# Section 6

## Recommended Water System Improvements

# Section 6: Recommended Water System Improvements

FIGURES 6-1, 6-2 ,6-3 DELETED FOR WEB SECURITY ISSUES.

The previous section presented the results of hydraulic analyses using the hydraulic model developed for CCSD's water system, calibrated by Boyle Engineering in their recent *Draft CCSD Water Model Calibration and Leimert Fire Protection Analysis* study, and updated by Kennedy/Jenks to include the latest demand projections per District directives. This section discusses the set and sequence of recommended improvements to alleviate identified hydraulic deficiencies for all growth scenario options as well as addresses current storage deficiencies identified by the District.

Additionally, existing District facilities may be approaching useful lives or may be generally undersized for the needs of the water system today. These facilities have been identified as a Replacement component of this Plan and has been developed with significant CCSD staff input.

Water supply evaluations to augment existing supply capacities and dependabilities are the focus of a separate element of the master plan scope and are not evaluated as part of this Task 3 report and are covered in the recently adopted Task 4: Water Resources Plan, also submitted by Kennedy/Jenks Consultants.

## 6.1 Basis for Evaluation of Recommended Improvements

It has been shown in Section 5 that CCSD's existing water system contains deficiencies when stressed with Future Maximum Day Demand conditions. For each scenario option (1 through 4), this future demand condition plus varying fire flow conditions is considered as the design criteria for proposed piping.

A component of storage requirements includes the need for fire flow volume. Therefore, as fire flow values are adjusted (as explained in section 5), storage volume fluctuates as well. Storage tanks are served by pumping stations throughout the system which may then need to be resized to provide adequate pumping capacities and head to deliver the required storage volume. Pressure zone interaction may be adjusted to provide more pressure and flow to a particular zone, if needed, and may be an alternate method of assisting a zone with storage supply and fire protection.

The scenarios evaluated are shown below. Each represent varying levels of demand and required fire protection and are the basis for the proposed improvements in this section.

- Peak Hour Demand for Future Conditions: Under this condition, the water system would meet normal operating demand and provide current, but undefined and variable, levels of fire protection.

- Simultaneous Commercial and Residential Fires During Maximum Day Demand: These conditions represent two alternative levels (2,500 gpm and 3,500 gpm) of residential fire protection combined with simultaneous commercial fire protection (4,500 gpm).

  It is this criteria which presents the driver for improvements. The combination fireflow demand of 2,500 gpm (or 3,500 gpm) residential and 4,500 gpm commercial stresses

the future system under maximum day demand conditions such that system demands become negligeable when considering headlosses, velocities, and low pressures in the system.

- Fire Sprinkler Activation During Maximum Day Demand: This condition eases the demand on the water system during fire flow as well as provide early fire detection and suppression.

- Wildfire Support During Maximum Day Demand: This condition would provide an additional level of fire protection in the event of wildfires near the urban interface.

The District's recent *Draft CCSD Water Model Calibration and Leimert Fire Protection Analysis* study has performed complementary analysis to this Plan. This Task 3 Plan's original proposed facility improvements addressed system needs as a whole, with an intent to achieve system-wide pressure criteria under maximum day plus simultaneous fire conditions. The *Draft Fire Protection Analysis* study applied this Plan's system-wide improvements and evaluated the impacts of those improvements on storage and pressure requirements for the Leimert tank and Zones 6 & 8, specifically, as this has been identified as an immediate need for the District. This resulted in multiple benefits:

- the original hydraulic model was updated and calibrated with 2004 piping, operational controls, and demands.
- a portion of the original Phase 1 improvements were used for the immediate need of Leimert storage and adequate pressures in zones 6 & 8.
- additional improvements and operational schemes were recognized

As a result, Phase 1A of this Plan will summarize those results from the *Draft Fire Protection Analysis* study and subsequent Phases 1B, 2, and 3 will summarize the balance of those improvements for system-wide benefit.

## 6.2 Basis of Preliminary Cost Estimates

The construction costs provided in this section are based upon developed unit costs for pipelines, pressure reducing stations, reservoirs and pump stations. Theses cost estimates are provided at a preliminary planning level of accuracy and do not assure that a bid price will be received at or below this estimate, as price bids are subject to many variables. All unit costs represent installed costs, including taxes (8.25 percent on materials only), contractor overhead and profit (18 percent), engineering (20 percent), legal/administration (2 percent), construction management (15 percent), and contingency (20 percent). Costs do not include land acquisition or right-of-way.

