Appendix A

Zone 7 Water Agency Water Resources Engineering Wells in 2005 Monitoring Program

Appendix A

Wells in 2005 Monitoring Program

Wells in 2005 Monitoring Program

		Objectives (see last page for definitions)							
					Water Rights				
Site	Well Name (SMP Name)	Key WL	Mon WL	SA WL	WL	WQ	Qual WQ	Muni WQ	EBDA WQ
2S/1E 31M 2	Mariposa (31M2)			SA			A		
2S/1E 32E 1	32E1 (T-HAC-1)			SA			A		
2S/1E 32N 1	2S/1E 32N 1 (T-HAC-2)			SA			A		
2S/1E 32Q 1	32Q1 (32Q1)			SA			A		
2S/1E 33L 1	33L1 (33L1)			SA	A				
2S/1E 33P 2	33P2 (33P2)			SA	A				
2S/1E 33R 1	(T-DUB-1)		M	SA	A				
2S/1W 15F 1	BOLLINGER			SA	A				
2S/1W 26C 2	PINE VALLEY			SA	A				
2S/1W 36E 3	KOLB PARK (36E3)			SA	A				
2S/1W 36F 1	dublin high shallow			SA	A				
2S/1W 36F 2	dublin high mid			SA	A				
2S/1W 36F 3	dublin high deep			SA	A				
2S/2E 27C 2	2S/2E 27C 2			SA					
2S/2E 27P 2	hartford ave east			SA	A				
2S/2E 28D 2	may school (T-MAY-1)			SA	A				
2S/2E 28J 2	new f.c.c.			SA					
2S/2E 28Q 1	hartford ave (T-MAY-2)			SA	A				
2S/2E 32K 2	jenson's N liv. Ave			SA	A				
2S/2E 34E 1	mud city (T-MAY-3)			SA	A				
2S/2E 34Q 2	(T-SPR-2)			SA	A				
3S/1E 1F 2	1F2 (T-AIR-1)			SA	A				
3S/1E 1H 3	collier canyon g1 (1H3)			SA	A				
3S/1E 1J 3	Triad Vineyard			SA					
3S/1E 1L 1	SMP LOC-1 (T-AIR-2)			SA	A				
3S/1E 1N 1	liv inj monitor			SA	A				
3S/1E 1P 2	airport gas g5 (T-AIR-3)			SA	A				
3S/1E 1P 3	new airport well			SA					
3S/1E 1R 2	3S/1E 1R 2			SA	A				
3S/1E 2J 2			M	SA	A				
3S/1E 2J 3			M	SA	A				
3S/1E 2K 2	doolan rd (2K2)			SA	A				

		Objectives (see last page for definitions)							
					Water Rights				
Site	Well Name (SMP Name)	Key WL	Mon WL	SA WL	WL	WQ	Qual WQ	Muni WQ	EBDA WQ
3S/1E 2M 3	SMP MW-2 (T-FRI-1)			SA	A				
3S/1E 2N 2	molt barn @friesman (T-FRI-2)			SA	A				
3S/1E 2N 6	SMP MW-1 (T-FRI-3)			SA			A		
3S/1E 2P 3	friesman			SA			A		
3S/1E 2P 7	Tri-Valley Driving Range			SA			A		
3S/1E 2Q 1			M	SA			A		
3S/1E 2R 1	red barron			SA			A		
3S/1E 3G 2	fallon rd			SA			A		
3S/1E 3Q 1	county farm			SA			A		
3S/1E 4A 1	SMP-DUB-2 (T-DUB-2)		M	SA			A		
3S/1E 4G 1	northside dr shallow		M	SA			A		
3S/1E 4J 4	northside dr deep (4J4)		M	SA			A		
3S/1E 4J 5	Pimlico shallow (T-DUB-3)		M	SA			A		
3S/1E 4J 6	Pimlico Deep (T-DUB-4)		M	SA			A		
3S/1E 4Q 2	gulfstream		M	SA			A		
3S/1E 5K 6	rosewood shallow			SA			A		
3S/1E 5K 7	rosewood deep			SA			A		
3S/1E 5L 3	(T-HAC-3)			SA			A		
3S/1E 5P 6	SMP LOC-3 (T-HAC-4)			SA			A		
3S/1E 6F 3	dublin ct			SA			A		
3S/1E 6G 5	nissan repair			SA			A		
3S/1E 6N 2	dsrsd mw-3			SA			A		
3S/1E 7B 2	hopyard rd			SA			A		
3S/1E 7B12	Hacienda Arch (T-CHA-1)			SA			A		
3S/1E 7G 7	Chabot Well (T-CHA-2)			SA			A		
3S/1E 7J 5	7J5 (T-CHA-3)			SA			A		
3S/1E 7M 2	DSRSD Sub (7M2)			SA			A		
3S/1E 7R 8	7R8 (T-CHA-4)		M	SA			A		
3S/1E 8B 1	tassajara creek (T-HAC-5)			SA			A		
3S/1E 8G 4	(T-HAC-6)			SA			A		
3S/1E 8H 2	Army Well #1			SA			A		SA
3S/1E 8H 9	Mocho 4 mw1		M	SA			A		SA
3S/1E 8H10	Mocho 4 mw2		M	SA			A		
3S/1E 8H11	Mocho 4 mw3		M	SA			A		
3S/1E 8H13	Mocho 3 mon		M	SA			A		
3S/1E 8H18	Mocho 4		M	SA			A	M	SA
3S/1E 8K 1	sutter gate			SA			A		SA
3S/1E 8N 1	sports park			SA			A		
3S/1E 9B 1	Stoneridge		M	SA			A	M	SA
3S/1E 9G 1	3775 trenery - Kamp			SA			A		
3S/1E 9M 2	Mocho 1		M	SA			A	M	SA
3S/1E 9M 3	Mocho 2		M	SA			A	M	SA
3S/1E 9M 4	Mocho 3		M	SA			A	M	SA
3S/1E 9P 5	Mohr Key	M	M	SA			A		

		Objectives (see last page for definitions)							
					Water Rights				
Site	Well Name (SMP Name)	Key WL	Mon WL	SA WL	WL	WQ	Qual WQ	Muni WQ	EBDA WQ
3S/1E 10A 1	rancho el charro			SA			A		
3S/1E 10A 2	el charro rd			SA			A		
3S/1E 10B 8	Kaiser Rd.		M	SA			A		
3S/1E 10B 9	Kaiser Rd.		M	SA			A		
3S/1E 10B10	Kaiser Rd.		M	SA			A		
3S/1E 10B11	Kaiser Rd.		M	SA			A		
3S/1E 10D 2	3S/1E 10D 2		M	SA			A		
3S/1E 10D 3	3S/1E 10D 3		M	SA			A		
3S/1E 10D 4	3S/1E 10D 4		M	SA			A		
3S/1E 10D 5	3S/1E 10D 5		M	SA			A		
3S/1E 11B 1	liv golf g3			SA			A		
3S/1E 11C 3	3S/1E 11C 3		M	SA			A		
3S/1E 11G 1	mw-4		M	SA			A		
3S/1E 11G 2	mw-3		M	SA			A		
3S/1E 11G 3	mw-2		M	SA			A		
3S/1E 11G 4	mw-1		M	SA			A		
3S/1E 11P 6	New Jamieson Residence			SA			A		
3S/1E 12A 2	liv stp g7 (12A2)			SA			A		
3S/1E 12F 1	hagemann #6			SA					
3S/1E 12G 1	3S/1E 12G 1			SA			A		
3S/1E 12H 4	LWRP monitor 1		M	SA			A		
3S/1E 12H 5	LWRP monitor 2		M	SA			A		
3S/1E 12H 6	LWRP monitor 3		M	SA			A		
3S/1E 12H 7	LWRP monitor 4		M	SA			A		
3S/1E 12P 5	Hagemann Key	R	R	R			A		
3S/1E 13E 1	hagmn S/W access rd			SA			A		
3S/1E 13G 1	cal rock recorder			SA			A		
3S/1E 13P 1	cal rock			SA			A		
3S/1E 14A 2	randj domestic			SA			A		
3S/1E 14B 1	Industrial Asphalt			SA			A		
3S/1E 14K 2	lone star ind			SA			A		
3S/1E 15F 3	kaiser #8			SA			A		
3S/1E 15J 3	shadow cliff			SA			A		
3S/1E 15M 3	Bush/Valley South		M	SA			A		
3S/1E 16A 2	Pleas 8		M	SA			A	M	
3S/1E 16A 4	Bush/Valley Mid		M	SA			A		
3S/1E 16B 1	Bush/Valley North		M	SA			A		
3S/1E 16E 4	black ave - cultural			SA			A		
3S/1E 16L 2	Pleas 3			SA			A		
3S/1E 16L 5	Pleas 5		M	SA			A	M	
3S/1E 16L 7	Pleas 6		M	SA			A	M	
3S/1E 16P 5	Vervais Monitor	R	R	R	SA		A		
3S/1E 16R 1	Stanley Berry Farm			SA					
3S/1E 17B 4	Casterson			SA			A		

		Objectives (see last page for definitions)							
		Key	Mon	SA	Water Rights		Qual	Muni	EBDA
Site	Well Name (SMP Name)	WL	WL	WL	WL	WQ	WQ	WQ	WQ
3S/1E 17D 3	HOP7_Mon1		M	SA			A		
3S/1E 17D 4	HOP7_Mon2		M	SA			A		SA
3S/1E 17D 5	HOP7_Mon3		M	SA			A		
3S/1E 17D 6	HOP7_Mon4		M	SA			A		
3S/1E 17D 7	HOP7_Mon5		M	SA			A		
3S/1E 17D10	Hopyard 7			SA			A		
3S/1E 17D11	Hop 9 mon			SA			A		
3S/1E 17D12	Hopyard 9		M	SA			A	M	SA
3S/1E 17Q 4	Fairground Key	M	M	SA	M	SA	A		
3S/1E 18A 5	Pleas 7		M	SA			A	M	
3S/1E 18A 6	Hopyard 6		M	SA			A	M	SA
3S/1E 18E 4	Valley Trails II			SA			A		
3S/1E 18J 2	camino segura			SA			A		
3S/1E 18N 1	merritt			SA			A		
3S/1E 19A 3	SFWD O6						A		SA
3S/1E 19A 5	SFWD O1			SA			A	M	
3S/1E 19A11	SFWD new well			SA			A	M	
3S/1E 19C 4	del valle and laguna			SA			A		
3S/1E 19K 1	680/bernal			SA			A		
3S/1E 20B 2	fairgrounds potable			SA			A		
3S/1E 20C 3	GWP_3S1E20C3			SA			A		
3S/1E 20C 7	New FG well		R	R			A		SA
3S/1E 20J 4	civic center			SA			A		
3S/1E 20Q 2	(T-PLE-3)			SA			A		
3S/1E 22D 2	vineyard trailer (T-BER-3)			SA			A		
3S/1E 23J 1	1627 vineyard trailer			SA			A		
3S/1E 24Q 1	Ruby Hills			SA			A		
3S/1E 25C 2	stoney ridge (T-RH-2)			SA			A		
3S/1E 25H 1	Ruby Hills			SA			A		
3S/1E 29E 4	castlewood north			SA			A		
3S/1E 29M 4	f.c. channel		M	SA	M		A		SA
3S/1E 29P 2	castlewood dr			SA			A		
3S/1W 1B 5	maple dr. #2			SA			A		
3S/1W 1B 9	dsrsd garden shallow		M	SA			A		
3S/1W 1B10	dsrsd garden mid		M	SA			A		
3S/1W 1B11	dsrsd garden deep (1B11)		M	SA			A		
3S/1W 2A 2	McNamara's (2A2)			SA			A		
3S/1W 12B 2	MW-1			SA			A		
3S/1W 12J 1	DSRSD South			SA			A		
3S/1W 13J 1	muirwood dr			SA			A		
3S/2E 1F 2	down barn			SA			A		
3S/2E 2B 2	south front rd			SA			A		
3S/2E 3A 1	Bluebell (T-SPR-1)			SA			A		
3S/2E 3K 3	first and S. front rd (3K3)			SA			A		

		Objectives (see last page for definitions)							
					Water Rights				
Site	Well Name (SMP Name)	Key WL	Mon WL	SA WL	WL	WQ	Qual WQ	Muni WQ	EBDA WQ
3S/2E 5J 1	N. liv and las positas			SA			A		
3S/2E 5N 1	1037 portola -trailer			SA			A		
3S/2E 6P 1	portola ave			SA			A		
3S/2E 7C 2	york way - jaws -G4			SA			A		
3S/2E 7H 2	dakota			SA			A		
3S/2E 7N 1	kittyhawk south			SA			A		
3S/2E 7P 3	CWS STA 24		M	SA			A	M	
3S/2E 7R 3	CWS STA 31		M	SA			A	M	
3S/2E 8F 1	CWS STA 10		M	SA			A	M	
3S/2E 8G 1	CWS STA 19		M	SA			A	M	
3S/2E 8H 1	CWS STA 4		M	SA			A	M	
3S/2E 8H 2	North k			SA			A		
3S/2E 8K 2	Livermore Key Well	R	R	R			A		
3S/2E 8N 2	CWS STA 14		M	SA			A	M	
3S/2E 8N 5	olivina and rincon			SA			A		
3S/2E 8P 1	CWS STA 8		M	SA			A	M	
3S/2E 9L 1	CWS STA 17		M	SA			A	M	
3S/2E 9P 1	CWS STA 12		M	SA			A	M	
3S/2E 9Q 1	CWS STA 9		M	SA			A	M	
3S/2E 9Q 4	school st			SA			A		
3S/2E 10C 4	250 mines rd			SA			A		
3S/2E 10F 1				SA			A		
3S/2E 10F 3	hexcel			SA			A		
3S/2E 10Q 1	almond			SA			A		
3S/2E 10Q 2	llnl p-703			SA			A		
3S/2E 11C 1	joan way (11C1)			SA			A		
3S/2E 11J 2	vasco rd pat pass			SA			A		
3S/2E 14A 3	S. vasco @east ave			SA			A		
3S/2E 14B 1	5763 east ave			SA			A		
3S/2E 14C 3	14C3 (14C3)			SA			A		
3S/2E 14D 1	Big Tree Well - New Wente			SA			A		
3S/2E 14H 1	2480 S. vasco			SA			A		
3S/2E 15B 4	4565 East avenue			SA			A		
3S/2E 15E 2	1356 S. Livermore			SA			A		
3S/2E 15J 2	1912 buena vista			SA			A		
3S/2E 15Q 6	Concannon			SA			A		
3S/2E 15R 6	2383 buena vista			SA			A		
3S/2E 16A 3	Memory Gardens			SA			A		
3S/2E 16B 1	CWS STA 5		M	SA			A	M	
3S/2E 16C 1	CWS STA 15		M	SA			A	M	
3S/2E 16E 4	pepper tree			SA			A		
3S/2E 17E 2	3S/2E 17E 2			SA			A		
3S/2E 18A19	MURRIETA		M	SA			A		
3S/2E 18B 1	CWS STA 20			SA			A	M	

		Objectives (see last page for definitions)							
					Water Rights				
Site	Well Name (SMP Name)	Key WL	Mon WL	SA WL	WL	WQ	Qual WQ	Muni WQ	EBDA WQ
3S/2E 18E 1	E. stanley			SA			A		
3S/2E 19D 7	ISABEL 1		M	SA			A		
3S/2E 19D 8	ISABEL 2		M	SA			A		
3S/2E 19D 9	ISABEL 3		M	SA			A		
3S/2E 19D10	ISABEL 4		M	SA			A		
3S/2E 20M 1	Alden Lane			SA					A
3S/2E 21E 3	Concannon			SA					A
3S/2E 21L13	3S/2E 21L13			SA					A
3S/2E 22B 1	grapes		M	SA					A
3S/2E 24A 1	S. greenville (24A1)			SA					A
3S/2E 26J 2	mines rd			SA					A
3S/2E 29F 4	usgs wetmore		M	SA	M		SA	A	
3S/2E 29H 6	Los Vinos			SA				A	
3S/2E 30D 2	vineyard (T-VIN-3)		R	R	R		SA	A	
3S/2E 30G 1	genesis farms			SA					
3S/2E 30H 1	750 vineyard			SA					
3S/2E 33G 1	crohare		M	SA	M		SA	A	
3S/3E 7D 2	7D 2			SA				A	
3S/3E 7M 2	lupin way			SA				A	

February 14, 2005

Frequency Codes: R = Recorder; D = Daily; W = Weekly; M = Monthly; Q = Quarterly; SA = SemiAnnual; A = Annual.

Objectives:
Key = Zone 7's Index Wells Mon = Zone 7's Monthly Objective SA = Zone 7's Semiannual Objective Water Rights = Required for Zone 7 Water Rights Qual = Zone 7's Water Quality Objective Muni = Municipal Pumping Wells -includes water quality sampling (frequency as listed) and monthly water level measurements
EBDA = Required by the East Bay Discharges Authority
WL = Water level measurements WQ = Water quality sampling

Salt Management Plan Designations (SMP 2004):
T-AIR = Airport Transect T-BER = Bernal Transect T-CHA = Chabot Transect T-DUB = East Dublin Transect T-FRI = Friesman Transect T-HAC = Hacienda Transect T-HV = Happy Valley Transect T-LIV = South Livermore Transect T-MAY = May Transect T-PLE = Pleasanton Transect T-RH = Ruby Hill Transect T-SPR = Springtown Transect T-VIN = Vineyard Transect T-WEN = Wente Transect

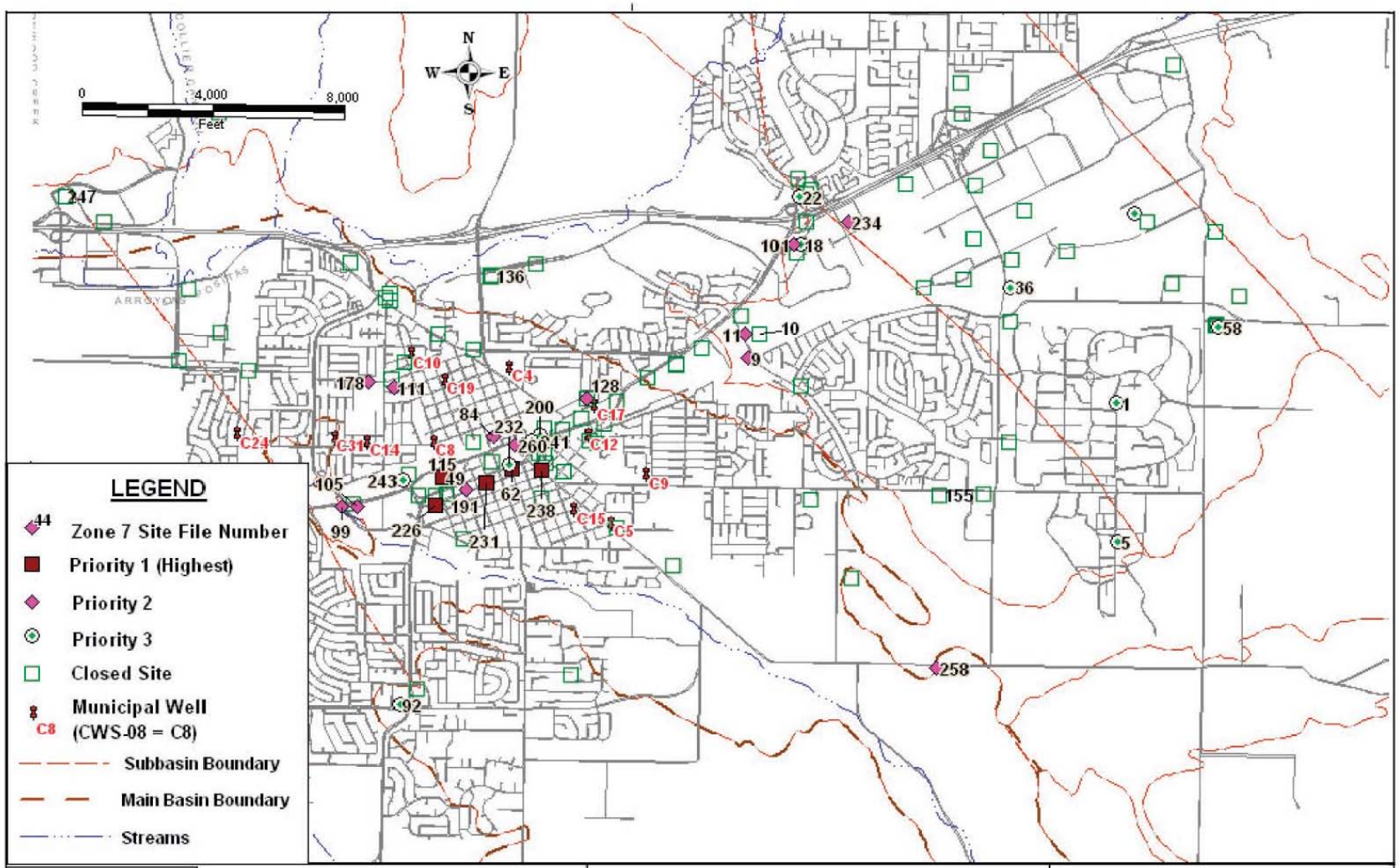
Appendix B

Toxic Site Surveillance Program Areas for Livermore, Pleasanton, and Dublin Areas

