City of Lomita

# Water Master Plan

# Update

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# Table of Contents

## List of Tables

## List of Figures

# Section 1: Executive Summary

## 1.1 Authorization and Scope

The City of Lomita's original Water Master Plan was prepared by Harris and Associates in 2004. In October 2014, the City Council authorized KEC Engineers, Inc. to:

- Update the 2004 Water Master Plan
- Develop an updated hydraulic model
- Analyze Water storage capacity
- Analyze and evaluate the Distribution system
- Evaluate Fire flow
- Forecast the future Demand
- Updated capital improvement plan, and
- Economic analysis,

## 1.2 Land Use and Existing Water Facilities

The land use information utilized for the Water System Master Plan is derived from the land Use Element of the 1998 City's General Plan and as provided by 2004 Water Master Plan and the 2015 SCAG.

A comprehensive system inventory and mapping of' the existing water system was developed utilizing water system atlas maps and major facility drawings. In addition, available production, and latest data for the system components were reviewed and summarized.

The City of Lomita's water distribution system is comprised of approximately 43 miles of pipelines ranging from 2-inch through 16-inch diameters, a potable water well, and two potable water storage reservoirs (Harbor Hills with a capacity of 100,000 gallons and Cypress reservoir with a capacity of 5.3 million gallons). Approximately 70% of the City's distribution system was built between the years of 1928 and 1970.

## 1.3 Water Demand

The existing total system demand for the average day use is approximately 2.2 million gallons per day (MGD. The water demand has slightly dropped since the 2004 Mater Plan Report. The drop in water demand is mostly due to drought condition and water conservation measures. The City of Lomita is almost completely developed. New development will largely consist of recycling and infill development on the few scattered remaining vacant parcels. Therefore, future growth

of the water demands is not anticipated and further conservation measures may result in slight decrease in water demand.

## 1.4 Water Supply

The City's primary source of water supply has been imported water purchased from the Metropolitan Water District of Southern California (MWD) via West Basin Municipal Water District (West Basin, WB-8, and WB-7). MWD has no restrictions on the volume of water supply the City receives.

The City has a 12-inch and an 8-inch MWD connections, which are all metered using pressure reducing valves: West Basin 7 (WB-7) which supplies the City's Walnut Pressure Reducing Station and West Basin 8 (WB-8) that supplies the Appian Way Pressure Reducing Station. The total capacity of these two connections is 5,161 gpm (7.4MGD).

### 1.4.1 WB-7 – Walnut Pressure Reducing Station

This connection is located in an MWD Vault at 24525 Walnut Street and is supplied by MWD's Palos Verdes 12-inch diameter water main. Water is conveyed through an 8-inch connection main at 320 feet of head and at 1,800 gpm rated flow capacity. This connection supplies only Zone I through a series of 8-inch pressure regulated valves.

### 1.4.2 WB-8 – Appain Way Pressure Reducing Station

This connection is located at 26255 Appian Way and is supplied by MWD's Palos Verdes 12-inch diameter water main. Water is conveyed through an 12-inch connection main at 320 feet of head and at 3,350 gpm rated flow capacity. This connection supplies all three zones within the City's system through three 8-inch pressure regulated valves.

### 1.4.3 Well No. 5

Well No. 5 is located at 26112 Cypress Street, Lomita CA 90717 and is a main component of the Cypress Water Production Facility (CWPF) . The gravel packed well was drilled in 1971 and is capable of producing 1,500 gpm. The well is 660 feet deep and has 102 feet of annular seal with a 36-inch conductor casing and is provided with an 8-inch diameter gravel chute. The 16-inch well casing is perforated from 368 to 648 feet below ground level. The conductor casing penetrates a 20 feet thick clay, which ranges in depth from 80 to 100 feet. The well is equipped with a Goulds Pump submersible vertical turbine, electric drive, 200 HP pump.

This well has the capacity of pumping water directly into both the distribution system and the Cypress Reservoir.

On March 15, 2013, the City received approval to distribute blended water from CWPF. CWPF is an iron-manganese greensand filtration treatment system designed to primarily remove iron and manganese. CWPF was later modified to enable aeration and blending with Metropolitan

Water District (MWD) imported water to address the aesthetic secondary issues of Total Dissolved Solids (TDS), Hardness (as Calcium Carbonate), and Taste/Odor. CWPF came online on April 1, 2013. These water sources provide the City with municipal water to its population and businesses through 4,174 service connections (4,102 residential, 72 commercial).

### 1.4.4 Harbor Hills Reservoir

The Harbor Hills Reservoir is an elevated steel reservoir built in 1940 and is located on Palos Verdes Drive North, west of Western Avenue in the City of Lomita. The reservoir is made of riveted steel and has a capacity of 100,000 gallons. This reservoir is 22 feet in diameter,35 feet tall and stands 75 feet above ground.. The influent and effluent piping is combined through a 10-inch main that supplies Zone III. This reservoir was rehabilitated in 2014 and meets all current standards.

### 1.4.5 Emergency Connections

The City's system has four emergency connections. Table 1.1 provides summary of the Systems emergency connections.

Table 1.1: Emergency Connections Summary

| Connection Location | Two way / One way | Status | Size [in] | Discharge [gpm] |
|---|---|---|---|---|
| City of Los Angeles at Palos Verdes Dr. | Two way | Active | 8 | 1,800 |
| City of Torrance at 239th St. & Narbonne St. (Arlington Ave) | One way | Active | 8 | 1,350 |
| City of Torrance Pennsylvania Ave. & 240th St. | One way | Active | 8 | 1,350 |
| Appian Way Pump Station - WB-8A | One way | Active | 12 | 3,350 |

## 1.5 Computer Modeling

The computer modeling software used for this master plan is Infowater Version 7, developed by Innovyze. The majority of the water distribution piping and facilities were captured from the City's GIS maps, and some from the "as built drawings" and the hydraulic model was calibrated based on the field information provided by City staff. The hydraulic model was first simulated based on the average day demand, maximum day demand, and peak hour demand. Based on simulations the water distribution system can handle variations of the water demand based on flow and pressures. The system deficiencies were noted based fire flow and maximum day demand simulation. The majority of the recommended pipeline upsizing was to improve fire flow conditions. In addition, the hydraulic model was used to identify deficiencies within the distribution system.

# Section 2: Study Area

## 2.1 Introduction

The City of Lomita was incorporated in 1964 and is located 26 miles south of downtown Los Angeles and bounded by the City of Torrance to the north and west; City of Los Angeles to the East; the City of Rolling Hills Estates on the Southwest; and the City of Rancho Palos Verdes and unincorporated Los Angeles County area to the North. The City's total area is 1,261 acres or 1.97 square miles.

## 2.2 Population Growth Trends

According to the City's planning document, in 1964, at the time of Lomita's incorporation, the City's population was approximately 15,000 residents. By the time of 2000 Census, the population grew to 20,046 and, according to the 2010 Census, the City's population increased slightly to 20256 (Table 2.1).

Table 2.1: Population Growth (1990 – 2010)

| Year | Estimated Population | Change | % Change |
|---|---|---|---|
| 1990 | 19,382 | -- | -- |
| 2000 | 20,046 | 644 | 3.4% |
| 2010 | 20,256 | 210 | 1.1% |

The Census data indicates that the City's population was relatively stable between 1970 and 1980. During the decades following 1970, the City's population actually declined. Since 2000, the City's population growth rate has been stagnant. From 2000 to 2010 Lomita experienced an average rate of growth of just 0.1 percent annually.

As shown in the table 2.2, the City is expected to experience limited growth over the next 20 to 25 years.

Table 2.2: Population Projections (2000 – 2035)