The pipeline construction cost estimates for proposed improvements were developed based upon materials costs, RS Means Building and Construction Cost Data 2002, and engineering judgment. Reservoir, pump station and pressure reducing valve costs estimates were based upon actual construction costs for similar facilities. Costs and cost estimates were adjusted using the Engineering News Record Construction Cost Index 20 city national average.

### 6.2.1 Pipelines

Preliminary cost estimates for pipeline improvements are based on the unit costs for both ductile iron pipe (DIP) and polyvinyl chloride pipe (PVC) as summarized in Table 6-1. Pipeline unit costs assume in-street construction with a moderate number of utility crossings and include valves, traffic control, and road resurfacing. System flushing and testing costs assume that approximately 1,000 feet of pipeline per day are treated.

**TABLE 6-1**
**PIPELINE UNIT COSTS (MID-2002 DOLLARS)**

| Pipeline | Capital Cost per LF ($) |
|---|---|
| 36" DIP | 468 |
| 24" DIP | 278 |
| 20" DIP | 229 |
| 18" DIP | 205 |
| 16" DIP | 186 |
| 14" DIP | 163 |
| 12" DIP | 139 |
| 10" DIP | 120 |
| 8" DIP | 100 |
| 24" PVC | 211 |
| 20" PVC | 192 |
| 18" PVC | 165 |
| 16" PVC | 150 |
| 14" PVC | 123 |
| 12" PVC | 100 |
| 10" PVC | 89 |
| 8" PVC | 70 |

### 6.2.2 Reservoirs

Reservoir unit costs include grading, materials, labor, and testing and are derived from a cost curve which was developed from recent above ground welded steel reservoirs construction costs. The cost curve is summarized in Table 6-2.

For capital costing calculations, contingency costs of 30% and Engineering & Administration costs of 25% of total construction costs have been added to the unit cost of each proposed facility.

**TABLE 6-2**
**RESERVOIR UNIT COSTS (MID-2002 DOLLARS)**

| Storage Capacity (gallons) | Capital Cost (mid-2002 dollars) |
|---|---|
| 400,000 | $620,000 |
| 500,000 | $680,000 |
| 600,000 | $750,000 |
| 700,000 | $810,000 |
| 800,000 | $880,000 |
| 900,000 | $920,000 |
| 1,000,000 | $1,000,000 |
| 1,100,000 | $1,090,000 |
| 1,300,000 | $1,260,000 |

### 6.2.3 Pump Stations

Pump station costs include materials, equipment, labor, and testing. For capital costing calculations, contingency costs of 30% and Engineering & Administration costs of 25% of total construction costs have been added to the unit cost of each proposed facility.

**TABLE 6-3**
**PUMP STATION UNIT COSTS (MID-2002 DOLLARS)**

| Power (hp) | Estimated $/hp |
|---|---|
| 40 | 4,260 |
| 90 | 3,490 |
| 110 | 3,100 |
| 300 | 2,480 |

### 6.2.4 Pressure Reducing Valves

Unit costs for pressure reducing valves were based on engineering cost estimates and include vaults, valves, piping, labor, and testing. A breakdown of these unit costs is included in Appendix F. Unit costs for pressure reducing valves are summarized in Table 6-4.

**TABLE 6-4**
**PRESSURE REDUCING VALVES UNIT COSTS (MID-2002 DOLLARS)**

| Valve Size (inches) | Capital Cost (mid-2002 dollars) |
|---|---|
| 8 | $41,000 |
| 10 | $46,000 |
| 12 | $51,000 |

### 6.2.5 Fire Hydrants

Unit Costs for fire hydrants were based on engineering cost estimates and include a cast iron hydrant, sleeve, piping and valves, gate box, thrust blocks and labor. A breakdown of these unit costs is in Appendix F. The estimated cost per hydrant is $7,000.

