APPENDIX B
Memorandum Regarding Water Supply Needs

Based on comments received during the Draft EIR public review period proposed project regarding City of Palo Alto emergency water supply needs, Carollo Engineers, the Technical Advisor for the proposed project, supplied the attached memorandum clarifying water needs.

Introduction

During the public comment period for the DEIR, the City received a number of comments that indicated some misunderstanding regarding the general concept behind the recommended emergency water supply improvement projects. This text summarizes how the improvement recommendations were identified and sized.

Design Basis

To better understand the basis for the improvement recommendations, it is important to understand how the distribution system will meet water demands during a shutdown of the SFPUC supply system. To start, it is also helpful to understand the basic assumptions under which these improvements were developed (i.e., the design basis):

- The design emergency event is an unplanned outage of the SFPUC water supply system.
- The goal of this project is to make cost-effective improvements to the distribution system to facilitate meeting the DHS recommended criteria of supplying eight-hours of water at the maximum demand day flow rate, exclusive of water needed for fire protection.
- The system must be able to provide fire protection for each pressure area independently, while making the best use of existing infrastructure.

Water Demands

For planning the emergency supply improvements, it is important to understand the normal and fire protection water demands that must be met during the design event. Normal demands are those related to residential, commercial, hospital, industrial, and other municipal uses. Fire protection water demands vary by pressure area depending on types of land use and construction. As reported in the 1999 Study, the Insurance Services Office batch report identified the highest fire protection water demand for each area. The details of both types of water demands are summarized below.

Normal Demands

The maximum day demand is the highest water demand exerted by the system on any given day in one year. Typically the maximum demand occurs in either July or August. As presented in the 1999 Study, the total system maximum day demand is projected to be 32.18 MGD, or 22,345 gpm. Average day demand is typically one-half of the maximum day demand or 16.1 MGD (11,175 gpm).

The City's water distribution system is divided into discrete pressure areas. This is necessary to control the maximum water pressure at the lowest elevation in each pressure area such that it doesn't exceed plumbing code standards by an excessive amount. Similarly, a minimum pressure must be maintained at the higher elevations of each pressure area to meet state standards, to maintain the sanitary condition of the potable water system, and for proper operation of plumbing appliances.

The 1999 Study identified the maximum and average day water demands and supply sources for each of the pressure areas. This information is summarized in Table 1.

Table 1 Existing Water Sources and Normal Demands by Pressure Area
Emergency Water Supply and Storage Project
City of Palo Alto

Pressure Area	Water Source		Average Day Demand[1]		Maximum Day Demand[2]	
	Normal	Emergency	(MGD)	(gpm)	(MGD)	(gpm)
1	SFPUC turnouts and Mayfield reservoir	3 wells and Mayfield reservoir[3]	7.92	5,500	15.84	11,000
2	SFPUC turnouts	Downflow from higher elevation areas[4]	5.55	3,850	11.09	7,700
3	SFPUC turnouts	None	1.01	700	2.02	1,400
4	Quarry pump station and Corte Madera reservoir	Corte Madera reservoir and downflow from higher elevation areas	0.79	550	1.58	1,100
5	Quarry pump station and Corte Madera reservoir	Corte Madera reservoir and downflow from higher elevation areas	0.42	290	0.83	580
6	Corte Madera pump station and Boronda reservoir	Boronda reservoir and downflow from higher elevation areas	0.24	170	0.48	330
7	Boronda pump station and Park reservoir	Park reservoir and downflow from higher elevation areas	0.09	60	0.18	125
8	Park pump station and Dahl reservoir	Dahl reservoir and downflow from higher elevation areas	0.02	10	0.03	20
9	Dahl pump station and Monte Bello reservoir	Monte Bello reservoir	0.07	45	0.13	90
Total			**16.11**	**11,175**	**32.18**	**22,345**

Notes:
(1) Calculated as one-half of the maximum day demand.
(2) From Table 4.1 of the 1999 Study.
(3) Pressure area 1 contains three wells that are currently operational (Hale, Rinconada, and Peers Park), and one well that is non-operational (Fernando).
(4) Pressure area 2 contains one well is non-operational (Matadero).

