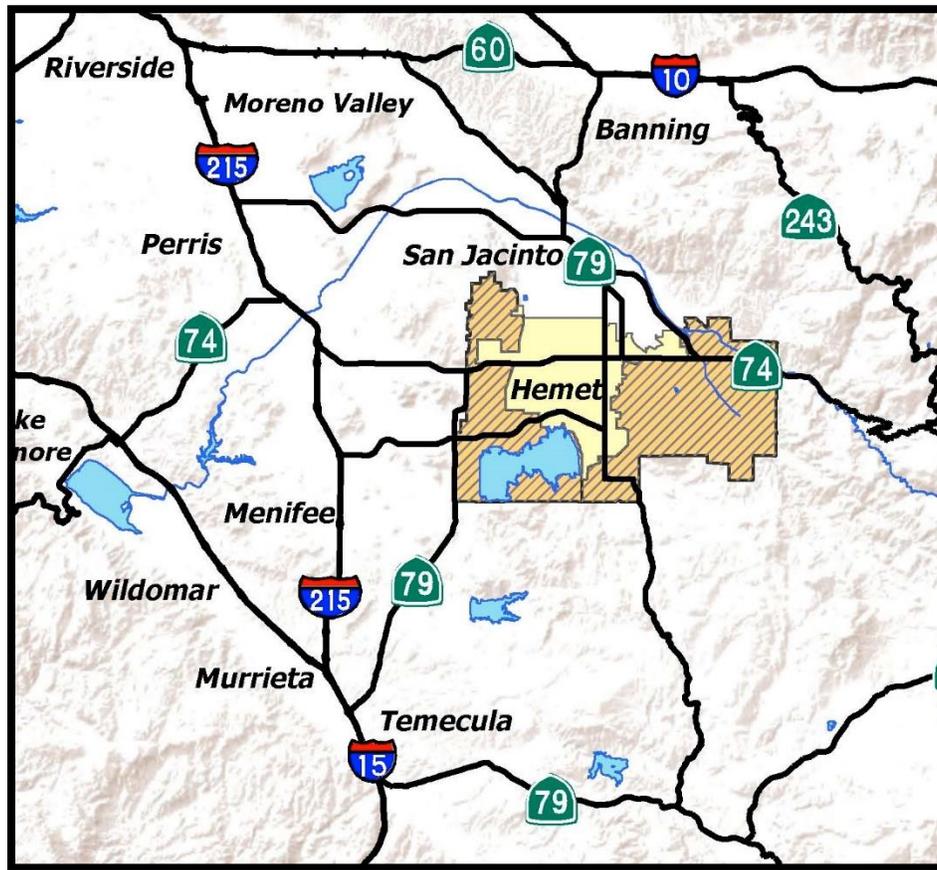
Water and Wastewater

Summary – The water and sewer systems within the City's service area meet current and projected capacity demands. However, both systems require extensive rehabilitation, retrofitting and/or replacement in order to continue providing adequate services to its customers. While the water system is generally in better condition than the sewer system, both systems have serious deficiencies that require immediate attention. In particular the City should focus on restoring groundwater wells in order to secure their main source of supply. Recent regulatory changes endanger the City's continued reliance on groundwater as a main supply source. Particular emphasis should be placed on development of treatment methods to protect groundwater as a vital and economical water supply.

City of Hemet Characteristics

The City of Hemet is located in the San Jacinto Valley, in the County of Riverside, California. Hemet and its surrounding communities have deep-rooted ties to the development of early California with settlement dating back to the 1800's. Hemet's historic contribution to the region include a robust agricultural community and cultural activities. Today it is home to many retired individuals as well as a significant population of younger residents who seek a less urban setting to raise their families.

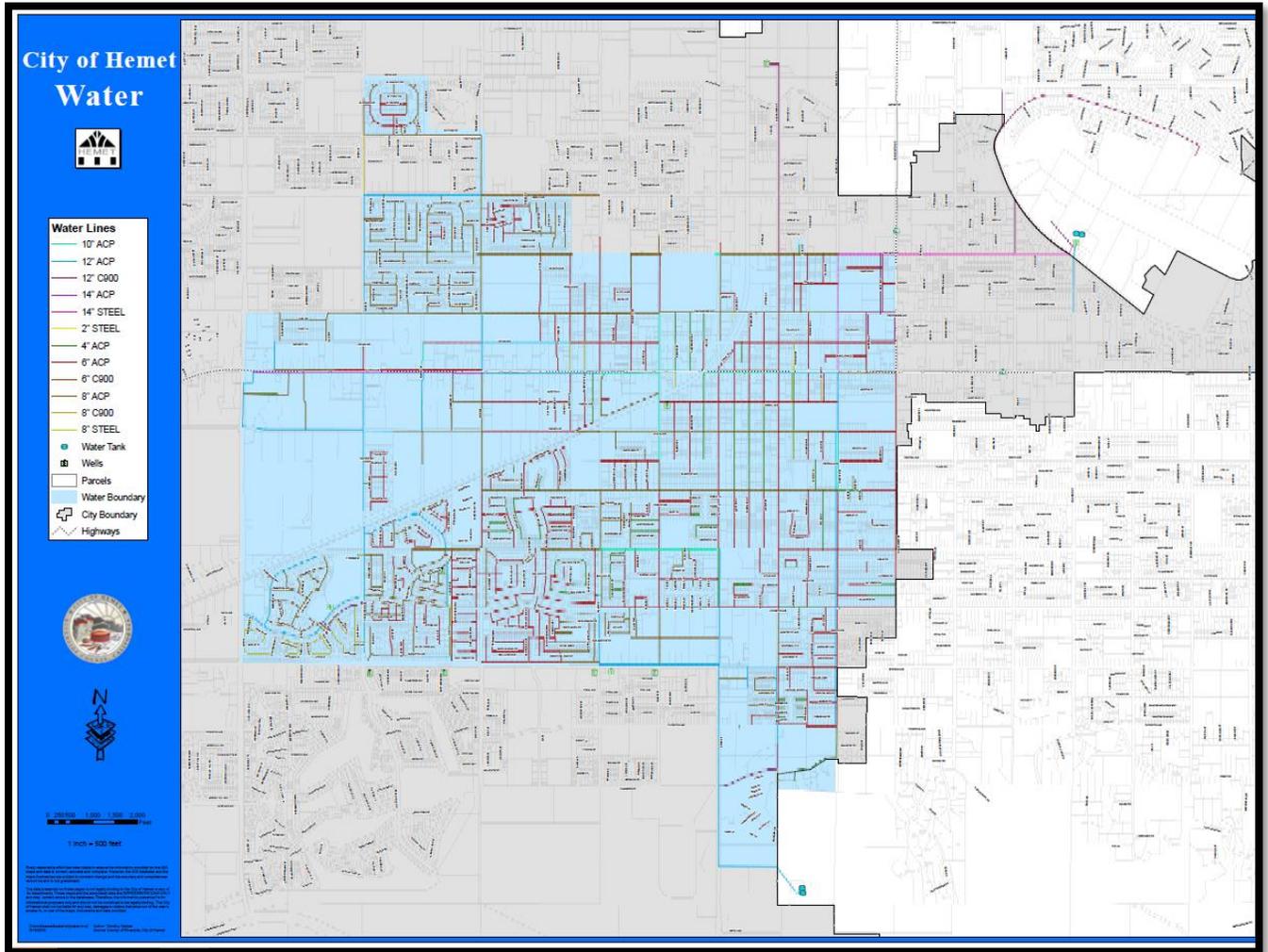
The City encompasses 27.8 square miles, and according to the 2020 census, was home to a population of 78,038 residents. The region is considered to be semi-arid, with an average annual temperature of approximately 70 degrees Fahrenheit, and average rainfall of 12.6 inches.



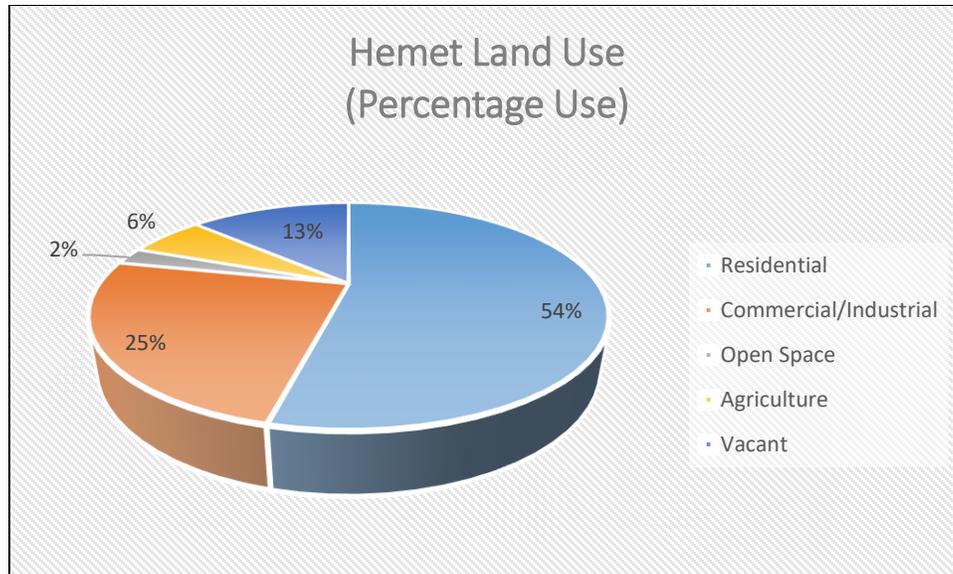
City of Hemet – Location Map

The City overlies the Hemet-San Jacinto Groundwater Management Area which is the major water supply for the City's water system. The basin has the potential capacity of up to 1 million acre-feet of water storage². Access to the basin is shared among other local users, both private and municipal. The basin is managed by a separate management plan.