## 6.3 Recommended Pipeline Improvements

Based on the hydraulic analyses described in Section 5, no pipeline improvements are necessary to meet future peak hour demands. Accordingly, there are no capital costs necessary to provide this level of service. The increases to distribution system pipelines are directly associated with increased fire flows. Initially, these costs were on the order of $16 to 20 million dollars in order to provide a residential fire flow of 3,500 gpm and commercial fire flow of 4,500 gpm. From review of the uniform fire code, and further review of actual structures using the District's GIS system, it was found that the commercial fire flow of 3.500 gpm with a three-hour duration could be applied. Similarly, the residential fire flow could be reduced to 2,500 gpm and two-hour duration. Typically, residential areas are designed for approximately 1,000 to 1,500 gpm fire flow. It is suspected that this similar sizing assumption was applied to the CCSD service area based on the number of 6-inch pipes in the system. However, due to the high fuel loads and close proximity of the residences in these areas, a mid-range value of 2,500 gpm was targeted for the residential areas.

Based on a 2,500 gpm residential fire flow rate and 3,500 gpm commercial fire flow rate, a total cost of 2.6 to 3.5 million dollars in proposed pipeline improvements results. This includes a new fire pump proposed for the upper Leimert pressure zone (Zone 6). Section 7 of this Task 3 Report further discusses phasing of the proposed improvements by priority level to yield the greatest return per dollar spent. The following table summarizes pipeline improvements for each priority level and Figure 6-1 illustrates recommended pipeline improvements for simultaneous commercial (4,500 gpm) and residential (3,500 gpm) fire flows.

| PIPE ID | Length | EX. DIAM. | PROP. DIAM. | DIP COST | PVC COST |
|---|---|---|---|---|---|
| **PRIORITY 1A** | | | | | |
| 109 | 355 | 6 | 8 | $35,472.00 | $24,830.40 |
| 113 | 226 | 6 | 8 | $22,554.80 | $15,788.36 |
| 161 | 392 | 6 | 10 | $47,017.92 | $34,871.62 |
| 163 | 448 | 8 | 10 | $53,776.68 | $39,884.37 |
| 165 | 505 | 8 | 10 | $60,565.92 | $44,919.72 |
| 177 | 336 | 6 | 10 | $40,336.92 | $29,916.55 |
| 123 | 110 | 4 | 12 | $15,252.47 | $10,973.00 |
| 185 | 2,328 | 6 | 12 | $323,644.18 | $232,837.54 |
| 477 | 91 | 6 | 12 | $12,718.04 | $9,149.67 |
| 483 | 195 | 6 | 12 | $27,052.88 | $19,462.50 |
| **IMPROVED PIPE** | **4,985** | | | **$638,391.81** | **$462,633.74** |
| **NEW PIPE** | **0** | | | **$0** | **$ 0** |
| **NEW CHARRING FIRE PUMP** | **--** | **1,250 GPM** | **150 FT. TDH** | **$250,000** | **$250,000** |
| **PRIORITY1B** | | | | | |
| 335 | 633 | 4 | 10 | $75,935.52 | $56,318.84 |

