Section 7: Recommended Recycled Water System

The previous section presented the results of hydraulic analyses using a model developed for CCSD's proposed recycled water system. This section discusses the recommended facilities to meet the hydraulic requirements.

7.1 Basis for Evaluation of Recommended Improvements

The previous section of this report presents the results of hydraulic analyses under critical operating conditions. These critical conditions are based on the level of service and fire protection that is provided by the recycled water system.

- Peak Hour Demand. Under this condition, the recycled water system would meet normal operating demand and provide undefined and variable levels of fire protection.

- Commercial Fire Event During Maximum Day Demand. These conditions represent maximum day demand combined with commercial fire protection (4,500 gpm for 4 hours).

Based on these critical conditions, the evaluation of recommended improvements presents the improvements necessary to meet peak hour demands and the improvements necessary to provide fire protection.

7.2 Basis of Preliminary Cost Estimates

The construction costs provided in this section are based upon developed unit costs for pipelines, tanks and pump stations. These 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 and pump station costs estimates were based upon actual construction costs for similar facilities. Costs and cost estimates were adjusted using the ENR Construction Cost Index 20-city national average. To be consistent with the Task 3 potable water distribution system analysis report and the Task 4 long-term supply report, the July 2002 ENR Index of 6605 was used.

7.2.1 Treatment Plant Improvements

As discussed in Section 4, the existing WWTP would require the addition of tertiary filtration to meet the requirements of Title 22 for irrigation use of recycled water at community parks and schools. The cost estimate only includes the treatment required to meet Title 22 and does not include additional processes which may be added to address emerging concerns. The plant

improvements were sized to accommodate the maximum daily demand (0.5 MGD). The estimated capital cost in mid-2002 dollars is provided in Table 7-1. Due to the higher capital cost of the MBR system, it is recommended that CCSD incorporate a tertiary filtration system.

TABLE 7-1
ESTIMATED COST FOR TREATMENT PLANT IMPROVEMENTS (MID-2002 DOLLARS)

Treatment Unit	Capital Cost ($)
Tertiary Filtration	$1,000,000 - $2,000,000
MBR System	$2,000,000 - $3,000,000

7.2.2 Pipelines

Preliminary cost estimates for pipelines are based on the unit costs for both ductile iron pipe (DIP) and polyvinyl chloride (PVC) as summarized in Table 7-2. 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. For DIP, the cost for purple polyethylene wrapping is included; for PVC pipe, the cost for purple pipe has been added.

TABLE 7-2
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
6" DIP	83
24" PVC	220
20" PVC	201
18" PVC	172
16" PVC	157
14" PVC	128
12" PVC	103
10" PVC	92
8" PVC	72
6" PVC	62

7.2.3 Storage Tanks

Tank unit costs include grading, materials, labor, and testing and are derived from the cost curve that was developed from recent above ground welded steel reservoir construction costs. The cost curve is summarized in Table 7-3.

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 7-3
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
1,500,000	$1,425,000

7.2.4 Pump Stations

Pump station costs include materials, equipment, labor, and testing. Costs are based on the construction of new pump stations and 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.

Cost curve values for pump station construction are summarized in Table 7-4.

TABLE 7-4
PUMP STATION UNIT COSTS (MID-2002 DOLLARS)

Power (hp)	Estimated $/hp
40	4,260
90	3,490
110	3,100
300	2,480
500	1,800

Pumping energy and O&M costs are considered in the capital costing portion of this Plan and annualized by acre-ft delivered in Table 7-8 below.

7.3 Recommended Recycled Water System Pipelines

The cost estimates for approximately 25,000 feet of proposed pipelines for both maximum day plus fire flow and peak hour demand conditions are presented in Table 7-5 and shown in Appendix E.

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 7-5
PROPOSED PIPELINE COSTS (MID-2002 DOLLARS)

Demand Scenario	Pipe Diameter (inches)	Pipe Length (feet)	Cost for DIP Pipe	Cost for PVC Pipe
Max Day plus Fire Flow	**18**	**25,000**	**$7,957,235**	**$6,676,315**
Total Peak Hour	**6 to 18**	**25,000**	**$3,778,125**	**$2,888,735**
Peak Hour	6	20,000	$2,580,750	$1,927,735
Peak Hour	8	2,400	$367,350	$264,585
Peak Hour	18	2,600	$830,025	$696,415

7.4 Recommended Storage

Storage for the recycled water distribution system is proposed at two locations: 1) the Santa Lucia Middle School site; and, 2) the WWTP. Seasonal storage to offset potential habitat impacts is assumed to occur below grade in the vicinity of the WWTP percolation pond areas. A cost estimate for seasonal storage to off-set basin demand increases is provided in this section.