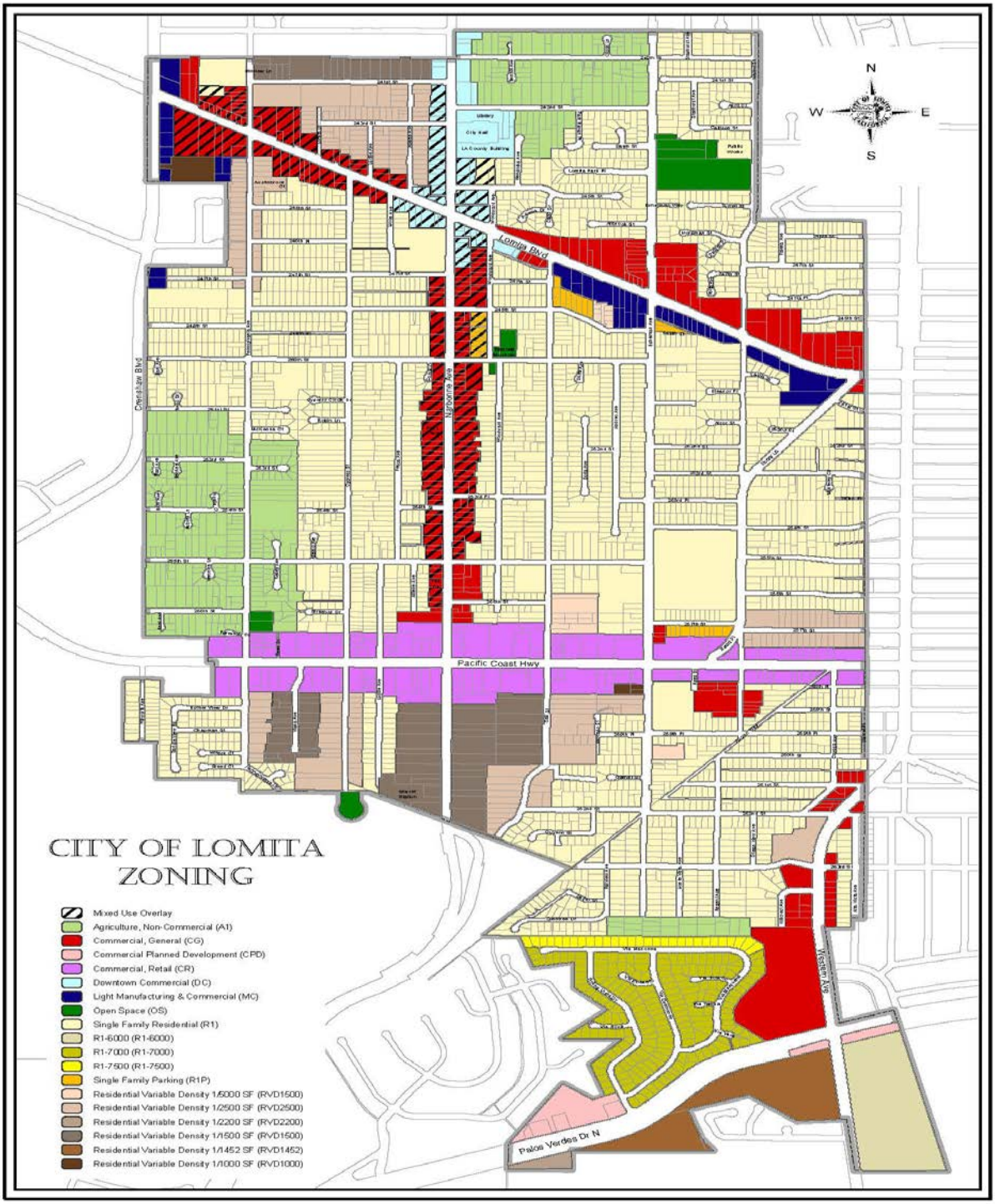
| Year | Population | Population Change |
|---|---|---|
| 2000[1] | 20,046 | -- |
| 2008[2] | 20,300 | +254 |
| 2010[1] | 20,256 | -44 |
| 2020[2] | 21,000 | +744 |
| 2035[2] | 21,900 | +900 |

Sources:

1. U.S. Census Bureau, 2000 to 2010 Census.
2. SCAG Integrated Regional Transportation Plan Growth Forecasts, 2012.

## 2.3 Land Use

Figure 2.1: City of Lomita Zoning Map



# Section 3: Existing Facilities

## 3.1 Introduction

The purpose of the Water Master Plan is to provide the City with a planning tool to recommend short term and long term Capital Improvement Projects, improve system reliability and provide flexibility of water distribution system operations.

Funding for Operation and Maintenance of the City's water distribution system is through the enterprise fund, that is supported by revenue from water user funds. Funding for Capital Improvement projects and capacity improvements is by the Water Capital Fund.

Harris and Associates completed the City's first Water Master Plan in December 2004. In October 2014, KEC Engineers, Inc. was retained by the City of Lomita to update the 2004 Water Master. Some of the recommendations made by Harris and Associates in the 2004 Water Master Plan have been implemented.

## 3.2 System History

As stated in the executive summary, the City's water system was originally owned and operated by the Los Angeles County Waterworks District 13 (District). The District was initially granted a water supply permit in August 1954. The District's water supply was provided by several wells and a 12-inch connection with the Metropolitan Water District of Southern California (MWD). The District's facilities included a 100,000 gallon concrete reservoir, a 50,000 gallon steel tank, a 25,000 gallon steel tank, and a network of pipelines. The system also included a well located at the northwest corner of CWPF . This well was destroyed due to high levels of sulfides and other organic constituents. The District's service area covered the entire City limit, except for 211 homes located at the southern portion of the City limit. This area has been and continues to be served by the California Water Service Company. In 1990, ownership of the water system was transferred to the City of Lomita.

The City of Lomita currently provides water service to a population of approximately 21,000 residents. Ground elevation within the City's water service area varies from 47 to 309 feet above mean sea level.

The City is essentially "Built-Out" and future development projects in the context of population growth will be minimal. The 2010 United States Census reported that Lomita had a population of 20,256.

The City of Lomita owns and operates a State-regulated water system consisting of approximately 43 miles of underground conveyance piping with approximately 797 valves, 470

fire hydrants, and 55 flushing points. There are two reservoirs with combined capacity of over 5.4 million gallons (Cypress Reservoir with 5.3 million gallon capacity and the Harbor Hills Reservoir, with 100,000 gallon capacity) which are able to supply water for 7 days, and four (4) pressure reducing stations, three of which are located at the WB8 metering station at Appian Way and one located at the WB7 metering station at Walnut, that supplies the City's Walnut Pressure Reducing Station. Approximately 45% of the distribution pipes are Asbestos Cement pipe, 21% Cast Iron, 13% Ductile Iron, 5% Steel Pipe, 14% PVC Pipe, and 1% are unidentified. The City also maintains 2 emergency interconnections with the City of Torrance and 1 emergency interconnection with the City of Los Angeles.

Table 3.1: Existing Pipe Materials

| Pipe Material | Approximate Length [ft] | Percent of System |
|---|---|---|
| Asbestos Cement Pipe (ACP) | 103,096 | 45.21 |
| Cast Iron (CI) | 47,252 | 20.72 |
| Cement Mortar Line & Coated Steel (CML&C) | 546 | 0.24 |
| Ductile Iron Pipe (DIP) | 30,637 | 13.44 |
| PVC | 32,513 | 14.26 |
| Steel Pipe (SP) | 11,260 | 4.94 |
| UNIDENTIFIED | 2,710 | 1.19 |
| **Total** | **228,015** | **100** |

Table 3.2: Existing Pipe Diameters

| Diameter [in] | Approximate Length [ft] | Percent of System |
|---|---|---|
| 2 | 1,990 | 0.87 |
| 3 | 24 | 0.01 |
| 4 | 13,650 | 5.99 |
| 6 | 78,669 | 34.50 |
| 8 | 58,968 | 25.86 |
| 10 | 27,261 | 11.96 |
| 12 | 44,522 | 19.53 |
| 14 | 26 | 0.01 |
| 16 | 2,905 | 1.27 |
| **Total** | **228,015** | **100** |

Table 3.3: Normally Closed Valves Listing

| Valve Number | Location |
|---|---|
| 36-13 | Hillworth Ave. & Pacific Coast Highway between Zones 1 & 2 on 4" line running N/S |
| Unknown | Eshelman Ave & 239th Pl. between Zones 1 & 2 |
| Unknown | On pipe running South of 26263 Appian Way & Zone 2 & 3 |
| 48-31 | 263rd St. & Regent Ave. between Zones 2 & 3 |
| 48-28 | 263rd St. & Monte Vista Ave. between Zones 2 & 3 |
| 48-23 | 263rd St. & Eshelman Ave. between Zones 2 & 3 |
| 49-09 | 263rd St. & Western Ave. between Zones 3 & 4 |
| Unknown | Narbonne Ave & Pacific Coast Highway between Zones 1 & 2 |
| Unknown | Hillworth Ave. & Pacific Coast Highway between Zones 1 & 2 on 10" line running N/S |
| 49-14 | 263rd St. & Alta Vista Ave. between Zones 3 & 4 |
| 48-32 | 263rd St. & Ocean View Ave. between Zones 3 & 4 |
| 39-15 | Eshelman Ave. & Pacific Coast Highway between Zones 1 & 2 |
| 40-02 | Appian Way & Pacific Coast Highway between Zones 1 & 2 |
| 38-06 | Oak St. & Pacific Coast Highway between Zones 1 & 2 |
| 37-13 | Cypress St. & Pacific Coast Highway between Zones 1 & 2 |

**It is recommended that all Normally Closed Valves within the City painted RED.**

## 3.3 Sources of Water

As indicated in executive summary, the City's primary source of water supply has been imported water purchased from the Metropolitan Water District of Southern California (MWD) via West Basin Municipal Water District (West Basin, WB8, and WB7). There is one groundwater source well, Well No. 5, with an approximate production capability of 1,500 gallon per minute (GPM).

Table 3.4: Imported Water Connections

| Site | Location | Inlet [psi] | Outlet [psi] | Flow Capacity [gpm] |
|---|---|---|---|---|
| WB-7 | 24525 Walnut Street | 120 | 58 | 1,800 |
| WB-8 | 26255 Appian Way Appian Way Plant and Pressure Reducing Station | 165 | 110 | 3,350 |

