

## **Section 6: Results of the Recycled Water System Analyses**

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This section presents the criteria used to evaluate the adequacy of the proposed recycled water system and the results of the hydraulic analyses using the recycled water system model described in the previous section. Results of the model were based on the development of both likely and less likely sites assuming a conventional irrigation system and include the potential future recycled water users.

### **6.1 Evaluation Criteria**

A discussion of the evaluation criteria used to determine the recycled water system needs for pipelines, reservoirs, and pumps stations is given below.

#### **6.1.1 Pipelines**

Evaluation criteria include system pressure, velocity and flow requirements for distribution system pipelines. These criteria were established to evaluate potential customer service issues such as excessive/low pressures, plumbing leaks, or excessive wear and pumping due to high headlosses or lost energy in the system. However, since recycled water systems are primarily used for irrigation, higher service pressures than those for potable water systems are allowable. At high flow rates, velocities can approach levels that are physically destructive to pipelines and valves. Evaluation criteria were developed through a review of industry standards and from completed and approved reclaimed water master plan projects of a similar nature.

The water service pressure criteria used for these analyses are:

Desired minimum pressure at peak hour demand:	50 pounds per square inch (psi)
Desired minimum pressure at maximum day with fire flow: (This allows for a 4 psi drop from the main to the hydrant so that fire flow can be delivered at 20 psi.)	24 psi
Desired maximum service pressure:	150 psi

The velocity requirements used for these analyses are as follows:

Desired maximum velocity at maximum day:	7 feet per second (ft/s)
Desired maximum velocity at maximum day with fire flow:	15 ft/s

The fire flow criteria used for these analyses are as follows:

- 4,500 gpm at no less than 24 psi for 4 hours during maximum day conditions. This reflects flow for a commercial structure fire or school fire in the East or West Village commercial areas. Commercial fire flow criteria were adopted for the entire recycled water system since it is located in predominantly commercial zones.

## **6.1.2 Recycled Water Distribution System Storage Tanks**

Storage of water to serve recycled water customers is required for two basic purposes:

- Operational storage = 1 maximum day's demand
- Fire storage

The reliability standard is lower than for a potable water system which provides an additional emergency storage component typically equating to 30% of 1 day's maximum day demand. Therefore, meeting the one maximum day demand for operational storage for the recycled water storage system may not be necessary due to it being used only for irrigation. Maximum day demand was used however, as this is the most conservative assumption. If pumps were adequately sized & operating, the storage volume could be reduced below one maximum day demand.

### **6.1.2.1 Operational Storage**

Reservoir capacity is used to provide additional water storage to serve demands in excess of the capacity of the recycled water supplied from the WWTP. In the case of peak hour demand conditions, the reservoir is sized to accommodate one 24-hour period of maximum day demand (or 20 hours of maximum day demand and two peak demand events) in case of an emergency. This would allow limited irrigation use of the system without providing fire flow support.

### **6.1.2.2 Fire Storage**

Storage for firefighting purposes should be provided to meet fire flow and duration demands without the necessity of transferring water storage from a lower pressure zone to a higher one. The amount of fire storage desired by CCSD was developed in consultation with the recommendations of CCSD's Fire Chief. The fire flow and duration requirements under these recommendations are based on land use and are presented in the previous subsection. For maximum day plus fire flow conditions, the storage capacity required was determined by calculating the amount of water needed during a 4-hour fire flow event in either service zone. Storage provided under this condition accounts for one 24-hour period of maximum day demand for both service zones plus fire flow support.

## **6.1.3 Pump Stations**

Inter-zone pump stations are necessary to convey water from lower pressure zones to higher pressure zones. If gravity storage is not available in the higher-pressure zone, pump stations should be capable of providing the larger of the zone's peak hour demand or maximum day demand plus fire flow. If adequate storage is available but the higher zone is served by a single reservoir, pump stations should be capable of providing the zone's peak hour demand so that the reservoir can be periodically removed from service. If the higher zone is served by multiple reservoirs, pump stations should be capable of providing the zone's maximum day demand.

## **6.2 Critical Conditions for Modeling**

The recycled water system model was run under a variety of normal and emergency operating conditions. Normal conditions included average day, maximum day, and peak hour demands. Emergency conditions included a fire flow scenario during maximum day demands. Fire flow scenarios parameters were provided by CCSD staff. Of these modeled operating conditions, the following were identified as critical conditions for the purpose of evaluating recycled water system design:

- Peak hour demand for potential recycled water users
- Commercial (4,500 gpm) fire flow during maximum day demand

## **6.3 Results of Hydraulic Analyses**

Hydraulic analyses of CCSD's recommended recycled water system were performed using the hydraulic model as described in Section 5. Because the model utilizes topographic contours from CCSD's GIS system, small pressure variations between those resulting from the model and those resulting from field measurements should be expected. Results from the hydraulic analyses for critical conditions are discussed in the following subsections.