² Hemet General Plan FEIR 2030



City of Hemet Water Distribution System Service Area (blue shaded area)



City of Hemet – Land Use by Percent

Land use within the City is a mix of residential, commercial/industrial, and other uses³. Development within the Hemet Water and Sewer service areas is nearly built out. Vacant land accounts for only 13 percent of the service area and consists primarily of smaller infill properties.

Historic population – City of Hemet

Year	Population
1970	12,252
1980	22,531
1990	36,094
2000	58,812
2010	78,053
2020 ⁴	85,175
2030 (Projected) ⁵	132,576

As is evident from the table above, since the last update of this Master Plan the population of the City has more than doubled. In addition, the City has become more diverse – both in population and industry. Many new areas have been developed and annexed to the City, and this growth and diversity has also changed the needs and demands on the water and wastewater systems. In general, the City has noticed a considerable decrease in per capita water use and sewage flows; a trend which is mirrored throughout the water and wastewater industry.

³ Southern California Association of Governments Land Use Database

⁴ Department of Finance E-5 1/1/20

⁵ Hemet General Plan FEIR 2030



City of Hemet Well # 2a

WATER MASTER PLAN



Park Hill Water Tanks # 1 and #2

WATER SYSTEM MASTER PLAN UPDATE - 2021

Previous Studies and Agreements

The preparation of this Water Master Plan update relied on several prior studies/plans as follows:

City of Hemet 2015 Urban Water Management Plan

Water suppliers who meet specific requirements must prepare a report assessing the long-term planning and reliability of water supplies. The report is submitted to the Department of Water Resources every five years. The City's 2015 was adopted in 2016. The Water Supply Assessment component of this Master Plan rely heavily upon the findings of the 2015 Urban Water Management Plan. For the purposes of this Master Plan only Volume One of the UWMP is included. (Appendix "A")

Metcalf and Eddy Water Distribution System Analysis – City of Hemet (1990)

In preparation of the previous Master Plan the City retained the services of Metcalf and Eddy to conduct hydraulic analysis of the water distribution system (Appendix "B"). That analysis was conducted using their Water Distribution System (WADSY) software program.

Typically, the preparation of a Master Plan would include a new hydraulic analysis, however given that there have been very few modifications to the distribution system that would significantly alter system parameters staff weighed the benefits of conducting a new hydraulic study against the time and financial resources required to perform a new study and opted to rely on the existing hydraulic analysis.

Since the City water system is nearing build-out consideration should be given to conducting a new hydraulic analysis of their water distribution system to provide baseline data prior to the next update of this Master Plan.

1. CHANGES AND REVISIONS FROM EXISTING WATER MASTER PLAN

CRITERIA	1990	PRESENT
Water Service Area	5.25 Square Miles	5.25 Square Miles
Annual Water Sales	5,319 ⁶ Acre-Feet	4,063 Acre-Feet
Miles of Water Mains	98 ⁷	132.3 Miles
Peak Day Production	11.54 Million Gallons ⁸	5.24 Million Gallons ⁹
Storage Capacity	5.75 Million Gallons	5.0 Million Gallons ¹⁰

⁶ Estimated since metering was not fully implemented.

⁷ Estimated since no accurate mapping was available at that time. System mapping occurred after last MP update.

⁸ Historic water use is estimated due to a high percentage of unmetered water sales.

⁹ Reduced flows resulting from decrease in agricultural demands and consumer conservation efforts.

¹⁰ Seismic retrofitting of existing tanks resulted in reduced storage capacity

2. BACKGROUND

The City of Hemet water production and distribution system covers an area of approximately 5.25 square miles. The area served runs generally from Menlo Avenue on the North to Stetson Avenue on the South, and from Sanderson Avenue on the West to San Jacinto Street on the East.

The City relies almost entirely on groundwater production as their main supply source. Groundwater is pumped from the Hemet-San Jacinto Groundwater Management Area. Water production facilities currently include three operating wells, and four storage reservoirs with a capacity of 5.0 million gallons. The City also has exchange agreements with both EMWD and LHMWD to provide two-way sharing of water supplies during emergencies.

Water is distributed through a network of 132.3 miles of pipe ranging in size from four inches to 24 inches in diameter. Pipeline materials include steel, concrete, asbestos-cement and PVC.

Both the Eastern Municipal and Lake Hemet Municipal Water Districts provide water service to customers within the incorporated City limits but outside the 5.25 square mile service area of the City of Hemet water service area.

3. EXISTING WATER SYSTEM

The existing City of Hemet water production, storage and distribution system consists of multiple wells, storage tanks and distribution piping all operating under very nearly ideal operating conditions. From a geographic perspective the service area is quite flat which allows the design of a distribution system with only one hydraulic zone.

Water is pumped from the groundwater basin at lower service elevations and is stored in reservoirs situated on higher ground, thereby creating constant hydraulic head. This results in an efficient and reliable distribution system which readily adapts to changes in system demand.

Significant portions of the distribution system were constructed nearly 100 years ago. This original grid was built at a time when per capita water use was much lower than currently exists. Accordingly, much of the older system consisted of four and six-inch piping with limited flow capacity. Some of the system even contains two-inch steel pipe.

As the population expanded the water demands also increased. The City installed new distribution and transmission mains in an effort to accommodate the needs of the community. These newer sections of the system are in sound condition but are reaching the age where they will soon require rehabilitation to preserve the asset. The City has generally kept current with industry trends and technology and has made significant improvements to its water system since the last Water Master Plan.

Today the City operates and maintains its water system in an efficient and professional manner. Although components of the production, storage and distribution system require attention the over-all system is generally in sound condition and provides reliable service to the consumer. Newly constructed facilities are required to be designed and built according to current design manuals and specifications utilizing modern materials and current technology. When existing components of the system are repaired or rehabilitated they are also brought up to current design criteria.

The water system is operated and maintained by experienced and knowledgeable staff holding appropriate certification by the State of California for the level of work performed. The City also supports the water system staff with a professional engineering department and other support services such as purchasing, vehicle maintenance, human resources and other administrative services.

The Capital Improvement Program identifies necessary rehabilitation, additions and upgrades required for the system, however in general the water system is in much better condition than the City's sewer collection system.

Water Wells

The 1990 Water Master Plan identified 11 water wells serving the City; of those seven were owned by the City and four were leased wells. Today, only three of those wells remain in production,¹¹. Water wells have been decommissioned in the past due to water quality degradation, lease expiration, and reliability issues. In some cases, the well casings and pumps simply wore out and were not replaced. The current CIP program identifies projects to restore some of those wells to service.

In addition to restoring existing wells, the City has plans to develop new wells to help restore water production capability. Since the City relies nearly entirely on groundwater for their water supply these efforts to restore or develop capacity should be given top priority. Additional concerns regarding upcoming water quality regulations jeopardizes the City's continued use of at least two wells. Please refer to **Section 5, Water Quality/Water Supply, Groundwater Quality**, for additional information.

¹¹ As of May 2018, wells #15 and #16 were removed from service due to levels of 1,2,3 TCP in excess of regulatory requirements. Staff hopes to return these wells to service after the addition of treatment systems.

City of Hemet Water Well Status

NAME	LOCATION	DATE DRILLED	STATUS	CAPACITY GPM
2A	W. Kimball	2011	In Service	1300
12	Park Ave	1949	In Service	300-500
10A	Augusta	2017	In Service	700

Wells Currently in Production

1	Devonshire	1955	Out of Service 2012 – Nitrates	500
2	W. Kimball	1949	2010 – casing failure and Nitrates	300-500
3	S. Gilbert	1961	High Nitrates	500-900
4	S. Palm	1972	High Nitrates	500-700
5	Mariposa	1944	High Selenium	400-700
6	Park	1977	Lost Lease	500-700
7	Bottle Tree	1971	Sand Bound 2014	500-800
8	Stetson	Unknown	Lease Canceled 2002	400-500
9	Park	1985	Lost Lease	1000-1300
10	Augusta	1943	Casing failure	400-700
11	W. Stetson	1948	Lost Production (New Well #14)	600
13	Buena Vista	1992	High Fluoride	800-1300
14	W. Stetson	1993	High Nitrates	500-600
15	Johnston	2002	1,2,3 TCP	1100-1250
16	W. Stetson	2004	1,2,3 TCP	900-1000

Wells Currently Out of Service

Water Distribution Facilities

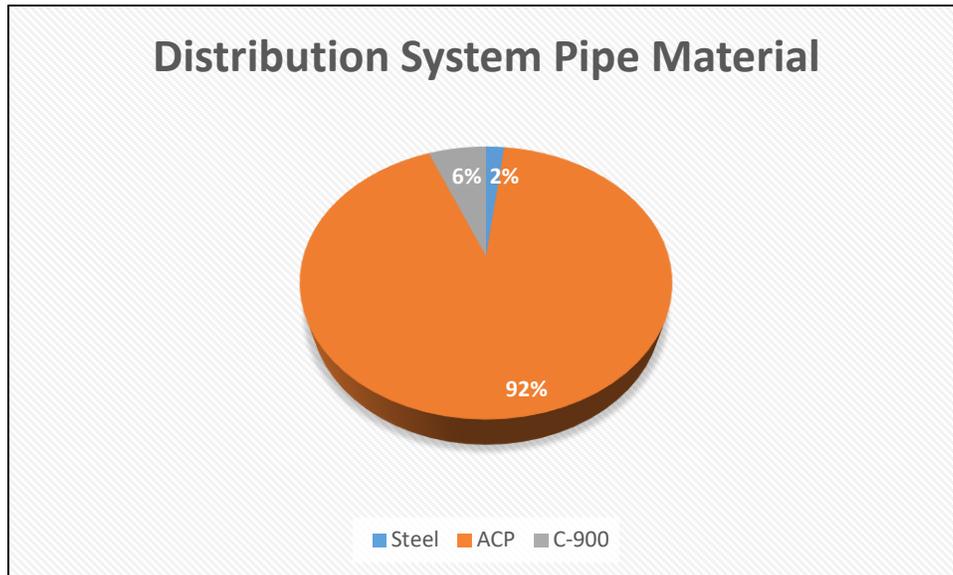
Pipelines - The City's water distribution system consists of a network of 132.3 miles of pipe ranging in size from two inches to 14 inches in diameter. Water is distributed through a single gravity-fed hydraulic pressure zone.