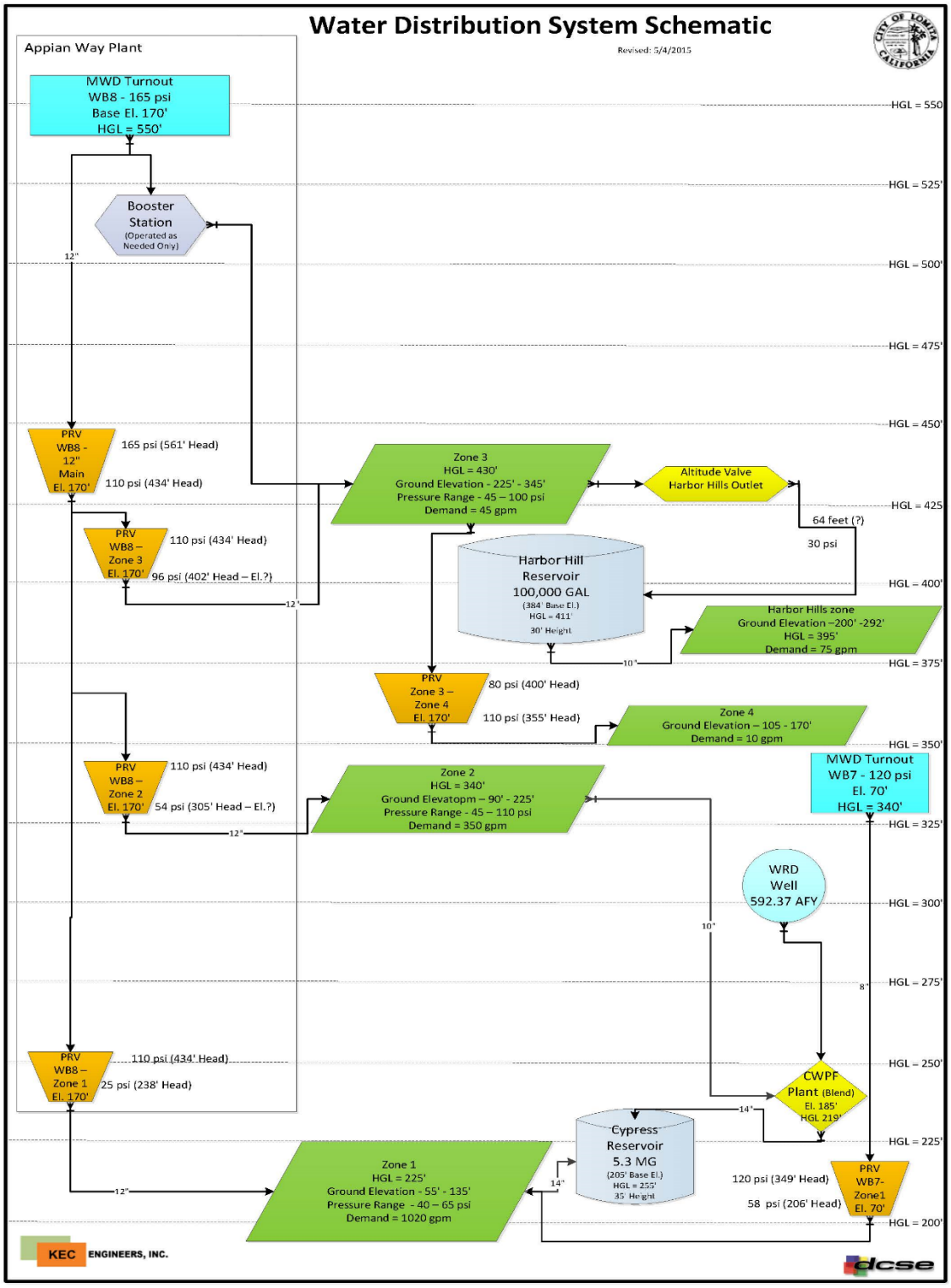
March 15, 2013, the City of Lomita received approval from the State Water Resources Control Board to distribute blended water from the Cypress Water Production Facility (CWPF) Well No. 5 to the City's customers. CWPF is an iron-manganese greensand filtration treatment system designed to remove primarily iron and manganese. CWPF was recently modified to enable aeration and blending with Metropolitan Water District (MWD) imported water to address the aesthetic secondary issues of Total Dissolved Solids (TDS), Hardness (as Calcium Carbonate), and Taste/Odor. CWPF came online on April 1, 2013. These water sources provide the City with municipal water to its population and businesses through 4,174 service connections (4,102 residential, 72 commercial).

Due to its topographical setting, the City of Lomita water system is divided into four different pressure zones that range in hydraulic grade line from 225 Feet to 430 Feet.

Potable water from West Basin is delivered to the City of Lomita through the WB8 metering station at Appian Way. Under normal operating conditions, this metering station has more than enough pressure (available water pressure at the WB8 metering station at Appian Way is about 165 psi) to serve all pressure zones. The City uses three separate pressure reducing stations at the WB8 metering station at Appian Way to lower/regulate pressures to accommodate each of the hydraulic pressure zones.. Two existing booster pumps at the WB8 metering station at Appian Way are available to operate on an as needed basis to pump water from Appian Way to Zone III and the Harbor Hills Reservoir in case of a pressure drop at the WB8 metering station at Appian Way.

The Harbor Hills Reservoir which exclusively serves Zone III is an elevated steel reservoir with a hydraulic grade line of 411'. The total water demand for the Zone III, and Zone IV is approximately 70 gpm.

Figure 3.1: Water Distribution System Schematic



## 3.4 Existing Water Pressure Zones

Zone I with a hydraulic grade line of 225 feet and a pressure range of 40-65 PSI, is the largest water pressure zone serving 3,062 water service connections and approximately 80% of the population residing north of PCH to the north City limit. This pressure zone receives a blended MWD and treated well water from the CWPF. Water in Zone I is supplied by blending groundwater from Well No. 5 and purchase water from MWD. and The water demand for this pressure zone is approximately 1,020 gpm. WB8 metering station at Appian Way and the Walnut pressure reducing facilities serve as a back up to this pressure zone. Zones II and III are solely supplied by purchased water from West Basin.

Table 3.5: Summary of Water Pressure Zones

| Pressure Zone | Hydraulic Grade Line | Pressure Range | No. of Connections | Demand [gpm] |
|---|---|---|---|---|
| I | 225 | 40 - 65 | 3,062 | 1,020 |
| II | 340 | 45 -110 | 930 | 400 |
| III | 430 | 60 -125 | 135 | 45 |
| III-HH | 430 | 60 - 125 | 4 | 75 |
| IV | 355 | 60 - 125 | 11 | 10 |
| **Total** | | | **4,138** | **1,500** |

Zone II with a hydraulic grade line of 340 feet and a pressure range of 45-110 PSI serves 930 water service connections between PCH and 263rd Street. The water demand in Zone II is approximately 400 gpm. In addition, Zone II delivers MWD water to blend at CWPF.
Zone III with a hydraulic grade line of 430 feet and a pressure rating between 60-125 PSI serves 135 connections of the residents south of 263rd Street to the southern City limit.

Zone IV with a hydraulic grade line of 355 feet and a pressure range of 60-125 PSI serves seven single family dwellings, three commercial businesses, and a two acre densely populated condominium complex.

The City of Lomita has a second metering station the Walnut pressure reducing station that is supplied by West Basin Municipal Water District's WB-7 and is located at 24525 Walnut Street in the City of Lomita. The Walnut pressure reducing station is used as a secondary supply for fire flow demands or other high demand periods in Zone I.

## 3.5 Water Consumption Demand

Demand variations throughout a year are affected by seasonal effects, including: temperature, humidity, and precipitation. System demand variations throughout a day are influenced by the customer's daily schedules. In primarily residential areas, the peak demands within a day typically occur in the morning hours between 6:00 am and 9:00 am, when customers wake to begin their daily routine. In commercial and industrial areas, the peaks may occur mid-day or remain relatively constant throughout the day.

Typical of most Southern California communities, the City's water consumption exhibits a distinct seasonal pattern. Peak and low monthly consumption occur during the dry summer months and wet winter months, respectively. Peak demands in Lomita occur in July and August. Low demands typically occur in February. The highest and lowest monthly demand factors between 2009 and 2015 were 241 and 144 acre-feet, respectively. The overall City's water demand is 1,500 gpm of which:

| | |
|---|---|
| **Zone I demand =** | **1,020 gpm** |
| **Zone II demand =** | **390 gpm** |
| **Zone III, IV, and Harbor Hill demands =** | **90 gpm** |

It is important to evaluate a water system during various incremental peak demands. Typically, a water system is designed to meet the maximum demands placed on it. The system components must be designed to cope with these demands as they occur. Maximum month and maximum day demands are important factors in sizing a system's supply capability. Maximum day demands usually dictate the design criteria for both system transmission and storage needs. Peak hour criterion is a measure of the system's overall adequacy with respect to its transmission and distribution elements, as well as its operational storage capacity. August has the highest peak demand within the City of Lomita, Average monthly demand in August is 229 Acre-Feet (74.61 million gallons). The average daily water demand is 2.1 million gallons per day. The maximum daily demand within the City of Lomita is about 2.6 million gallons per day. City's water consumption is in line with other communities in Southern California.