| | | | | | |
|---|---|---|---|---|---|
| 339 | 1,725 | 4 | 10 | $206,992.44 | $153,519.39 |
| **PIPE ID** | **Length** | **EX. DIAM.** | **PROP. DIAM.** | **DIP COST** | **PVC COST** |
| 515 | 289 | 6 | 10 | $34,642.48 | $25,693.17 |
| 533 | 624 | 6 | 10 | $74,853.96 | $55,516.69 |
| ***1635*** | 3,487 | ***10*** | 10 | $418,462.80 | $310,359.91 |
| 1065 | 12 | 8 | 12 | $1,729.58 | $1,244.30 |
| 1067 | 13 | 10 | 12 | $1,764.19 | $1,269.20 |
| 1625 | 43 | 8 | 12 | $5,915.46 | $4,255.73 |
| 1575 | 180 | 10 | 14 | $29,264.03 | $22,082.67 |
| ***999-PARKHILLVALVE**** | 118 | ***NEW*** | 12 | $51,000.00 | $51,000.00 |
| **IMPROVED PIPE** | **3,517** | | | **$431,097.65** | **$319,899.99** |
| **NEW PIPE** | **3,605** | | | **$469,462.80** | **$361,359.91** |
| **SUBTOTAL 1A & 1B** | **12,107** | | | **$1,788,952.26** | **$1,393,893.64** |
| | | **PRIORITY 2** | | | |
| 707 | 285 | 6 | 8 | $28,522.00 | $19,965.40 |
| 1185 | 181 | 6 | 8 | $18,118.00 | $12,682.60 |
| 1187 | 277 | 6 | 8 | $27,664.00 | $19,364.80 |
| 419 | 992 | 6 | 10 | $119,024.40 | $88,276.43 |
| 421 | 511 | 6 | 10 | $61,346.40 | $45,498.58 |
| 451 | 202 | 6 | 10 | $24,207.60 | $17,953.97 |
| 453 | 183 | 6 | 10 | $21,981.60 | $16,303.02 |
| 471 | 183 | 6 | 10 | $21,981.60 | $16,303.02 |
| 1047 | 686 | 6 | 10 | $82,309.20 | $61,045.99 |
| 1301 | 268 | 6 | 10 | $32,131.20 | $23,830.64 |
| 1303 | 204 | 6 | 10 | $24,536.40 | $18,197.83 |
| 1369 | 246 | 6 | 10 | $29,548.80 | $21,915.36 |
| 1371 | 190 | 6 | 10 | $22,766.40 | $16,885.08 |
| 1373 | 27 | 6 | 10 | $3,198.00 | $2,371.85 |
| 477 | 92 | 6 | 12 | $12,718.50 | $9,150.00 |
| 483 | 195 | 6 | 12 | $27,053.57 | $19,463.00 |
| 1291 | 23 | 8 | 12 | $3,223.41 | $2,319.00 |
| 1293 | 298 | 10 | 12 | $41,412.27 | $29,793.00 |
| 1591 | 87 | 6 | 12 | $12,088.83 | $8,697.00 |
| 1579 | 54 | 6 | 14 | $8,793.85 | $6,635.85 |
| 1583 | 83 | 6 | 14 | $13,537.15 | $10,215.15 |
| **IMPROVED PIPE** | **5,266** | | | **$636,163.18** | **$466,867.57** |
| **NEW PIPE** | **0** | | | | |
| | | **PRIORITY 3** | | | |
| 1359 | 308 | 6 | 8 | $30,812.00 | $21,568.40 |
| 433 | 518 | 6 | 10 | $62,100.00 | $46,057.50 |
| 485 | 209 | 6 | 10 | $25,110.00 | $18,623.25 |
| 1361 | 194 | 6 | 10 | $23,236.80 | $17,233.96 |
| 1375 | 210 | 6 | 10 | $25,167.60 | $18,665.97 |
| 1379 | 634 | 8 | 10 | $76,123.20 | $56,458.04 |
| 1381 | 312 | 6 | 10 | $37,413.60 | $27,748.42 |
| 63 | 345 | 6 | 12 | $47,961.95 | $34,505.00 |
| 319 | 351 | 8 | 12 | $48,733.40 | $35,060.00 |
| 473 | 594 | 6 | 12 | $82,595.19 | $59,421.00 |
| 1287 | 538 | 8 | 12 | $74,777.83 | $53,797.00 |
| 1289 | 558 | 10 | 12 | $77,567.56 | $55,804.00 |
| 1391 | 2,481 | 10 | 14 | $404,370.40 | $305,138.40 |
| **IMPROVED PIPE** | **7,251** | | | **$1,015,969.53** | **$750,080.94** |
| **NEW PIPE** | **0** | | | **$0.00** | **$0.00** |

***sustaining valve (with control) across Highway 1**

In addition to performing iterations on the required fire flow requirements, further discussions also took place with the Mr. Vern Hamilton, the District's recently retired General Manager (and former Fire Chief) on the need to loop dead-end cul-de-sacs. Based on Mr. Hamilton's suggestion, a portable large diameter hose truck is being recommended as opposed to looping every dead-end cul-de-sac with new piping. This approach will allow fighting a fire using a hydrant near the front access into the cul-de-sac as opposed to relying upon a hydrant near the end of each cul-de-sac.

## 6.4 Recommended Reservoir Improvements

Based on the evaluation criteria for reservoir capacity shown in Table 5-8, there exist significant deficiencies of storage capacity within the CCSD's water distribution system. Because of the age and condition of the Pine Knolls Reservoir, it is recommended that the existing Pine Knolls tanks be replaced by new tanks with a total capacity of at least 1.10 million gallons. Similarly, the Stuart Street tank site should have a total capacity of at least 1.3 million gallons. Alternatively, and provided a second tank site could be developed, an additional 0.94 million gallons could be added to augment the existing Stuart Street tanks. Additionally, Fiscalini & Leimert storage must add capacities of 600,000 gallons and 250,000 gallons, respectively. However, each of these sites is at a dead-end within the distribution system and do not turn over very frequently. Therefore, an additional fire pump is being recommended for the Leimert site. A fire pump or additional tank storage could be considered for the Fiscallini tank site as a means to alleviate the storage deficiency for pressure zones 3 and 4.