Figure A, Toxic Site Surveillance, Livermore Area Sites

Figure B, Toxic Site Surveillance, Pleasanton Area Sites

Figure C, Toxic Site Surveillance, Dublin Area (North of Main Basin)



ZONE 7 WATER AGENCY
100 NORTH CANYONS PKWY.
LIVERMORE, CA 94551

For Toxic Report:	January 2004
Drawn By:	CMahoney
Revised By:	CWiney
Date Updated:	01/16/04
File: \zone7-file\mapinfo\Toxic\ToxReport2003.wor	

04727.04

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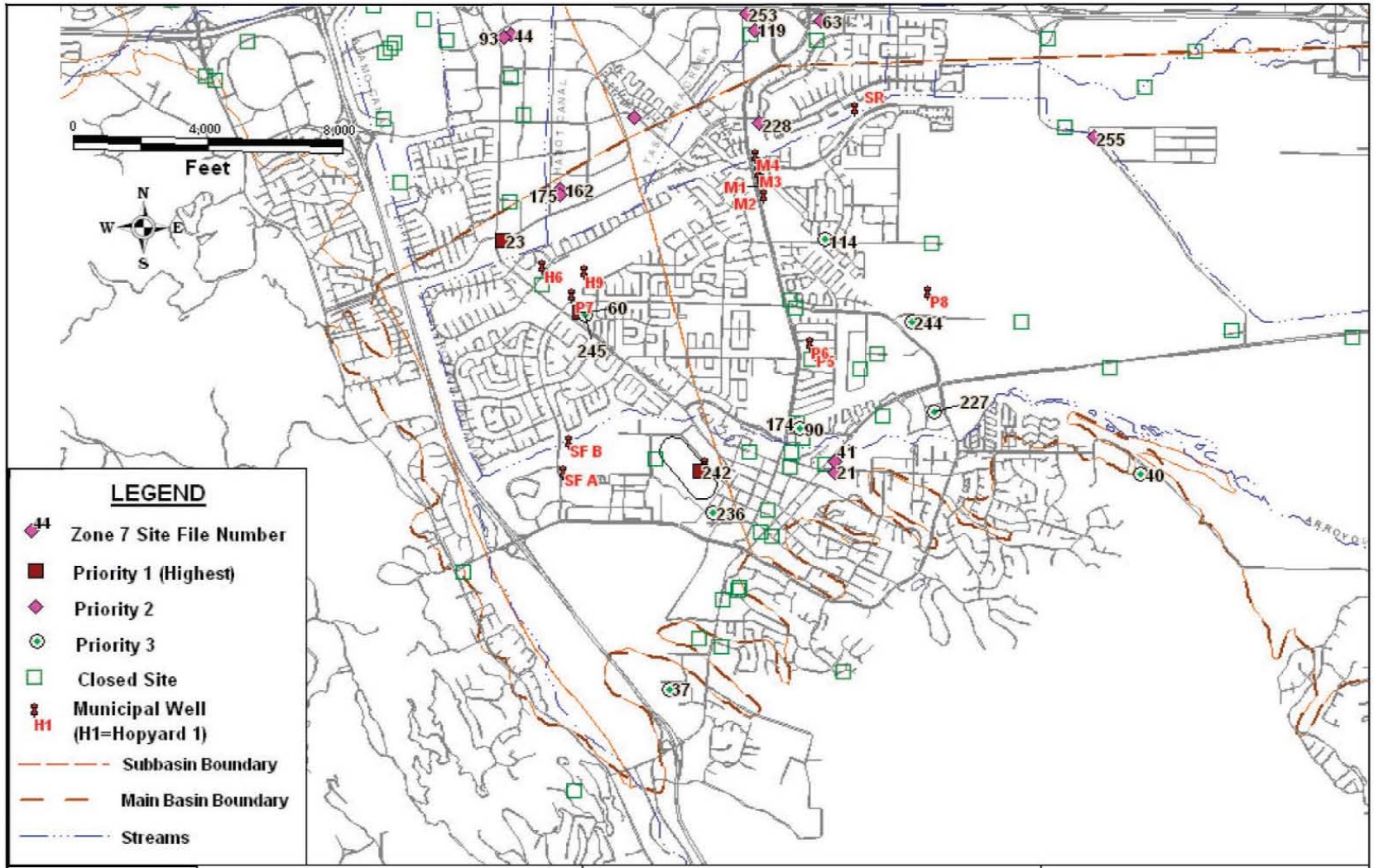
Figure A
Toxic Site Surveillance, Livermore Area Sites



04727.04

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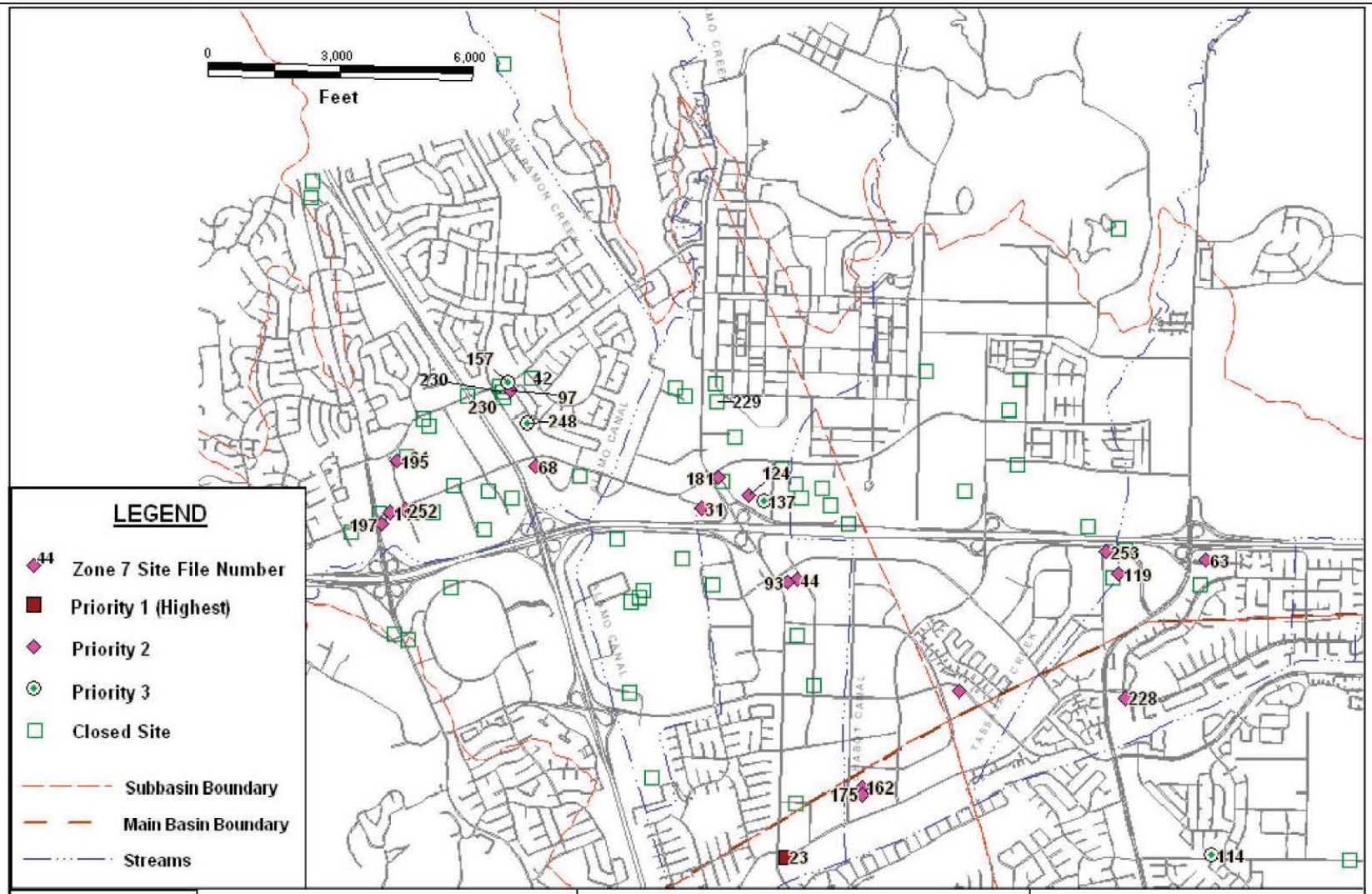
Figure B
Toxic Site Surveillance, Pleasanton Area Sites



ZONE 7 WATER AGENCY
100 NORTH CANYONS PKWY.
LIVERMORE, CA 94551

For Toxic Report:	January 2004
Drawn By:	CMahoney
Revised By:	CWiney
Date Updated:	1/16/04
File: \zone7-file\mapinfo\Toxic\ToxReport2003.wor	

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Figure C
Toxic Site Surveillance, Dublin Area (North of Main Basin)

Appendix C

Standard Operating Procedures

Appendix C

Standard Operating Procedures

C.1 General Procedures

Standard Operating Procedures (SOPs) are essential in running a successful monitoring program to ensure that all data collection procedures for each specific type of monitoring remain homogenous. Zone 7 adheres to such standard procedures in all types of monitoring and data collection.

Appropriate equipment will be brought into the field including appropriate sample containers, sampling equipment, container labels, chain of custody sheets, and field sheets. Sample containers are provided by the laboratory with the appropriate preservative, if any is required. Containers are labeled with the site, date, time, and sampler. Sample timing will be coordinated with the laboratory so that samples can be analyzed within the specified holding time for that analysis. Zone 7's laboratory supplies clean sample collection containers appropriate for each of the analyses.

Upon arrival to the site, all on-site equipment is monitored for damage and maintained, if necessary. If maintenance cannot be completed at that time, the equipment is either brought back to the office for maintenance or field personnel will return with the appropriate equipment/personnel as soon as possible to repair the equipment.

A Chain of custody form is completed for each set of samples and is submitted to the laboratory along with the samples. Samples will be delivered to the laboratory within the recommended holding times for the appropriate analysis.

C.2 Climatological Monitoring

Each of the daily rain gage stations (excluding the California Irrigation Management Information System or CIMIS Station) is equipped with a 10-inch Forester rain gage. Once a day, an observer measures and records the depth of rain (to the nearest 0.01 inch) that has fallen in the preceding 24 hours. If the station is operated by a private observer, the observer then mails their monthly data to Zone 7 at the end of the month. The Livermore station, 15E, also reports to the National Oceanic and Atmospheric Administration (NOAA) and is

currently Livermore's official NOAA station. The NOAA Livermore record is the longest record in our valley, extending back to January 1871. Station 44, part of the Lick Observatory on Mt. Hamilton, has records going back to 1881.

The recorder stations consist of a 10-inch Forester rain gage and a computerized tipping bucket recorder. These tipping buckets continuously record the amount of rain that has fallen at that station.

The California Irrigation Management Information System (CIMIS) Station was installed in 2004 by the California Department of Water Resources (DWR). This station collects 15 minute data sets for precipitation, air temperature, soil temperature, wind speed, wind direction, solar radiation and evapotranspiration. The data is stored and corrected as necessary by DWR and is made available to Zone 7 via DWR's website:

<http://wwwcimis.water.ca.gov/cimis/welcome.jsp>.

The two evaporation stations located at the Livermore Water Reclamation Plant (LWRP) and Lake Del Valle Dam are logged daily and record evaporation to the nearest 0.01 inches.

New average precipitation and average pan evaporation are computed at the end of each water year for use in the following water year. The new average monthly and annual precipitation values are computed using the entire historic database including the current year. For statistical accuracy, an adjusted average is computed by adjusting the monthly totals until the numeric sum of the monthly totals, rounded to the nearest 0.01 inch, equals the average of the water year totals. Typically, only a few of the monthly mean values are changed, and only by one or two hundredths. These adjusted means are listed at the bottom of the monthly table of precipitation.

C.3 Groundwater Elevation

For groundwater level data, Zone 7 measures depth-to-water from a surveyed reference point in each well. Reference point elevations are typically surveyed to an accuracy of 0.01 feet. Mean sea level is used as a common datum for all monitoring wells. Several different devices are used to measure the depth to water. Each device is calibrated routinely to ensure the accuracy of these measurements. Measurements are made to within 0.1 feet and recorded on field data sheets. The elevation of the water surface in the well is computed by subtracting the depth to water from the reference point elevation. The field data is then entered into a database and made available to staff for further analysis.

The California Water Service Company (CWS) and the City of Pleasanton provide monthly water level data from their production wells.

Groundwater levels for all monthly wells are graphed and reviewed monthly. Wells with levels that do not correspond to past or other nearby observations are re-measured to check the elevation. Water levels measured by others are

received a month or more after the actual measurement, so a check measurement is usually not possible. Unusual water levels are noted as suspect in the database and are deleted from the graphs. Pumping water levels are sometimes obtained and are so noted in the database.

Semiannual groundwater level data are initially compared to previous elevations in the field at the time of measurement. These levels are then graphed and contoured to check the general accuracy of the data.

Municipal wells are turned off prior to water level measurements and turned on prior to sampling.

C.4 Groundwater Quality

Groundwater samples are collected at least annually from all wells in the program provided a suitable sample can be obtained. Zone 7 municipal wells, which are turned on prior to sampling, are sampled quarterly by lab personnel. Zone 7 personnel sample other municipal wells annually or analytical results are obtained from the respective agency. Water rights wells are sampled semi-annually.

Groundwater quality samples are monitored for electrical conductivity (EC) and temperature during pumping to determine stability. Samples are collected after the conductivity and temperature have stabilized. Typically, several casing volumes are pumped before stability has been confirmed, when feasible.

Depth to water, sample temperature, EC, and pH are measured in the field. Samples are filtered in the field through a 0.45-micron filter and are generally transported to the laboratory at the Del Valle Water Treatment Plant on the same day. Municipal wells sampled by the lab personnel are not filtered. Samples not analyzed within a few days are preserved by refrigeration. Analysis of samples is limited to major minerals and miscellaneous metals (e.g., arsenic, boron).

Samples sent to the DWR lab are preserved using industry standards for each analytical method. Split samples are obtained for all of the DWR samples and are tested in Zone 7's lab.

C.5 Surface Water Flow

Data loggers have been installed at all surface water recorder sites. These data loggers allow Zone 7 to retrieve 15-minute gage-height data. Most stations are equipped with some type of telemetry capability enabling Zone 7 to download the data remotely. For sites where there is no telemetry capability, data is downloaded directly onto laptop computers monthly.

In general, the procedures used to operate the Zone 7 recording stations and compute streamflow data are in conformance with USGS standards. Each Zone 7 station is visited twice each month: at the beginning of the month for a service visit, and during the middle of the month for an equipment check (the three USGS stations are also visited at this time). The service visit usually consists of a streamflow measurement to verify the station discharge rating, the equipment is checked and serviced, and the used A35 recorder paper chart is removed. The middle of the month visit consists of checking of the station equipment for proper operation, obtaining an outside gage height, and measuring the EC and temperature of the stream. Streamflow measurements are plotted on the rating curve to either confirm the validity of the curve or to make adjustments to the curve. Daily streamflow data are calculated from the A35 recorder chart, or the digital data, which serves as record of flow, and the data obtained from the servicing visits. The streamflow records are computed and reviewed monthly and are given a final review before the compilation of this annual report.

Gage-height records and calculated flow data at the recorder stations are generally of good to fair quality, usually within about eight percent of actual flow. There may be periods when records are missing or incomplete. Flow records from other stations are used to estimate flows during those periods of missing records.

Metered sites in the surface water program are read monthly by Zone 7 personnel or by personnel from other agencies or companies. Daily flow volumes are estimated from the monthly values and meter activity logs. Staff gage sites in the program are visited weekly, when gage-heights are recorded. Flow data is estimated or measured from the gage readings from historical stage-discharge curves. Flow values are then prorated for the previous week. General stage-discharge relationships are developed for staff gage sites, but generally do not contain the rigorous review given to recorder sites. For ‘Other’ sites, surface water flow is estimated by visual inspection.

C.6 Surface Water Quality

Surface water quality sample locations are selected in areas of well-mixed flow, away from influent flow sources. Samples are collected in an intermediate container by wading into the stream or at a suitable bank location. If conditions are unsafe, a sample container is attached to the end of a grab pole or by affixing a Teflon bailer to a rope for submersion into the creek and then immediately emptied into the intermediate container. Water temperature, specific conductance, and pH are measured in the field, by inserting probes into the intermediate container.

While in the field, samples are filtered from the intermediate container into designated sample containers through a 0.45-micron filter. Samples are then transported to the laboratory at the Del Valle Water Treatment Plant on the same day. Samples not analyzed within a few days are preserved by refrigeration.

Analysis of samples is limited to major minerals plus miscellaneous metals (e.g., arsenic and boron).

C.7 Land Surface Elevation

C.7.1 Surveying of Benchmark

C.7.1.1 Overview

Zone 7 performs seasonal elevation monitoring to evaluate changes in land surface elevations across the Livermore-Amador Valley Main Basin. This monitoring is performed by a surveyor licensed by the State of California. In 2002 Zone 7 contracted Kier and Wright Civil Engineers and Surveyors of Pleasanton, California to set up the circuits and has performed all of the surveying events since that time.

C.7.1.2 Main Circuit (A1)

The surveyor performs a cross-valley run, as an "open" loop using "multiple collection" electronic differential levels. The circuit:

- Starts at USC and GS bench mark "G 972 1964" (A1-1.0) located along Foothill Boulevard (State Highway 21),
- Runs east along the Arroyo Mocho to "M1257-1974 reset 1988" (A1-7.0) to include bench marks near Zone 7's Mocho 1 to Mocho 4 pumping stations,
- Runs north along Santa Rita Rd and Old Santa Rita Rd to "L1257-1974" (A1-9.0),
- Returns south to A1-7.0,
- Runs southeasterly along the former South Pacific Railroad Right of Way to Stanley Boulevard to include Alameda County bench mark "TBM-2, ALA Co., 1971" (A1-13.0) and pumping wells 3S/1E 16B1 and 16A 4,
- Runs east along Stanley Boulevard to USC and GS bench mark "D 8" (A1-15.0),
- Return westerly along Stanley Boulevard to Kottinger Drive to include "V1" (A1-16.0), and
- Runs southeast along Kottinger Drive to Adam Way to close at City of Pleasanton bench mark "K2" (A1-17.0).

C.7.1.3 Supplemental Circuits

Circuit B1 (Mocho wells loop):

The surveyor uses the established elevation on bench mark “M1257-1974 reset 1988” to run “multiple collection” closed loop electronic differential levels through monitoring discs located on the Santa Rita Road and Stoneridge Drive bridges over the Arroyo Mocho. Points in this circuit include:

Well #	Mark/Location
3S/1E 9M 2	Mocho 1: Fnd. Cut sq. on conc. @pump house door.
3S/1E 9M 4	Mocho 3: Fnd “PK” nail and KW tag south side door.
3S/1E 8H18	Mocho 4: Fnd “PK” nail and KW tag south side door.
3S/1E 8H13	Fnd. Cut mark north side 12" dia. casing.
3S/1E 8H 2	Fnd. Cut X on conc. @pump house door.
3S/1E 8H 4	Fnd. Cut X. on conc. @pump house door.
3S/1E 8H 3	Fnd. Cut X. on conc. @pump house door.
3S/1E 9M 3	Mocho 3: Set. Cut mark on conc @pump house door.

Circuit B2 (Mocho wells loop):

The surveyor uses the established elevation on bench mark “TP50” (3" diameter brass disc “ACFCandWCD”, “ZONE 7) to run “multiple collection” electronic differential levels through monitoring discs along Tassajara Creek. The circuit:

- Starts at Arroyo Mocho,
- Runs north along the west bank of Tassajara Creek,
- Continues east over the Tassajara Creek at West Las Positas Blvd.,
- Proceeds south along the east bank of Tassajara Creek, and
- Closes back on “TP50”.

Circuit B3 (Hopyard wells loop):

The surveyor uses the established elevation on bench mark “C972 reset 1967” to run “multiple collection” closed loop electronic differential levels to tie in Zone 7’s Hopyard 6 and 9 pumping wells. The circuit:

- Runs southeasterly along Hopyard Road through previously established monitoring disc “Mocho/Park 2002” located within the Zone 7’s old Parkside Drive office complex,

- Runs southeasterly along Hopyard Road through Alameda County bench mark “1H” located on the westerly concrete bridge abutment over the Pleasanton Canal,
- Runs along the north side of the Pleasanton Canal to Zone 7’s municipal well “Hopyard 9” within the Pleasanton Sports Park, and
- Returns through each point to end back on bench mark “C972 reset 1967”.