Figure 3.2: City Water Distribution System by Pressure Zone Legend

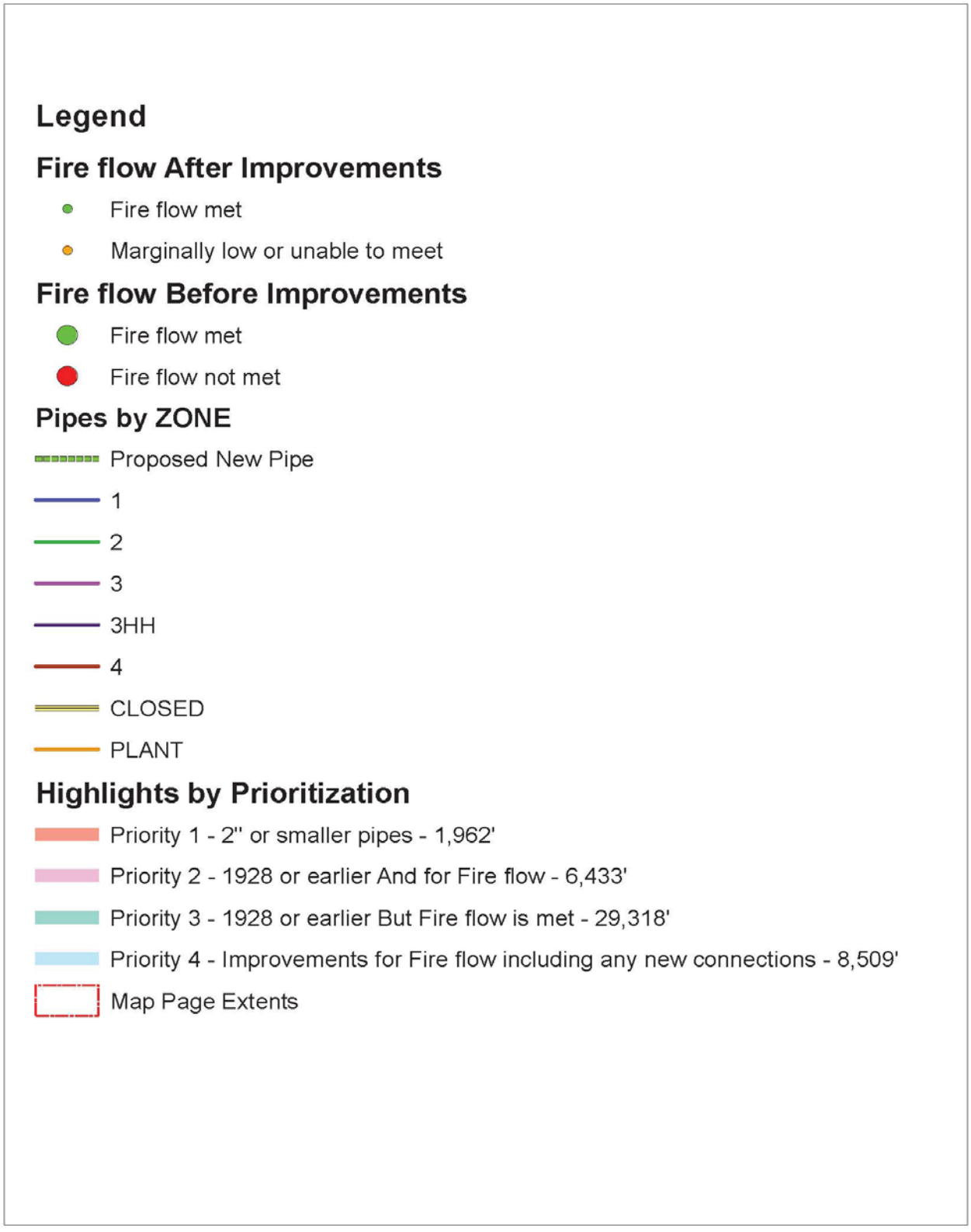
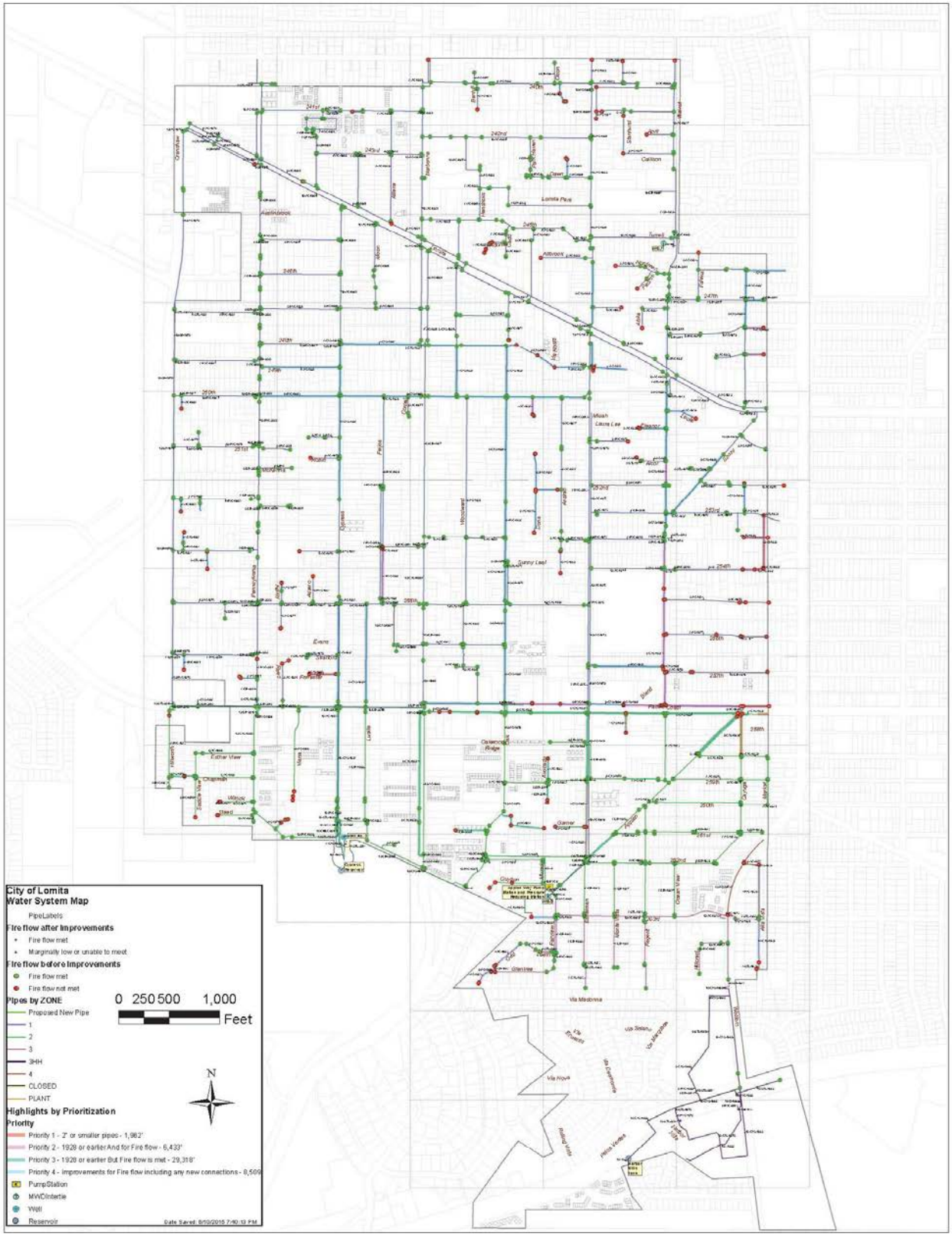


Figure 3.3: City Water Distribution System by Pressure Zone




***Supplemental 24”x36” maps were provided separately**

Figure 3.4: Water System Map

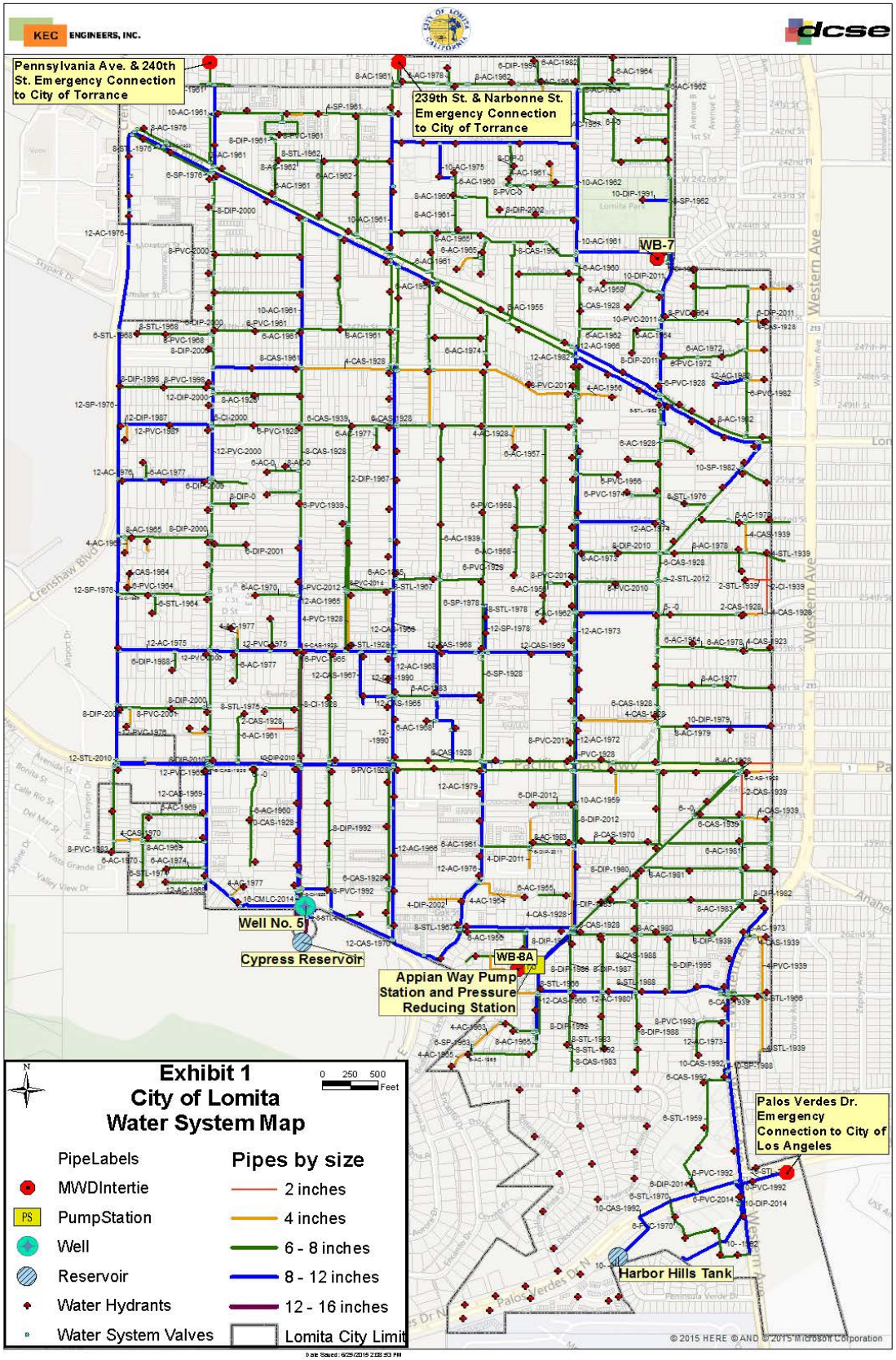


Table 3.6: Summary of Analysis Peaking Factors

| Simulation Scenario | Peaking Factor | Existing System Demand [gpm] |
|---|---|---|
| Average Day Demands | 1.00 | 1,500 |
| Maximum Day Demands | 1.3 | 1,950 |
| Peak Hour | 2.0 | 3,000 |