Pipeline materials include steel, asbestos-cement and PVC. The CIP identifies several rehabilitation projects required to maintain a high level of service to various facilities however adequate funding is lacking for some critical projects.

In contrast to the storage facilities which do provide adequate storage to meet peak and fire flow demands, the distribution system is lacking in such capacity. The 1991 WADSY analysis identified numerous sections of the transmission and distribution systems which are inadequate to accommodate required fire flow needs during maximum day demands. The study also pointed to the fact that undersized pipelines result in higher head losses which in turn increases the amount of electricity required to move water within the system during peak demands or when refilling tanks.

In addition to the capacity constraints there are numerous instances of dead-end lines, missing or damaged valves, or mains constructed from pipe materials that are no longer considered acceptable (such as bare steel).

Staff has developed numerous plans to rectify the most serious of these capacity restrictions. The CIP identifies projects to increase transmission pipeline capacity and to replace aging pipelines in residential areas. However, these projects are very costly and require additional sources of funding prior to proceeding with design and/or construction.



Valves – The matrix of transmission and distribution pipelines that comprise the water system is controlled by approximately 4,265 valves ranging in size from two-inches to 24 inches in diameter. Staff exercise the valves at a rate of approximately 20 percent per year. Throughout older sections of the distribution system some of the valves fail to seat completely. This requires crews to isolate larger portions of the distribution grid when performing maintenance.

Pump Stations – The City does not operate any pump stations.

Water Storage

The water system relies on four different tanks to store water to accommodate variations in production and demand during routine operation and to provide a pressurized water supply during emergency conditions such as during power outages or in order to meet fire flow demands.

Tanks number One and Two is located at Park Hills, which is situated on the northeast side of the distribution system. Tanks number Three and Four sits on Echo Hill, on the southern end of the distribution system.

FACILITY NAME	CAPACITY	PAD ELEVATION	OVERFLOW ELEVATION	LAST CLEANING	DATE RECOATED	YEAR COMMISSIONED
Tank #1	1.3	1738	1778	January 2003		1954
Tank #2	1.1	1738	1778	January 2003		1962
Tank #3	1.3	1737	1777	January 2003	January 2017	1967
Tank #4	1.3	1737	1777	January 2003		1979

The 1991 Master Plan identified total system storage capacity as being 5.25 million gallons. Since that time the tanks underwent seismic retrofitting which resulted in a slightly lower overflow level. As a result, water storage capacity currently stands at 5.0 million gallons.

Although current storage capacity is adequate to meet existing supply demands it is insufficient to allow staff to utilize off-peak pumping. The CIP includes a recommendation to add a third tank at the Echo Hills tank site to provide extra storage capacity that would allow staff to move water in a more cost-effective manner and to supplement fire flow demands and other emergency conditions. Staff is currently researching funding opportunities for this project.

The tanks are inspected by a diver every three years. Recent inspections of the storage tanks identified issues with the interior coatings. Staff has determined that recoating the tanks is necessary to help maintain water quality and to protect the structural integrity. The CIP includes projects to recoat the interior of the tanks over a four-year period.

4. POPULATION/WATER DEMAND RELIABILITY

The City of Hemet prepares an Urban Water Management Plan which evaluates and assesses the long-term planning and reliability of water supplies. The 2015 UWMP was utilized for this section of this Master Plan update. For a detailed description regarding water supply please refer to the UWMP.

POPULATION/PROJECTIONS

Population within the city limits is anticipated to see significant growth in coming decades. However, growth within the water distribution boundaries is not expected to see substantial change from current levels. Vacant land within the distribution system service area comprise approximately 13 percent of available land. Assuming that vacant land would be developed at similar density levels as current development leads to an estimated population at build out of approximately 36,000.

Year	Population
1990	24,869
1995	26,915
2000	28,139
2005	28,125
2010	29,214
2015	31,873
2020	32,600
2025	33,300
2030	33,800
2035	34,300
2040	34,600

Historic and Projected Populations within Distribution Service Area

HISTORIC/PROJECTED WATER USE

Since adoption of the last Water Master Plan per-capita water use has steadily declined. This trend has been noticed throughout the water industry and is generally contributed to technological advancements in water saving devices, water conservation efforts by consumers, and the downturn in the economy which affected commercial and industrial use.

In 2010 the state mandated water reduction plans which are anticipated to continue to reduce per-capita water use through 2020.

Year	Water Use in Acre Feet
2000	4,740
2005	4,405
2010	4,240
2015	3,750 ¹²
2020	3,890
2025	4,250
2030	4,250
2035	4,250

Historic and Projected Water Use

ABILITY TO MEET FUTURE DEMANDS

According to the findings of the 2015 UWMP, the City will be able to meet water demands during normal, single dry and multiple dry years relying primarily on groundwater production with supplemental purchases of domestic water. Attainment of meeting projected future demands depends upon completion of several projects identified within the CIP.

5. WATER SUPPLY/WATER QUALITY

SOURCES OF SUPPLY

The City relies almost exclusively on groundwater from the Hemet and San Jacinto groundwater basins as their main source of water supply. The City uses three deep wells; three in the Hemet Basin and one in the San Jacinto Basin. In addition, the City has connections with the EMWD and has historically imported minor quantities of domestic water to supplement demand as needed.

The basin and sub basins are adjudicated and managed as the Hemet/San Jacinto Groundwater Management Area; the Hemet/San Jacinto Groundwater Management Plan dated 2007 is the governing agreement. Recharge of the basin and sub basins is accomplished by both natural and artificial sources.

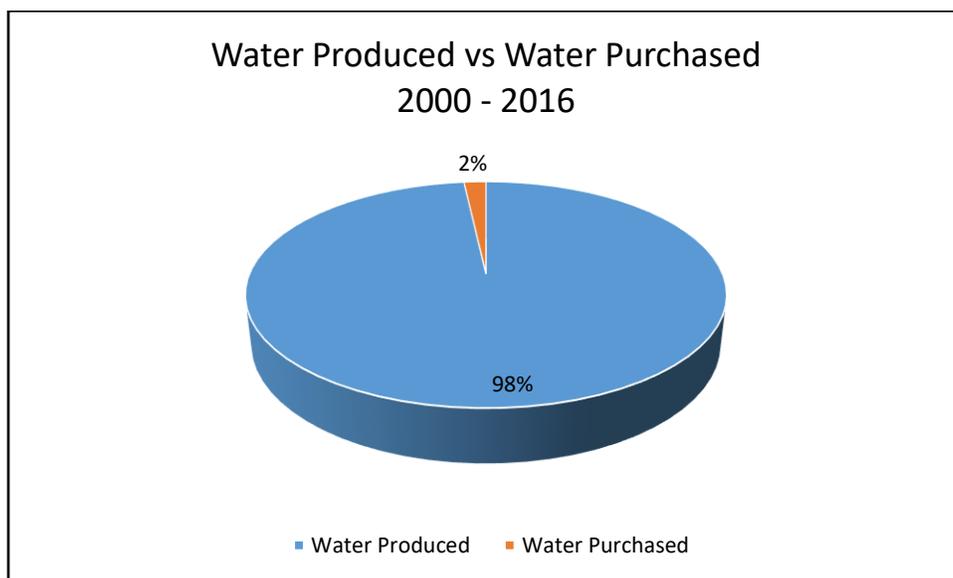
¹² In 2015 mandatory water use restrictions were in place as a result of extended drought.



City of Hemet Well #15

From a historic perspective the basin has been over drafted which has resulted in decreased water levels, changes in direction of flows within the basin, and diminished water quality. In addition to over drafting, the region's historic agricultural practices have resulted in water quality issues which affect potable uses.

The City also has the ability to purchase treated potable water from EMWD. Historically purchased water accounts for a small percentage of water use and has primarily been limited to water used for groundwater recharge.



GROUNDWATER QUALITY

Although groundwater quality is generally acceptable within the basins the City has experienced limited incidents of groundwater quality exceeding maximum contaminant levels – primarily for Nitrates which are attributed to the region’s agricultural past. Several wells have been removed from service due to water quality concerns, which places additional demand on those wells remaining in service.

Also, of significance is the State’s recently adopted Maximum Contaminant Level (MCL) for 1,2,3-Trichloropropane, also known as 1,2,3 TCP, which is a chlorinated hydrocarbon found at industrial or hazardous waste sites, and has been used as a cleaning and degreasing solvent and also is associated with pesticide products. 1,2,3 TCP is a carcinogen. The new MCL has been established at 5 parts per trillion (PPT). Beginning in 2018 the City implemented quarterly sampling of source water for 1,2,3 TCP. That analysis found the levels of 1,2,3 TCP at Wells #15 and #16 in excess of the limits. As a result, staff had to remove the two wells from service until a treatment system can be constructed. The loss of these two wells severely limits the City’s water production capacity and may require the purchase of more costly imported water.

Additional demands placed on the groundwater basins by all users, various sources of contamination and pollution, and climatic change all have the potential to impact groundwater quality. The City has identified several projects necessary to help assure water quality meets acceptable standards including the addition of new wells, pipelines to allow blending of water to reduce contaminant levels, and water treatment facilities to remove Nitrates and/or 1,2,3 TCP prior to water being introduced into the distribution system. Those projects are identified in the Capital Improvement Projects.

6. CAPITAL IMPROVEMENT PROGRAM

City staff have identified and recommended numerous construction and rehabilitation projects that are necessary to continue to meet current demands, and which will be needed to meet projected demands in the future. Those projects are included in the comprehensive 2017 Public Works Department CIP program. It is also worthy of mention that some projects contained within the Sewer System Capital Improvement Plan could help improve groundwater quality by eliminating potential sources of contamination.