Circuit B4 (Stoneridge wells loop):

The surveyor uses the established elevation on bench mark “M1257-1974 reset 1988” to run “multiple collection” closed loop electronic differential levels along the Arroyo Mocho to the east of Santa Rita Rd. The circuit:

- Runs along the south side of the Arroyo Mocho through two existing district brass disc located on the South and North side of the gaging station weir,
- Continues easterly along the south side of the Arroyo Mocho to Zone 7’s Stoneridge Well (3S/1E 9B 1),
- Continues along the south side of the Arroyo Mocho to include two additional points east of the Stoneridge Well (from 2004 to present), and
- Returns through each point to end back on bench mark “M1257-1974 reset 1988”.

If water levels in the Arroyo Mocho prevent safe crossing, the surveyor will only run though the south side disc located within the arroyo at the gauging station. If water levels present a danger to the field crew, they will omit running through either of the brass discs located within the arroyo at the gaging station.

Circuit B5 (Tassajara-Rosewood loop):

This loop, which extends north from the Mocho Municipal Well Field to “L1257-1974” (A1-9.0), has been incorporated into Circuit A1 (see Section C.7.1.2, above).

Circuit B6 (Verona loop) (Discontinued in 2004)

The surveyor uses the established elevations on monitoring points at the Tassajara Bridge as part of Circuit B2 to run a loop into the Verona subdivision. The survey includes elevations on monuments located:

- On Belleza Drive opposite Verde Court,
- At the end of Flora Court,
- At 5606 Belleza Drive, and
- On a point previously established on Circuit A1.

Circuit B7 (Sutter Gate loop) (Discontinued in 2004)

The surveyor uses the established elevations on monitoring points as part of Circuit B1 to extend into the Sutter Gate subdivision area. The circuit:

- Runs west from the Mocho Municipal Well field to include elevations on the monuments located on Larame Gate Drive and Larame Gate Court,
- Run along Larame Gate Drive southwesterly to Sutter Gate Avenue,
- Runs northwesterly along Sutter Gate Avenue to the monument at Sutter Gate Avenue and Lin Gate Street,
- Continues along Sutter Gate Avenue to the monument at Sutter Gate Avenue and Jones Gate Court, and
- Closes on a Circuit A1 point.

C.7.1.4 Level Loop Misclosure Check

If the Circuit A1 run fails to close back on to the previously established elevation for “K2” by more than +/-0.02 feet, the surveyor will run a closing “multiple collection” electronic differential level loop back to “G 972 1964”. This assures that the differences are not in the surveyor’s work, but may be related to vertical movement of either “G 972 1964” or “K2” or both.

C.7.2 Zone 7 Surveying of Wells

For groundwater elevation reference points, Zone 7 also surveys small circuits to some of the Zone 7 wells. These small circuits branch off of the Kier and Wright surveyed circuits. Due to security and access issues, Zone 7 staff surveys these points. These survey points are listed on Table 1 and include reference point elevations for measuring groundwater levels in the following wells:

- Army Well 1 – 3S/1E 8H 2
- Army Well 2 – 3S/1E 8H3
- Army Well 3 – 3S/1E 8H
- Hopyard 6 – 3S/1E 18A 6
- Hopyard 9 – 3S/1E 17D12
- Mocho 1 – 3S/1E 9M 2
- Mocho 3 – 3S/1E 9M 4
- Mocho 4 – 3S/1E 8H18
- Stoneridge – 3S/1E 9B 1

Zone 7 uses a theodolite transit (Leitz DT5A or equivalent) for surveying the points. The Zone 7 procedures for using the transit include the following:

1. Measurements are read to the nearest one half of a hundredth of a foot.
2. Readings are double-checked to ensure that they have been recorded correctly.
3. After the reading has been recorded, both vials on the transit are double-checked to ensure that the bubbles are exactly centered between the marks. If they are not, the transit is recentered and the reading procedure is repeated.
4. Field notes are kept in the "Zone 7 Wellhead Survey Field Notes" book.
5. 'Back-sights and 'Fore-sights' are taken on each 'Turning Point' at each survey location. The Back-sights (+) and the Fore-sights (-) should be summed and the loop closed to less than 0.015 feet. If the error is greater than 0.015 feet. The entire survey loop is performed again until it can be closed to within the tolerances specified.

C.8 Land Use/Mining Area

The land use and mining area data are derived from field observations, aerial photography and interviews. An aerial image of the Livermore-Amador Valley provides the basis for the mapping.

The aerial image, obtained as a color photographic print, is scanned and utilized in MapInfo, a geographic information systems (GIS) mapping software. The resulting land use and mining area boundaries are a combination of aerial imagery, field observations and, in the case of land use agricultural areas, field interviews. Mining area land use data are compiled from mining area observations. Recycled water use areas are amended using maps and information provided by Dublin San Ramon Services District and the City of Livermore.

Mapping accuracy and efficiency has improved due to the Regional GIS data sharing between local agencies. In the future, developments may be further defined to include categories such as detention basins in order to quantify their impacts on the groundwater basin.

The total acreage of unclassified land is computed by subtracting the classified land use types from the total nodal area. It should be noted that beginning in 2003 the Land Use study includes Node 36 as part of the Main Basin. Node 36, containing approximately three miles of the Arroyo Valle stream channel below the dam, was historically deemed insignificant due to limited groundwater storage potential and minor impacts on the Main Basin. The impacts of this node on the Main Basin have increased in recent years due to significant urban, agricultural and gravel mining developments. It should also be noted that, beginning in 2003, the inclusion of Node 36 in our data tables has changed certain totals and historical averages.

The land use and mining area maps are generated and stored on the computer. All tabulated areas are calculated from maps using MapInfo software.

C.9 Data Management

The Water Resources section of Zone 7 maintains a number of relational databases that track most of the information of importance to Zone 7's groundwater management, including production and distribution parameters, climatological data, benchmark elevations, and water quality data. The data set amassed includes more than 100 years of hydrology in the Livermore-Amador Valley. These databases were developed as a direct result of co-operative programs with both USGS and DWR.

Zone 7 breaks up data into different classes:

- Site Data—typically data about specific monitoring or operational sites (e.g., location, capacity, age, and owner).
- Event Data—is a recording of a specific event and might include a site, a date, and a measure of an event. The water level database is an example of an event database.
- Daily/Monthly/Annual Data—is normally an aggregate total and is fixed based on the duration of interest. An example of daily data is the daily water production database.
- Continuous Recorded Data—can come from a variety of sources such as data-loggers with set interviews, or program recorders that record value changes.

Zone 7 has collected data dating back to the early 1900s and earlier. The collected data sets are converted to other data sets so they can be easily reviewed, compared, and presented. The available data sets are dependent on the type of measurement device at the site:

- Recorder—15 minute data sets for gage height, water levels, and or EC are recorded and downloaded at least weekly for sites with telemetric capabilities or monthly for those without. Recorder data is stored and compiled using proprietary software by 'Western Hydrologic Systems' specifically designed for storing and manipulating field recorder data. Gage height values are converted (using discharge rating tables for each stream) to daily and monthly data values for flow.
- Wells—Monthly water levels are collected from about 80 wells in the program. Semi-annual water levels are collected from about 225 wells in the program.
- Benchmark—Land surface elevation benchmarks are measured semi-annually and correspond to times when water levels are expected to be the highest and lowest during the water year.

- Staff—Weekly data sets for gage height are collected. In most cases, these are compiled and stored as daily and monthly values for flow. However, in some cases only the gage height is stored.
- Meter—Monthly data sets for flow are collected. These are compiled and stored as daily and monthly values for flow.
- Calculated—Monthly data sets are calculated from other data. These are compiled and stored as daily and monthly values for flow.
- Other/None—For sites in the program, weekly data sets are collected by visual inspection since there are no devices. These are compiled and stored as daily and monthly values for flow.
- Mining area lake levels—water levels are monitored monthly from various lakes in the mining area.

All flow data is stored in various relational database files. All water level data is stored in a relational database file and in "GIS\Key", a proprietary database and GIS program specifically designed for storing and presenting environmental data.

All water quality samples submitted to Zone 7's laboratory for testing, are analyzed for EC, Temperature, pH, minerals, and metals. Water quality data generated by Zone 7's laboratory is stored in various database files and in GIS\Key.

Appendix D

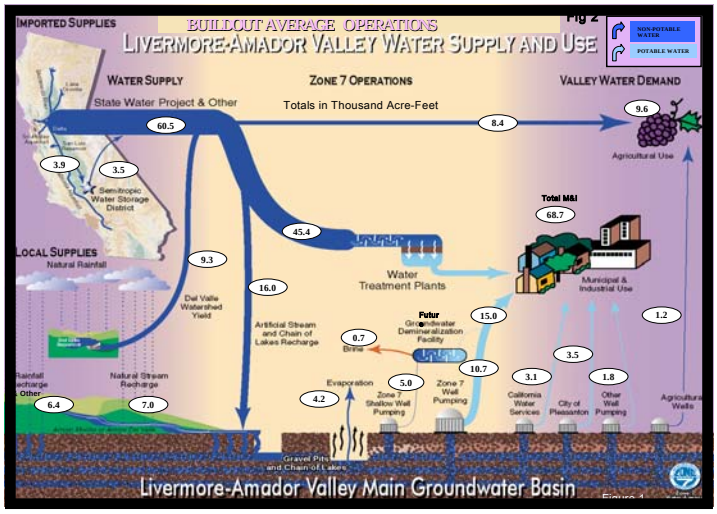
Executive Summary of Salt Management Plan

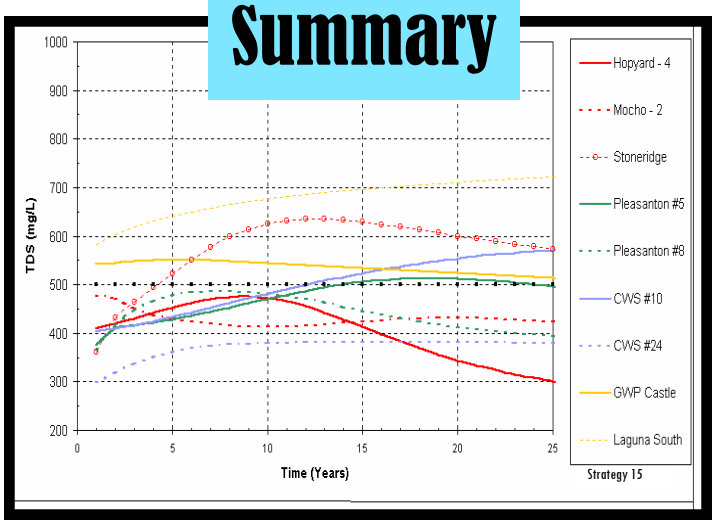
ALAMEDA COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT

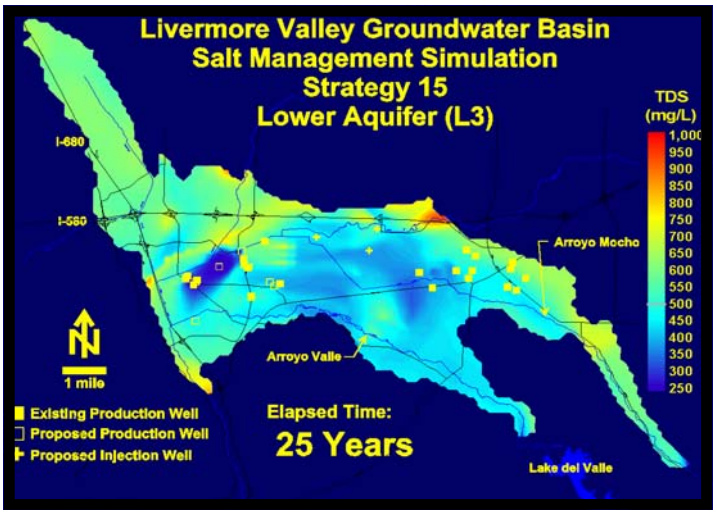
Livermore-Amador Valley Main Groundwater Basin

Salt Management Plan

Executive Summary







May 2004

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94588-5127 • PHONE (925) 484-2600 FAX (925) 462-3914

June 3, 2004

Mr. Bruce Wolfe
Executive Officer
Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Subject: Zone 7 Salt Management Plan Submittal and DSRSD/Livermore Water Recycling Permitting Coordination

Dear Mr. Wolfe:

The San Francisco Bay Regional Water Quality Control Board (RWQCB) issued Order No. 93-159, the "Master Water Recycling Permit," to the Zone 7 Water Agency, the City of Livermore and Dublin San Ramon Services District in December of 1993. The Master Permit specified requirements for implementation of recycled water projects in the Livermore-Amador Valley, including Provision D.1.c.ii. for development and implementation of a Salt Management Plan (SMP). One component of the SMP was to ensure that the overall impact of permitted water recycling projects would not unacceptably degrade groundwater resources.

Zone 7 developed a comprehensive SMP over the last several years with input from the Technical Advisory Group (TAG), including Livermore, DSRSD, and others. The SMP addresses all Master Permit requirements (Permit Attachment 3 Section B) and additional issues. It was designed to document all of Zone 7's current and proposed surface and groundwater resource management and monitoring practices within the Livermore-Amador Valley, not just water recycling impacts. (Currently less than ten percent of the net salt loading to the main groundwater basin is due to recycled water irrigation.) Salt management is being accomplished by Zone 7 in cooperation with its water retailers, through an adaptive management process designed to maintain, and where feasible, to improve both groundwater quality and delivered (potable) water quality.

In August 1999, the Zone 7 Board of Directors approved Resolution 99-2068 adopting an Interim Salt Management Implementation Plan and associated goals. Since then, Zone 7 has been implementing this Interim SMP that focuses on salt impacts from use of imported water supplies and existing recycled water supplies. Zone 7 has now finalized the documentation for the Final SMP and resolved a number of institutional and regulatory issues necessary before being able to fully implement regional water recycling and salt management programs.

Groundwater demineralization and export of salts from one or more reverse osmosis (RO) treatment systems combined with artificial stream recharge with low TDS surface water are the key elements of the SMP. The LAVWMA/EBDA effluent pipeline is the only viable option to export RO concentrate (export salt) from wellhead demineralization. Zone 7 has budgeted over $20 million to construct groundwater RO facilities over the next several years. Zone 7 has been working with DSRSD and Livermore to document the benign impacts of disposal of groundwater RO concentrate water on the

quality of wastewater discharged to San Francisco Bay via LAVWMA and EBDA facilities. Zone 7 entered into a "Basis of Agreement" with DSRSD in March 2004 to support Zone 7's implementation of the groundwater demineralization program portion of the SMP and to support DSRSD's wastewater disposal needs and implementation of local recycled water irrigation projects.

Livermore's NPDES permit, Order No. 00-089, Finding 7, recognized disposal of groundwater RO concentrate via the LAVWMA/EBDA export pipeline as the preferred disposal option, as cited below:

7. "*Livermore, DSRSD, Zone 7 and/or other entities in the Livermore-Amador Valley are likely to implement one or more groundwater demineralization projects in the future to help control salt loading and resultant groundwater degradation, and to help maintain and improve potable water quality. The currently preferred option for disposal of this concentrate is directly to the LAVWMA/EBDA export pipeline. Concentrate typically does not require discharge to the sewer collection system and treatment plant since it is essentially brackish water with low levels of naturally occurring trace elements from the local groundwater. Any sewer discharge would also reduce Joint Powers Agreement limited influent capacity. Board staff find that discharge of concentrate to the Livermore Interceptor would be consistent with the terms and conditions of this Order as long as the combined stream is in compliance with all applicable effluent limitations as measured at the joint EBDA monitoring location. The discharger shall notify the Board prior to allowing any such concentrate discharge and the Executive Officer will amend the Self-Monitoring Program to include appropriate monitoring requirements.*"

DSRSD Water Recycling Permitting

In January 2004, DSRSD submitted a report to the RWQCB and Department of Health Services titled "*Update to Engineer's Report and Notice of Intent for Inclusion Under RWQCB Order 96-011.*" Over 10 years have passed since adoption of the Master Permit (Order No. 93-159) and many aspects of that permit are outdated and/or are no longer applicable. Order No. 96-011 is the General Water Recycling Order applicable throughout the region. The stated intent of the General Order "is to streamline the permitting process and to delegate the responsibility of administrating water reuse programs to local agencies to the fullest extent possible."

The General Order addresses salt management issues in General Provision D.5, as cited below:

> "*When directed by the Regional Board, in groundwater basins that are a significant source of drinking water where there is a likely potential for groundwater degradation from salt buildup from extensive water recycling irrigation, a Producer shall prepare and submit a Salt Management Program, acceptable to the Executive Officer, to insure that the overall impact of permitted water recycling projects does not degrade groundwater resources.*"

The General Order wording is similar to that in Master Permit Provision D.1.c.ii, as cited below:

> *"The permittees shall prepare and submit a Salt Management Program (SMP), acceptable to the Executive Officer, to insure that the overall impact of permitted water recycling projects does not degrade groundwater resources. The program will contain monitoring, management and mitigation elements necessary to achieve salt management goals defined in Zone 7 policies and in the Basin Plan. At the permittees option, the SMP may be incorporated into the Engineering Report or other regulatory documentation."*

To facilitate regulatory and administrative efficiency and to reduce customer costs, DSRSD has requested that its recycled water landscape irrigation projects be transferred from Order No. 93-159 to General Order No. 96-011. DSRSD has committed to complying with the SMP, and to providing TDS and related monitoring data as specified in the SMP, whether the SMP is submitted pursuant to the Master Permit or the General Order.

Livermore Water Recycling Permitting

Recycled water irrigation at the Livermore Golf Course is currently regulated under the city's existing Water Reclamation Permit Order No. 90-102. This order is outdated in many ways and does not reflect the current basin-wide salt management approach of the Master Permit and SMP. The RWQCB stated its intent to rescind Order No. 90-102 and to regulate all of Livermore's water recycling projects under the Master Permit, following submittal and Executive Officer approval of the Salt Management Program in Provision D.4 of the Master Permit, stated below:

> *"Following Executive Office approval of the Salt Management Program (SMP) required to be developed in Provision D.1.c.ii of this Order, the requirements prescribed by the Order will supersede the requirements prescribed by Order No. 90-102 (Livermore and Caltrans Water Reclamation Requirements) and the applicable requirements of Order No. 91-042 (Region 2 Water Reuse Requirements)."*

In April 1998, Livermore submitted to the RWQCB its "*Water Reuse Program Manual.*" This document contains detailed information on how Livermore manages, administers, and permits its recycled water program. As recommended by RWQCB staff, the manual was developed to provide the same basic information as that required to be submitted in the Notice of Intent for coverage under the General Order No. 96-011. DHS and RWQCB staff reviewed and approved the manual in December 1998. Therefore, Livermore would also appear to have an acceptable program in place to allow for coverage for irrigation projects under the General Order.

Requested RWQCB Actions

Zone 7, DSRSD, and Livermore hereby submit the enclosed Salt Management Plan Report and Executive Summary in fulfillment of Master Water Recycling Permit Order No. 93-159 Provision D.1.c.ii requirements and General Water Recycling Permit Order No. 96-011 Provision D.4 requirements. Zone 7 will be the lead agency responsible for implementation of the SMP. DSRSD and Livermore commit to participate with Zone 7 in the SMP to offset salt loading associated with their

implementation of water recycling projects as required by General Order No. 96-011 General Provision D.5.

To provide a comprehensive and effective approach for administering, regulating and encouraging water recycling in the Livermore-Amador Valley, the agencies collectively request RWQCB staff to:

- Review the SMP and provide your approval as soon as possible that the SMP provides a satisfactory program to ensure that salt loading from water recycling projects will be offset;
- Notify Livermore when the SMP is approved that the requirements of Order No. 90-102 are no longer applicable and are superceded by those of Order No. 96-011 and the SMP;
- Approve all DSRSD landscape irrigation programs under Order No. 96-011 following DSRSD submittal of an updated NOI; and
- Cooperate with Livermore and DSRSD in the approval of the addition of groundwater RO concentrate to their wastewater discharge from the Valley to San Francisco Bay.

We would like the opportunity to present to you the results of our significant collective efforts that resulted in this SMP and to answer any questions that you may have about how the SMP is being implemented. We would like to schedule a meeting with you to accomplish this the week of June 7. Dr. Tom Hall of EOA will be contacting you to find out about your availability to meet the morning of Wednesday June 9 and to answer any initial questions that you may have. We look forward to meeting with you.

If there are any questions, please call David Lunn at extension 327.