Table 3.7: City of Lomita Water Consumption 2012 - 2014 (AF)

| | Month | WRD (Well) [AF] | Blend Ratio | MWD (CWPF) [AF] | MWD (City) [AF] | WB-07 | WB-08 | Total Used (City) [AF] |
|---|---|---|---|---|---|---|---|---|
| **FY 2012 – 2013** | 12-Jul | 0 | - | 0 | 219.3 | 35.1 | 184.2 | 219.3 |
| | 12-Aug | 3.8 | - | 0 | 234 | 19.2 | 214.8 | 237.8 |
| | 12-Sep | 0 | - | 0 | 222.4 | 14.9 | 207.5 | 222.4 |
| | 12-Oct | 0 | - | 0 | 210.1 | 9.6 | 200.5 | 210.1 |
| | 12-Nov | 19.66 | - | 0 | 195.3 | 6.8 | 188.5 | 214.96 |
| | 12-Dec | 6.67 | - | 0 | 167.5 | 1.9 | 165.6 | 174.17 |
| | 13-Jan | 0 | - | 0 | 167.4 | 0.70 | 166.7 | 167.4 |
| | 13-Feb | 0.93 | - | 0 | 156.2 | 0.80 | 155.4 | 157.13 |
| | 13-Mar | 4.64 | - | 0 | 185.7 | 2.30 | 183.4 | 190.34 |
| | 13-Apr | 30.28 | 25/75 | 90.2 | 174.7 | 0.70 | 174 | 204.98 |
| | 13-May | 37.03 | 28/72 | 93 | 175.7 | 0.30 | 175.4 | 212.73 |
| | 13-Jun | 58.78 | 36/64 | 102.43 | 166.7 | 0.40 | 166.3 | 225.48 |
| | **TOTAL** | **161.79** | **-** | **-** | **2275** | **-** | **-** | **2436.79** |
| **FY 2013 – 2014** | 13-Jul | 53.21 | 35/65 | 98.51 | 169.9 | 0.30 | 169.6 | 223.11 |
| | 13-Aug | 60.47 | 37/63 | 100.87 | 169.2 | 0.10 | 169.1 | 229.67 |
| | 13-Sep | 57.74 | 39/61 | 90.37 | 158.1 | 0.20 | 157.9 | 215.84 |
| | 13-Oct | 16.68 | 39/61 | 25.77 | 196.4 | 68.50 | 127.9 | 213.08 |
| | 13-Nov | 44.72 | 37/63 | 75.33 | 147.5 | 8.70 | 138.8 | 192.22 |
| | 13-Dec | 52.73 | 43/57 | 68.88 | 122.3 | 0.0 | 122.3 | 175.03 |
| | 14-Jan | 46.49 | 38/62 | 77.15 | 135.7 | 0 | 135.7 | 182.19 |
| | 14-Feb | 41.44 | 39/61 | 64.21 | 114 | 0 | 114 | 155.44 |
| | 14-Mar | 46.82 | 38/62 | 75.9 | 131.3 | 0.1 | 131.2 | 178.12 |
| | 14-Apr | 46.5 | 39/61 | 73.77 | 134.1 | 1.2 | 132.9 | 180.6 |
| | 14-May | 59.79 | 39/61 | 92.55 | 161.9 | 2.5 | 159.4 | 221.69 |
| | 14-Jun | 65.78 | 46/54 | 78.24 | 147.3 | 1.2 | 146.1 | 213.08 |
| | **TOTAL** | **592.37** | **-** | **-** | **1787.7** | **-** | **-** | **2380.07** |

Table 3.7: City of Lomita Water Consumption 2012 - 2014 (AF)

| | Month | WRD (Well) [AF] | Blend Ratio | MWD (CWPF) [AF] | MWD (City) [AF] | WB-07 | WB-08 | Total Used (City) [AF] |
|---|---|---|---|---|---|---|---|---|
| FY 2014 – 2015 | 14-Jul | 61.41 | 45/55 | 73.62 | 150.3 | 10.5 | 139.8 | 211.71 |
| | 14-Aug | 60.01 | 46/54 | 69.12 | 153.4 | 18.5 | 134.9 | 213.41 |
| | 14-Sep | 62.56 | 50/50 | 62 | 141.4 | 3.5 | 137.9 | 203.96 |
| | 14-Oct | 51.26 | 50/50 | 51 | 143.8 | 0.7 | 143.1 | 195.06 |
| | 14-Nov | 59.03 | 50/50 | 59 | 118.9 | 2.6 | 116.3 | 177.93 |
| | 14-Dec | 52.01 | 52/48 | 48.18 | 102.2 | 0.2 | 102 | 154.21 |
| | 15-Jan | 61.11 | 56/44 | 48.79 | 102.3 | 0.5 | 101.8 | 163.41 |
| | 15-Feb | 56.55 | 56/44 | 44.46 | 91.3 | 0.2 | 91.1 | 147.85 |
| | 15-Mar | 64.55 | 56/44 | 51.29 | 104.8 | 0.2 | 104.6 | 169.35 |
| | 15-Apr | 54.96 | 49/51 | 56.51 | 114.4 | 2.3 | 112.1 | 169.36 |
| | 15-May | 48.58 | 50/50 | 48.12 | 125.5 | 1.4 | 124.1 | 174.08 |
| | 15-Jun | 55.69 | 50/50 | 55.17 | 114.2 | 1.6 | 112.6 | 169.89 |
| | **TOTAL** | **687.72** | **-** | **-** | **1462.50** | **-** | **-** | **2150.22** |

## 3.6 Existing Water Distribution System Deficiencies

1- Except for a few miles of the pipelines built in the last 10 years, more than 80 percent of the existing network was built in 1928 through the 1970s. The life expectancy of water pipelines is approximately 65 years, after which they will typically experience corrosion and water leaks. The City has not experienced major leaks in the existing system primarily because the system is operating at a low water pressure and low velocity.

2- The oversized design and construction of the new 5.3-million-gallon reservoir has contributed to the City's water quality problems. Prior to year 2007, the City's total water storage capacity was less than 1-million gallons. Although the population growth in the City has been less than 1%, the City's water storage capacity has increased by approximately 500 percent. Having additional water storage capacity in any water distribution system is valuable for fire protection and during emergency periods as long as the water storage facilities are logistically constructed to provide system reliability. However, keeping all water storage in one reservoir is problematic and creates a water quality problem due to stagnation.

3- The City is challenged with a water quality problem in some parts of the City. This problem is mainly related to the existing oversized reservoir (5.3 MG) at the Cypress Water Production Facility and low water demand in the City. In our hydraulic model analysis we learned that during the max day demand, the velocities throughout the water distribution system are less than 2 ft/sec. Typical velocities in a water distribution system

are greater than 4 ft/sec. The slow water movement in the City's distribution system has resulted in a drop in chlorine residual. The City has established a few flushing points to flush the stagnant water in the distribution system; however, the flushing of the stagnant water is labor intensive, costly, and problematic.

4- Inadequate fire flow in some areas in the City is another problem that the City needs to address. The lack of fire flow is due to undersize pipelines in the network.

# Section 4: Hydraulic Model of the Existing Water System

The hydraulic model is an "all mains" representation of the City of Lomita's Water Distribution system. The model consists of the distribution and transmission mains, and does not include service lines or laterals. Since the model was developed from GIS data, it will be relatively easier to maintain both GIS and model in sync. The hydraulic model was developed using Innovyze's INFOWater software. The following is the workflow which we used to develop the hydraulic model:

GIS Data Updates – The City's GIS data did not have updates in the recent past. We updated the GIS data using the as-built drawings for the most recent developments.
Hydraulic Model – We reviewed the GIS data and prepared it for modeling. This includes proper pipe segmentation, and layerization. Import GIS Data into Hydraulic Modeling Software
Develop Demands – We obtained billing system records for last couple of years, and– Next we imported the GIS data into the hydraulic model (pipes, junctions), and added the major infrastructure elements (water supply sources, PRVs, tanks, well) processed the pdf file to create tabular billing system data. This data was used to determine the average demand in gpm, at each meter. The meter account type was also identified. The following is a summary of the demands by account type:

Table 4.1: Summary of Demands by Account Type

| Account Type | Demand [gpm] |
|---|---|
| RESIDENTIAL | 1329.82 |
| COMMERCIAL | 204.75 |
| CITY | 13.51 |
| **Total** | **1548.26** |

Next, we assigned a model pipe to each of the service meters, followed by the closest junction serving the pipe. The pressure zone was carefully assigned to each meter before linking it to the pipe within the same zone. Also, existing service line connection in GIS and as-builts were used wherever available to ensure that the demand was allocated to the right pipe. These demands were imported into the hydraulic model, and adjusted for unaccounted flows.