Fire Protection Demands

In addition to the normal demands presented in Table 1, the City must also provide for fire protection during the water supply emergency. The fire protection demands for each pressure area are listed in Table 2.

Table 2 Fire Protection Water Demands[1]
Emergency Water Supply and Storage Project
City of Palo Alto

Pressure Area	Fire Flow Demand (gpm)	Design Fire Duration (hours)	Fire Flow Volume (MG)
1	6,000	4	1.44
2	7,500	4	1.80
3	5,000	4	1.20
4 and 5[2]	4,500	4	1.08
6	3,500	3	0.63
7	1,500	2	0.18
8	1,500	2	0.18
9	1,500	2	0.18

Notes:
(1) From Table 3.1 of the 1999 Study.
(2) Pressure area 4 relies on emergency water supply from pressure area 5, so these areas are considered together.

Total Demands

With both the normal and fire protection water demands identified, Table 3 summarizes the total water demands for each pressure area in terms of both flow rate and volume.

Table 3 Total Water Demands by Pressure Area
Emergency Water Supply and Storage Project
City of Palo Alto

Pressure Area	Maximum Day Demand		Fire Flow Demand[3]		Total Design Emergency Demand	
	(gpm)[1]	(MG)[2]	(gpm)	(MG)	(gpm)[4]	(MG)[5]
1	11,000	5.28	6,000	1.44	17,000	6.72
2	7,700	3.70	7,500	1.80	15,200	5.50
3	1,400	0.67	5,000	1.20	6,400	1.87
4 and 5	1,680	0.81	4,500	1.08	6,180	1.89
6	330	0.16	3,500	0.63	3,830	0.79
7	125	0.06	1,500	0.18	1,625	0.24
8	20	0.01	1,500	0.18	1,520	0.19
9	90	0.04	1,500	0.18	1,590	0.22
Total	**22,345**	**10.73**		**6.69**	**53,345**	**17.42**

Notes:
(1) From Table 1.
(2) For planning emergency supplies, DHS recommends eight hours of maximum day demand. These volumes represent the volume of water used in each pressure area on the maximum day over an eight hour period.
(3) From Table 2.
(4) The flow rates represent the maximum instantaneous flow rate anticipated for each pressure area during a water supply emergency (i.e. maximum day normal demands plus the design fire flow rate).
(5) Total emergency demand expressed as a volume (eight hours of maximum day demand plus the design fire flow rate for the specified duration per table 2).

Conservation

In the event of a major water supply emergency, the City intends to make all efforts possible to reduce water demand to extend the available supply. The recommended improvements were sized based on maximum demands, however, in order to comply with the DHS recommendations. In addition, if the SFPUC water supply outage were to occur from a large

local earthquake, it is possible that some water mains would break or other damage could occur to the distribution system. This would create a significant water demand that cannot be predicted. Carollo recommends using the DHS recommended criteria as a minimum basis for planning the emergency supply improvements.

Existing Emergency Water Supplies and Supply Deficiency

The 1999 Study performed a detailed analysis of how the City's water distribution system could respond to an unplanned shutdown of the SFPUC supply. It was determined that there is more water stored in the reservoirs in the Foothills area (pressure areas 4 through 9) than is needed to meet the design normal and fire protection demands. Thus, in order to take the greatest advantage of the City's existing infrastructure, during the design event the "excess" water will be drained downhill into pressure area 2 over the eight hour period to help meet the emergency water demands. Thus the only areas in the City that are not able to meet the DHS recommended criteria are pressure areas 1 through 3. Table 4 summarizes the emergency water supply deficiency in those areas.