Very truly yours,

Edward Cummings	Dave Requa	Darren Greenwood
Zone 7	DSRSD	City of Livermore
Assistant General Manager	Assistant General Manager	Water Resources Manager

JC:arr

Enc.

cc: Rich Condit, Regional Water Quality Control Board
Steve Cusenza, City of Pleasanton (w/enc.)
Henry Wind, CWS (w/enc.)
David Lunn
Jarnail Chahal

California Regional Water Quality Control Board
San Francisco Bay Region

Gary Tamminen
Secretary for
Environmental
Protection

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http://www.swrcb.ca.gov/rwqcb2

Arnold Schwarzenegger
Governor

SEP 24 2004

File: 2199.9295 (RJC)

Dale Myers, General Manager
Alameda County Flood Control and Water
Conservation District (Zone 7 Water Agency)
5997 Parkside Dr.
Pleasanton, CA 94588-5127

RECEIVED
SEP 27 2004

Dear Mr. Myers:

Subject: Zone 7 Water Agency - *Salt Management Plan*

We have received and reviewed your letter of June 3, 2004 transmitting the Executive Summary and supporting technical document for your Salt Management Plan (SMP), dated May 2004. This letter is approving the SMP with comments on future salt management monitoring plans. Separate approval from the NPDES Permit Division is required for seasonal groundwater export and wellhead demineralization, two salt management strategies that will result in discharges to surface waters.

The SMP is required under Provision D.1.c.ii of the San Francisco Bay California Regional Water Quality Control Board's (Board) "Master Water Recycling Permit," Order No. 93-159 (Master Permit) if the permittee(s) seeks to undertake a Group C project. The permit was issued to the Alameda County Flood Control and Water Conservation District (Zone 7), the City of Livermore (Livermore) and Dublin San Ramon Services District (DSRSD) in December of 1993. The Master Permit authorizes Livermore, DSRSD, and Zone 7 to produce, distribute, and manage recycled water projects throughout the Livermore-Amador Valley (Valley). The Master Permit requires that prior to implementation of valley-wide recycling projects, the permittees submit a SMP for approval by the Executive Officer. The permit also authorizes groundwater projects using surface spreading and well injection.

Recycled Water Projects in the Valley

In the early 1990's Zone 7, Livermore, and DSRSD conducted a valley-wide water recycling study and found that properly treated recycled water can provide a safe and cost-effective source of additional water supply. The study also found that use of demineralized recycled water could help improve the salt balance and groundwater quality. But relatively little recycled water has been used directly in the Valley due to concerns about potential impacts from elevated total dissolved solids (TDS) levels in recycled water.

The 1993 Master Permit and the SMP

Before extensive recycling projects could be implemented by Livermore and DSRSD under the Master Permit, a SMP required that would assess and manage the impacts of salt loading from those projects on the water quality of the Valley's underlying groundwater basin. Zone 7 would be the lead agency responsible for the development and implementation of the SMP. The SMP was developed during 1994-

1999 through a cooperative effort involving Zone 7 staff, technical consultants and local citizens. Over the years the scope broadened beyond that outlined in the Master Permit, to one more resembling a comprehensive watershed water resources management plan. It identifies and documents Zone 7's long-term plan and strategy for managing salts and mineral water quality within the Valley's groundwater basin. Most of the proposed projects in the Master Permit were never implemented, awaiting the implementation of a SMP to fully offset both current salt loading from natural sources and operations, and any future salt loading associated with new recycled water use. The success of the SMP in controlling salt loading on water quality in the Valley is essential if wastewater reuse is to reach its maximal potential in the Valley.

Salt Management Monitoring Plan (SMMP)

As part of the SMP, Zone 7 conducts an extensive groundwater monitoring program to identify changes in groundwater quality throughout the watershed, to refine salt loading estimates, and provide input to the groundwater models. It is proposed that Zone 7 would submit annual reports to the Board summarizing results obtained as part of the SMMP. In addition to data collected by Zone 7 for the SMMP, there are additional salt loading assessments that may be useful for the SMP. These may include salt loading data from Alameda County Water District, mining companies, septic tank discharges, increased agricultural irrigation outside the Main Basin, sanitary sewer overflows from Livermore's and DSRSD's sewage collection systems, Alameda County's stormwater control program that implements stormwater infiltration as best management practices, private recycled water projects, (i.e., vineyards) etc. Staff encourages Zone 7 to continue to incorporate such information into applicable Zone 7 databases so that Zone 7 can continue to serve as a centralized repository/clearinghouse for surface and groundwater quality and quantity information in the Valley.

Future Water Recycling Programs (General Permit)

Both DSRSD and Livermore have applied for the Board's **General Water Reuse Order** (General Order) to administer their current and future landscape and/or agricultural irrigation type recycled water projects within their individual jurisdictions. Both have completed Notices of Intent (NOI) as required by the General Order. As with the Master Permit, an approved SMP is also required under the General Order. Approval of the SMP by the Executive Officer will also satisfy the General Order's SMP requirement. All future surface recycled water projects by DSRSD and Livermore will be administered by the General Order, once their respective NOIs have been approved by the Executive Officer. Livermore and DSRSD have requested that the Master Permit be kept active to only address potential future groundwater recharge projects. Once the State Water Resources Control Board and the State Department of Health Services finalize new regulations on groundwater recharge reuse, the Board staff will work with Zone 7, Livermore and DSRSD in updating the Master Permit for those uses.

Approval of the Zone 7 Salt Management Plan

Our review of the SMP finds that program provides Zone 7 a very valuable, comprehensive and flexible tool for management of the Valley groundwater basin. It uses an adaptive management process to identify and evaluate many input sources of information that are used to modify salt management strategies for protecting/improving the basin's groundwater quality for domestic and municipal beneficial uses while maximizing recycled water use. This adaptive management process allows annual changes to Zone 7's salt management approaches and operational plans and helps ensure that they result in an optimized combination of strategies for any given year.

In addition to being an essential management tool for protecting and maintaining basin water quality, the SMP will provide the Board valuable insight on the impacts of salt loading on surface and groundwater quality from various sources in the valley. To that end, the Board would like to be appraised of Zone 7 policy directives, available water resources and demands in the basin, updates to groundwater modeling, salt loading tracking, and changes in salt management strategies in an annual summary report to this Board. The contents, format, and timing of the summary report submittal can be determined through consultation between our staffs.

I find that the **Salt Management Plan**, submitted by Zone 7 of the Alameda County Flood Control and Water Conservation District, pursuant to Master Permit Provision D.1.c.ii, satisfactorily meets the intent of the Master Permit. It is understood Zone 7 will be the lead agency responsible for SMP implementation, and that DSRSD and Livermore have committed to actively participate with Zone 7 in SMP implementation. We agree with the SMP approach that it will be implemented via an adaptive management process within the context of the annual Zone 7 water operations plan and in accordance with Zone 7 approved SMP policies and objectives.

If there are questions regarding this matter, please contact either Richard Condit at (510) 622-2338 or Shin-Roei Lee at (510) 622-2376.

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Acknowledgements

Salt Management Plan Report

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Other Zone 7 staff, managers and consultants who participated in this multi-year effort are recognized for their contributions to the success of this project.

Executive Summary

Zone 7 Salt Management Plan

Introduction

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The Salt Management Plan (SMP) is a cooperative effort developed to address the increasing level of total dissolved solids in the main groundwater basin. It was developed in partnership by Zone 7 staff and consultants, a technical advisory group (TAG) composed of local water retailers, and a Zone 7 citizens committee—the Groundwater Management Advisory Committee (GMAC). In-house data compilation work began in 1994, with technical analyses and presentations continuing through 1999. This SMP report provides the technical information and analyses that support the August 1999 Zone 7 Board approved salt management strategy of using increased conjunctive use combined with shallow groundwater demineralization in the western portion of the service area to fully offset current and future sources of salt loading to the main groundwater basin (Main Basin). This strategy was designed to also maintain or improve delivered water quality and to facilitate increased use of recycled water using planned Zone 7 facilities to offset salt loading. Annual Salt Management decisions are to be made via an adaptive management process integrated into Zone 7's annual water operations plan.

Chapter 1 provides a brief history of the SMP process and the regulatory framework that initiated and guided its development. It includes a summary of water recycling investigations and proposed projects in the Livermore-Amador Valley and how such projects could be implemented under the Master Water Recycling Permit and the SMP.

Chapter 2 provides an overview of both current and future Zone 7 facilities, water demands, and operations. It describes the key role of the annual operations plan in maintaining a sustainable water supply. The water system operations computer model used to project delivered water quality under alternative operating strategies is also described.

Chapter 3 provides a condensed summary of historic information and ongoing data collection on the hydrogeology of the fringe and main groundwater basins. Connectivity and mixing, fringe to Main Basin and upper to lower aquifer are addressed. Supporting information is presented from the enhanced Visual Modflow computer groundwater flow and MT3D solute transport model developed for the SMP.

Chapter 4 summarizes the extensive database of surface and groundwater quantity and quality information collected and maintained by Zone 7 as part of its management of water resources in the Livermore-Amador Valley. Issues of seasonal and spatial variability are addressed in addition to the major influence that imported South Bay Aqueduct water quality has on delivered water quality.

Chapter 5 describes the methodology and extensive data required by Zone 7 to calculate the annual and steady state-based water and salt balances for the main groundwater basin. Historic and projected year 2010 salt loadings are discussed. Variations of these salt balance calculations are used in the SMP to evaluate the impacts of alternative salt management strategies.

Chapter 6 presents Zone 7's existing monitoring programs, as well as additional surface and groundwater monitoring implemented to track current and future sources of salt loading in the watershed and to address areas of hydrogeological uncertainties. The surface and groundwater monitoring networks for each drainage basin are described.

Chapter 7 presents the key salt management plan policy issues and options developed through consultation with the TAG and GMAC. Key recommendations include: (1) fully offset current and future net salt loading and (2) maintaining and, where feasible, improving delivered water mineral quality. Background information is presented on consumer acceptability of varying TDS concentrations of delivered water.

Chapter 8 describes the range of individual and composite salt management strategies that are evaluated in more detail in the remaining chapters of the SMP. The focus is on strategies that use previously planned and budgeted Zone 7 facilities such as wells and groundwater demineralization facilities. Preliminary unit operations and maintenance (O&M) costs are also presented.

Chapter 9 presents the results of the salt loading calculations for 20 salt management strategies under projected year 2010 conditions. The strategies are based on the policies and options described in Chapter 7. Estimated costs and impacts on groundwater and delivered water quality TDS are included. A screening process is presented to identify the most feasible strategies for further analysis.

Chapter 10 presents the computer modeling results for four of the most promising strategies identified in the screening analysis discussed in Chapter 9. Included are computer model generated maps and graphics depicting impacts on groundwater, individual wells, and retailer turnouts under status quo operations versus SMP strategies.

Projected impacts of potential strategies using demineralized recycled water injection also are included.

Chapter 11 presents alternatives and recommended approaches for allocating the costs of salt management as a function of the salt source: existing municipal and industrial (M&I), future M&I, untreated water, or recycled water. TAG recommendations to fund capital costs through connection fees and O&M costs through water rates, similar to other Zone 7 facilities, are summarized.

Chapter 12 presents the SMP near-term implementation plan, including the most feasible salt management strategies identified in Chapter 10 scaled down to offset the current 2,200 tons/year salt loading versus the 5,400 tons/year loading projected for year 2010. These strategies include increased conjunctive use, shallow groundwater demineralization, and potential future demonstration scale stream recharge with demineralized recycled water. Chapter 12 describes the specific near-term (2000-2002) SMP implementation plan that was approved by the Zone 7 Board in August 1999 and two implementation options for 2004-08. The SMP concludes with recommended next steps to address future salt loading sources and to further investigate potential lower cost salt management strategies such as seasonal groundwater export.

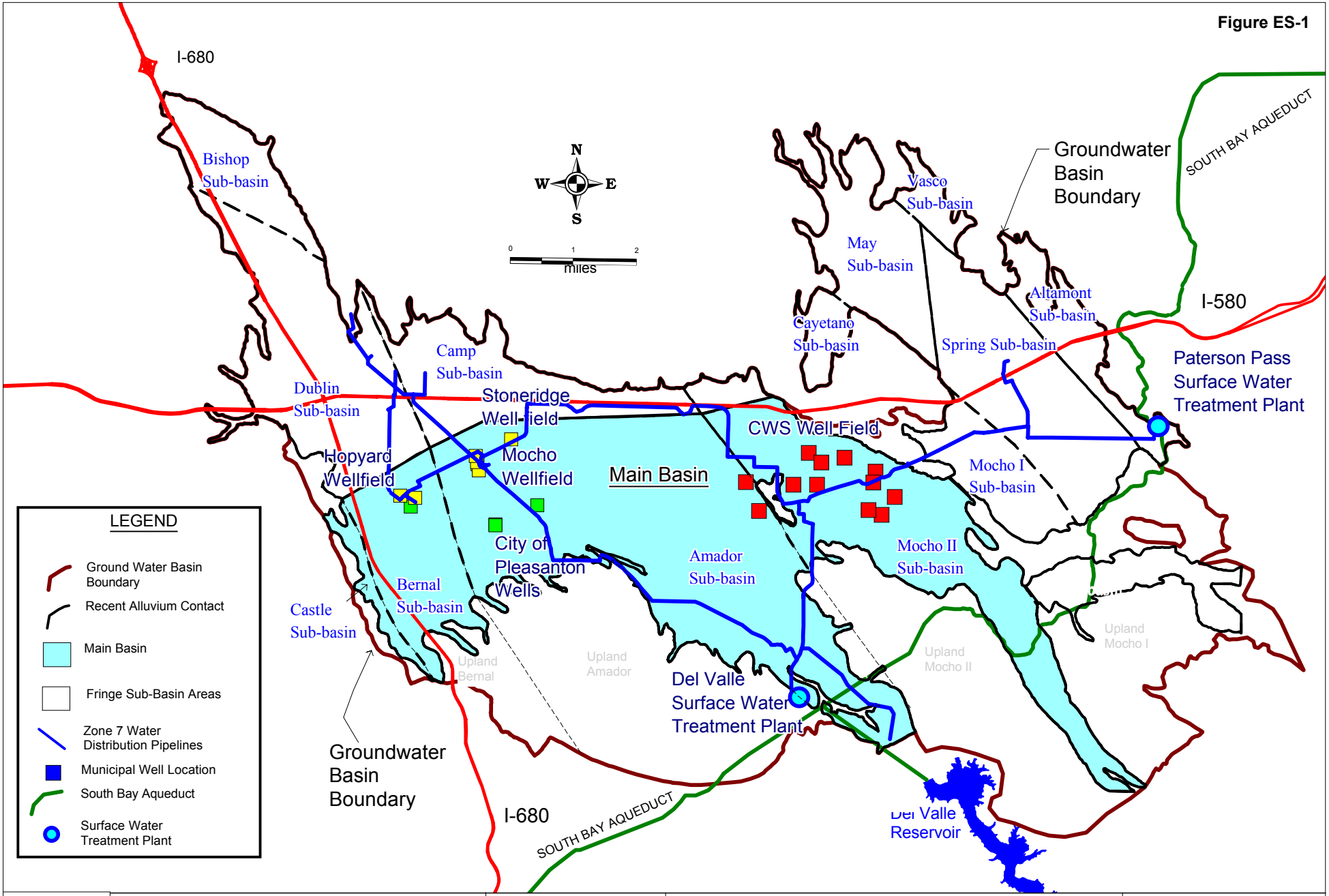
Background

Zone 7 of Alameda County Flood Control and Water Conservation District, locally known as Zone 7 Water Agency, serves as the overall water quality management agency for the Alameda Creek Watershed above Niles. Zone 7 has the primary responsibility of managing the Livermore-Amador Valley surface and groundwater resources. It has historically managed the 250,000 acre-foot capacity main groundwater basin (Figure ES-1) by maximizing lower TDS surface water deliveries, artificially recharging the Main Basin with low total dissolved solids (TDS) imported surface water, restricting groundwater pumping, and restricting wastewater disposal and water recycling within the watershed.

Studies relating to the groundwater supply of the Livermore Amador Valley were first conducted in the early 1900's. Since that time, a number of studies have been completed by entities, including the California Department of Water Resources, the U.S. Geological Survey, as well as Zone 7. To signify the area of the groundwater basin that had long been recognized as containing the majority of usable groundwater storage, the concept of a central or "main" basin was developed in the 1980's.

The Livermore-Amador groundwater basin is located in the heart of the Livermore-Amador Valley and extends into the hills south of Pleasanton and Livermore. The basin includes the areas occupied by both the Livermore Valley and Livermore uplands. The principal water-bearing units are the unconsolidated recent alluvium sands and gravels, and the tilted, semi-consolidated beds of sandstones and conglomerates of the Livermore Formation. Groundwater occurs in the aquifers under unconfined, semi-confined and

Figure ES-1



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SALT MANAGEMENT PLAN

GROUNDWATER BASIN AND WATER FACILITIES MAP

SCALE	1" = 2 Miles
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confined conditions, depending on depth and location in the basin. Several geologic faults or linear groundwater anomalies cut across the groundwater basin. Based in large part on these fairly linear fault-related groundwater impediments, the basin has been divided into 13 sub-basins: Altamont, Amador, Bernal, Bishop, Camp, Castle, Cayetano, Dublin, May, Mocho I, Mocho II, Spring, and Vasco. Together, portions of the Castle, Bernal, Amador, and Mocho II sub-basins overlain by recent alluvium are considered the "main" basin because of their large capacity to store and transmit groundwater and their significance to the local groundwater supply. The other sub-basins are collectively called the "fringe" basins.

Groundwater in the Livermore Valley exists in a multi-layered aquifer system with the upper aquifer being unconfined and the subsequent deeper aquifers being semi-confined or leaky. Flow generally follows a westerly pattern, like the surface water streams, along the structural central axis of the valley. The majority of subsurface inflow, however, occurs across the northern boundaries of the Main Basin, in particular from the Dublin and western Camp sub-basins, and flows in a southerly direction. These sources of groundwater co-mingle in the Bernal and Amador sub-basins and generally flow towards groundwater pumping facilities in Pleasanton.

It is a common misconception that the groundwater basin is a "totally closed" basin suggesting that minerals or contaminants that enter the groundwater basin have no way of leaving the basin. In the late 1800s, pre-development groundwater levels in the basin created a gradient causing groundwater to flow from east to west and naturally exit the basin as surface flow (rising groundwater) in the Arroyo de la Laguna. In the early to mid-1900s, groundwater began to be extracted in appreciable amounts causing groundwater levels to drop throughout the basin, below the level where it would naturally rise into the Arroyo de la Laguna and exit the basin through stream flow. This was the closest the Main Basin came to being, by definition, a "closed" basin. At present, the basin cannot be considered "totally closed" since water is recharged into and exported from the basin through various means. On average, approximately 8% of the total groundwater storage exits the basin each year.

Treated water production facilities in the valley include two surface water treatment plants owned and operated by Zone 7, as well as groundwater production wells owned and operated by Zone 7, the City of Pleasanton, and California Water Service Company (CWS). Total surface water treatment design capacity is 55 mgd. Actual capacity can vary with South Bay Aqueduct flow (water elevation). Zone 7 has seven existing active production wells with a total peak production capacity of 32 million gallons per day (mgd). Pleasanton has three existing active wells with a production capacity of 11 mgd and CWS has 12 existing active wells with a production capacity of 10 mgd. Total combined groundwater capacity for Zone 7 and its retailers is approximately 53 mgd.

Zone 7's treated water distribution system conveys treated water to retailer turnouts. The system includes booster pump stations and distribution pipelines, and 13.5 million gallons of total storage capacity in three storage reservoirs that help meet hourly demand fluctuations. Water retailers own and operate their own water distribution system to serve

their customers. Pleasanton and CWS both pump directly into their distribution systems to meet hourly and daily peak demands. Annual total groundwater pumping by Pleasanton and CWS is limited to their groundwater pumping quotas.

Water Quality and Variability

The historic management approach implemented by Zone 7 (i.e., maximizing surface water deliveries, artificially recharging the Main Basin with low total dissolved solids (TDS) imported surface water, restricting groundwater pumping, and restricting wastewater disposal and water recycling within the watershed) has been successful in maintaining a sustainable and reliable water supply. The valley-wide annual average delivered water blend during an average year is about 85% surface water and 15% groundwater. TDS is used as an indicator of overall mineral (salt) content in this SMP. However, Zone 7 monitors for a large suite of mineral constituents in surface and groundwater in addition to TDS. These more detailed data and TDS data are used to track sources of water and analyze water quality trends, as well as to calculate salt loading of the Main Basin.

The quality of Zone 7 potable deliveries varies seasonally as a function of both source water quality and the blend ratio of surface water to groundwater. The TDS concentrations of source water from the South Bay Aqueduct (SBA) can vary from 100 to 700 mg/l on an annual average basis depending on the wetness of the water year (climatic conditions) and seasonally, month to month depending on reservoir releases into the Delta and Delta pumping patterns. Groundwater quality changes slowly and is generally more consistent, ranging from 400 to 550 mg/L TDS. Hence, actual delivered water TDS varies from month to month and year to year. The ratio of groundwater to surface water can vary by season, by day, and by turnout depending on demand. Table ES-1 shows typical winter and summer source water quality, delivered water blend, and resultant delivered water TDS of Zone 7 deliveries under three climatic conditions: dry, average and wet years.