Per CCSD staff, construction at the Stuart Street tank site presents complex construction issues with limited space to build. Therefore, during the planning process a new reservoir above and behind the new elementary school was considered. This new reservoir would serve Zone 2, account for the storage deficit in the Stuart Street reservoirs, and would assist fire flow residual pressures and available flows in zones 2 and 5 with an additional, more direct feed into zone 2. This tank would then be sized to meet the storage deficit of the Stuart St. tank site and would be 0.94 million gallons. However, coordinating this concept with the recent school construction project was abandoned after learning of special conditions imposed upon the school by the Coastal Commission that precluded crossing their property line with any utility pipes.

The District's *Draft CCSD Water Model Calibration and Leimert Fire Protection Analysis* has proposed the addition of a "Charring" fire pump at the currently closed valve location, which separates zone1 from 8. Additionally, the PRVs at the Charring and Chiswick location would remain open, allowing zone 6 to feed zone 8 directly. High pressures would result, and would be acceptable to the District. With this operational schema, zone 1 would be allowed to feed zones 6 and 8 under fire or emergency conditions, and allow the existing Leimert tank volume to supply daily demands. Therefore, the proposed capital costs for reservoirs below include this scenario as a means to replace additional storage needed at Leimert. The associated improvements to piping and pumping to make this work operationally have been included in piping and pumping capital costs discussed in this and the following Section.

The estimated capital cost of recommended reservoir improvements is summarized in Table 6-5 and includes associated piping, pumping, and pressure reducing valve settings to accommodate the recommended storage volumes.

**TABLE 6-5**
**ESTIMATED CAPITAL COST OF RESERVOIR IMPROVEMENTS**

| Reservoir | Est. Cap. Cost w/ School Tank & Imp. to Leimert[(a)] |
|---|---|
| Pine Knolls | $1,090,000. |
| Stuart St. | |
| Using existing site | $1,260,000 |
| Augmented offsite | $960,000 |
| Leimert[(b)] | |
| Estimate for fire pump at Charring | $250,000 |
| Fiscalini | $750,000 |
| **Total Estimated Cost:** | **$3,350,000 to $3,050,000** |

Note: (a) Dollar values prorated using Table 6-2
(b) Per this Plan in concert with the District's *Draft CCSD Water Model Calibration and Leimert Fire Protection Analysis.* Recommendations = Phase 1A of prioritized improvements

## 6.5 Recommended Pump Stations Improvements

Zones 6 and 8 are served by the Leimert Booster Pump Station (BPS), which have been shown as deficient based on future demands using option 4 of 4,650 dwelling units with 1.66 persons per dwelling unit. To provide capacity for the larger of future peak hour demand (116 gpm) or future maximum day (58 gpm) plus fire flow (2,500 gpm), it is proposed that an additional fire pump be installed near the existing Charring PRV station, as a virtual bypass from zone 1 to zone 8, around the existing closed valve between these two zones. This fire pump would serve zones 6 & 8 for fire flows and would be equipped with a capacity of approximately 1,250 gpm at 150 TDH, at 80 HP to accommodate this service area's identified need for an additional 1,058 gpm. The pump station evaluation is shown in Table 5-9. The estimated capital cost of the recommended pump station improvements is $250,000, per the District's recent *Draft CCSD Water Model Calibration and Leimert Fire Protection Analysis* for a fire flow of 2,500 gpm. Based on future demands and recommended storage, there are no additional pumping deficiencies projected.

## 6.6 Recommended Reliability Improvements

Through the hydraulic analyses and evaluation of existing facilities, several reliability improvements were identified. Although the estimated capital cost of these improvements are generally small, they significantly enhance system reliability. The recommended reliability improvements are discussed in the following subsection, "District Facility Replacement and Upgrade Discussion".