Unfortunately, funding and engineering resources for the CIP is limited. This requires attention to be focused on the most critical projects while staff researches alternative funding and/or financing of these projects. This Master Plan focuses on those projects deemed a high priority in the current CIP.

Nitrate Removal System

In 2017 the City retained the services of AdEdge Water Technologies to conduct a pilot-scale demonstration of treatment and removal of nitrate from the City’s groundwater at Well Number 4. Utilizing a two-stage fixed bed bioreactor system the contractor was able to successfully demonstrate over the 73-day test period that the treatment method could reduce nitrate to an acceptable level.

However, cost estimates for the addition of a treatment facility are estimated at between \$9 and \$10 million dollars; the City will also need to acquire land for the treatment plant construction. As currently envisioned a treatment plant will only serve one well head. Staff is currently evaluating options and applying for grant funding for this project.

1,2,3 TCP Removal System

In 2018 new requirements for monitoring of the contaminant 1,2,3 TCP go into effect, with action required as early as 2019. Based on preliminary monitoring for 1,2,3 TCP staff expects the water pumped from wells 15 and 16 to exceed the MCL. This would require the City to act which could include removing the wells from service. Obviously, this would severely impact the City's water supply and require them to purchase costly treated water. Wells 15 and 16 exceeded the MCL for TCP and were removed from service in 2018.

Traditional water treatment methods (coagulation, sedimentation, and filtration) is relatively ineffective for 1,2,3 TCP. Typically, the best available technology to adequately remove 1,2,3 TCP from drinking water is granulated active carbon, although other methods may be considered. The results of the sampling program will be utilized as the basis for treatment system design, so no complete CIP project is presented here. Staff is pursuing funding alternatives for the 1,2,3 TCP removal system.

Park Hill to Florida Water Main Rehabilitation/Replacement

The City operates an existing 14-inch water main that runs from the Park Hill Tank site to Florida Avenue. The 1991 Master Plan and hydraulic study identified the need to increase the size of this transmission line to 16 inches in order to provide adequate capacity and system reliability. Additionally, in recent years has experienced numerous failures, primarily as a result of corrosion to the steel liner.

This project would construct approximately 8,200 linear feet of a new 16-inch transmission main, with the design beginning in fiscal year 2021-2022, and construction beginning the following year.

Radio Read Water Meter Replacement

Just over a decade ago the City installed radio read water meters which replaced old manual read meters. The meters have functioned well since their installation; however, they are now reaching the age where the battery component is reaching the end of its lifecycle and meters are failing to capture reads as a result. The warranty period has expired.

Accurate water meters are vital to the City's operation as they are directly responsible for measuring water consumption which has a direct impact on the City's ability to capture revenue from sales. Staff explored the possibility of just replacing the battery component of the meters but opted to replace the entire meter since labor costs are similar and you get the added benefit of increased accuracy with new meters. This project began in 2016 and is expected to conclude during fiscal year 2020-2021.

Distribution System Upgrades – four-inch to eight-inch – Various Locations

The 1991 Master Plan identified several locations throughout the service area where four-inch diameter water mains exist. These smaller lines increase resistance to flow and also have a negative impact on water quality. In addition, the small lines cannot meet the demands of maximum day flows or current fire flow standards.

This project will provide for the necessary replacement of those undersized mains with new eight-inch diameter lines. The project includes regular scheduled replacement of infrastructure instead of reacting to unplanned emergencies. It also includes system enhancements that would improve fire protection throughout the service area. Staff plans on preliminary design work during the 2020-2021 fiscal year with construction taking place in the 2021-2022 fiscal year.

Water Main Rehabilitation/Replacement – Various Locations

The City's water infrastructure is aging. Sections of the distribution system are approaching 100 years in age; other portions – though much newer – are reaching the end of their lifecycle and require rehabilitation and/or replacement. This project calls for the ongoing rehabilitation of the distribution system proactively rather than reacting to emergencies.

Staff anticipates spending approximately \$400,000 per year beginning in fiscal year 2020-2021, and continuing in perpetuity. Outside funding sources are being evaluated for this project.

Groundwater Recharge Pipeline

Presently the only way the City can take delivery of stored recharge water purchased through the Groundwater Management Plan is to wheel the water through either the EMWD or LHMWD distribution system. This increases costs to the City in the form of wheeling payments, and during periods of peak delivery the adjacent agencies may not have adequate capacity in their systems to accommodate the additional flows for the City.

The City is evaluating the feasibility and need for this pipeline from the recharge ponds to the Park Hill Tank. This study effort will commence in the 2022-2023 fiscal year, and may include routing of pipeline, land acquisition costs and need.

Stetson Avenue Distribution Main

This project will install a new distribution main to provide adequate system capacity and provide even distribution of water. Staff anticipates beginning this project in the 2021-2022 fiscal year.

Water Storage Tank Recoat

The City of Hemet owns and maintains four potable water storage tanks. The tanks were originally constructed more than 30 years ago; the tanks were retrofit to accommodate new seismic standards in 2011. As part of their maintenance program the tanks are inspected by divers at three-year intervals. The inspections occurring during the 2015/16 Fiscal year identified several issues with the protective coatings on the interior of the tanks.



Roof of Tank #3 Prior to Recoating

Recoating the tanks is planned to span a four-year period which will allow for rehabilitating one tank per year. The project commenced with the recoating of Tank #3 in 2017. The projects will require careful coordination to assure system demands can be met with one tank removed from service for an extended period of time. The project is expected to continue in the 2023-2024 fiscal year pending available funding.



Walls of Tank #3 after recoating

Water Main Line Drop Replacement

Water mains serving the residential neighborhood in the vicinity of Sanderson Avenue on the west, Stetson Avenue to the south, Santa Teresa to the east and the drainage channel on the north were originally constructed with drop sections under existing storm drains. The pipe material is cement mortar-lined steel. The drop sections are of varying depths (from four to 14 feet) and were originally fabricated on-site by cutting angled sections and welding them to form an exaggerated “V” shape which was then installed beneath the storm drains.

Apparently, the drop sections were not coated properly and many of the fabricated joints have failed (recent rates of failure occur three to five times per year). When the sections fail it results in significant damage to the adjacent pavement and water outages to large numbers of residents.

Design of this project will evaluate relocating the water main above the storm drain where feasible, and/or construction of new drop sections from non-corrosive pipe material. Staff is currently evaluating options for this project and anticipates commencement with design during the 2022-2023 fiscal year.

New Well Development

At present the City is unable to meet peak day demands without relying on purchased potable water. This project would provide for two additional wells to be designed and constructed during the period of 2022 to 2025. During recent years the City has seen the number of water wells reduced as a result of lease expirations, water quality issues and infrastructure issues.

These new wells are vital to help assure that the City can meet future demands without the extra expense of relying on purchased water. Staff estimates commencement of the planning phase of this project during the 2022-2025 fiscal year.

New Water Storage Tank – Echo Hills

This project calls for the construction of a third reservoir (approximately 2-million-gallon capacity) to be constructed at the current Echo Hills tank site. There is an existing pad which – pending engineering analysis – should reduce the cost of construction. The 1991 Master Plan and hydraulic study identified the need for an additional five-million gallons of storage in order to meet fire flow and operational storage needs.

The addition of this tank would provide staff with extra storage capacity to meet demand, as well create the opportunity to pump water during off-peak power periods, thereby reducing operational costs. Design is expected to begin during fiscal year 2021-2022 with construction pending funding.

Echo Hills Distribution Main Replacement

The 1991 Master Plan identified flow restrictions through the existing 12-inch transmission line running from Stetson Avenue to the Echo Hills tank site. This project calls for the construction of a new 18-inch transmission line which would provide necessary flow capacity to meet ultimate demands.

The project also converts the existing 12-inch line to an overflow line serving the Echo Hills Tanks. Staff anticipates planning for this facility to commence in fiscal year 2020-2021, with construction starting the following year.

7. CONCLUSIONS AND RECOMMENDATIONS

Capacity for Future Growth

In general, the City's water distribution system has adequate capacity to meet current and future demands relating to conveyance and storage capacity. The 1991 WADSY study indicated that the distribution system had capacity to meet then-current Max Day demands of 11.54 MGD and predicted that by 2010 Max Day demands would be in excess of 15 MGD. However, due to reduction in per-capita water use and a loss of agricultural customers, in reality the current Max Day demand is only 8.24 MGD, nearly 30 percent lower than the Max Day demand of 1991. Individual projects are required to meet fire flows plus Peak Day demand in select areas.

Although adequate to meet current production demand on most days, the current well system lacks capacity to meet current and future Max Day demand, and the well system lacks any redundancy so reliability is limited. Additionally, new regulatory requirements for 1,2,3 TCP may necessitate well-point treatment devices for affected wells. The City should place major emphasis on reestablishing water wells in order to avoid having to purchase costly imported water. Additional system storage and related pipe projects will afford staff the opportunity to operate the distribution system in a more cost-effective manner.

Existing Reports and Documentation

The existing hydraulic flow model is nearly 30 years old. While the infrastructure has not changed significantly in that time per capita water use has varied significantly. The City anticipates updating that modeling the 2021-2021 fiscal year.

The 2015 Urban Water Management Plan adequately addresses water supply reliability for the City's service area. The City is currently updating the Urban Water Management Plan.

Water System CIP

City Water staff have developed a comprehensive program to address the system's capital improvement needs. Although there is a considerable backlog of projects (some date back to the 1991 Master Plan) with proper planning and support from policy makers the projects can be completed in a timely manner.

Staffing for CIP

The manpower required to implement such an extensive CIP would place a significant burden on the City's current workforce. The City could hire the necessary operations and engineering staff, or rely on contract services to perform the work. Since implementation of the CIP will be ongoing for the foreseeable future the City will need to determine the best approach to providing staffing dedicated to the CIP program, such as construction inspectors and other supporting staff, while relying on technical consultants for specialized studies, project management, and administration.