Table ES-1
Typical Delivered Water TDS
Under Historic Basin Management Strategy

	Source water Quality (TDS)		
Climatic	SBA TDS (mg/L)		GW
Conditions	Winter	Summer	TDS
Dry	500	500	450
Average	270	220	450
Wet	170	150	450

	Delivered Water Blend	
Climatic	%Surface Water Delivered	
Conditions	Winter	Summer
Dry	30%	30%
Average	100%	90%
Wet	100%	90%

Climatic	**Delivered Water Quality, TDS (mg/L)**	
Conditions	**Winter**	**Summer**
Dry	**470**	**470**
Average	**270**	**240**
Wet	**170**	**180**

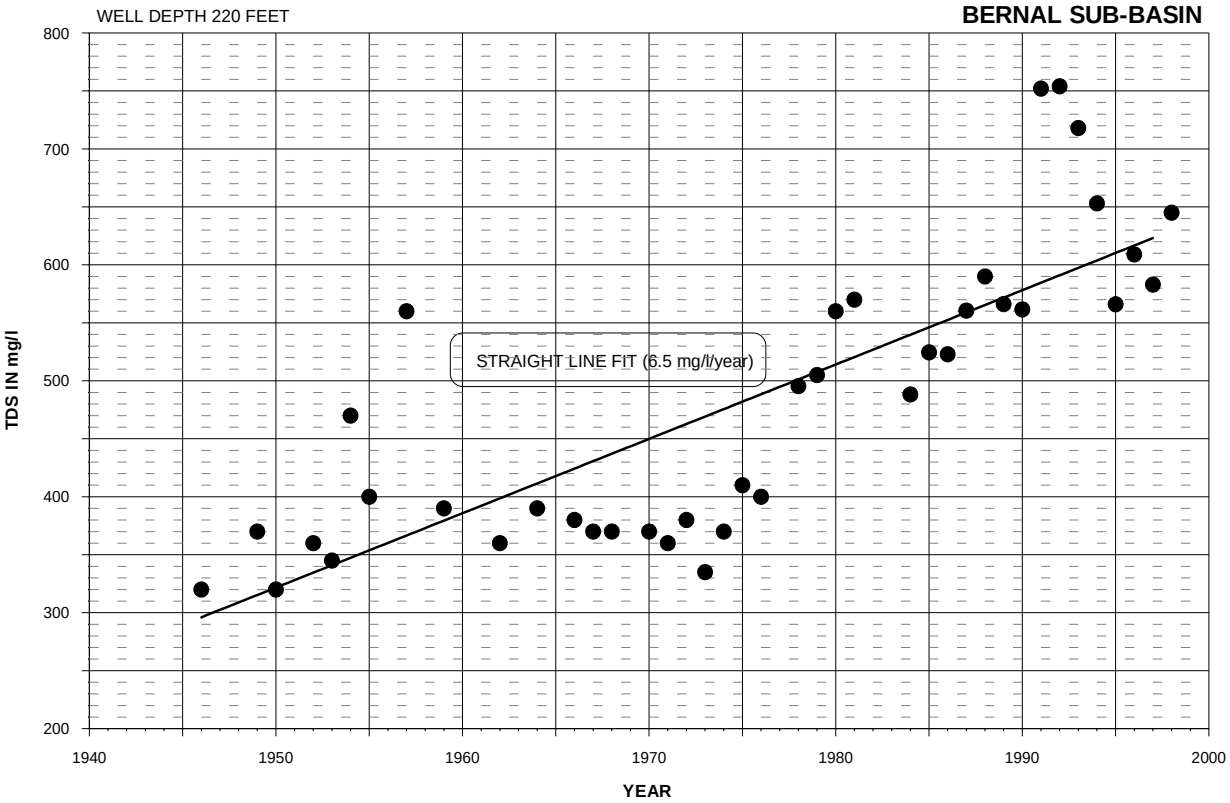
Delivered water TDS also varies from east to west in the valley. The blend of surface to groundwater varies between turnouts because of the locations of the wells relative to the turnouts and because of their intermittent use. The Livermore and CWS service areas, which are closer to surface water treatment plants, typically receive a higher percentage of treated surface water, while Pleasanton and DSRSD service areas, which are closer to Zone 7 wells, receive higher percentages of groundwater (see Figure ES-1). CWS and Pleasanton also operate their own wells and blend groundwater with their Zone 7 deliveries, adding to the variability of water quality delivered to their customers.

Salt Loading, Sources, and Sinks

As in other arid areas that rely on imported water for a significant portion (75-85%) of the local supply, the historic groundwater management approach has allowed a gradual but continual degradation in groundwater mineral (salts) quality. Annual net loadings varied from about 11,800 to a negative 4,800 tons, with a 25-year average of about 2,550 tons/year. The cumulative salt loading to the Main Basin during that time period was approximately 63,500 tons and there were only six years in which there was a negative salt accumulation in the Main Basin, three of them being 1996-1998. The net steady state salt loading to the Main Basin under 1998 conditions was 2,200 tons. The 2,200 tons per

year is equivalent to a TDS increase of about 10 mg/L per year in the groundwater. Figure ES-2 presents the groundwater TDS changes with time in the Bernal Sub-basin.

Figure ES-2



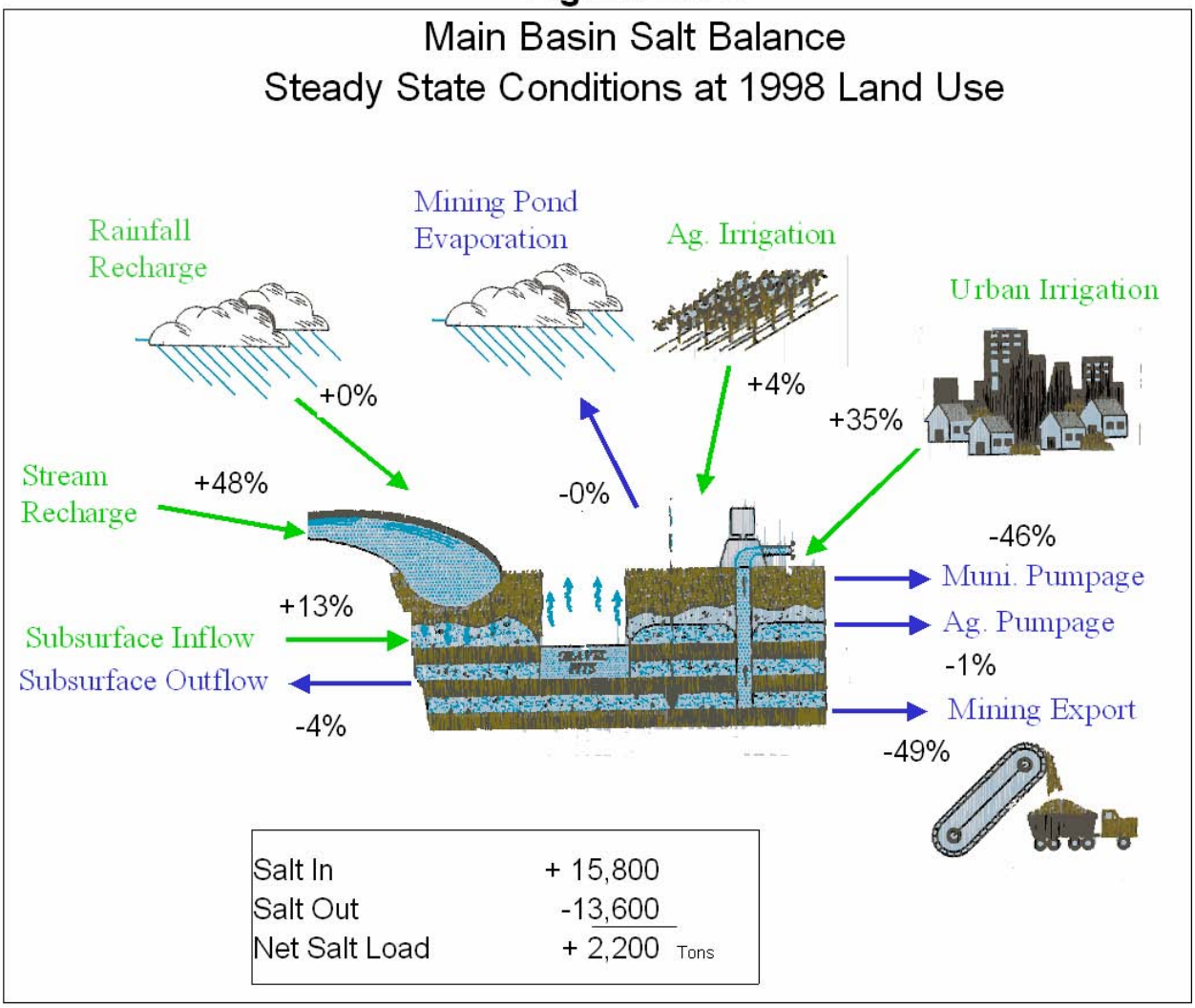
NOTE: ALL DATA IS FROM O-LINE (DEEP AND SHALLOW WELLS)

The main sources and removal mechanisms of salts from the groundwater basin under 1998 land use are shown schematically in Figure ES-3. The main salt sources are conveyed through natural and artificial surface water flow when the water is percolated or recharged into the Main Basin aquifers (48%). Deep percolation of urban irrigation water contributes 35% of total salt loading. Subsurface inflow of high salinity (1,000 mg/L TDS) fringe basin groundwater contributes about 13% of salt loading. Rainfall does not contribute any salt but it dilutes and transports the salts added through urban and agricultural irrigation down to the water table. Salts are removed from the Main Basin primarily as water is pumped from wells (46%) or from gravel mining pits (49%). Zone 7 manages the basin levels so that there is little or no loss of water (and salts) via subsurface outflow. However, the basin is not truly “closed” since, through recharge and pumpage, annually approximately 8% of the total basin storage and more than half of the pumped water and associated salts leave the basin.

Some of the extracted municipal pumpage and associated salts (25-30%) are returned to the basin in areas where irrigation over the Main Basin takes place. The remainder of the pumpage and salts is either used inside the home and then exported as wastewater through the LAVWMA pipeline or used for irrigation in fringe basin areas where the applied salts do not impact the Main Basin. Some of the mining pumpage is returned to the Main Basin through stream recharge but most of this water, along with the salts, leaves the basin and valley via stream outflow.

The annual salt loading under 2003 land use conditions is 5,000 tons per year, an increase of 2,800 tons over the 1998 salt loading. The major cause for the increase in annual salt loading is the cessation of the majority of the gravel mining pumpage and associated salt export from the valley. Salt loading is projected to increase to 5,400 tons per year by year 2010.

Figure ES-3



Salt Management Monitoring Plan

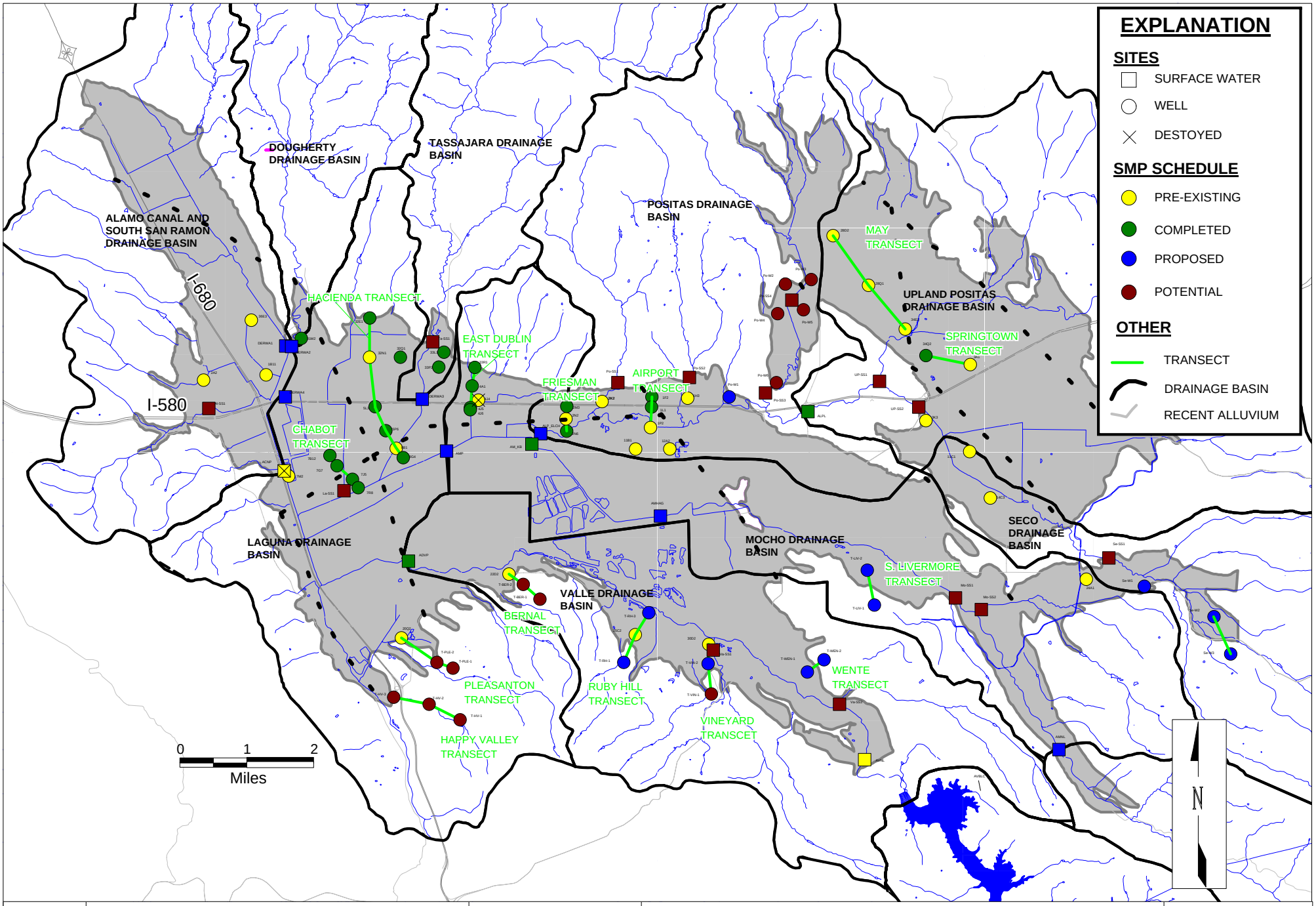
The SMP includes a Salt Management Monitoring Plan (SMMP) designed to help refine the baseline salt loading estimates, particularly from new urban and agricultural irrigation in the fringe basins. Seventeen additional monitoring wells and upgraded continuous recording surface water monitoring facilities have been identified to supplement information provided by existing monitoring program sites. Figure ES-4 shows the locations of the existing and new Salt Management Monitoring Plan monitoring sites.

Salt Loading Calculations

Since 1974, Zone 7 has computed both an annual and a long-term steady state salt balance using a fundamental salt balance equation: inflow of salts dissolved in water minus outflow of salts dissolved in water equals the change in dissolved salts in the groundwater basin. The actual balance in any one year is not indicative of long-term trends since there can be significant storage changes due to change in recharge (e.g., rainfall) and extraction components in a given year. The steady state salt balance equations are used in this SMP to track long-term expected TDS impacts on the Main Basin. They are also adjusted for future land use and operational conditions to evaluate the impacts of alternative salt management strategies under year 2010 conditions.

Supply and demand components each have associated TDS concentrations based on the given year's monitoring data, some historic data, and a few assumed (immeasurable) values. The salt balance calculations include several fundamental and intentionally simplifying assumptions as part of the screening level "spreadsheet" model of the Main Basin. Perhaps the most important simplifying assumption is that all salts applied through irrigation eventually make their way to the underlying groundwater (while in actuality vadose zone processes can delay salt transport for decades). Salts removed by plant uptake and by the application of fertilizers are considered negligible. Percolate quality is assumed to be primarily a function of the differing percentage of applied water that recharges throughout the area due to site specific variations in soil characteristics.

The calculations of main basin water quality assume that the main groundwater basin is well mixed. Monitoring and modeling information developed for and presented in this SMP support the conclusion that there is significant long-term movement from the upper to the lower aquifers in the Main Basin. High TDS (700-2,000 mg/L) irrigation percolate that accumulates in the upper (0-150 foot) aquifer and then "leaks" and mixes into the lower aquifer is a key source of the Main Basin TDS increases. This upper/lower connectivity explains in part why extraction and demineralization (or export) of this high TDS shallow groundwater can provide significant long-term salt management benefits. The same benefits would also result from extraction of high TDS shallow groundwater (e.g., Dublin Sub-basin) that would otherwise enter the Main Basin as subsurface inflow.



ZONE 7 WATER AGENCY 5997 PARKSIDE DRIVE PLEASANTON CA 94588	DRAWN GERALD GATES DESIGNED/CHECKED GG/TR FILE NAME: H:\SMP\Fig6a-TRUpdate.wor	*SALT MANAGEMENT PROGRAM* *SURFACE WATER AND GROUNDWATER MONITORING SITES*	SCALE 1" = 2 miles DATE APRIL 8, 2004 FIGURE: **Fig ES-4**

Recycled Water

Numerous studies of potential recycled water use have been conducted but relatively little recycled water has been used directly to date in the valley. This is due in part to concerns about potential impacts from the elevated TDS levels in recycled water (versus potable water) on groundwater TDS concentrations. Zone 7, Livermore, and Dublin San Ramon Services District (DSRSD) conducted a valley-wide water recycling study (*Livermore-Amador Valley Water Recycling Study—May 1992*) and found that properly treated recycled water can provide a safe and cost effective new source of additional water supply and wastewater disposal capacity for the valley. The study also found that use of demineralized recycled water could help improve the salt balance and groundwater quality. Zone 7 subsequently adopted Resolution No. 1548, which affirmed the conclusions of the May 1992 Water Recycling Study and stated Zone 7's intent to work cooperatively with Livermore, DSRSD, and other entities to encourage the proper and orderly development of water recycling projects in a manner that would avoid degradation of groundwater quality.

In December 1993, the Regional Water Quality Control Board (RWQCB) issued a Master Water Recycling Permit (Order No. 93-159) to Zone 7, DSRSD, and Livermore. A key permit requirement was the development and implementation of a Salt Management Plan to fully offset both current salt loading from natural sources and operations, and any future salt loading associated with new recycled water use. The permit, through the SMP, provided the framework within which local decisions could thereafter be made determining the quality, quantity and location of permitted recycled water use.

Furthermore, the RWQCB 1995 Basin Plan Implementation Plan acknowledged the balancing of uses that needs to occur in managing the Livermore-Amador Valley groundwater basin:

"*... The Regional Board supports efforts to concurrently improve the salt balance in the Main Basin, to improve the local water supply, and to reduce the need for wastewater export through recycled water irrigation, groundwater recharge, and other basin management practices.*"

The Basin Plan supported the use of a "*mass-balance approach in assessing cumulative impacts*" for the SMP. This mass-balance approach has more commonly been called the "salt bubble" approach and was fundamental to the SMP and its salt management strategies. The salt balance calculation is the mass balance calculation that determines the long-term impacts.

Salt Management Plan Goals

The SMP was developed during 1994-1999 through a cooperative effort involving Zone 7 staff, Zone 7 consultants, the Technical Advisory Group (TAG) comprised of local water retailers, and the Zone 7 Groundwater Management Advisory Committee (GMAC)

comprised of local citizens. In consultation with the above advisory groups, a series of policy goals were developed for the SMP to help guide the development and refinement of various salt management strategies. The policy goals were also recommended for Zone 7 adoption and inclusion in the annual operations plan to help guide the use of available surface and groundwater supplies and treatment facilities (e.g., demineralization).

The SMP 1999 policy goals are as follows:

- Offset the current (1999) 2,200 tons per year of salt loading plus the approximately 50 tons per year of projected annual increase.
- Maintain or improve groundwater mineral quality.
- Maintain or improve delivered water quality.
- Provide comparable delivered water quality to all water retailers.
- Provide a mechanism for full mitigation of all salt loading associated with recycled water use.
- Minimize total operations and maintenance costs through an adaptive management process.

Over several years during which the SMP was being developed, the scope broadened beyond that outlined in the Master Permit. The resultant effort and product in many ways more closely resemble an overall watershed water resource management plan than simply a Main Basin salt management plan. In particular, at the request of the retailers, a considerable effort was devoted to evaluating the impacts of the salt management strategies on delivered water quality. The Visual Modflow computer groundwater model was further refined to compute future water quality at each production well. The water system operations model (WRMI) was developed and calibrated to provide better estimates of impacts on individual wells and delivered water quality at each Zone 7 turnout under alternative operational and salt management strategies. The WRMI model calculated monthly water quality at each turnout over an extensive 75-year hydrologic period.

Year 2010 Salt Management Strategies

Reducing net salt loading requires reducing the import of salts and/or increasing the export of salts. The SMP evaluates over twenty alternative individual and composite salt management strategies based on their compliance with the SMP policy goals. These include their ability to fully offset the projected year 2010 salt loading of 5,400 tons/year, operational costs, and impacts on delivered water quality.