### **6.3.1 Peak Hour Demand for Recycled Water System**

A peak hour demand scenario was evaluated for the future recycled water system, assuming development of all existing and future recycled water users. For this scenario, all areas of the system had pressures within the desired 50 to 150 psi range, with the exception of the high elevation area near the Santa Lucia Tank/booster pump site. This system is proposed to be serviced by the booster station as a hydropneumatic zone. Included within this hydropneumatic zone is the future grammar school. With the hydro-pneumatic system, the lowest system pressure was 49 psi located at Future Grammar School site. The areas of high pressure were primarily located in the northern pressure zone due to lower service elevations and the proximity to the WWTP booster station. Outside of the treatment plant area, the highest system pressure was 52 psi located at Shamel Park. The node identifications, locations, and residual pressures are summarized in Appendix D and shown as Figure 5-1.

### **6.3.2 Commercial Fires During Maximum Day Demand**

The recycled system model was evaluated for fire flow by applying the fire flow demand to nodes and running the model to determine if the system could convey the required flow. For fire flow conditions, all pipes are required to be a minimum of 18-inches in diameter to meet the pipeline design criteria due to the lack of hydraulic loops in the system.

## **6.4 Storage Tanks**

Based on the established evaluation criteria for the storage tanks and discussions with CCSD staff regarding storage distribution, the tank capacities were determined. Results of this evaluation are presented in Table 6-1. For maximum day plus fire flow demand conditions, 1.5 MG of tank storage is required. To meet Peak hour demand, 0.4 MG of tank storage is necessary. The potential for rehabilitating and/or refurbishing existing tanks may alleviate the need for significant additional recycled water storage. An evaluation of existing tank reuse will be discussed in Section 7 of this Report.

**TABLE 6-1  
EVALUATION OF TANK STORAGE**

Tank Storage and Zones Served		Average Daily Demand (MGD)	Maximum Daily Demand (MGD)	Storage Requirements (MG)		Total Required Storage (MG)	Total Existing Storage (MG)	Total Storage Deficit (MG)
				Operational	Fire			
<i>Without any Existing Storage</i>								
Fire Flow	Zones 1&2	0.164	0.444	0.444	1.08	1.52	0	1.52
Peak Hour	Zones 1&2	0.164	0.444	0.444	0	0.44	0	0.44
<i>With Reuse of Pine Knolls Tanks Only</i>								
Fire Flow	Zones 1&2	0.164	0.444	0.444	1.08	1.52	0.20	1.32
Peak Hour	Zones 1&2	0.164	0.444	0.444	0	0.44	0.20	0.24
<i>With Use of Cantex Tank Only</i>								
Fire Flow	Zones 1&2	0.164	0.444	0.444	1.08	1.52	0.40	1.12
Peak Hour	Zones 1&2	0.164	0.444	0.444	0	0.44	0.40	0.04
<i>With Reuse of Pine Knolls Tanks and Cantex Tank</i>								
Fire Flow	Zones 1&2	0.164	0.444	0.444	1.08	1.52	0.60	0.92
Peak Hour	Zones 1&2	0.164	0.444	0.444	0	0.44	0.60	-0.16

## 6.5 Pump Stations

Based on the established criteria, the capacities for the new recycled water pump stations were evaluated. The results of this evaluation are presented in Table 6-2. The proposed recycled water system pump stations are located on Figure 5-1.

**TABLE 6-2  
EVALUATION OF PUMPING CAPACITY**

<b>Pump Station</b>	<b>Region Served</b>	<b>Tank Storage Serving Zone</b>	<b>Peak Hour Demand (gpm)</b>	<b>Fire Flow (If Pressure Zone is not Served by Gravity Storage) (gpm)</b>	<b>Required Pumping Capacity (gpm)</b>
<i>With Fire Flow</i>					
WWTP	Zone 1 & Santa Lucia	2, 1	700	—	700
Santa Lucia Booster	New Grammar School	2	300	4500	4750
<i>Without Fire Flow</i>					
WWTP	Zone 1 & Santa Lucia	2, 1	700	—	700
Santa Lucia Booster	New Grammar School	2	300	—	300