Table 4 Existing Emergency Water Supply Deficiency
Emergency Water Supply and Storage Project
City of Palo Alto

Pressure Area	Emergency Source	Existing Supply (gpm)	Fire Flow Demand[(1)] (gpm)	Max Daily Demand[(2)] (gpm)	Total Demand (gpm)	Total Deficiency (gpm)
1	Wells and Storage	11,875[(3)]	6,000	11,000	17,000	(5,125)
2	Downflow from Foothills Area Storage	5,100[(4)]	7,500	7,700	15,200	(10,100)
3	None	0	5,000	1,400	6,400	(6,400)
Total		**16,975**	**18,500**	**20,100**	**38,600**	**(21,625)**

Notes:
(1) From Table 2.
(2) From Table 1.
(3) 8,300 gpm supply from Mayfield pump station and 3,575 gpm from existing wells.
(4) Emergency demands for pressure areas 4-9 are met by existing reservoir storage, with an excess of 5,100 gpm over eight hours to supply to pressure area 2.

Based on the deficiencies in pressure areas 1, 2, and 3, the total deficiency in emergency water supply is 21,625 gpm. This equates to approximately 31.2 million gallons per day (mgd) necessary to meet both normal emergency demands and fire flow demands under emergency supply conditions.

Recommended Improvements

The 1999 Study and several subsequent studies evaluated a range of improvement alternatives to address the identified deficiency. The overall most cost-efficient and effective approach for addressing the emergency supply deficiency in pressure areas 1 through 3 is a combination of wells and storage:

- Construct two new wells in pressure area 1 and one new well in pressure area 3, each expected to produce 1,000 gpm of water.
- Rehabilitate the five existing wells so that they can deliver up to 8,000 gpm.
- Construct a new 2.5 MG reservoir with a pump station that can deliver up to 2,200 gpm to pressure area 1, and up to 5,400 gpm to pressure area 3.
- Modify the Mayfield reservoir pump station so that it can deliver up to 5,600 gpm to pressure area 1 and up to 9,300 gpm to pressure area 2.

The modifications to the Mayfield pump station actually decrease the design flow to pressure area 1 in order to make some of the water stored in the Mayfield reservoir available to pressure area 2. Again, this makes the best use of the City's existing infrastructure. Table 5 presents how the recommended improvements address the emergency water supply deficiencies.

Table 5 Recommended Improvements Meeting Emergency Demands (flow rates)
Emergency Water Supply and Storage Project
City of Palo Alto

		Supply from Emergency Sources					
Pressure Area	**Total Demand (gpm)[1]**	**Existing Wells (gpm)[2]**	**New Wells (gpm)**	**Foothills Area Downflow (gpm)**	**Mayfield Reservoir (gpm)**	**New Reservoir and Pump Station (gpm)**	**Total (gpm)**
1	17,000	7,200	2,000	0	5,600	2,200	17,000
2	15,200	800	0	5,100	9,300	0	15,200
3	6,400	0	1,000	0	0	5,400	6,400
Total	**38,600**	**8,000**	**3,000**	**5,100**	**14,900**	**7,600**	**38,600**

Notes:
(1) From Table 3.
(2) Following rehabilitation.

The information in Table 5 can also be presented in terms of volume (instead of flow rate) to demonstrate how the proposed reservoir was sized. This information is presented in Table 6.

Table 6 Recommended Improvements Meeting Emergency Demands (volumes)
Emergency Water Supply and Storage Project
City of Palo Alto

		Supply from Emergency Sources					
Pressure Area	Total Demand (MG)[1]	Existing Wells (MG)[2]	New Wells (MG)[3]	Foothills Area Downflow (MG)[3]	Mayfield Reservoir (MG)	New Reservoir and Pump Station (MG)[6]	Total Supply (MG)
1	6.72	3.46	0.96	0	1.34[4]	1.00	6.75
2	5.50	0.38	0	2.45	2.66[5]	0	5.50
3	1.87	0	0.48	0	0	1.50	1.98
Total	**14.09**	**3.84**	**1.44**	**2.45**	**4.0**	**2.50**	**14.23**