The SMP focuses primarily on strategies that would only require use, or increased use of, existing and already planned Zone 7 facilities. Among the key individual conceptual salt management strategies are:

- **Conjunctive use via stream recharge—**Contrary to historic basin management, this strategy would maximize the amount of groundwater delivered to customers

and, to the extent practicable, allocate more local and imported surface water for stream recharge, thereby "flushing" the basin with lower TDS water.

- **Conjunctive use with ASR wells**—Aquifer storage and recovery (ASR) wells are capable of pumping groundwater from and injecting surface water into the groundwater basin. Under this strategy, low TDS treated surface water would be injected for about six months (winter) and subsequently extracted for six months (summer). This strategy would maintain and, in average to wet years, improve delivered water quality by creating bubbles of low TDS water around Zone 7's wells. This strategy, however, does not directly impact the salt balance. Zone 7 testing has identified potential clogging problems that may limit the feasibility of ASR operation.
- **Seasonal groundwater export**—This strategy consists of pumping high TDS shallow groundwater to the creeks during wet season periods if it did not adversely impact in-stream and downstream beneficial uses. To implement this strategy, various agency approvals and close coordination with Alameda County Water District operations would be required. Additional water would need to be procured to replace the water "lost" due to export.
- **Wellhead demineralization** — This strategy consists of groundwater demineralization at the point of extraction. For the SMP, demineralization is assumed to include a reverse osmosis membrane-based treatment system producing water in the 100 mg/L TDS range. The product water would be blended with non-demineralized groundwater and/or surface water prior to delivery to achieve a target delivered water TDS or hardness and to reduce aggressiveness to distribution pipelines. Demineralizing shallow high TDS water that could otherwise migrate vertically over time and degrade the lower aquifer would maximize salt removal benefits and minimize costs.
- **Demineralized recycled water injection**—This strategy is based on the City of Livermore's and DSRSD's potential projects as originally designed to inject demineralized recyled water into the groundwater basin. Both projects were designed to produce product water that meets all drinking water requirements and have less than 100 mg/L TDS prior to injection.
- **Conjunctive use with Chain of Lakes (2005)**—Similar to conjunctive use via stream recharge, this strategy consists of allocating local and imported surface water for recharge in the Chain of Lakes.
- **Delta fix (future)**—This strategy refers to the State and Federally sponsored CalFed Bay-Delta Program's proposed projects to solve multiple Bay-Delta water quality, quantity, resource, and environmental problems. Of interest for the SMP are options which, if implemented, would result in higher quality (lower TDS) Delta water being conveyed to the State Water Project and thus to Zone 7 and other municipalities throughout California.

A composite strategy that includes more than one strategy offers a more flexible and potentially cost-effective approach. For example, a composite strategy could be comprised of a blend of seasonal groundwater export, conjunctive use and demineralized recycled water recharge. Initially, all SMP strategies included the use of 6 TAF of Reverse Osmosis (RO) recycled water injection. Following public concerns in 1998 about the acceptability

of RO recycled water injection, an additional subset of strategies was developed without RO recycled component. The current recommended strategy does not include RO recycled water injection.

Table ES-2 presents the salt management strategies evaluated for projected year 2010 land and water use conditions. Baseline conditions are established by Strategy 1A. If implemented, Strategy 1A would continue Zone 7's historical operational practice of maximizing surface water deliveries and pumping groundwater only for peaking and drought conditions. Under this "status quo" strategy and year 2010 conditions, an average salt loading of 5,400 tons/year and delivered water TDS of 275 mg/L would result.

A screening for technical feasibility, timeline, economics, delivered water quality, including public and institutional acceptance, showed that only Strategy 15 could successfully pass all feasibility screening criteria (Section 9.6). Strategy 15 consists of a combination of conjunctive use and 5,000 AF of high TDS shallow groundwater wellhead demineralization (WHD). Detailed modeling analyses (Chapter 10) confirmed that Strategy 15 would provide the projected benefits to municipal groundwater and delivered water quality, and would eliminate the positive net salt loading in the Main Basin. Delivered water quality would be maintained at the baseline level of 275 mg/L.

Table ES-3 shows the difference in municipal groundwater quality (TDS) from using Strategy 15 versus Strategy 1A. It is clear that after 25 and 50 years of operation under Strategy 15, groundwater TDS would be improved at all listed locations except at well CWS#10, which is located in the Mocho II Sub-basin. This happens because recharge and pumping conditions in the Mocho II Sub-basin remain the same under both strategies. The modeled groundwater TDS for the lower aquifer after 25 years of operating under strategies 1A and 15 are mapped in figures ES-7 and ES-8, respectively. When comparing the figures, it is clear that the area of the basin with groundwater TDS below 500 mg/L would be significantly larger under Strategy 15. The Bernal Sub-basin lower aquifer and western portion of the Amador aquifer would benefit most under Strategy 15. Most of the Main Basin lower aquifer would stabilize near or below 500 mg/L.

Table ES-2

SUMMARY OF SALT BALANCE STUDIES AT 2010 CONDITIONS

		LONG TERM AVERAGE									
Study No.	Name	Vadose Zone Attenuation Credit	Demineralized Municipal Pumpage TAF	Salt Mgt. Conj. Use GW Pumpage TAF	Total Zone 7 GW Pumpage TAF	Net Salt Loading Tons/Yr	Net Increase In TDS mg/l/year	Projected GW TDS After 10 Years	TDS of Zone 7 Deliveries mg/l	Incremental Operational Cost	
										Per year	Per Acre-foot of TW Delivery
1	Status Quo 6 TAF RO RW INJECTION (1)	NONE	NONE	NONE	12	**3100**	**10**	CURRENT 450 **550**	**300**	**$0**	**$0**
1A	Status Quo NO RO RW INJECTION	NONE	NONE	NONE	7.5	**5400**	**18**	**630**	**275**	**$0**	**$0**
1B	Status Quo 3640 AF RO RW INJECTED PLUS 20% MORE GW PUMPED FOR AG	NONE	NONE	NONE	10.4	**5000**	**17**	**620**	**270**	**$0**	**$0**
2	DELTA FIX 100mg/l SBA water quality	NONE	NONE	NONE	12	**0**	**0**	**450**	**180**	**$0**	**$0**
3	15% ATTENUATION	15%	NONE	NONE	12	**2000**	**7**	**520**	**300**	**$0**	**$0**
4	30% ATTENUATION	30%	NONE	NONE	12	**1000**	**3**	**480**	**300**	**$0**	**$0**
5	INCREASED GW PUMPING FOR CONJUNCTIVE USE	NONE	NONE	16	28	**800**	**3**	**480**	**360**	**$760,000**	**$10**
6		NONE	NONE	22	34	**0**	**0**	**450**	**390**	**$1,100,000**	**$20**
7	DEMINERALIZE ZONE 7 GW PUMPAGE	NONE	13	NONE	12	**1700**	**6**	**510**	**210**	**$5,473,000**	**$100**
8	DEMINERALIZE ZONE 7, CWS & PLEASANTON GW PUMPAGE	NONE	20	NONE	12	**900**	**3**	**480**	**210**	**$8,420,000**	**$160**
9	COMPOSITE OF CONJUNCTIVE USE & DEMINERALIZATION OF GW PUMPAGE	NONE	19	7	19	**100**	**0**	**450**	**212**	**$8,333,000**	**$160**
10		NONE	10	16	28	**-100**	**0**	**450**	**250**	**$4,968,000**	**$90**

Table ES-2

SUMMARY OF SALT BALANCE STUDIES AT 2010 CONDITIONS

Study No.	Name	LONG TERM AVERAGE: Vadose Zone Attenuation Credit	Demineralized Municipal Pumpage TAF	Salt Mgt. Conj. Use GW Pumpage TAF	Total Zone 7 GW Pumpage TAF	Net Salt Loading Tons/Yr	Net Increase In TDS mg/l/year	Projected GW TDS After 10 Years	TDS of Zone 7 Deliveries mg/l	Incremental Operational Cost: Per year	Incremental Operational Cost: Per Acre-foot of TW Delivery
11	COMPOSITE OF CONJUNCTIVE USE & DEMINERALIZATION OF SHALLOW GW PUMPAGE	NONE	5 (Demin 1000 mg/l GW pumpage to 100 mg/l)	5	17	**-2200**	**-7**	**380**	**270**	**$2,351,000**	**$40**
11A		NONE	1.5 (Demin 1000 mg/l GW pumpage to 100 mg/l)	10	22	**0**	**0**	**450**	**320**	**$1,091,500**	**$20**
11B		NONE	3 (Demin 1000 mg/l GW pumpage to 100 mg/l)	3	15	**0**	**0**	**450**	**277**	**$1,383,000**	**$30**
12	COMPOSITE OF ATTENUATION, CONJUNCTIVE USE & GW DEMINERALIZATION	15%	1.5 (Demin 1000 mg/l GW pumpage to 100 mg/l)	10	22	**-1200**	**-4**	**410**	**320**	**$1,077,500**	**$20**
13	ZONE 7 GW (1000TDS) PUMPAGE TO ARROYO MOCHO (EXPORT) WHEN GW STORAGE IS ABOVE 200 TAF	NONE	NONE	Average 3.6 TAF Seasonal GW Export	15.6	**0**	**0**	**450**	**300**	**$404,000**	**$8**
13A	ZONE 7 GW (1000TDS) PUMPAGE TO ARROYO MOCHO (EXPORT) WHEN GW STORAGE IS ABOVE 200 TAF	NONE	NONE	Average 1.5 TAF Seasonal GW Export	13.5	**1730**	**6**	**510**	**300**	**$169,000**	**$0**
14	COMPOSITE OF RO RW, ASR CONJUNCTIVE USE & DEMINERALIZATION OF GW PUMPAGE **ASR RO RW PUMPAGE FOR AG USE**	NONE	4.6 (Demin 1000 mg/l GW pumpage to 100 mg/l)	4	14.3	**0**	**0**	**450**	**250**	**$2,096,600**	**$40**
14A	COMPOSITE OF RO RW ASR CONJUNCTIVE USE & DEMINERALIZATION OF GW PUMPAGE **ASR RO RW PUMPAGE FOR URBAN IRRI.**	NONE	3.8 (Demin 1000 mg/l GW pumpage to 100 mg/l)	4	14.3	**0**	**0**	**450**	**255**	**$1,759,800**	**$30**
15	COMPOSITE OF CONJUNCTIVE USE & DEMINERALIZATION OF GW PUMPAGE **NO RECYCLED WATER INJECTION**	NONE	5 (Demin 1000 mg/l GW pumpage to 100 mg/l)	8.5	16	**0**	**0**	**450**	**270**	**$2,607,000**	**$50**

Assumptions:

1. *All studies include 6 TAF/YEAR of RO recycled water (RW) injection except Study 1a & 15 have no RO RW water injection and studies 14 & 14a have 3640 af of demineralized RW injection.*
2. *All studies do not include salt loading due to future development outside the main basin or new recycled water irrigation water use.*
3. *Incremental operational cost is based upon total treated water deliveries (45,100 AF Zone 7 plus 7,214 AF GPQ pumpage) .*

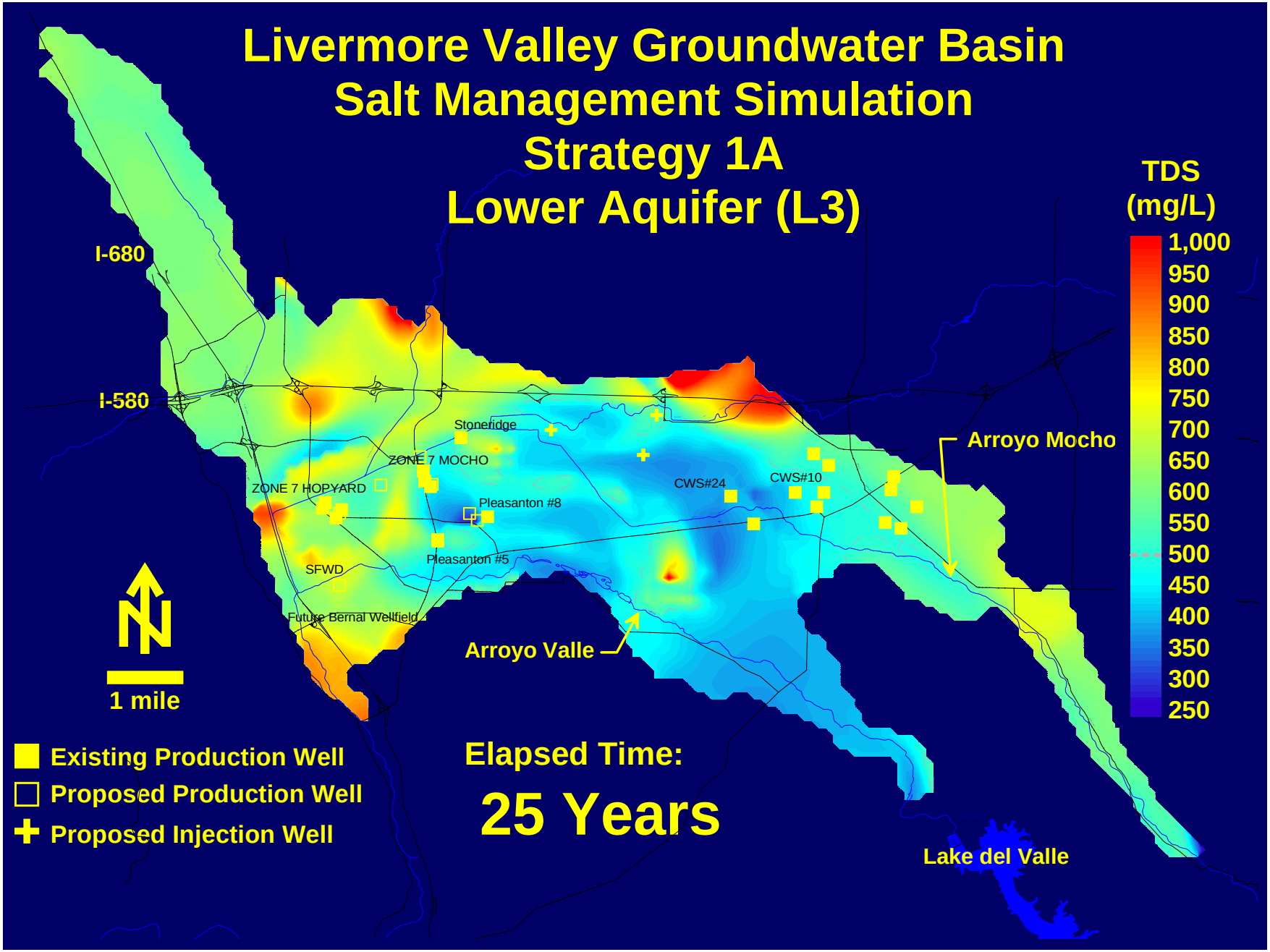

Livermore Valley Groundwater Basin
Salt Management Simulation
Strategy 1A
Lower Aquifer (L3)
TDS
(mg/L)
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
I-680
I-580
Stoneridge
ZONE 7 MOCHO
ZONE 7 HOPYARD
Pleasanton #8
Pleasanton #5
SFWD
Future Bernal Wellfield
CWS#24
CWS#10
Arroyo Mocho
Arroyo Valle
Lake del Valle
1 mile
Existing Production Well
Proposed Production Well
Proposed Injection Well
Elapsed Time:
25 Years

Figure ES-7

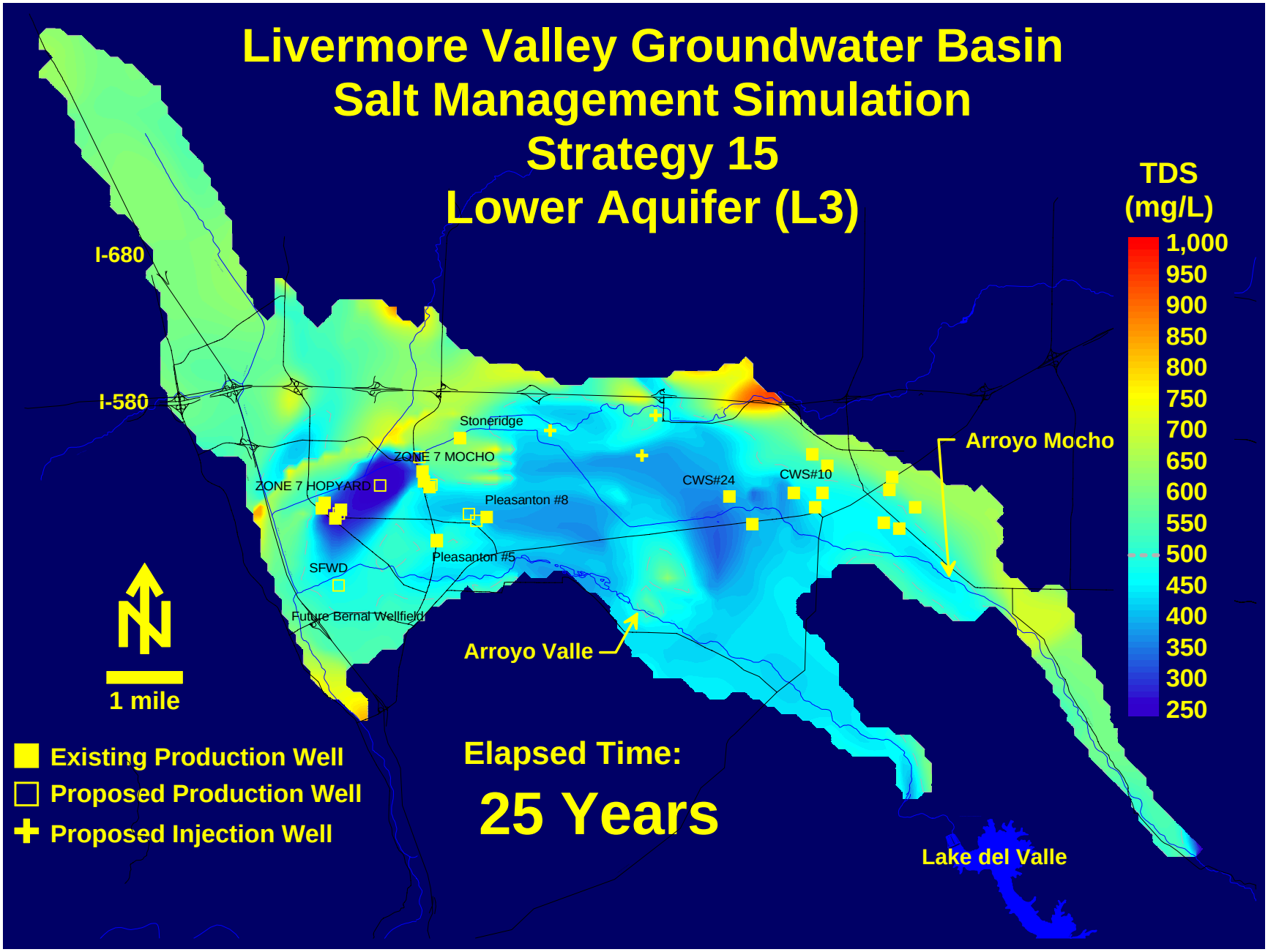

Livermore Valley Groundwater Basin
Salt Management Simulation
Strategy 15
Lower Aquifer (L3)
TDS
(mg/L)
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
I-680
I-580
Stoneridge
ZONE 7 MOCHO
ZONE 7 HOPYARD
Pleasanton #8
Pleasanton #5
SFWD
Future Bernal Wellfield
CWS#24
CWS#10
Arroyo Mocho
Arroyo Valle
Lake del Valle
1 mile
Existing Production Well
Proposed Production Well
Proposed Injection Well
Elapsed Time:
25 Years

Figure ES-8

Table ES-3: Strategy 15 Versus Strategy 1A Groundwater Model Simulation Results Municipal Wellfield Groundwater Quality (TDS) at Select Locations

Wellfield or Well Name	Groundwater TDS and Change from Strategy 1A, mg/L			
	After 25 Years	Change	After 50 Years	Change
Zone 7 Hopyard Welfield (Hop-9)	300	-250	260	-410
Zone 7 Mocho Wellfield (Mocho 2)	420	-60	400	-80
Zone 7 Stoneridge Wellfield	570	-10	550	-50
Pleasanton # 5	490	-10	430	-50
Pleasanton # 8	390	-50	390	-60
CWS # 10	570	50	550	10
CWS # 24	380	-20	390	-20
SFWD Wellfield	510	-130	490	-320
Future Bernal Wellfield (Laguna South - Shallow Aquifer)	720	-160	760	-220

Cost Allocation

By late 1998, the TAG and GMAC agreed to support the cost allocation approach of having Zone 7 fund annual salt management O&M costs via the treated water rates to offset the existing 2,200 tons/year salt loading (Section 11.3). The majority recommended that it made the most sense economically and administratively to not attempt to differentiate between sources of salts and let Zone 7 manage future salt loading by expanding the approach adopted to manage current salt loading. A methodology for calculating individual project salt loading was developed in the SMP. This provides the framework under which future salt loading could be determined on a project-by-project basis and/or where salt management projects can be conducted by agencies other than Zone 7 and generate salt "credits".