Closing

This concludes the update of this Water Master Plan for the City of Hemet Water and Wastewater Division. The City should strive to revisit and update this Water Master Plan in ten years, or sooner if system conditions change that would affect the accuracy of this report.

SEWER SYSTEM MASTER PLAN UPDATE

Previous Studies and Agreements

The preparation of this Sewer Master Plan update relied on several prior studies/plans as follows:

Flow Monitoring Program (November 1989)

Flow information for the 1991 Sewer Master Plan (SMP) relied on results from a flow monitoring program completed in November 1989. The 1989 flow study is included in the Appendices section as Appendix "C". In preliminary discussions for this update to the SMP staff evaluated the option of conducting additional flow monitoring; a decision was reached to utilize the findings from the 1989 monitoring program for reasons as follows:

- Typically, a flow monitoring program would be used to verify that adequate capacity exists within the sewer system, and/or to calibrate a hydraulic model of the sewers. Since the recommendation is to rely on the existing hydraulic model, and most sewer sections identified as being undersized in the 1989 report have not yet been addressed, there would be little benefit to conduct a new flow monitoring study at this time.
- Staff did not want to delay the preparation of this SMP update to incorporate a new flow monitoring program. Staff experience and observations indicate that sewer flows throughout the service area do not overburden the sewer system. Realistically, a flow monitoring program takes approximately a year to conduct to allow for both wet weather and dry weather flow data, and that period of time can be extended if the observation period occurs during a rainy season that delivers below average precipitation. One of the recommendations of this updated SMP is to conduct a flow monitoring program prior to the preparation of the next SMP update.
- The financial impact of conducting a flow monitoring program at this time would place an additional burden on a limited sewer budget. Considering that a multiple-year backlog of known trouble areas exists within the sewer system the resources would be better utilized on construction.

Hydraulic Sewer System Modeling (1990)

The 1990 hydraulic modeling relied on estimated wastewater production of 3.6 million gallons per day (MGD), and determined that the sewer system had adequate capacity to convey up to 9.8 MGD. The 1990 model is included in the Appendices section as Appendix "D". It was decided to incorporate the findings of the 1990 hydraulic model into this SMP update for the following reasons:

- Most wastewater agencies have noted that wastewater generated per capita has declined as a result of several decades of repeated drought cycles and ensuing water usage reduction technology. Most individuals are currently producing wastewater at levels below those during the 1990 forecast projections. Although flow meters do not exist within the wastewater system staff believes the flows are approximately the same as they were in 1991 (3.6 MGD) in spite of increases in population. Current flows are well within the capacity identified in the earlier study (9.8 MGD).
- The four locations identified as potential bottlenecks in the 1990 study have been monitored by staff throughout the years and have not shown any indication of inadequate capacity, such as surcharging manholes, overflows, or backups. This is most likely due to the fact that wastewater

flows never reached the volumes projected in those earlier studies for the aforementioned reasons. Assuming wastewater flows remain similar to those currently generated staff does not believe the trunk sewers identified in the 1990 hydraulic model as requiring replacement/upsizing will need to be completed in the foreseeable future (Table 1.1).

Table 1.1 TRUNK SEWERS REQUIRING REPLACEMENTS (1990)

Location	Description	Length	Diameter	Proposed Diameter
Gilbert	Line T	1,320'	12"	18"
Palm	Line Y	1,300	10"	18"
Ribbonwood	Line L	350'	8"	18"
Devonshire	Line G	1,385	8"	10"

Sewer Rate Study

In 2015 the City Council approved the City of Hemet Sewer Rate Study. That comprehensive report evaluated then-current sewer rates and made recommendations for new sewer rates that would allow the City to fund infrastructure repair and replacement. As a result of that study the City Council approved new sewer rates and fees to address shortfalls in operating and capital improvement funding. A copy of the rate study is included in the Appendices section as Appendix "E".

City of Hemet Public Works Department Sewer System Management Plan (March 2016)

The City of Hemet Public Works Department SSMP describes the activities used to effectively manage the wastewater collection system. These activities include administrative tasks, as well as delineating the operational and maintenance (O&M) practices used to keep the sewer system operating in a safe and efficient manner.

Through the implementation of those O&M practices staff have identified and documented facilities within the collection system that require rehabilitation and/or replacement. Those facilities have been included in this SMP update. A copy of that SSMP is included in the Appendices section as Appendix "F". The City anticipates updating the SSMP in 2021.

Inter-Agency Sewer Agreement

In 2001 the City of Hemet and Eastern Municipal Water District (EMWD) entered into an agreement to delineate the rights and obligations of the respective parties relating to wastewater conveyance and treatment within the City limits. A copy of that agreement is included in the Appendices section as Appendix "G". It bears mentioning that this agreement is silent as to any flow capacity limits on either party to the agreement. According to the agreement EMWD is obligated to treat any sewage generated within the City's service area; staff is not aware of any other agreements that address limits on the volume of flow generated within the City's sewer system. Accordingly, this SMP update only addresses conveyance capacity and not treatment capacity. The agreement is also silent as to ownership of the wastewater generated within the City's sewer service area. This may become an issue if the City ever desires to provide recycled water service.

1. CHANGES AND REVISIONS FROM EXISTING SEWER MASTER PLAN

General

The wastewater collection service area from the City of Hemet Water and Wastewater Department has remained basically the same as it was in the previous SMP. Wastewater flow has not increased in any significant volume and staff indicates that, with limited exceptions identified elsewhere in this SMP, sewer conveyance capacity is not an issue within the system.

Table 1.1 provides comparative data from 1990 to present.

Table 1.1 Comparative Data 1990 vs Present

CRITERIA	1990	PRESENT
Sewer Service Area	5.25 square miles	6.75 square miles
ADF Dry Weather	3.6 MGD	3.6 MGD ¹³
Maximum Daily Flow	5.76 MGD	5.76 MGD ¹⁴
Miles of Sewer Mains	120	140
Average Persons/Connection	3.0	3.6
City Population	36,094	78,053 (2010) ¹⁵

Although the population within the City has increased substantially much of that growth has occurred outside the City’s sewer service area. Both present wet and dry weather sewer flows are based on staff estimates and experience. Consideration should be given to verifying these flows in the future.

2. BACKGROUND

Service Area

The City of Hemet owns, operates and maintains the gravity portion of the wastewater collection system within the 17.33 square miles of the developed portion of the City boundaries. Wastewater pumping, treatment and disposal is provided through agreement with the Eastern Municipal Water District (EMWD). Both the EMWD and Lake Hemet Municipal Water District owns and operates wastewater collection systems within the City boundaries. Exhibit 3.1 illustrates the portions within the City of Hemet which receives sewer service directly from the City’s Water and Wastewater Department.

¹³ Estimated based on staff experience. Flow meters do not exist.

¹⁴ Based on estimated peaking factor of 1.6 from 1991 flow monitoring data.

¹⁵ Includes residents served by other sewer service providers.

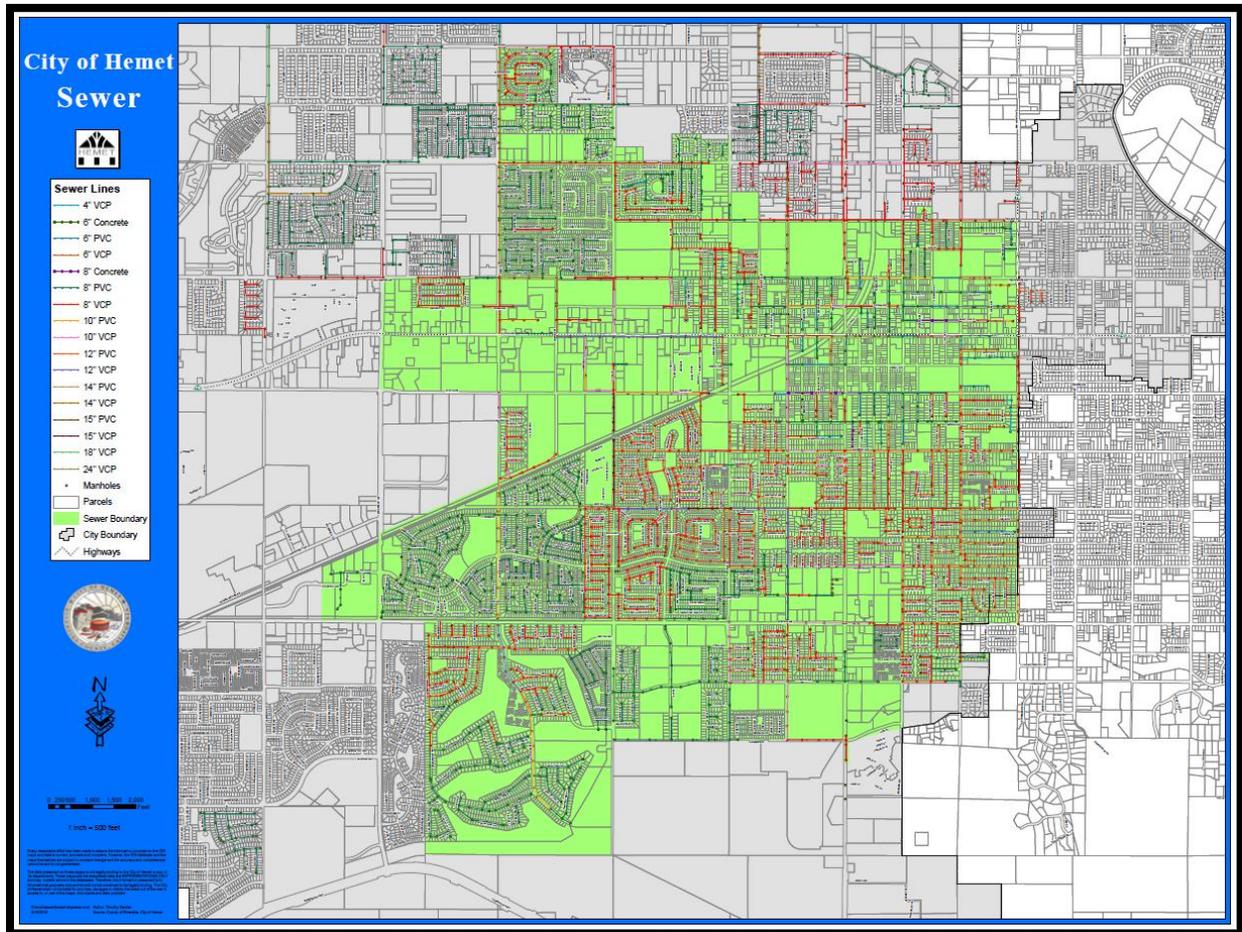


Exhibit 3.1 Sewer System map (green shaded area)

Current Development and Future Growth

Since the last update of the SMP the City’s sewer system has expanded slightly and is presently nearing build-out. In 1990 the system was estimated at 80 percent build-out, and in both 2010 and 2015 estimates placed the number at closer to 85 percent build-out. There are no major or large-scale development projects on the planning horizon within the City’s sewer service area and the remaining future projects are predominantly in-fill or redevelopment projects.