## 4.1 Diurnal Curves

Diurnal demand curves were developed based on Industry standards for the following types of users:

Figure 4.1: Demand Factor for Account Type City

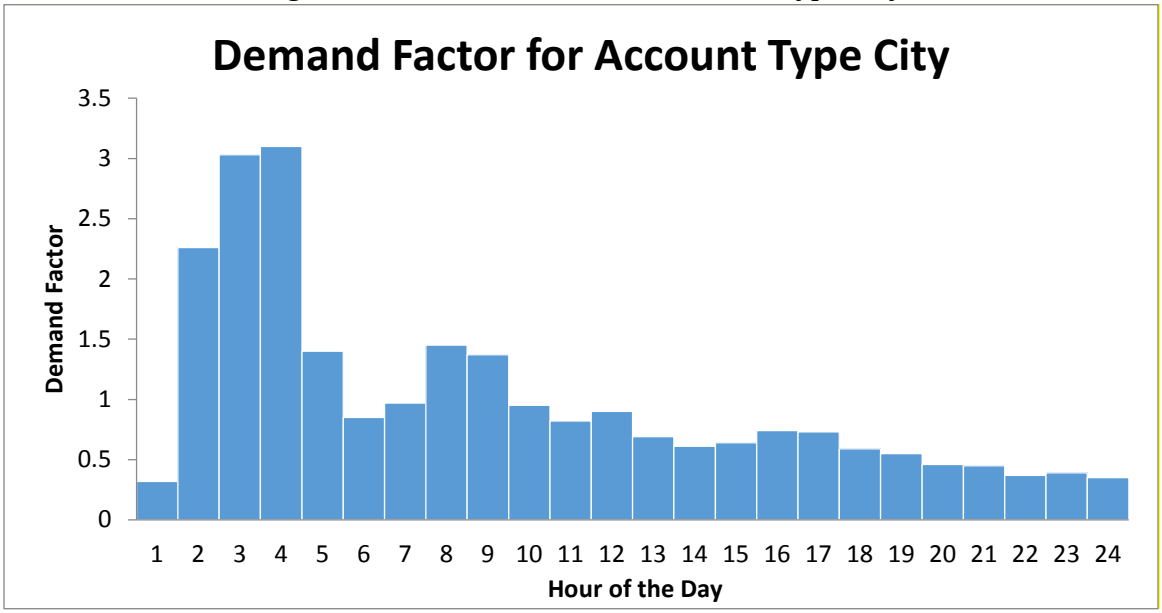



Table 4.2: Demand Factor of Account Type City

| Hour | Demand Factor for Account Type City |
|---|---|
| 1 | 0.32 |
| 2 | 2.26 |
| 3 | 3.03 |
| 4 | 3.1 |
| 5 | 1.4 |
| 6 | 0.85 |
| 7 | 0.97 |
| 8 | 1.45 |
| 9 | 1.37 |
| 10 | 0.95 |
| 11 | 0.82 |
| 12 | 0.9 |
| 13 | 0.69 |
| 14 | 0.61 |
| 15 | 0.64 |
| 16 | 0.74 |
| 17 | 0.73 |
| 18 | 0.59 |
| 19 | 0.55 |
| 20 | 0.46 |
| 21 | 0.45 |
| 22 | 0.37 |
| 23 | 0.39 |
| 24 | 0.35 |

Figure 4.2: Demand Factor for Account Type Commercial

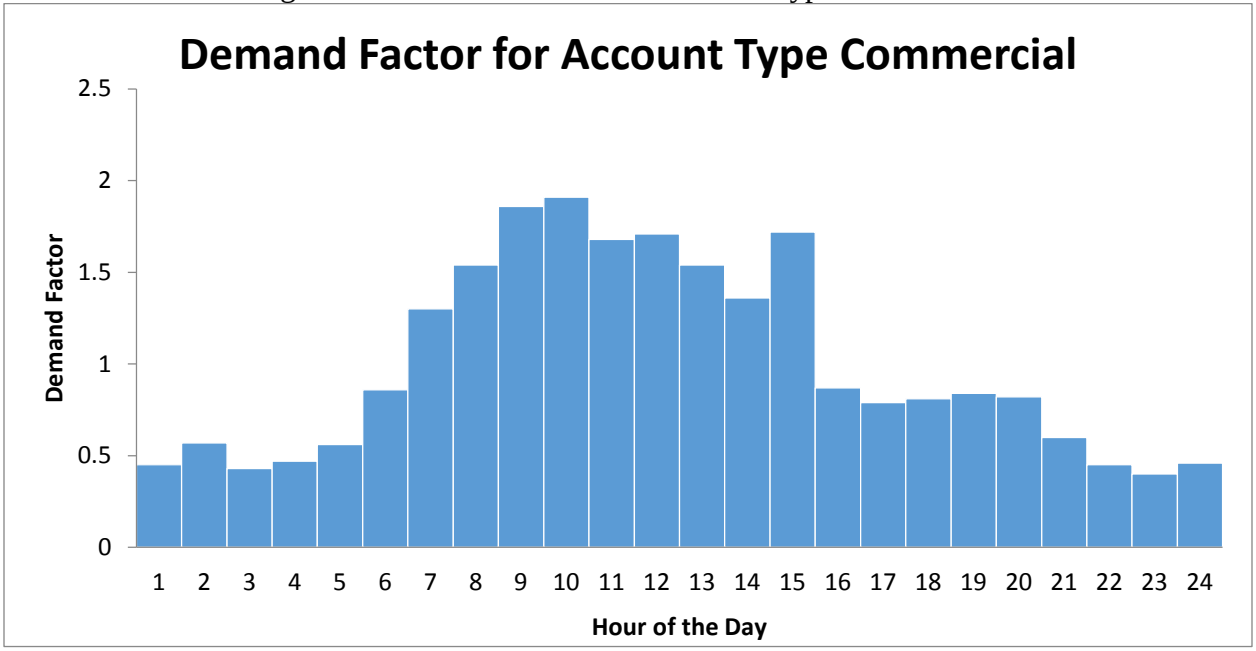



Table 4.3: Demand Factor of Account Type Commercial

| Hour | Demand Factor for Account Type Commercial |
|---|---|
| 1 | 0.45 |
| 2 | 0.57 |
| 3 | 0.43 |
| 4 | 0.47 |
| 5 | 0.56 |
| 6 | 0.86 |
| 7 | 1.3 |
| 8 | 1.54 |
| 9 | 1.86 |
| 10 | 1.91 |
| 11 | 1.68 |
| 12 | 1.71 |
| 13 | 1.54 |
| 14 | 1.36 |
| 15 | 1.72 |
| 16 | 0.87 |
| 17 | 0.79 |
| 18 | 0.81 |
| 19 | 0.84 |
| 20 | 0.82 |
| 21 | 0.6 |
| 22 | 0.45 |
| 23 | 0.4 |
| 24 | 0.46 |

Figure 4.3: Demand Factor for Account Type Residential

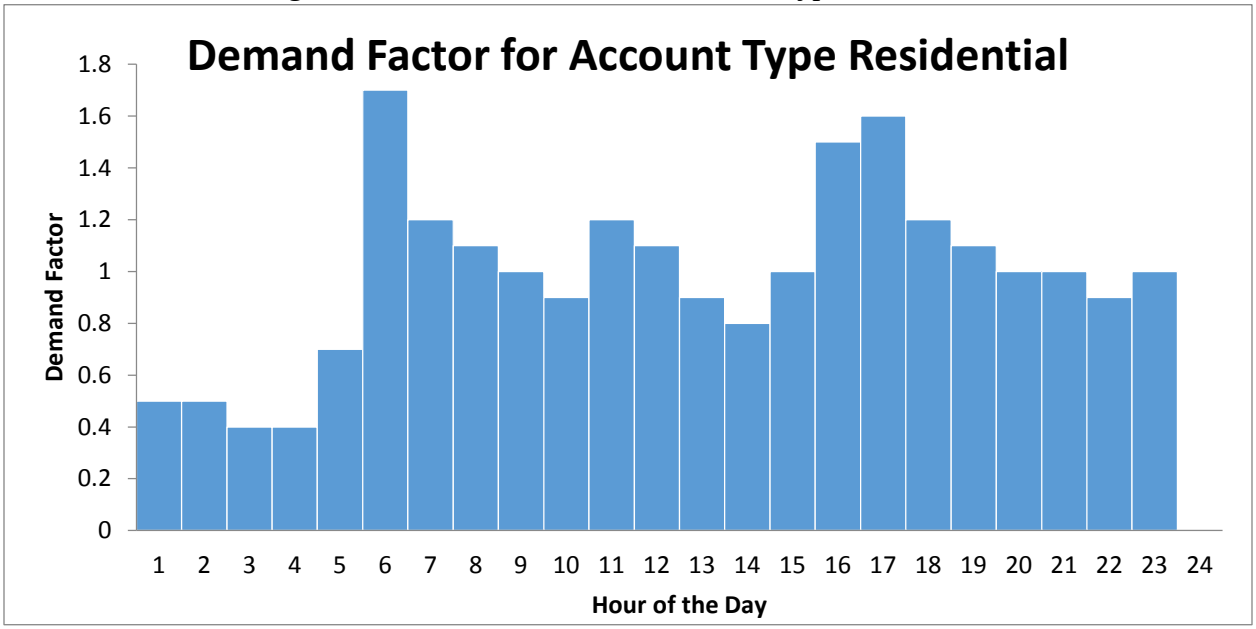



Table 4.4: Demand Factor for Account Type Residential

| Hour | Demand Factor for Account Type Residential |
|---|---|
| 1 | 0.5 |
| 2 | 0.5 |
| 3 | 0.4 |
| 4 | 0.4 |
| 5 | 0.7 |
| 6 | 1.7 |
| 7 | 1.2 |
| 8 | 1.1 |
| 9 | 1 |
| 10 | 0.9 |
| 11 | 1.2 |
| 12 | 1.1 |
| 13 | 0.9 |
| 14 | 0.8 |
| 15 | 1 |
| 16 | 1.5 |
| 17 | 1.6 |
| 18 | 1.2 |
| 19 | 1.1 |
| 20 | 1 |
| 21 | 1 |
| 22 | 0.9 |
| 23 | 0.4 |
| 24 | 0.46 |

Operating Conditions – We assigned operating conditions which include the following:

- Zone isolation valves
- Tank initial and max levels
- PRV settings
- Boundary conditions

The model was simulated to examine the preliminary results, and anomalies were discussed and resolved with the City's help. Model Calibration we performed fire flow analysis at locations provided by City to match the model.