Near-Term Salt Management Strategies

Zone 7 staff, in consultation with the TAG and GMAC, decided in early 1999 to develop a revised set of salt management strategies that could be implemented in the near term (i.e., in 2000-2002) rather than in year 2010. These near-term strategies were the strategies previously identified and screened for year 2010 conditions (Section 9.6), but scaled down for the current 2,200-tons/year loading conditions. Letter suffixes (e.g., 15A) are variations of the same basic year 2010 strategy. The near-term salt management strategies and implementation plan are detailed in Chapter 12.

From among the 2010 strategies, seven near-term salt management strategies believed to be feasible were identified. These are listed in Table ES-4. The values in the table were

calculated as if the strategies were to be implemented under year 2000 loadings, treated water deliveries, and costs. The unit O&M costs and salt removal capability assumptions used to develop these near-term strategies were the same as described in detail in Section 8.14. As previously indicated, the TAG and GMAC agreed to support the cost allocation approach of having Zone 7 fund annual salt management O&M costs via the treated water rates to offset the existing 2,200 tons/year salt loading (Section 11.3). Therefore, incremental operational costs in Table ES-4 are also expressed as a percentage increase in treated water rates, based on an assumed annual water usage of 1/2 acre-foot per household.

Table ES-4

NEAR TERM SALT MANAGEMENT STRATEGIES

			Long - Term Average						
							ZONE 7 INCREMENTAL OPERATIONAL COSTS		
STRATEGY NO.	NAME	POLICY OPTION	NET SALT LOADING TONS/YR	NET INCREASE IN GW TDS mg/l/year	Projected GW TDS after 10 yrs mg/l	TDS OF ZONE 7 DELIVERIES mg/l	PER YEAR	PER ACRE-FOOT OF TW DELIVERY	% Rate Increase
Status Quo 1A	Year 2000 Status Quo (no demineralized RW injection)	I	2200	7	520	300	$0	$0	0.0%
Conj. Use 5A	Minimum Conjunctive Use 3000 AF (Stoneridge well - no GW demin)	II	1600	5	500	310	$120,000	$4	0.8%
6A	Major Conjunctive Use 11,000 AF.(zero out salt balance)	III	0	0	450	350	$680,000	$20	3.8%
Wellhead Demin 15A	2200 AF Demin GW Pumpage (1000 mg/L to 100 mg/L)	III	0	0	450	280	$976,800	$29	5.5%
COMPOSITE OF 5A AND 15A	Minimum Conjunctive Use (3000 AF/Y) and 1500 AF/Y Demin GW PUMPAGE	III	0	0	450	300	$786,000	$23	4.4%
COMPOSITE OF 5A, 15 A AND 17A (17A Ref. Table 12.2)	Minimum Conjunctive Use (3000 AF/Y) and 1300 AF/Y Demin GW PUMPAGE 840 AF (Livermore) RW RO Stream Recharge	II	0	0	450	300	$714,000	$21	4.0%
6A PLUS 15A	Major Conjunctive Use (11000 AF/Y) and 2200 AF/Y Demin GW PUMPAGE	IV	-2100	-7	380	330	$1,656,800	$49	9.3%

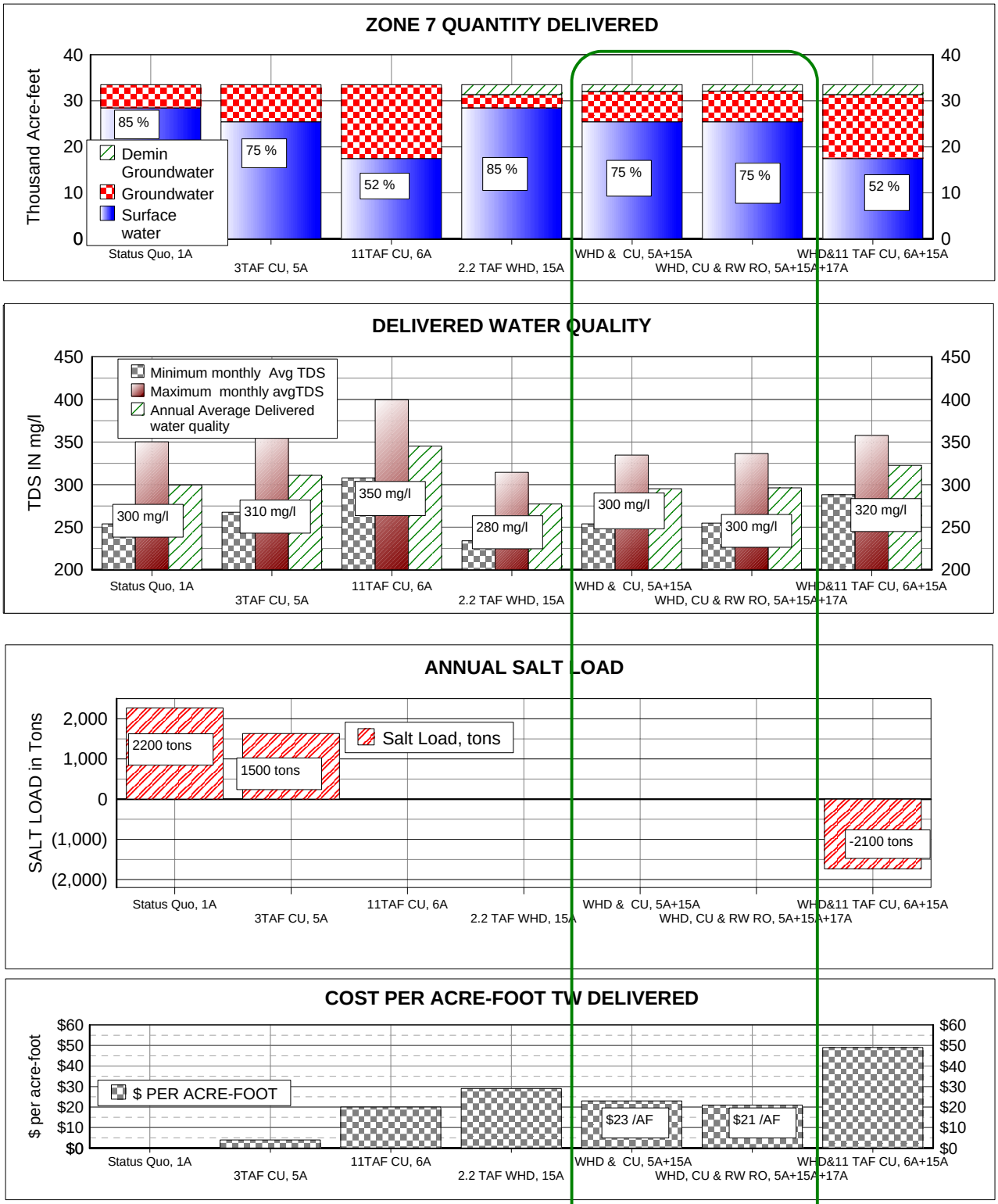
Assumptions:

1) *Zone 7 TW delivery of 33,500 AF and UTW of 7300 AF (Year 2000)*
2) *Base TW rate of $528 / AF for year 1999.*
3) *Incremental cost spread only to Zone 7 Treated water deliveries.*
4) *GW TDS of 450 mg/l and SW TDS 270 mg/l (Historic average at PPWTP)*
5) *GW Demin capacity at 2200 AF/Y (180 af/ month for 12 months)*

The above (seven) individual and composite year 2000 strategies are compared in figures ES-9 and ES-10. Figure ES-9 presents four parallel bar charts. The first (uppermost) bar chart series presents the ratio of surface water to total groundwater delivered by Zone 7 under each of the seven strategies. The second graph presents every strategy's resultant minimum and maximum monthly average TDS (12 month average), and the overall annual average TDS of Zone 7 deliveries (i.e., three bars per strategy). The third graph presents the annual average salt loading (in tons) remaining after implementation of each strategy. The fourth (bottom) graph presents the incremental O&M cost per acre-foot of

Figure ES-9

COMPARISON OF STRATEGIES FOR 2000-2002 IMPLEMENTATION



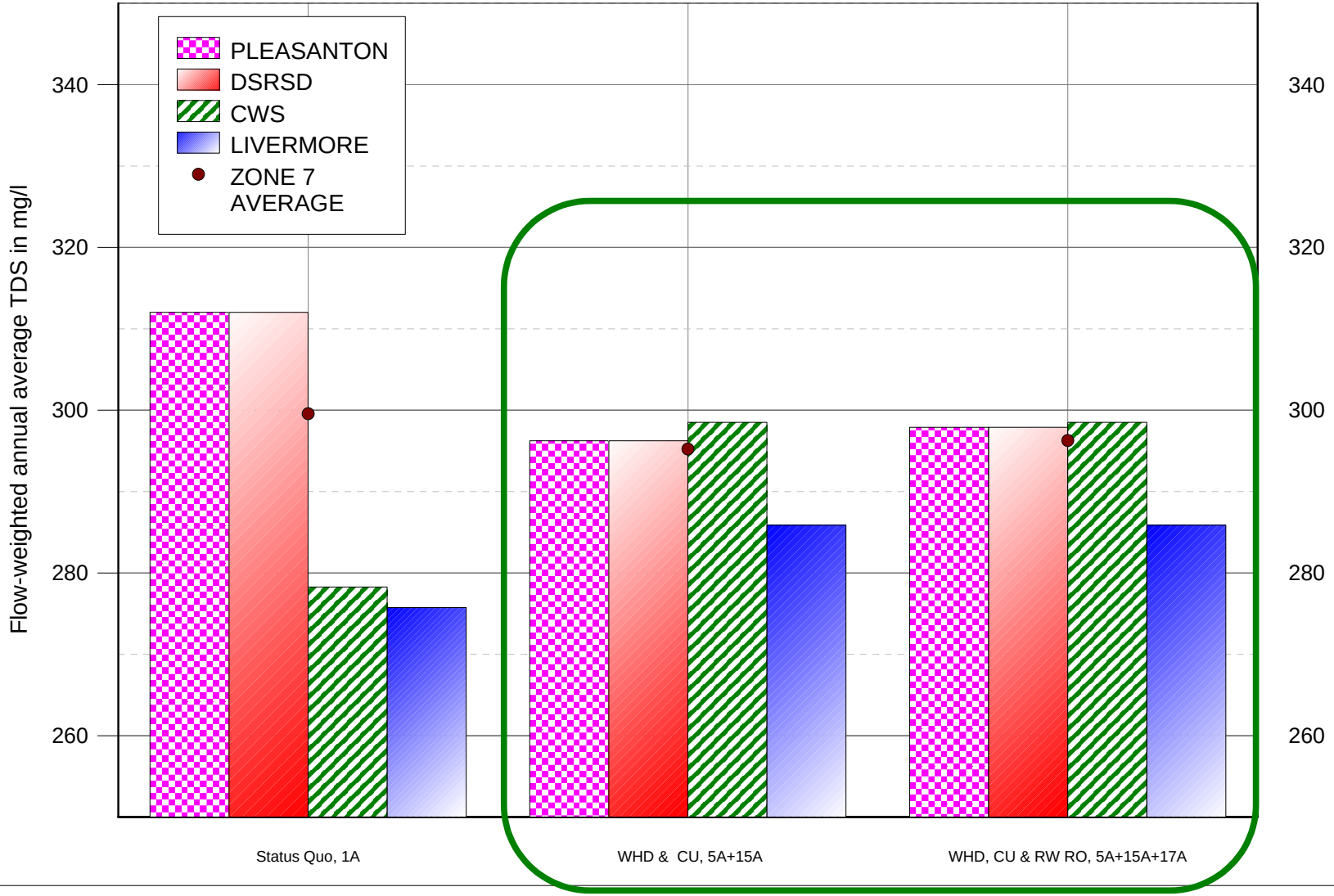
CU = CONJUNCTIVE USE, WHD= WELL HEAD DEMINERALIZATION
RW RO= RECYCLED WASTE WATER RO, PENDING PUBLIC ACCEPTANCE
AF= ACRE-FEET, TAF=THOUSAND ACRE-FEET

Most economical that meet salt loading and delivered water TDS goals.

RECOMMENDED STRATEGIES

Figure ES-10

Annual Average TDS Delivered to Retailers
Under Historic and Proposed 2000-2002 Operating Conditions



NOTE:

1) Assuming that 75% of the time the Stoneridge pumpage will be diverted to East (to CWS & Livermore) by closing rate control valve in X-valley pipeline.

2) Assuming that all the other GW pumpage (GW, WHD & ASR) is delivered to Pleasanton and DSRSD (prorated by delivery amount) .

3) Assumes Stoneridge pumpage at 400 mg/l and all other Zone 7 pumpage at 450 mg/l, Well Head Demineralization to 100 mg/l.

Figure ES-10

Zone 7 deliveries (i.e., increase in treated water rates attributable to salt management). Figure ES-10 compares the annual average TDS of Zone 7 deliveries to individual retailers between status quo operation (i.e., Strategy 1A) and two composite strategies.

Comparison of the strategies indicates the following:

- Strategy 1A (Status Quo)—This strategy minimizes operational costs but fails to achieve any other SMP goals. Under this strategy, treated water rates would not increase.
- Strategy 5A (Minimum Conjunctive Use)—This reduces salt loading by about 600 tons/year (28%), but it increases the annual average TDS of Zone 7 delivered water by about 3%. Under this strategy, treated water rates would increase by 0.8%.
- Strategy 6A (Major Conjunctive Use)—This is minimum cost strategy and is salt neutral. However, it would significantly increase the TDS of Zone 7 deliveries, particularly to the west side of the valley, which contradict SMP goals. Under this strategy, treated water rates would increase by 3.8%.
- Strategy 15A (Wellhead Demineralization)—This salt neutral strategy would decrease the TDS of blended Zone 7 deliveries, particularly to the west side of the valley. However, it is the highest cost near-term salt neutral strategy. Under this strategy, treated water rates would increase by 5.5%.
- Composite of 5A and 15A (Minimum Conjunctive Use and Wellhead Demineralization)—This is the most economical near-term strategy that satisfies all salt management criteria. Under this strategy, treated water rates would increase by 4.4%.
- Composite 5A, 15A and 17A (Minimum Conjunctive Use, Wellhead Demineralization, and RO Recycled Water Stream Recharge)—This strategy could satisfy all salt management criteria and would be slightly less expensive than the composite 5A/15A strategy. Under this strategy, treated water rates would increase by 4%. If the RO recycled water stream recharge component did not occur or were postponed, wellhead demineralization would need to be increased, and it would effectively make this strategy the same as the composite 5A/15A strategy.
- Composite 6A and 15A (Major Conjunctive Use and Wellhead Demineralization)—Groundwater quality would improve most rapidly under this strategy but delivered water quality would degrade. This is the highest cost near-term strategy. Under this strategy, treated water rates would increase by 9.3%.

Several of the 2010 strategies passed the feasibility screens (technical, timeline and water quality), except for public and institutional acceptability. If regulatory and/or perception barriers are overcome, at least some of these strategies could also potentially be implemented before 2010. A select group of what appeared to be the more promising of these other strategies were scaled down to current 2,200 tons/year loading and were named potential near-term strategies. Eleven potential near-term salt management strategies were identified based on a Delta fix, RO recycled water injection, seasonal

groundwater export, Lake G recycled water storage and irrigation, and RO recycled water stream recharge. These strategies are discussed in Section 12.3.

Zone 7 staff, in consultation with the TAG and GMAC, developed a recommended near-term implementation plan (Section 12.4) out of the near-term strategies evaluated. The plan included recommended policy goals and a three-year phased implementation of increased conjunctive use, wellhead demineralization with brine export, and potential demonstration scale RO recycled water stream recharge. The plan also identified how annual salt management decisions would be made via an adaptive management process and integrated into Zone 7's annual operations plans.

Adaptive Management

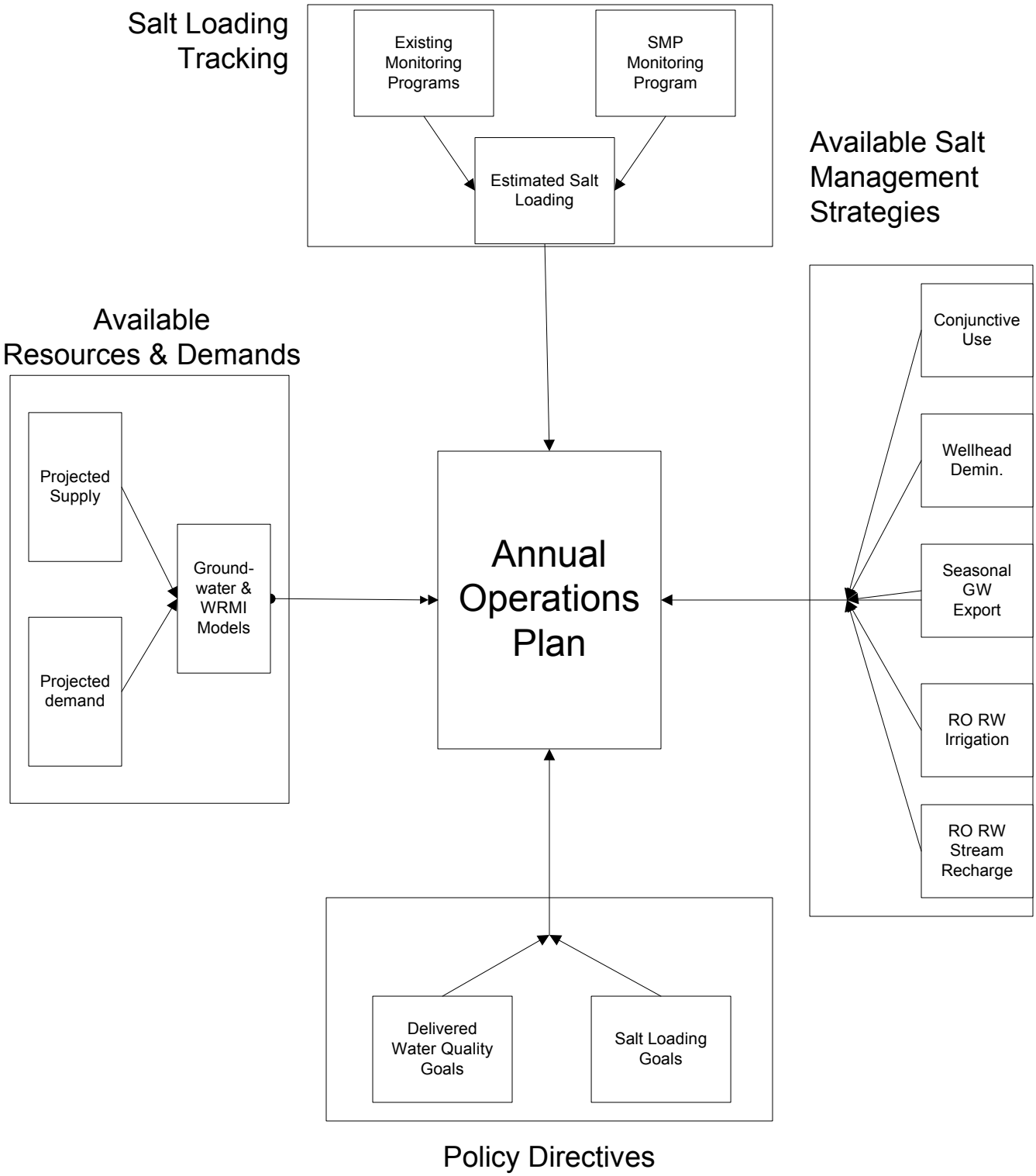
Zone 7's annual operations plan has been expanded to incorporate the SMP goals and an adaptive management process. This means that when all the facilities are in place to fully implement the SMP, each year staff will review the projected water supply forecast, retailer water demands and adopted salt management goals to select the most cost-effective combination of available salt management tools to be used during the upcoming year. Annual operational costs will be estimated and allocated as appropriate during the annual water rate setting process. Over time, it is expected that additional strategies may become available (e.g., seasonal groundwater export) and Zone 7 will re-evaluate the optimum combination of strategies for any given year. Figure ES-11 illustrates Zone 7's proposed adaptive management process through which multiple changing variables will be balanced annually to arrive at an optimal operational decision.

The adaptive management approach requires input in four major areas: policy directives, available resources and demands, salt loading tracking, and available salt management strategies.

- Policy directives include items such as Zone 7 Board decisions/guidance that there be no long-term average net salt loading to the groundwater basin and that delivered water mineral quality be maintained or improved.
- Available water resources and demands involve assessing the new water supply, demand and groundwater storage conditions at the beginning of each year. This basically represents the information tracked and processed by the historic operations plan.
- Salt loading tracking involve collection of data and information from the various monitoring programs. The existing monitoring program is sufficient for tracking salt loading from existing sources and for existing land use conditions. Future land use changes and any increased use of recycled water will require additional monitoring to track the resultant salt loading. The Salt Management Monitoring Program will provide this new salt loading source information, facilitate tracking of salt removal, and provide the information needed to calculate the annual salt removal targets for inclusion in the annual operations plan.