### 6.6.1 Pressure Reducing Valves & Sustaining Valves

The existing water system includes eight pressure reducing valves (PRV's). By adding PRV's between pressure zones the water system's interconnections increase and areas that are susceptible to low pressure during high demand periods can draw water from higher pressure zones to meet water demand with adequate residual pressures. Additionally, multiple PRV's to the same zone provide redundant connection points so that the loss of one PRV can be compensated by another. PRV's that are intended only for fire flow can be adjusted so that they only allow flow when fire flow demand occurs.

Recommended PRV's and their settings are summarized in Table 6-6 and have considered recent recommendations by Boyle Engineering included in the *Draft CCSD Water Model Calibration and Leimert Fire Protection Analysis* report, specific to zones 6 and 8 interconnection.

Additionally, a need for 1 pressure sustaining valve has been identified across Highway 1, in Windsor Blvd. (near Heath), between the east and west side of pressure zone 1, on the northern portion of the Park Hill development. This valve will prevent flow from crossing the highway until it sees that the east portion of zone 1 has fallen below its set point. This allows the Park Hill area to remain pressurized, receiving pressure and supply from zone 5, via the proposed East/West Ranch interconnection. With the proposed setting, this valve is only activated when a fire occurs simultaneously in the commercial area of zone 1 AND the Park Hill development.

**TABLE 6-6 DELETED DUE TO WEB SECURITY ISSUES**

### 6.6.2 Key Pipeline Interconnections

An existing 4-inch loop along Windsor Boulevard in Zone 1 should be removed and replaced with a larger diameter pipeline that runs across the East/West Ranch property to connect to Windsor Boulevard in Zone 5. A PRV is not necessary for this connection as the grades between zones 5 and 1 are similar. The addition of this pipeline however, provides an additional water source connection for Zone 5 and the Park Hill development of Zone 1, in addition to allowing the Park Hill area in zone 1 to remain pressurized until the proposed pressure sustaining valve triggers to allow flow from west to east, towards Highway 1. The estimated capital cost of this improvement is $418,000 for ductile iron pipe and $310,000 for PVC pipe (mid-2002 dollars).

There are 2-inch pipelines along Hesperian Lane and Santa Rosa Lane in Zone 1 that should be replaced with larger diameter pipelines and looped into Burton Drive. These lines are located in a commercial and retail zone where large fire flows are necessary and 2-inch lines cannot convey the flow necessary for fire protection. There is also a 2-inch line from the Leimert tank which should feed as a transmission main to zones 6 & 8. This and other downstream undersized pipelines are vital to the delivery of adequate flows and pressures to its zones and needs to be replaced with a larger diameter pipeline to provide adequate service. The estimated capital cost of these improvements is $150,000 for ductile iron pipe and $110,000 for PVC pipe (mid-2002 dollars).

### 6.6.3 Emergency Generator Capacity

The San Simeon well field is currently the primary water supply for the CCSD's water system. The current emergency generator is only capable of powering two of the three wells at this site. In the event of a power loss due to a fire, only two of the wells will be able to pump water for fire protection. Accordingly, it is recommended that the CCSD increase the emergency generator capacity so that all three wells can pump during a power outage. The estimated capital cost of this improvement is $66,000 (mid-2002 dollars).

## 6.7 Recommended Fire Hydrant Spacing

Since Cambria is located in an area that is highly susceptible to fires, the fire hydrant spacing needs to be adequate to provide enough flow without having to run a prohibitive amount of fire hose to reach hydrants. Based on the 2000 UFC, the recommended hydrant spacing is as follows:

- For commercial areas (4,500 gpm): 300 feet maximum
- For residential areas (2,500 gpm): 400 feet maximum
- For residential areas (3,500 gpm): 350 feet maximum

Hydrant spacing in the commercial zones and some residential zones exceeds these guidelines as indicated in the June 2002 report issued by Mr. John Montenero. To meet the spacing requirements for the 4,500 gpm and 3,500 gpm fire flow scenario approximately 300 residential and 40 commercial fire hydrants need to be added to the system. The estimated capital cost of these improvements is $2,380,000 (mid-2002 dollars). Alternatively, the District could employ

the use of large diameter hose truck to back up those areas that are deficient in hydrant spacing.

## 6.8 District Facilities Upgrade and Replacement Discussion

In addition to identified improvements to meet system service criteria for existing and future demands, the District has provided input for other facility upgrades which are required due to aging, general areas which are undersized for today's demand conditions, and operational needs to maintain existing sources of supply given water quality and supply issues. These areas of improvement are identified and briefly described below.