Although the population within the City limits is expected to increase substantially within the next 15 years, most of that growth will occur outside the service area of the City’s Water and Wastewater Department. The City expects population growth within the sewer service area to increase at a rate of only 0.30 percent per year, or about 92 units per year. Accordingly, future growth within the sewer service area is not anticipated to have significant effect on sewer system capacity.

Regional trends indicate per capita wastewater contribution is declining. Accordingly, the current wastewater conveyance capacity should be adequate for build-out¹⁶.

System Parameters

Introduction

Much of the sewer infrastructure within the City’s system was constructed decades ago and design plans, record drawings and as-built information is not available for many pipeline segments. Sewer flows are not metered within the system so accurate flow data does not exist. The City’s sewer system atlas books have been pieced together from limited drawings, in-field observations and staff recollection of locations, and updating these vital documents is time consuming and costly.

Where possible the information within this SMP was retrieved from well documented sources; however, some of the information is based on staff experience or was extracted from other partial reports or studies.

Wastewater Infrastructure

Table 3.2 Wastewater Infrastructure Parameters

Parameter	Units
Miles of Sewer Mains	140
Sewer Manholes	1,846
Average Daily Flow	3.6 MGD ¹⁷
Sewer Service Connections	9,600
Customers on Septic System ¹⁸	34

3. EXISTING SEWER SYSTEM

Background

The exact age of the existing wastewater collection system is unknown. Although record drawings do exist for development from about 1970 – 1980 to the present much of the wastewater system lacks documentation and no record documents exist for the original collection system.

In about 1990 the City undertook a project to prepare Atlas Maps in an attempt to document the collection system. A series of incomplete, unlabeled and unidentified 600-scale maps of the sewer system was overlaid onto existing 400-scale street maps. City staff reviewed the newly created maps and through field inspection verified line location, size, and direction of flow. Information for newer developments was added to the 400-scale sewer maps. Staff conducted field surveys to add data for approximately 30 percent of the sewage collection system for which no records existed at all. The resulting maps comprise the current sewer system Atlas Maps. Although extensive efforts are made to update and verify the accuracy of these maps they do not substitute for proper as-built record drawings, and accordingly, any recommendation made relying on these maps should be validated by in-field verification.

¹⁶ Some individual pipe segments are undersized and requires replacement. Those projects are addressed in Section 4 of this SMP

¹⁷ Estimate based on 1991 flow monitoring

¹⁸ Jurisdiction of County of Riverside Department of Environmental Health

Condition

A typical estimated planned life cycle for a properly designed and constructed gravity sewer system is 50 years, although in reality they can last much longer with proper operation and maintenance and it is not unusual for systems to be in service that are more than 100 years old. However, several design and construction issues exist within the City's sewer system; particularly in much of the older sewer pipes.

Concrete Pipe - A considerable amount of the sewer lines are constructed from various types of concrete pipe¹⁹. In a water system concrete pipe has excellent wear and service life; in sewage systems it can be problematic in systems with high concentrations of hydrogen sulfide gasses (H₂S). Additionally, since concrete pipe is considerably more resistant to physical damage during installation it was not uncommon for concrete sewers to be installed without proper pipe bedding which eventually leads to misaligned joints, sags, cracked or broken joints and pipes, and in more severe instances, collapsed lines.

Portions of the City's sewer system suffers from all of these conditions. When those conditions exist, the sewage flow is disrupted or blocked and H₂S gas is released. This gas is oxidized to form Sulfuric Acid which has further devastating impact on concrete. When Sulfuric Acid attacks concrete it softens the cement which is then washed away leaving exposed aggregate. Hydro cleaning the sewer lines accelerate this sloughing of material thereby exacerbating the problem. Eventually the pipe wall is washed away exposing the pipe bedding and trench walls. When this occurs dirt and debris can be washed into the sewer line leading to potential blockage, trench collapse (sink holes), and groundwater contamination. Photo 4.1 shows a sewer line missing the sidewall and bottom of concrete pipe.



Photo 4.1 – Damaged Concrete Sewer

Improper Lateral Connection – During normal installation of sewer laterals the proper procedure is to install a wye fitting in the sewer main and connecting the lateral to the wye. A wye fitting assures the

¹⁹ asbestos cement pipe (ACP) also known as Transite pipe, and a thin-walled concrete pipe lined with a PVC liner

sewage flow enters the sewer main with minimal turbulence and also provides for a sanitary, water tight connection. In many areas of the City's system the sewer laterals were installed by simply knocking a rough hole into the sewer line and running the lateral to the hole in the pipe and then trying to seal the ensuing gaps with tar-like material or concrete. Eventually the tar or concrete deteriorates and leaves gaps between the laterals and sewer resulting in root intrusion, possible groundwater contamination, and groundwater infiltration.

Also, since the lateral flow enters the sewer main at a right angle to the main line flow it creates turbulence that further erodes the concrete pipe as mentioned above. In some cases, the lateral connection extends into the sewer main and prevents staff from cleaning and/or videoing the sewer main. Photo 4.2 shows a typical improperly connected sewer lateral.



Photo 4.2 – Improper lateral connection (typical).

Improper Flow Line – Sewer pipes must be installed in such a manner as to ensure the flow line of the pipe assures adequate grade. If a pipe is constructed with sags or bellies in the flow line the sewage flow can be obstructed which can lead to excessive grease accumulation and/or odor problems. Although less of an issue than the concrete pipe and improper lateral connections mentioned above, it does occur in numerous pipelines within the City's system. Unfortunately, where a damaged concrete pipe can normally be rehabilitated using trenchless technology, the only way to correct an improper flow line is to excavate the pipe and reinstall it with the proper grade.

Manhole Damage – Most sewer manholes are constructed from concrete. According to City Standard Drawing S-601A the manhole bench (base of the manhole) should be constructed as a solid monolithic pour, thereby assuring structural integrity. It appears that many of the older manholes in the system had the benches poured as a separate structure and now those benches are crumbling into large pieces. If a large chunk moves into the sewer system it could block flows and would be very difficult to remove using traditional cleaning methods.

Hydrogen Sulfide attack is also an issue in numerous manholes and causes a loss of cement leading to exposed aggregate and reinforcing steel. Once the reinforcing steel is compromised it can lead to structural issues with the structure. Photo 4.3 and 4.4 shows crumbling manhole benches.



Photo 4.3 – Large piece of manhole bench broken away



Photo 4.4 – Crumbling manhole channel

Improper Prior Repair – As a result of the recommendations identified in the 1991 Sewer Master Plan the City completed numerous improvements to the sewer system. Many of those repairs were completed by slip-lining the old sewers. Although trenchless technology is an excellent means to rehabilitate sewers the repair work performed by the City’s contractor was done improperly now many of the repairs at those locations are experiencing failure of the repaired locations. Properly designed plans and specifications and full-time inspection should be a critical component of any planned future sewer rehabilitation project.

General - In many of the older sections of the City’s sewer system the concrete pipes are at the end of their lifecycle and should be rehabilitated or replaced outright prior to failure. Video inspection records dating back as far as 1987 include comments such as:

- Very badly deteriorated pipe. Bad joints throughout. Some portions of pipe missing side.
- Badly deteriorated pipe. Many bad joints. Possible hole in pipe.
- Badly cracked and deteriorated. Holes in pipes at several locations.
- Very bad line. Many sags and possibly cracked throughout. Missing manhole.
- Several holes in pipe. Several sags in line.
- Very badly deteriorated pipe. Probably no bottom at most sections. Many holes in top of pipe.

According to staff observation and experience these comments are not exaggerated and these conditions exist throughout much of the older section of the system. In numerous instances the pipe integrity is still intact, however repeated cleanings are washing away the pipe material which has become soft due to continual acid attack. As a result, the pipe walls are thinning out and are more prone to collapse. These lines would be ideal candidates to reline if the project can be done prior to the collapse of the line.

Although newer portions of the sewer system are in better condition it is reaching an age where increased maintenance expenditures are required in order to assure it does not begin to deteriorate. Even in the newer section's, problems exist due to improper installation of sewer laterals, sags or bellies in lines, or failing concrete in manhole structures. Staff has recommended a Capital Improvement Program that address the needs to rehabilitate this newer infrastructure in order to keep it from falling into a state of disrepair.