It is assumed that fire storage will be planned for and provided by the potable water system. Therefore, the recommended storage requirements were based on the peak hour evaluation criteria, which establishes one maximum day's recycled water demand as the basis for storage calculations as explained below. All subsequent storage recommendations and capital costs are based on this criteria and the assumptions regarding use of existing storage reservoirs as follows.

Among the scenarios evaluated was the reuse of the existing Pine Knolls tanks by way of relocating to the Santa Lucia Middle School location and reconfiguring the 2 existing tanks to 3 shorter tanks to reduce their visual impact and make them more resistant to seismic forces. Discussions with CCSD staff and Paso Robles Tank representatives have demonstrated a cost benefit in reusing these Pine Knolls tanks for storage at the Santa Lucia School site. Based on the established evaluation criteria for the reservoirs, the capacity of the Pine Knolls reservoirs was evaluated and additional storage requirements were addressed. CCSD staff is also evaluating a rehabilitation effort at the Cantex WWTP and anticipates the availability of an additional 0.40 MG in storage from the refurbished Cantex Tank site.

7.4.1 Operational Storage

For peak hour demand conditions, 0.4 MG in tank storage is required to meet pressure requirements at all service nodes while the system is experiencing one day of maximum day

demands. Reuse of the Pine Knolls reservoirs reduces storage requirements in this zone to 0.2 MG. To meet fire flow storage criteria, a proposed 1.5 MG reservoir is required. With District reuse of the existing Pine Knolls reservoirs for storage, the size of the proposed reservoir decreases from 1.5 MG to 1.3 MG. An additional alternative to augment storage considers using the old Cantex WWTP Tank for added storage. As shown in Table 6-1, this will provide 0.40 MG when the District has completed with rehabilitations, including roofing of this site.

Costs associated with using various tank storage options are shown below in Table 7-6.

It is recommended that the CCSD proceed with its plans to reuse tank storage as it has shown to be cost beneficial, while providing adequate storage for the proposed recycled water system under the peak hour criteria (one maximum day's demand).

If fire flow were a consideration for the recycled system and tank reuse is considered, then CCSD would require an additional 1.0 MG of storage. The estimated capital cost of the recommended reservoirs including the cost of moving the Pine Knolls reservoirs and refurbishing the Cantex Tank Site is presented in Table 7-6.

TABLE 7-6
ESTIMATED RESERVOIR COSTS

Reservoir	Estimated Capital Cost (mid-2002) dollars
Without Existing Storage	
1.5 MG for fire flow	$1,425,000
0.4 MG for max day	$620,000
With Reusing Pine Knolls Only	
1.3 MG for fire flow[(a)]	$1,270,000
0.2 MG for max day[(a)]	$400,000
With Using Cantex Tank Only	
1.1 MG for fire flow	$1,090,000
0.04 MG for max day[(b)]	$0
With Reuse of Pine Knolls AND Cantex Tanks	
0.92 MG for fire flow	$920,000
0.00 MG for max day[(c)]	$100,000
For Seasonal Storage Requirements	
Subterranean Storage	$600,000

Notes:

a Includes the cost of relocating the Pine Knolls Reservoirs estimated to be $100,000 by Paso Robles Tank plus the cost for a new 0.2 MG tank. Recent dive tests conducted by the District have indicated the presence of lead based coating to be minimal and negligible when considering costs for relocating and reconstructing.

b Storage deficit is negligible to assign associated costs. Distribution system will accommodate the need for storage using valve adjustments, off-peak pumping to different storage source, etc.

c Includes the cost to relocate the two Pine Knolls Tanks.

7.4.2 Seasonal Storage

As discussed in Section 2, CCSD may need to provide seasonal storage to off-set an increase in Basin demand as well as provide sufficient supply during dry months. For purposes of this report, subterranean storage is recommended because it would provide sufficient storage to accommodate the increase in basin demand from the future community park, if the park is developed prior to a new long-term potable water supply. Table 7-6 provides a cost estimate for the subterranean storage facility.