- The existing pumping system at the Leimert tank site employs pressurized hydropneumatic tanks to serve the upper Leimert Heights area. By its nature, this is a non-conventional method for supplying a pressure zone as there is no redundancy to the supply piping and the frequency of pressurized pumping is erratic as the pumps trigger with the filling and draining of a relatively small-volume within the hydropneumatic tanks. Currently, the main service pump to this area cycles at approximately 20 cycles/hour. To obtain less cycling and a more constant feed to this area, a jockey as backup to a variable frequency drive (VFD) pump is recommended to replace the existing hydropneumatic tank and run directly off the existing Leimert tank. Estimated capital costs are anticipated at $100,000.

- The District's older Santa Rosa well field (wells SR1 & 3) are currently shut down due to MtBE contamination in the nearby groundwater. Additionally, the existing corporation yard is within a flood plain to the Santa Rosa Creek. To date of this report It is not known when the contamination will be remediated. Therefore, the District may need to consider making the interim well and treatment facility a permanent facility. Additionally, the existing corporation yard should ultimately be moved.

- The District's existing Water Yard pump station, pumps A, B, C, & D and associated electrical controls are near the end of their useful lives. These pumps currently act to feed pressure zone 7 through a PRV and also pump directly into zone 2 to feed the existing Stuart St. tanks. Additionally, the current location of these pumps is near an identified flood plain and thus should be considered for replacement and relocation. It is estimated that replacing these pumps may require capital cost of approximately $350,000.

- There currently exist a set of 2" steel pipelines, which are undersized for today's fireflow and demand requirements and additionally, have reached their useful life. These 2" steel pipelines are located on Hesperian Dr. and West St., near the District Yard and Pump House, and off of Highway 1, just west of Sheffield Dr. These pipelines total approximately 1,000 feet and it is recommended that the District replace these pipelines with larger diameter, PVC or ductile iron pipe.

- The Supervisory Control and Data Acquisition (SCADA) capabilities of an agency operating a water distribution system is critical for real-time monitoring of tank levels and operations of facilities such as valve and pumping stations. It is the District's intention to upgrade CCSD's existing SCADA system in the upcoming fiscal year.

# Section 7

## Recommended Implementation Plan

# Section 7: Recommended Implementation Plan

FIGURES 7-1 to 7-5 DELETED DUE TO WEB SECURITY ISSUES.

The previous section identifies all recommended improvements to alleviate identified hydraulic deficiencies based on various levels of fire protection and growth patterns. It was shown that substantial piping was necessary to satisfy pressure and flow criteria based on simultaneous fire flows with future maximum day demand projections and the assumed 4,650 dwelling units at 1.66 person per dwelling unit. This section prioritizes key system piping segments to address hydraulic issues deemed most important by CCSD staff and supported by the hydraulic analysis. By identifying the criteria explained below and prudent discussions with staff, it was found that CCSD 18% of the total proposed improvements may be applied towards well over 50% of the hydraulic deficiencies.

## 7.1 Considerations for Establishing Implementation Priorities

Total pipeline improvements proposed in Section 6-3 range from $17,200,000 DI pipe and $12,700,000 for PVC pipe, with a sustaining valve necessary for optimal conveyance under system stress. Of these proposed pipelines, there are those which provide more benefit than others. This benefit, as discussed and evaluated with CCSD and refined and validated by Boyle Engineer's *Draft CCSD Water Model Calibration and Leimert Fire Protection Analysis*, is the basis for the phased improvement plan discussed below. As mentioned earlier in this report, phase 1 is separated by phase 1A's immediate need for zone 6 and 8 supply and Leimert storage and phase 1B which is the highest benefit improvements system-wide. All phased improvements consider the following design criteria:

**Growth Scenario 4 (per Section 2.1.4):**

| | | | |
|---|---|---|---|
| 4 | 4,650* | 2011 | Adding 3,812 existing units (estimated as of the end of 2002) plus 165 connections in process, plus 670 remaining CCSD wait listed customers. This approximates the number of dwelling units served by a proposed desalination project that was subject of an August 2000 advisory ballot and also follows a July, 2003 Board recommendation for ultimate number of units. |