City staff has a comprehensive maintenance program where main sewer lines are cleaned every two years. High priority areas or trouble spots are scheduled as necessary (weekly, bi-weekly or monthly) in order to maintain proper flow and to prevent blockages. In deference to City Sewer Department staff they have a remarkable record of preventing sanitary sewer spills in spite of the system's over-all condition. According to the Santa Ana Regional Water Quality Control Board data base in the past ten years the City has only experienced one Class 1 spill²⁰ (10 gallons), and 12 Class 3 spills²¹ (2,795 gallons total). In the more recent past the City has only had three spills totaling 30 gallons over the last five years. Although staff does a commendable job maintaining the sewers their efforts are often hindered by sewer lines that will not pass a cleaning head or video camera.

In addition, City staff utilize chemical addition to prevent buildup of fats, oils and grease (FOGs) as necessary. The City's FOG program falls under the jurisdiction of the EMWD, and as such the FOG program is administered by EMWD staff. The excessive accumulation of FOGS is a problem within the City's sewers and suggestions relating to such are included in the Recommendations section of this report.

As a result of the 1991 Sewer Master Plan the City contracted for repairs and rehabilitation to numerous sewer lines within the system. Most of the work was performed by slip-lining the existing sewer lines. Unfortunately, many of those previously repaired pipes are failing again and the lining is sloughing off or slipping, thereby obstructing sewer flow and making the line difficult to clean or inspect. These lines must be rehabilitated again in order to retain integrity of the pipe and assure adequate sewer flow.

Budget/Funding

In 2015 staff developed a new rate structure which established fair and reasonable sewer rates and fees necessary to provide for ongoing operation and maintenance of the sewer collection system, as well as funding an ongoing Capital Improvement Plan (CIP) for sewer rehabilitation/replacement. The City Council adopted those recommendations and the new rates went into effect in March 2016.

As a result of the new sewer rates and fees the City plans to contribute approximately \$1.32 million annually for the CIP program. While the newly adopted rate structure enhances funding for the CIP it is insufficient to fully fund necessary ongoing improvements to the sewer system. Considering that the system consists of 140 miles of pipe and a substantial amount of those mains – around 30 percent – are concrete pipe in need of rehabilitation or replacement it would take 42 years to complete the current backlog of the CIP.

²⁰ A class 1 spill is a spill of any size that reaches surface waters.

²¹ A class 3 spill does not reach surface waters.

4. CAPITAL IMPROVEMENT PROGRAM

Rehabilitation and/or Replacement of Existing System

City staff have recommended a comprehensive CIP program to address the aforementioned sewer system infrastructure issues referenced within this SMP. The first five years of the CIP call for rehabilitating and/or replacing approximately one mile of sewer line per year on average. Due to the locations, depths, and condition of some of these projects' costs will vary considerably.

In order to address the high priority projects while also addressing more routine projects to prevent them from entering an advanced state of disrepair, staff recommends bifurcating the CIP into priority projects and routine rehabilitation projects. The planned CIP budget is as follows:

<i>Table 5.1 – Sewer Capital Improvement Expenditures – Five Year Plan</i> Project Priority	2017/18	2018/19	2019/20	2020/21	2021/22
High Priority – Repair needed to address failed infrastructure as identified on Table 5.2. (Approximately .5 miles per year).	\$906,035	\$920,000	\$895,000	\$895,000	\$895,000
Routine Priority – Rehabilitation to proactively maintain the sewer system in order to prevent it from falling into an advanced state of disrepair (approximately .5 miles per year).	\$906,035	\$920,000	\$895,000	\$895,000	\$895,000
Total	\$1,812,070	\$1,840,000	\$1,790,000	\$1,790,000	\$1,790,000

The expected revenue for these projects from the recently adopted sewer rates and fees is approximately \$1.32 Million per year; this level of expenditure requires drawing down the balance of the existing Sewer Fund by an average of \$484,000 per year through FY 2021/22. Staff has anticipated this in their budget forecasts.

Priority Improvements

City staff has assembled a list of projects identified as *High Priority*; that list is compiled as Table 5.2, below. These projects represent sewer lines and manholes that are in an advanced state of disrepair, and either have failed or are near failure, and should receive urgent attention.

Table 5.2 – Sewer Capital Improvement High Priority

LOCATION	ISSUE	PIPE SIZE	LENGTH (feet)	MATERIAL
Acacia – Gilbert to Harvard	Very badly deteriorated pipe. May be missing bottom of pipe. Many holes in joints and tops of pipe. Pipe side wall missing? Protruding taps.	8"	1,642	Concrete

LOCATION	ISSUE	PIPE SIZE	LENGTH (feet)	MATERIAL
Weston Park – Between Taylor and Thompson	Concrete main deteriorating badly, multiple cracks along springline and haunches	8"	329	Concrete
Devonshire – Between Palm and Western	Deteriorated pipe. Some sags, some holes in pipe, protruding laterals.	8"	347	Steel
Buena Vista – Between Central and Acacia	Deteriorated pipe; undersized. Bad joints throughout, some portions of pipe missing sides.	8"	655	Concrete
Vista del Monte	Bad sag in pipe results in grease build up and odor problems.	8"	70	Clay
Residential back yard between Central/Mayberry and Harvard/State	Pipe has deteriorated badly – missing in some places. Candidate for slip lining.	Unknown	599	Unknown
Under residential homes between Thompson and Franklin on Central.	Pipe has deteriorated badly – very little pipe left. Candidate for slip lining.	Unknown	Unknown	Unknown
Devonshire/Kirby/Latham/Florida	Pipe in this location is Transite (ACP) pipe and has deteriorated badly.	8"	Unknown	Concrete
Juanita Between Acacia and Kimball	Previous relining of cement pipe has failed.	8"	652	Concrete
Harvard Between Acacia and Central	Previous relining of cement pipe has failed. Cannot get camera through pipe.	6"	505	Concrete
Carmalita Between Acacia and Central	Portion of Carmalita are new PVC but transitions to old cement pipe that has previously been relined but has failed. Cannot get camera through pipe	6"	240	Concrete
Residential easement from Central to Mayberry between Carmalita and Juanita	Some portions of pipe have deteriorated badly. Manhole inaccessible. Sewer runs through an easement between homes. Access is extremely limited making any rehabilitation of this line very difficult.	6"	527	Concrete and PVC
Elmwood – Alessandro to State	Previous relining work has failed and is sloughing off.	6"	563	PVC

LOCATION	ISSUE	PIPE SIZE	LENGTH (feet)	MATERIAL
	Bad lateral connections; lots of dirt infiltration.			
Hamilton – Florida to Kimball	Pipe deteriorated badly. First 20’ pipe is missing and sewage is flowing through dirt.	8”	330	Clay
Buena Vista From Mayberry 305’ southerly	Unable to get camera through pipe due to protruding laterals.	8”	305	Clay
Taylor – Whittier 295’ northerly	Pipe is undersized.	6”	295	Clay

In addition to the projects identified in Table 5.2 (above), the City’s sewer system contains many miles of sewer that are nearing the end of their normal service life and should be rehabilitated before they begin to fail. Addressing rehabilitation prior to total failure of the pipes will result in considerable cost savings and helps assure protection of public health and safety.

The City is in a unique position due to the fact it has such a backlog of needed rehabilitation and/or replacement projects that from a practical logistics perspective it could not take on all the projects at once even if funding were available. As such the work must be prioritized based on several criteria.

The City’s 2016 Sewer System Management Plan identifies a rating system for classifying repair projects as shown below.

Priority 1 – Worst Case, cracked, collapsed, disintegrating, visible holes in pipe

Priority 2 – Undersized lines, pipe is overloaded due to new hookups or increased flow

Priority 3 – Beginning signs of deterioration, pipe still able to receive lining

By using the City’s Priority Ratings as the basis of ranking rehabilitation projects and factoring in logistical issues relating to tackling multiple projects simultaneously, the City can accomplish the required work with optimum efficiency.

Factors affecting the City’s ability to accomplish the CIP projects include:

Staffing – The City has been plagued with a considerable turnover in its labor force, and budgetary issues require the Water Department to be staffed on the lean side. Even if construction activities relating to sewer rehabilitation is performed by contract, the labor burden placed on current Operations staff can be considerable. There needs to be extensive coordination between Operations and contractors to assure uninterrupted sewer service and reduce the potential for sewer spills during construction.

In addition to the additional labor requirements for O&M staff there will be additional demands relating to project management and inspection. To take on multiple projects the City will need to retain the services of well-trained, experienced project management/inspection personnel. This could be done either through hiring in-house staff or retaining outside contract staff. The type of projects identified in

Table 5.2 will require full-time inspection during the actual construction period, and part-time construction/project management during the project design and construction phase.

City staff has expressed concern over not having adequate in-house staffing levels to dedicate to multiple projects.

Engineering/Planning – The City retains a minimal engineering staff. Projects of these magnitudes would normally require a multiple-phased approach to project planning and construction.

1. Project identification/conception
2. Request for Proposals
3. Review of Proposals
4. Prepare/Award of Design Contract
5. Project Design
6. Project Construction Bid
7. Prepare/Award Construction Contract
8. Project Management
9. Project Inspection
10. Project Wrap up
11. Warranty Inspection

The City Engineering Department currently lacks the manpower and other resources to handle multiple simultaneous projects of this scope.

Summary

The City must determine whether or not they want to add staffing, rely on contract labor and services, or a combination of both to supplement existing staffing levels in order to meet the extensive resources required to plan and manage the Sewer CIP. Many agencies who choose to retain their own staff to support CIP projects capitalize the salaries and benefits for those employees so as not to burden O&M budgets.

Project Approach

Each project will have logistical issues and characteristics that make them unique from the others. Accordingly, there is no single design or scope of work that will suffice for every job. As such, each project will need to be evaluated and in many cases that may require additional inspection and evaluation in order to determine the best approach to rehabilitation or replacement. Similar projects can be combined into a single scope of work, and where other factors do not interfere with construction (traffic circulation, wastewater flow, etc.) the projects can be bid in one contract.