Notes:
(1) From Table 3.
(2) Following rehabilitation, and volume calculated as the anticipated flow rate over eight hours.
(3) Volume calculated as the anticipated flow rate over eight hours.
(4) Volume calculated as the remainder after what volume was made available to pressure area 2.
(5) Volume calculated as the remaining amount needed to meet the DHS-recommended criteria.
(6) Volume calculated as the remaining amount needed to meet the DHS-recommended criteria, slightly rounded-up.

Tables 5 and 6 show that the recommended improvements address the remaining supply deficiencies such that the City's system could meet the DHS recommended criteria. In addition, the combination of storage and wells works to effectively meet the two types of demands. The reservoirs provide an immediate high capacity source for fighting fires. The wells provide a longer lasting supply to meet the normal demands during the design emergency event.

Role of Improvements for Extended or Supplemental Supply

While the DHS criteria recommends eight hours of supply in case of an unplanned SFPUC supply system shutdown, it is possible that such an emergency could last longer than eight hours. The recommended well system is planned to provide up to 11,000 gpm, which is very close to the City's average day water demand. With some conservation during the water supply emergency, the improved well system should be able to supply the water needed to meet normal demands for an extended duration.

There is some concern that extended well operation could lead to negative consequences including subsidence, contaminant plume migration, or saltwater intrusion. The City

commissioned a study to evaluate this situation (Groundwater Supply Feasibility Study, April 2003). That study found that limiting the withdrawal to 1,500 acre-feet (AF) in any year limits the drop in the groundwater table and allows it to recharge between pumping events thus preventing the potential negative consequences of pumping. Since the improved well system could produce 11,000 gpm, continuous pumping could be practiced for about one month before reaching 1,500 AF.

Similarly, it may also be possible to use one of the wells as a supplemental supply during a drought. 1,500 AF represents about 10 percent of the City's annual water use. Since the wells will be classified with the DHS as standby sources, however, and per State regulations, the City would need to petition the DHS to use any of its wells for more than 15 days in any year, or for any five consecutive days.

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Governor appoints Delta Vision task force

By Andrew McGall, MEDIANEWS STAFF
Inside Bay Area

Article Last Updated:02/09/2007 02:48:48 AM PST

SACRAMENTO — Gov. Arnold Schwarzenegger on Wednesday appointed a special panel to devise a plan to sustain the Delta.

The Delta Vision Blue Ribbon Task Force is to develop by Jan. 1, 2008, a sustainable management program for the Delta, and an implementation plan by the following October.

Task Force members are:

-Monica Florian of Huntington Beach, a city planner and most recently an Irvine Company senior vice president.

-Richard Frank of Sacramento, executive director of the California Center for Environmental Law and Policy at Boalt Hall School of Law at University of California, Berkeley.

-Phillip Isenberg of Sacramento, president of a lobbying firm and a former assemblyman who was a member of the Water, Parks and Wildlife Committee and an ex-mayor of Sacramento.

-Thomas McKernan of Arcadia, chief executive officer of the Automobile Club of Southern California and Auto Club Enterprises. He is chairman of the California Business Roundtable and sits on the state Chamber of Commerce board.

-Sunne Wright McPeak of Pleasanton, president and chief executive officer of the California Emerging Technology Fund. She is a former Contra Costa County supervisor who was a leader in the fight against the Peripheral Canal.

-William Reilly of San Francisco, a founding partner of Aqua International Partners, under the Texas Pacific Group, an investment company. He is a former administrator of the U.S. Environmental Protection Agency and former president of the World Wildlife Fund.

-Raymond Seed, 49, of Walnut Creek, a UC Berkeley professor of civil and environmental engineering and a member of the International Society for Soil Mechanics and Geotechnical Engineers.