***Scenario 4 presents the strongest case for future growth as this 1) is the most recent value recommended by the CCSD Board (as per reasons discussed above), and 2) represents the lowest build-out value for CCSD, which will show favorably with public opinion. It is for these reasons that future improvement phasing recommendations (Section 7.2) were made using 4,650 housing units and a dwelling unit density of 1.66, which is consistent with 2000 Census data.***

Using this growth scenario, future maximum day demands were projected and designed to satisfy hydraulic criteria with simultaneous 3,500 residential and 4,500 commercial fire flows. This hydraulic criteria is as follows:

- Desired minimum pressure at maximum day with fire flow: 24 psi
  (This allows for a 4 psi drop from the main to the hydrant outlet so that fire flow can be delivered at 20 psi.)
- Target available fire flows @24psi in residential areas: 3,500 gpm
- Other residential fire flows @24 psi, with CCSD staff approval: 2,500 gpm
- Target available fire flows @24 psi in commercial areas: 4,500 gpm
- Desired maximum velocity at maximum day with fire flow: 15 ft/s

Having met these target criteria with a 3-phased improvement (considering phase 1A and 1B as phase 1), CCSD supplies a water system with capacity and redundancy enough to provide independent 3,500 residential fire flows and 4,500 commercial fireflows at nearly all locations in the system. Hydraulic criteria is the same as above and is explained and illustrated in Section 7.2.

## 7.2 Implementation Schedule

With hydraulic criteria identified, the hydraulic model was updated to create a sensible phasing plan to satisfying the majority of system deficiencies with the least amount of piping improvements. The following phasing criteria was developed with close CCSD staff interaction:

**Phase 1A:** Improvements must satisfy an immediate District need and meet criteria for upgrading existing facilities to meet pressure and fireflow criteria.

**Phase 1B:** Improvements must demonstrate, through the hydraulic analysis and confirmation with CCSD staff, the ability to increase available fire flows, raise system residual pressures, reduce headloss (gaining energy), and augment the existing water grid system to add redundancy.

**Phase 2:** Those improvements to help convey largest available flows, typically nearby a storage reservoir which creates a “bottleneck” for flow. An undersized pipeline connected to a transmission main would be an example which would reduce flow from the tank and create large amounts of headloss, reducing pressures and limiting flows.

**Phase 3:** Those pipelines needed for area-specific improvements. After addressing pipes which would have a more system-wide impact, pipelines were upsized to satisfy specific area concerns such as Parkhill, higher portions of zone 2, and commercial areas of zone 1.

As part of phase 1B, a need for 1 pressure sustaining valve was identified across Highway 1, between the east and west side of pressure zone 1, on the northern portion of the Parkhill development. This sustaining valve remains in a “closed” position during maximum day demand, allowing the east side of zone 1 to be served by the Pine Knolls tank and the Parkhill development to be served by a higher grade from zone 5 with the proposed East/West Ranch connection and upsizing.

Only in the event of a simultaneous fire in Parkhill AND the commercial area of zone 1 would this sustaining valve open and allow flow from Parkhill east, across Highway 1, and into zone 1 to supplement that flow from the Pine Knolls tank. It is only in this emergency situation that flow

would be allowed to cross Highway 1 and the direction of flow is controlled to sustain in the West to East direction (from Parkhill into commercial areas of zone 1).

Phase 1A, 1B, 2, and 3 piping is shown in Figure 7-1. CCSD's existing water system available flows with simultaneous fires @24 psi is contoured and illustrated as Figure 7-2 with the results of each phased improvement contoured and shown as Figures 7-3, 7-4, and 7-5.

A summary of Phase 1A, 1B, 2, and 3 costs is provided as table 7-1 below and detailed in Appendix H with model pipeline ID, diameter, length, existing size, replacement size, and associated costs.

**TABLE 7-1**
**PRIORITIZED IMPROVEMENTS**

| PRIORITY | DIP | PVC Pipe | Other Improvements |
|---|---|---|---|
| 1A | $638,391.81 | $462,633.74 | $250,000[(a)] |
| 1B | $865,901.29 | $642,015.90 | 0 |
| 2 | $636,163 | $466,868 | 0 |
| 3 | $1,015,970 | $750,081 | 0 |
| TOTAL | $3,156,426 | $2,321,598 | $250,000 |

[(a)]Charring fire pump.