# Section 5: Model Analysis

We ran several scenarios of the system hydraulics and created simulations in order to evaluate the existing water system's strengths and deficiencies. The hydraulic simulations included:

1- Average day demand simulation;
2- Max day demand simulation and system pressure;
3- Peak hour simulation and system pressure;
4- Network system flow velocities during max day demand;
5- Fire flow simulations under max day demands - with different fire flows at each junction based on the account type serviced. Residential customers were assigned 1,500 gpm fire flow, whereas commercial were assigned 2,500 gpm, and the City accounts had 3,500 gpm.

Based on our hydraulic simulation, we learned the following:

1- System pressure is adequate during the max day demand;
2- Fire flow is low in some areas;
3- Several segments of the existing pipes need to be upsized to meet the fire flow conditions.

Flow velocities are very low throughout the system; this condition will cause depletion of the chlorine residual and cause potential problems for the water quality.

## Section 6: Proposed Water System Improvements and Priorities

More than 80 percent of the City's existing water distribution system is due for replacement and all could be identified as the number one priority. Some pipes in the network have surpassed their life expectancy (specifically, those built in 1928). Some pipes are undersized and have surpassed their life expectancies (2- and 4-inch pipes built in 1928 which restrict the required fire flow demand). It is obviously unrealistic to replace 80 percent of the City's water distribution system because of the funding requirements. To date, the City of Lomita has not been able to replace many of the pipelines recommended for replacement in the 2004 Harris and Associates Report, so we developed a list of priorities to allow the City to replace their water system network at a more realistic pace.

Most municipalities make fire flow demand as their highest priority. However, we recommend setting the priorities as follows:

**Priority #1** – Replace the 2-inch pipes. The cost is minimal but the improvement to the water system is substantial**.** Some of these improvements are just to eliminate the dead end pipes and improve water circulation

Length of pipe to be replaced: 1,701 ft
Total cost for Priority #1 is approximately: $221,130

**Priority #2** – Replace all 1928 or earlier built pipelines. This will improve fire flow conditions.

Length of pipe to be replaced: 11,595 ft
Total cost for Priority #2 is approximately: $1,542,440

**Priority #3** – Replace all 1928 or earlier built pipelines regardless of their impact on the fire flow requirement. We believe the risk of failure for these old pipelines is high and if they fail, they will substantially impact the fire flow and the fire flow conditions will change from low to very poor.

Length of pipe to be replaced: 23,147 ft
Total cost for Priority #3 is approximately: $3,482,500

**Priority #4** – Replace all pipes as required to meet the fire flow conditions.

Length of pipe to be replaced: 9,605 ft
Total cost for Priority #4 is approximately: $1,283,860

**Priority #4 (New)** – New Pipeline Connections.

Length of pipe to be added: 136 ft
Total cost for Priority #4 (New) is approximately: $17,680

**Total Length of Pipe:** 46,185 ft
**Total Cost:** $6,547,610

Figure 6.1: Improvements Map

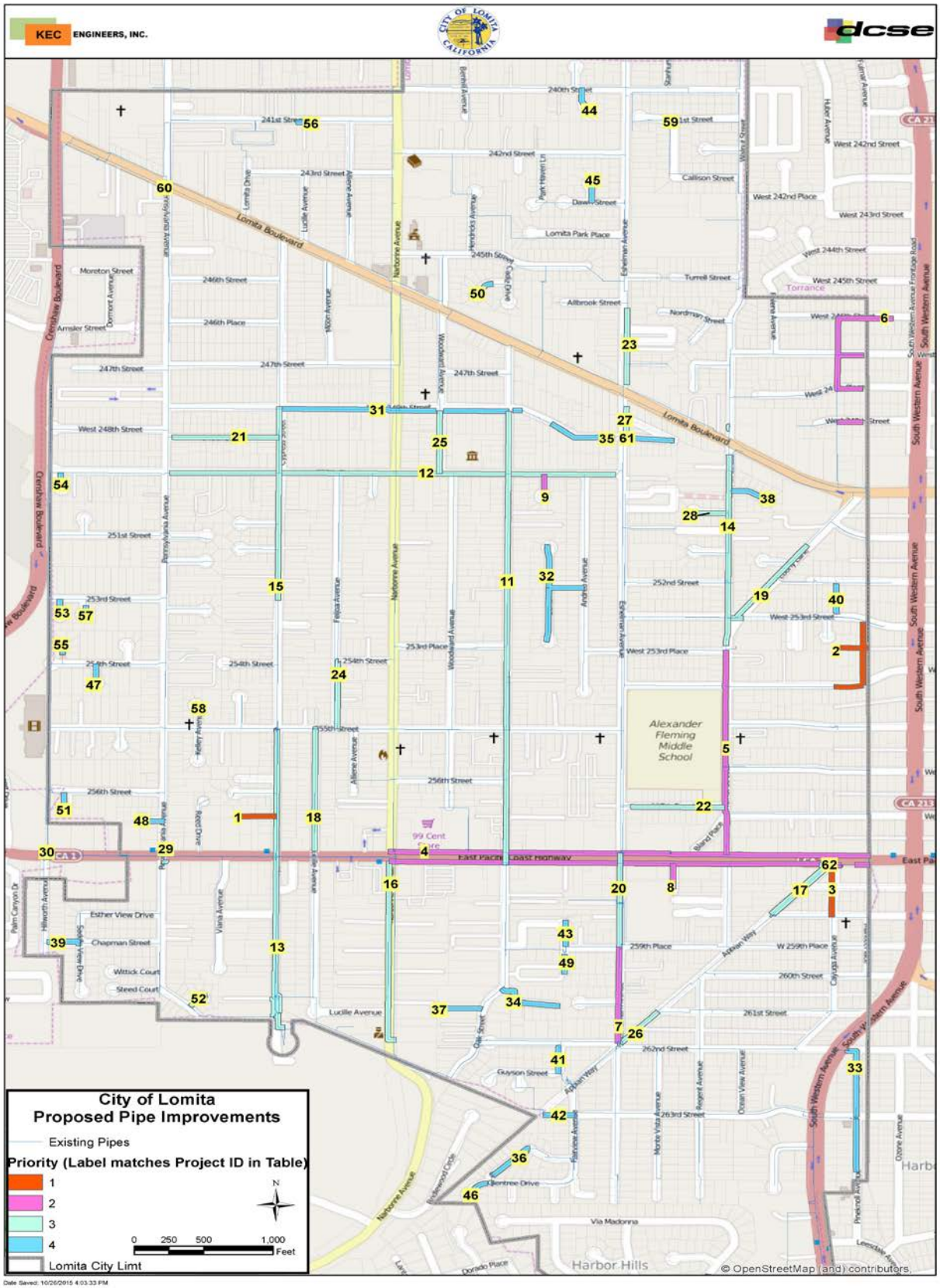


Table 6.1: Prioritized Pipe Upgrade & New Connection Listing

| Priority Level | Location Description | Old Pipe Description | Proposed Pipe Size [in] | Project ID | Pipe Length [ft] | Cost |
|---|---|---|---|---|---|---|
| 1 | Forrester Dr. off of Cypress St. | All 2" - 1928 | 6 | 1 | 289 | $37,570 |
| 1 | Western Limits of City - South of W. 253rd St. to W. 254th St. | 125ft of 4" 1928 Pipe on W. 254th St. Rest is 2" 1928 / 1930 pipe | 6 | 2 | 970 | $126,100 |
| 1 | Cayuga Ave North of W. 259th St. and South of PCH. | All 2" - 1939 | 6 | 3 | 442 | $57,460 |
| **Total Length & Cost for Priority 1 - Pipe Upgrades** | | | | | **1,701** | **$221,130** |
| 2 | PCH - East of Narbonne Ave. | 2" - 1939 - 386 ft., 4" 1939 - 30 ft., 6" 1928 - 6244 ft., 8" - 1928 - 76 ft., 6" 1999 - 342 ft. | 6 | 4 | 7077 | $920,010 |
| 2 | On Walnut, North of PCH, South of W. 253rd Pl. | All 6" 1928 pipe. | 8 | 5 | 1761 | $264,150 |
| 2 | At Western City Limit - on W. 246th St. , W. 247th St., and W. 247th Pl., Between W. 246th St. and w. 247th Pl. | 4" 1928 - 955 ft. Remaining 6" 1928 | 6 | 6 | 1537 | $199,810 |
| 2 | On Eshelman South of 259th Pl. and North of 262nd St. | All 4" 1928 - except 15 ft 6" 1928 pipe. | 6 | 7 | 815 | $105,950 |
| 2 | Reed St. off of PCH | All 4" 1928 | 6 | 8 | 209 | $27,170 |
| 2 | Doria Ave. South of 250th St. | All 4" 1928 | 6 | 9 | 195 | $25,350 |
| **Total Length & Cost for Priority 2 - Pipe Upgrades** | | | | | **11,595** | **$1,542,440** |
| 3 | Oak St. North of PCH, | All 6" 1928 | 8 | 11 | 3742 | $561,300 |