The Engineering Project Manager must work in concert with Water Department staff to select projects from the priority list and develop a schedule of work flow. Since many of the projects will require considerable design and planning they may be best suited to begin that planning work now so as to be prepared to perform construction two or three years into the CIP. Inversely, simpler projects which do not require a lot of design work could be addressed early in the CIP while the design work is being completed on more complex projects.

Individual projects should be evaluated on a variety of factors, but a major emphasis should be placed on those priority projects that include eroded or missing pipe sections. These voids in pipes present myriad concerns including the potential for collapsed lines, sinkholes, and groundwater contamination.



Photo 5.1 – Hole in Sewer Pipe - Acacia

In addition to the aforementioned issues, many of the pipes which have serious erosion and/or holes are still in a condition that might allow them to be rehabilitated with trenchless technology. However, once the conduit collapses repair methods are basically limited to costlier open-trench replacement.

Trenchless Rehabilitation

Trenchless sewer line repair is a cost-effective and less intrusive means of rehabilitating sewer lines as opposed to conventional open-trench repair. Trenchless methods utilize the existing sewer conduit so it is not suitable where the flow line is not proper (sags or bellies in the line), and there must be enough existing material to support the new pipe material. In many cases the new lines can be installed through existing manholes so no excavation is required at all. One problem Hemet will face though is there are so many improperly installed laterals it will require an excavation just to adjust the sewer lateral. The most common methods of trenchless rehabilitation are:

Pipe Bursting

Pipe bursting, or in-line expansion, is a method by which the existing pipe is forced outward and opened by a bursting tool. It is the only in-situ method of rehabilitation that can result in a larger pipe size, thereby increasing flow capacity. The bursting tool is pulled into the existing sewer line and then hydraulic pressure is applied that forces the bursting tool to split the pipe. During in-line expansion, the existing pipe is used as a guide for inserting the expansion head (part of the bursting tool). The expansion head, typically pulled by a cable rod and winch, increases the area available for the new pipe by pushing the existing pipe radially outward until it cracks.

The bursting device pulls the new, larger pipeline behind itself. Although cost effective in some applications pipe bursting requires bypass pumping for the duration of the project, and because of the size of equipment used, a pit must be excavated at each end of the section of pipe. Additionally, each sewer lateral must be excavated and reattached to the new sewer line.

Slip Lining

Slip lining is a well-established method of trenchless rehabilitation. During the slip lining process, a new liner of slightly smaller diameter is placed inside the existing pipe. The annular space, or area between the existing pipe and the new pipe, is typically grouted to prevent leaks and to provide structural integrity. This is the method previously used by Hemet to rehabilitate sewers in the 1990's and many failures resulted in the completed work. This was likely due to the work being performed improperly and should not be a reason to reject slip lining as an option.

Slip lining requires the excavation of pits and in most cases lateral connections must be excavated as well. It is not a suitable alternative where the flow through existing sewers is at capacity as it slightly reduces the inside pipe diameter.

Cured in Place Pipe

Cured in Place Pipe is a process where a flexible fabric liner, coated with a thermosetting resin, is inserted into the existing pipeline and cured to form a new liner. The liner is typically inserted into the existing pipe through an existing manhole. The fabric tube holds the resin in place until the tube is inserted in the pipe and ready to be cured.

The CIPP method can be applied to rehabilitate pipe lines with defects such as cracks, offset joints, and structurally deficient segments. The thermosetting resin material bonds with the existing pipe materials to form a tighter seal than most other trenchless techniques.

After being pulled through the pipeline, the tube is inflated to push the liner against the existing pipe walls. This process of inversion presses the resin-coated tube against the walls of the existing pipe. During both the winch-in-place and inversion-in-place methods, heat is then circulated through the tube to cure the resin to form a strong bond between the tube and the existing pipe.

Laterals can be cut out using a robotic cutter from inside the new line so CIPP is truly a trenchless technology. An additional benefit from CIPP is usually the planning and design requirements are much less than with other methods because less emphasis is placed on road closures, bypass pumping, trenching, and excavation.

5. CONCLUSIONS AND RECOMMENDATIONS

Capacity for Future Growth

The City of Hemet Water and Wastewater Division provides wastewater conveyance within their service area, while the sewage treatment is handled by the EMWD. According to the results previously reported in the 1989 Sewer Flow Monitoring study and 1991 Hydraulic flow model, and supported by the experience and observations of current Division staff, the City's wastewater conveyance system meets both the current demands and the projected future demands at build out²².

Existing Reports and Documentation

Operations staff, management and policy-makers must rely on a variety of documentation and reports in order to assure proper operation, maintenance and administration of a sewer system.

Sewer System Management Plan

The SSMP describes the activities used to effectively manage the wastewater collection system. City staff have prepared the SSMP and the City Council recertified the Plan in April 2016. The SSMP is required to be reapproved every five years, and is scheduled for an update in 2021

Flow Monitoring and Hydraulic Modeling

The current Flow Monitoring and Hydraulic Models were last prepared in 1989 and 1990 respectively. Although both of these documents are outdated very little has changed regarding the wastewater loading within the sewer system since their completion.

Understanding the dynamics that wastewater flow and system capacity is crucial to most wastewater agencies, however in the unusual case with the City of Hemet the cost of conducting new studies must be compared to the benefits which might be derived from the findings of such studies:

1. The City is not responsible for treatment or pumping costs so there is no financial benefit to having accurate flow data as a basis to determine those costs.
2. The current reports, although dated, indicated that adequate capacity exists to build-out, and very little has changed relating to system demand has changed since their preparation, and the system is very near build-out.
3. Sewer flow monitoring would help identify storm water intrusion and/or groundwater infiltration. From an operational perspective the elimination of these conditions is desirable, however the City would not gain any financial benefit since they do not pay pumping or treatment costs.
4. Any costs deferred by not completing new flow monitoring and hydraulic models could be directed towards the CIP program.

Accordingly, it is recommended that the City rely on the current Flow Monitoring Study and Sewer Hydraulic model for the purpose of this Sewer Master Plan. However, at some point prior to the next Sewer Master Plan the City should conduct minimal wet weather and dry weather flow monitoring to validate the 1989 findings and provide a baseline for the sewer system at build-out.

Sewer Atlas Books

The City's existing Atlas Books are a compilation of overlays of old unlabeled maps and field study, verification and measurements. The information has been converted to a digital format, however that

²² This does not address sewage treatment capacity which is under the jurisdiction of the EMWD.

format basically consists of a picture of the maps, and not a true graphical interface of the sewer system. At some point the City should consider transitioning to a true Computerized Maintenance Management System that could track each segment of the sewer system as an asset and act as the central repository for all maintenance activity, inspections, repairs and/or reports related to that asset.

Again, the City will need to weigh the cost of such a migration compared to the need to fund the ongoing CIP for sewer repairs.

Fats Oils and Greases (FOG)

Fats, oil and greases are problematic for sewers for a variety of reasons. They accumulate on the inside of pipe walls, thereby reducing capacity which may lead to sewer spills. In addition, grease build up becomes rancid and attracts vermin and causes odors. Also, the buildup of FOGS leads to destruction of pipe material and manholes. Finally, the requirement to remove FOG buildup requires more frequent cleaning, thereby increasing maintenance costs.

As the holder of the National Pollution Discharge Elimination Standards (NPDES) discharge permit the EMWD retains authority to enforce the discharge of fats, oils and grease into the sewer collection system. The EMWD Source Control Division has the responsibility to enforce program requirements. However, City of Hemet staff reports that FOGs continue to be a major source of problems in the sewage collection system.

In order to improve the control of FOGs the City may want to consider either renegotiating implementation of the current FOG program by EMWD with the goal of increasing enforcement of the rules and regulations, or assume administration and enforcement of the City's own FOG program. The cost to implement such a program could be offset by sewer customers who contribute to the discharge of FOGs. The program could either be administered by new City staff or by one of the many companies who administer FOG control programs.

Sewer System CIP

City Water and Wastewater staff have developed a comprehensive program to address the sewer system capital improvement needs. Due to the current backlog of needed rehabilitation and repair the task of rehabilitating the existing system seems daunting. However, with proper planning, adequate dedication of resources, and support from policy makers the process of improving the City's sewer system can be completed in a timely manner. The City should continue to seek other sources of funding, such as state and federal low interest loans or grants to help offset the considerable cost of needed rehabilitation.

Early focus should be placed on those projects requiring minimal planning while simultaneously completing design work and documentation on more complex plans. This will help assure a continual work flow on the CIP and help minimize delays.

Staffing for CIP

The manpower required to implement such an extensive CIP would place a significant burden on the City's current workforce. The City could hire the necessary operations and engineering staff, or rely on contract services to perform the work. Since implementation of the CIP will be ongoing for the foreseeable future the City should consider adding permanent staff dedicated to the CIP program, such as construction inspectors and other supporting staff, while relying on technical consultants for project management and

administration. Most municipalities allow for the capitalization of wages and benefits to support completion of a CIP so as not to unduly burden the O&M budget.

Closing

This concludes the update of this Sewer Master Plan for the City of Hemet Water and Wastewater Division. The City should strive to revisit and update this Sewer Master Plan in ten years, or sooner if system conditions change that would affect the accuracy of this report.

APPENDICES

“A” City of Hemet 2015 Urban Water Management Plan – Volume One



APPENDIX A.pdf

“B” Metcalf and Eddy Water Distribution System Analysis – City of Hemet (1990)



APPENDIX B.pdf

“C” Flow Monitoring Program (November 1989)



APPENDIX C.pdf

“D” Hydraulic Sewer System Modeling (1990) (PARTS 1 & 2)



APPENDIX D - PART
1.pdf



APPENDIX D - PART
2.pdf

“E” Sewer Rate Study



APPENDIX E.pdf

“F” City of Hemet Public Works Department Sewer System Management Plan (March 2016)



APPENDIX F.pdf

“G” Inter-Agency Sewer Agreement



APPENDIX G.pdf