Construction costs are anticipated to be between $10 per square foot. Assuming walls that total 2,000-feet in length and 30-feet in depth, the estimated capital cost (2002 dollars) is approximately $600,000.

7.5 Recommended Pump Stations Improvements

This recycled water system proposes use of two pump stations to meet peak hour demands. The first pump station is located at the existing Cantex WWTP and should be sized to meet peak hour demands for Zones 1 & 2. The pumps will deliver capacity to fill the Santa Lucia tank for serving Zone 1 and provided adequate capacity for the second pump station, located at the Santa Lucia tank site, to deliver the peak hour demand to the proposed New Grammar School tank to serve Zone 2. Maximum day plus fire flow criteria was considered as well, for conservative purposes, and the most conservative capacity for a commercial fire has been included in the Cantex WWTP to deliver to the Santa Lucia tank site for emergency purposes to Zone 1.

Peak hour and fire flow support may be provided by the reservoir at the Santa Lucia site. Recommended pump station costs are shown in Table 7-7.

TABLE 7-7
ESTIMATED PUMP STATION COSTS

Demand Scenario	Pump Station Description	Pump Station Capacity (gpm)	Cost
Max Day plus Fire Flow	WWTP Pump Station	700	$300,000
Max Day plus Fire Flow	Santa Lucia Booster	4,750	$1,055,000
Total Max Day plus Fire Flow			**$1,355,000**
Peak Hour	WWTP Pump Station	700	$300,000
Peak Hour	Santa Lucia Booster	300	$150,000
Total Peak Hour			**$450,000**

7.6 Estimated Recycled Water System Costs

The estimated recycled water system costs for both demand scenarios are presented in Table 7-8. Although sizing has been discussed for fire flow criteria, costing is shown only for those facilities required for peak hour criteria as the Task 3: Potable Water System Modeling

report, performed in parallel with this Report, considers capital costs for pipeline, storage, and pump sizing with fire flows as the driving criteria.

For peak hour demand without fire flow, estimates are given for all new storage and for use of both the Pine Knolls and Cantex tanks. These reservoir options were selected because they were feasible, cost-effective, and met with CCSD planning requirements. Treatment plant improvement cost consists of the cost for the addition of a tertiary filtration system only. A mid-range capital cost was used between the estimated $1M to $2M, to add a reasonable level of conservatism.

Annual O&M costs were estimated by evaluating power costs, parts costs, and labor costs. Table 8-25 provides a summary of the total capital and annual O&M costs.

TABLE 7-8
ESTIMATED O&M COSTS (2002) FOR RECYCLED WATER

Description of Cost	Est. Capital Cost (PVC pipe)	Fixed O&M Cost
Pipeline[(a)]	$2,888,700	$2,800
Pump Station[(b)]	$450,000	$4,500
Reservoir[(a)]	$100,000	$100
Seasonal Storage[(a)]	$600,000	$600
Treatment	$1,500,000	
Labor[(c)]		$26,500
Total ($/Yr)	$5,538,700	$34,500/Yr.
Variable O&M Costs (AFY)		
Treatment costs[(d)]		$408
Power costs[(e)]		$405
Total Variable ($/AF)		$812

Notes:
(a) Evaluated at 0.1 percent of capital cost.
(b) Evaluated at 1.0 percent of capital cost.
(c) Evaluated at 3 hrs/day at $34/hr, including benefits, and 260 days a year.
(d) Evaluated at 5.0 percent of capital cost, including chemical cost, in AFY
(e) Evaluated using an electricity rate of $0.15/kW-hr and 365 days of operation. This includes the power cost for both pump stations. A pump efficiency of 80 percent and a motor efficiency of 90 percent were assumed.

The total annual fixed cost is $355,000 and the total variable cost is $810 per AF.

Supply	Capital Costs	Annual Capital Cost[(a)]	Fixed O&M	Total Annual Fixed Cost ($/Yr)	Total Variable Cost ($/AF)[(b)]
185 AFY	$5,538,700	$320,000	$34,500	$354,500	$810

Notes:
(a) Calculated using a 4 percent interest rate and a 30-year life span.
(b) Rounded to the nearest $10/AF.