| Priority Level | Location Description | Old Pipe Description | Proposed Pipe Size [in] | Project ID | Pipe Length [ft] | Cost |
|---|---|---|---|---|---|---|
| | South of W. 248th St. | | | | | |
| 3 | On 250th St. West of Pennsylvania Ave. | All 6" 1928 | 8 | 12 | 3209 | $481,350 |
| 3 | Cypress St. - from plant to 255th St. | 10" - 1928 - 1859 ft., 12" 1928 - 7', 6" 1928 - 5 ft, 8" 1928 - 1261 ft. | 10 | 13 | 3131 | $500,960 |
| 3 | On Walnut St. North of W. 253rd Pl., and South of Lomita Blvd. | 10" 1928 - 1859 ft., 12" 1928 - 6 ft., 6" 1928 - 5 ft., 8" 1928 - 1262 ft. | 10 | 14 | 1606 | $256,960 |
| 3 | On Cypress St. South of W. 248th St. North of 254th St. | 8" 1928 | 8 | 15 | 1600 | $240,000 |
| 3 | On Narbonne South of PCH to Southern City Limit | All 6" 1928 | 8 | 16 | 1554 | $233,100 |
| 3 | Appian Way South of PCH, North of W. 259th St. | All 6" 1928 | 8 | 17 | 1236 | $185,400 |
| 3 | On Lucille Ave. Between 255th St. and PCH. | All 6" 1928 | 8 | 18 | 1040 | $156,000 |
| 3 | On Ebony, North of W. 253rd St. | All 6" 1928 | 8 | 19 | 909 | $136,350 |
| 3 | On Eshelman between PCH and 259th Pl. | All 6" 1928 | 8 | 20 | 787 | $118,050 |
| 3 | On 249th St. between Pennsylvania Ave. & Cypress St. | All 8" 1928 | 8 | 21 | 773 | $115,950 |
| 3 | On 257th St. Between Eshelman & Walnut | All 4" 1928 | 6 | 22 | 679 | $88,270 |
| 3 | On Eshelman between Lomita Blvd. & Allbrook | All 6" 1928 | 8 | 23 | 632 | $94,800 |

| Priority Level | Location Description | Old Pipe Description | Proposed Pipe Size [in] | Project ID | Pipe Length [ft] | Cost |
|---|---|---|---|---|---|---|
| | St. | | | | | |
| 3 | On Feoijia between 255th St & 254th St. | All 4" 1928, except 23 ft. of 8" 1928 | 6 | 24 | 589 | $76,570 |
| 3 | On Woodward Ave. between W. 250th St. & W. 248th St. | All 4" 1928 | 6 | 25 | 519 | $67,470 |
| 3 | On Appian Way between 261st St. & 262nd St. | All 8" 1928 | 8 | 26 | 408 | $61,200 |
| 3 | On Eshelman - across W. 248th St. South of Lomita Blvd. | All 6" 1928 | 8 | 27 | 295 | $44,250 |
| 3 | On Laura Lee Ln. off of Walnut | All 6" 1928 | 8 | 28 | 284 | $42,600 |
| 3 | On Pennsylvania Ave. North and South of PCH. | All 6" 1928 | 8 | 29 | 82 | $12,300 |
| 3 | On Hillworth Ave. North and South of PCH. | All 4" 1928 | 6 | 30 | 74 | $9,620 |
| **Total Length & Cost for Priority 3 - Pipe Upgrades** | | | | | **23,147** | **$3,482,500** |
| 4 | On W. 248th St. Cypress to Oak St. | 1555 ft of 4" 1928, 27 ft of 6" 1928, 103 ft of 8" 1928 | 6 | 31 | 1684 | $218,920 |
| 4 | 252nd St. & Doria Ave | All 6" 1958 | 8 | 32 | 1055 | $158,250 |
| 4 | On Alta Vista Ave. Between W. 262nd St. & City Limit. | All 4" 1939 | 6 | 33 | 1043 | $135,590 |
| 4 | On 261st St. East of Oak St. | All 4" 1954 | 6 | 34 | 523 | $67,990 |
| 4 | W. 248th St. On East and West sides of Eshelman | All 4" 1956 | 6 | 35 | 873 | $113,490 |

| Priority Level | Location Description | Old Pipe Description | Proposed Pipe Size [in] | Project ID | Pipe Length [ft] | Cost |
|---|---|---|---|---|---|---|
| 4 | Ovid Ave. | All 4" 1963 | 6 | 36 | 352 | $45,760 |
| 4 | Alley off of Oak St. on West side, South of 26th St. | All 4" 2002 | 6 | 37 | 317 | $41,210 |
| 4 | On Leola off of Walnut | All 6" 1959 | 8 | 38 | 292 | $43,800 |
| 4 | West of Chapman, between Hillworth & Saddleview | All 4" 1970 | 6 | 39 | 254 | $33,020 |
| 4 | Running between W. 252nd St. & W. 253rd St. at Western City limit. | All 4" 1939 | 6 | 40 | 250 | $32,500 |
| 4 | On Murad Ave. between 262nd St. & Guyson Ave. | All 6" 1956 | 8 | 41 | 236 | $35,400 |
| 4 | On 263rd St. West of Appian Way | All 4" 1956 | 6 | 42 | 227 | $29,510 |
| 4 | Arcado St. North of 259th Pl. | All 4" 1963 | 6 | 43 | 218 | $28,340 |
| 4 | Alley off of 240th St. at intersection of 240th St. & Olson | All 4" 1965 | 6 | 44 | 213 | $27,690 |
| 4 | Carlene Ln. off of Dawn St. | All 4" 1961 | 6 | 45 | 197 | $25,610 |
| 4 | End of Glentree Dr. | All 4" 1965 | 6 | 46 | 193 | $25,090 |
| 4 | Aubrey Ln. South of 254th St. | All 6" 1964 | 8 | 47 | 184 | $27,600 |
| 4 | Forrester Dr. off of Pennsylvania Ave. | All 4" 1981 | 6 | 48 | 181 | $23,530 |
| 4 | Avacado St. South of 259th Pl. | All 4" 2011 | 6 | 49 | 166 | $21,580 |
| 4 | Adona off of Cadiz Dr. | All 4" 1965 | 6 | 50 | 166 | $21,580 |
| 4 | Bani South of 256th St. | All 4" 1981 | 6 | 51 | 165 | $21,450 |

| Priority Level | Location Description | Old Pipe Description | Proposed Pipe Size [in] | Project ID | Pipe Length [ft] | Cost |
|---|---|---|---|---|---|---|
| 4 | Danmar Ct. off of Pennsylvania Dr. | All 4" 1977 | 6 | 52 | 159 | $20,670 |
| 4 | Bani South of 253rd St. | All 4" 1965 | 6 | 53 | 134 | $17,420 |
| 4 | Bani South of 250th St. | All 4" 1965 | 6 | 54 | 128 | $16,640 |
| 4 | S. Bani Ave. North of 254th St. | All 4" 1964 | 6 | 55 | 118 | $15,340 |
| 4 | In front of 2262 241st St. | All 4" 1961 | 6 | 56 | 114 | $14,820 |
| 4 | Becknell Ave. South of 253rd St. | All 4" 1965 | 6 | 57 | 82 | $10,660 |
| 4 | Kelley Ave North of 255th St. | All 4" 1977 | 6 | 58 | 80 | $10,400 |
| **Total Length & Cost for Priority 4 - Pipe Upgrades** | | | | | **9,605** | **$1,283,860** |
| 4 - New Pipe Connections | Stanhurst / 241st St. | | 6 | 59 | 58.11 | $7,540 |
| 4 - New Pipe Connections | Lomita & Pennsylvania | | 6 | 60 | 25.04 | $3,250 |
| 4 - New Pipe Connections | Eshelman & 248th St. | | 6 | 61 | 36.43 | $4,680 |
| 4 - New Pipe Connections | PCH & Appian | | 6 | 62 | 17.04 | $2,210 |
| **Total Length & Cost for Priority 4 - New Pipe Connections** | | | | | **136.62** | **$17,680** |
| **Total Length & Cost for All Priorities** | | | | | **46,185** | **$6,547,610** |

# Section 7: Capital Improvements Financing

The capital improvements outlined in this report must be implemented in order to bring the City's water system up to standards. The City will need to invest a total of $6,547,610 in order to do so. Recommendations to finance these improvements include increasing the water utility rates and acquiring grants or loans available through the California Department of Water Resources. These options should be further explored by the City staff.

## 7.1: SCADA System

The City's current SCADA system is limited to monitoring and controlling the Cyprus reservoir site. Neither Harbor Hills Reservoir nor the Apian Way facilities are connected to the City's SCADA system. The City should consider installing new RTUs at each of the critical sites and connect all facilities to a centralized location for operation and monitoring. The City may use a radio frequency for communication and operating of the new SCADA system. The estimated cost of equipment software and installation of a new and basic SCADA system including new RTUs is about $100,000.