Figure ES-11

Schematic of Salt Management Annual Operations Plan



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- Available salt management strategies include all the available salt removal strategies and their relative removal capacities. The number and type of strategies are expected to increase over time with the facilities owned and operated by Zone 7 and others (see tables 12.2 and 12.3).

With adaptive management, factors such as current and projected salt loading, relative salt removal costs ($/ton removed), impacts on delivered water quality, and water supply conditions, will be evaluated together and the best possible solution that balances the competing salt management goals will be incorporated into the annual operations plan. In some years, the decision-making may require groundwater modeling or other sophisticated prediction methods.

An example of a possible outcome of the adaptive management process is a decision to not implement any salt removal measures in a given year and to accrue a salt deficit recognizing that it would need to be offset in future years. This may be the case in the early years of implementing the SMP when there will be few salt management strategies to choose from (e.g., conjunctive use). This outcome could also result during a drought when demineralization facilities may not be operated to conserve the water that would otherwise be lost as salt concentrate. A similar decision to limit or not operate demineralization facilities may be made during periods of limited power supply and/or high power cost. Conversely, under very favorable water supply and water quality conditions, Zone 7 could choose to implement extra salt removal measures and thereby accrue salt credits.

Zone 7 Board's Near-Term Implementation Plan Approval

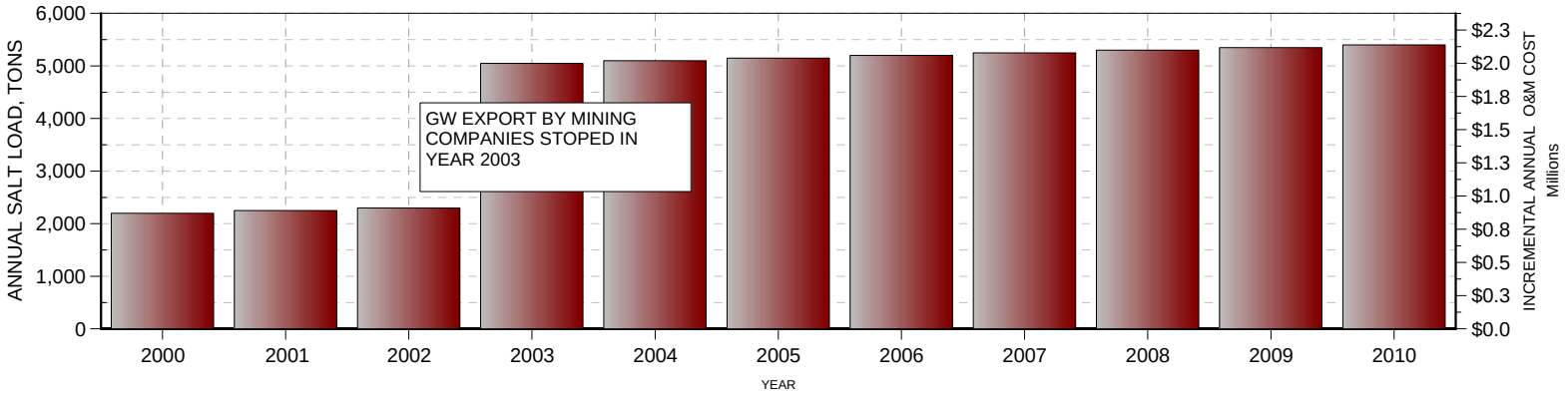
The above phased near-term implementation plan was presented to and approved by the Zone 7 Board of Directors on August 18, 1999 by Resolution No. 99-2068. The tables and figures illustrating the plan contained in Chapter 12 (ES 9-12) are essentially the same as those presented to the Board. The Resolution stated the Board's support for the proposed Salt Management Program Implementation Plan and for inclusion of the six policy goals in the Zone 7 annual operations plan. The Resolution also authorized the Zone 7 General Manager to proceed with the recommended year 2000-2002 Salt Management Implementation Plan.

Future Salt Loading

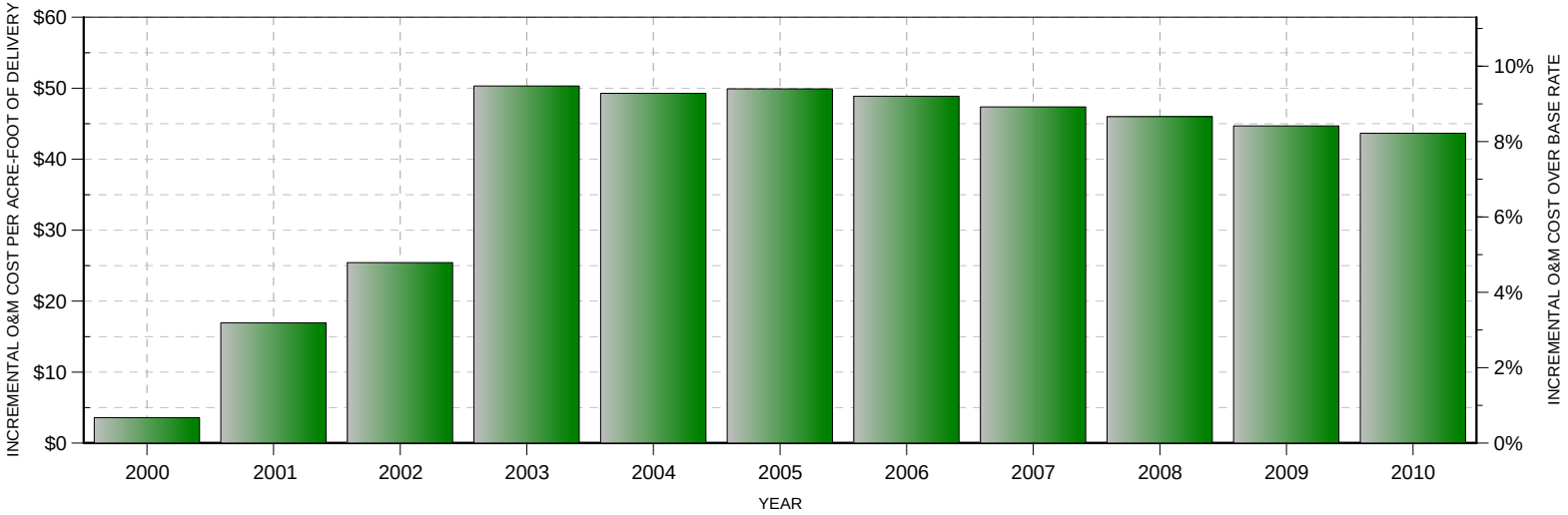
Main Basin salt loading has been projected to increase from the current (1999) 2,200 tons/year to 5,400 tons/year by year 2010 (Section 8.9). The upper graph in Figure ES-12 presents projected future annual salt loading from year 2000 through 2010. This graph shows the salt load in tons on the left y-axis and incremental annual O&M cost on the right y-axis. The costs shown are based on one strategy and reflect the potential annual operation and maintenance (O&M) costs to fully offset each year's loading, assuming the

Figure ES-12

FUTURE ANNUAL SALT LOAD & REMOVAL COST (2)



O&M COST PER ACRE-FOOT (normalized for annual Zone 7 treated water deliveries)



NOTE: *1) Salt load calculation does not include:*

a) The impacts of increased future subsurface inflows due to increased agricultural irrigation outside the main basin.

b) The incremental increase in salt loading due to recycled water irrigation over the main basin.

2) Salt removal cost is based upon removal by Shallow Well GW Demin (1 - 4 TAF/Y) and Conjunctive use (3 - 7 TAF/Y) . For any other strategy or combination of strategies, the cost will change.

Figure ES-12

use of shallow well demineralization (1 to 4 TAF/Y) and conjunctive use (3 to 7 TAF/Y). Under any other strategy or composite strategies, the costs would differ.

The lower graph shows the incremental O&M cost per acre-foot of Zone 7 treated water deliveries on the left y-axis. The right y-axis shows this cost as a percentage over the base treated water rate. For years 2000 2002, the incremental cost would increase from about $3/AF/year (first bar on lower graph of Figure ES-12) or $1.50/houseold/year to about $25/AF/year (left y-axis) or $12.50/household/year. That would be an increase of about 5% (right y-axis) over the Zone 7 1998 base treated water rate ($528/AF).

A major change occurred in year 2003 with the cessation of the majority of the water and salt exports by the gravel-mining companies. To remain salt neutral, the SMP will have to be expanded to offset an additional 2,800 tons/year of salts. This will cause the incremental operational costs to increase by about $50/AF of Zone 7 treated water deliveries over base treated water rates. After 2003, the increase in salt loading is projected to be gradual, about 50 tons/year or 500 tons by 2010 primarily due to increased urban and agricultural development-related irrigation.

Zone 7 treated water deliveries are projected to increase each year successively at least through year 2010, increasing the base volume over which to distribute the increased O&M costs. Therefore, the incremental operational cost for salt management in 2010 would stabilize at around $45/AF/year. This represents about an 8% incremental cost over the Zone 7 1998 base treated water rate. If any of the other lower-cost salt removal strategies become feasible in the future, they will be integrated into the annual operations plan as part of the SMP adaptive management process and operational costs will be reduced.

These future salt loading estimates do not include impacts of potential increased future subsurface inflow or surface water runoff due to increased agricultural irrigation outside the Main Basin (to be tracked via the Salt Management Monitoring Plan). However, the potential loadings due to increases in subsurface flow are believed to be minimal and the effects of these impacts would not be seen for many decades due to the various geologic barriers between the fringe and the Main Basin (as documented in Chapter 3). The estimates shown also do not include any incremental increase in salt loading due to new or retrofit recycled water irrigation projects impacting the Main Basin. New and/or expanded salt management strategies and facilities will need to be implemented to offset these future potential salt sources to comply with the SMP goal of fully offsetting net salt loading.

SMP Next Steps

Zone 7 began implementing the SMP in the year 2000 by increasing conjunctive use (Strategy 5A). Zone 7 has wellhead demineralization facilities scheduled within its Capital Improvement Program (CIP). Further planning studies have been conducted that verified the feasibility of shallow groundwater demineralization as described in this SMP. Those studies also investigated, in more detail, alternative sites for the demineralization facilities.

A well master plan is being prepared that will in part also evaluate sites for shallow groundwater wells. Negotiations are continuing with DSRSD and Livermore on use of the LAVWMA facilities for RO concentrate disposal. Zone 7 has completed a Water Quality Master Plan. The SMP goals and operations have been integrated into and coordinated with the Water Quality Master Plan goals.

Given enough public support, Zone 7 and Livermore could begin exploring in more detail, summertime stream recharge with demineralized recycled water in the Arroyo Mocho near Isabel Avenue (strategies 17A and 17B). Zone 7 will continue discussions with Alameda County Water District on possible operational agreements that would identify conditions under which it would be acceptable for Zone 7 to conduct seasonal high TDS groundwater export (strategies 13B, 13C, and 13D). Zone 7 will contact the RWQCB to determine what type of permit, if any, is required to carry out this activity.

Zone 7's submittal of this SMP (Reference S) to RWQCB staff documents Zone 7's long-term plan and strategy for managing salts and mineral water quality within the Livermore-Amador Valley groundwater basin to promote the wise use of all water resources and to protect the long-term sustainable quality of potable water delivered within the valley.

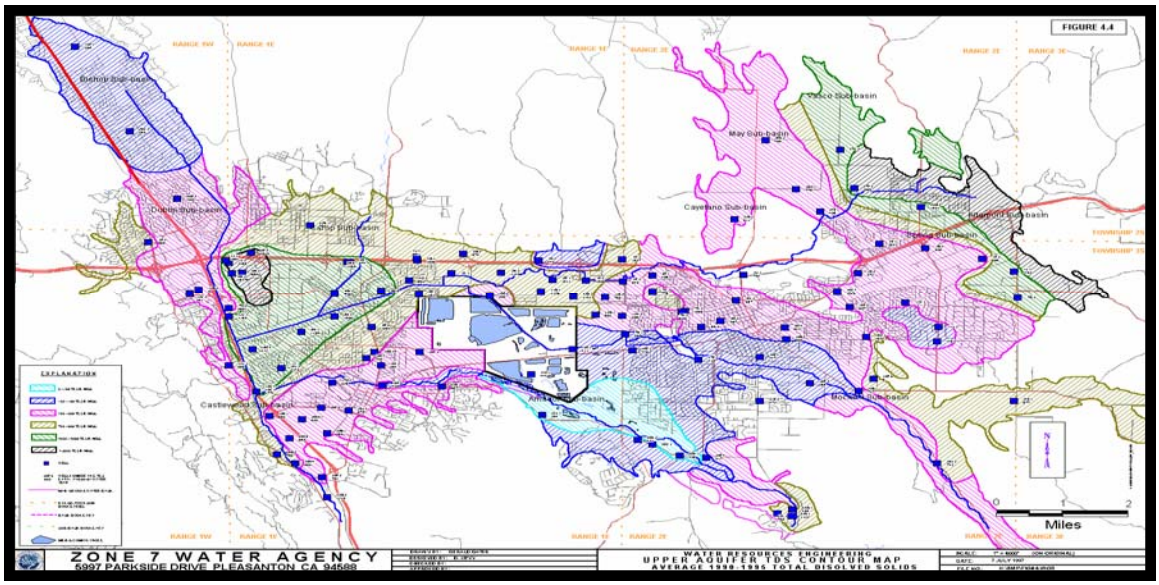
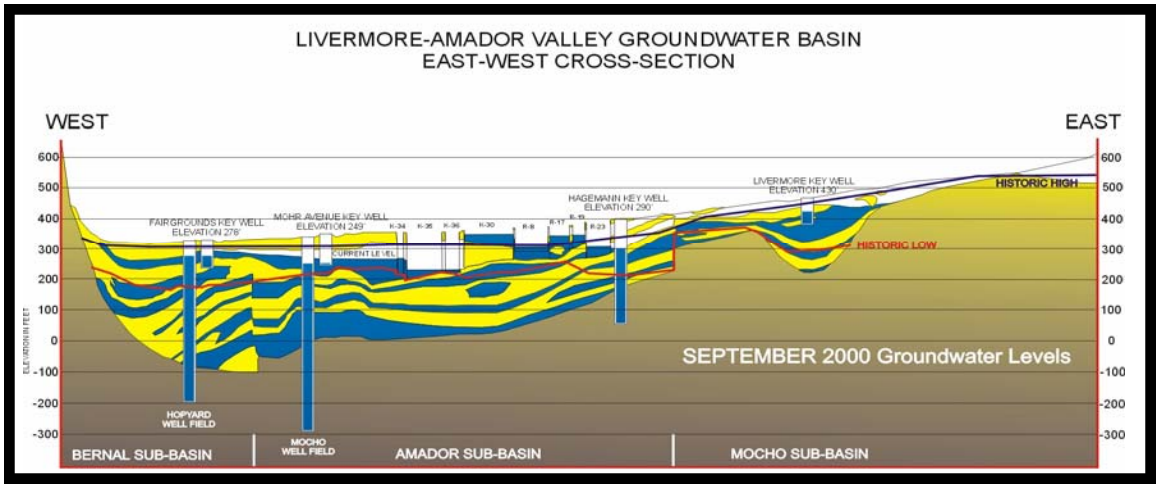


FIGURE 4.4
Bishop Sub-basin
Chain Sub-basin
Castenada Sub-basin
May Sub-basin
Cayetano Sub-basin
Amador Sub-basin
Mocho Sub-basin
Miles
ZONE 7 WATER AGENCY
5997 PARKSIDE DRIVE PLEASANTON CA 94588
WATER RESOURCES ENGINEERING
UPPER AQUIFER TDS CONTOUR MAP
AVERAGE 1988-1995 TOTAL DISOLVED SOLIDS


LIVERMORE-AMADOR VALLEY GROUNDWATER BASIN
EAST-WEST CROSS-SECTION
WEST
EAST
FAIRGROUNDS KEY WELL ELEVATION 278'
MOHR AVENUE KEY WELL ELEVATION 249'
HAGEMANN KEY WELL ELEVATION 290'
LIVERMORE KEY WELL ELEVATION 430'
HISTORIC HIGH
HISTORIC LOW
CURRENT LEVEL
SEPTEMBER 2000 Groundwater Levels
HOPYARD WELL FIELD
MOCHO WELL FIELD
BERNAL SUB-BASIN
AMADOR SUB-BASIN
MOCHO SUB-BASIN

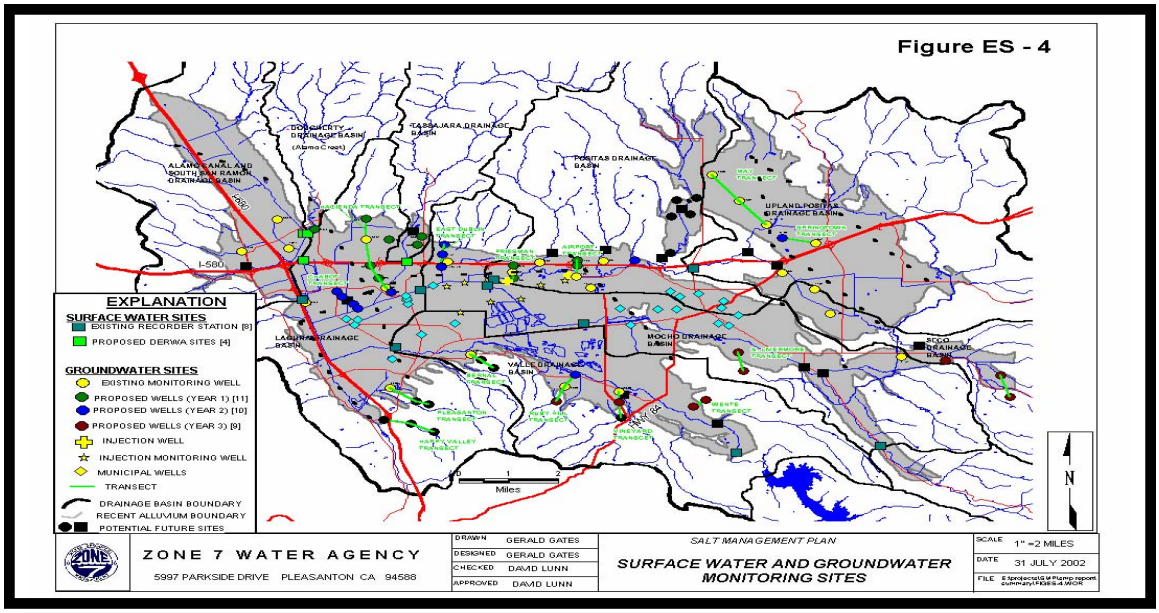


Figure ES - 4
DOWNTOWN DRAINAGE BASIN
CASSAJARA DRAINAGE BASIN
POSITAS DRAINAGE BASIN
ALAMEDA CANAL AND SOUTHERN RAMON DRAINAGE BASIN
UPLAND POSITAS DRAINAGE BASIN
I-580
LAGUNA DRAINAGE BASIN
VALLEY DRAINAGE BASIN
MOCHO DRAINAGE BASIN
SCOO DRAINAGE BASIN
EXPLANATION
SURFACE WATER SITES
EXISTING RECORDER STATION [8]
PROPOSED DERWA SITES [4]
GROUNDWATER SITES
EXISTING MONITORING WELL
PROPOSED WELLS (YEAR 1) [11]
PROPOSED WELLS (YEAR 2) [10]
PROPOSED WELLS (YEAR 3) [9]
INJECTION WELL
INJECTION MONITORING WELL
MUNICIPAL WELLS
TRANSECT
DRAINAGE BASIN BOUNDARY
RECENT ALLUVIUM BOUNDARY
POTENTIAL FUTURE SITES
Miles
N
ZONE 7 WATER AGENCY
5997 PARKSIDE DRIVE PLEASANTON CA 94588
DRAWN GERALD GATES
DESIGNED GERALD GATES
CHECKED DAVID LUNN
APPROVED DAVID LUNN
SALT MANAGEMENT PLAN
SURFACE WATER AND GROUNDWATER MONITORING SITES
SCALE 1" =2 MILES
DATE 31 JULY 2002

Appendix E

Resolutions and Policy Statements

D2

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

BOARD OF DIRECTORS

ZONE NO. 7

RESOLUTION NO. 728

Introduced by Director Zodtner

Seconded by Director Pearson

WHEREAS, Zone No. 7 of the Alameda County Flood Control and Water Conservation District under the District Act, in addition to other powers, is authorized to:

> "store water in surface or underground reservoirs within or outside of the district for the common benefit of the district or of any zone or zones affected; to conserve and reclaim water for present and future use within the district; to appropriate and acquire water and water rights, and import water into the district and to conserve within or outside, of the district, water for any purpose useful to the district; to commence, maintain, intervene in, defend or compromise, in the name of the district, or otherside, and to assume the costs and expenses of, any action or proceeding involving or affecting the ownership or use of waters or water rights within or without the district, used or useful for any purpose of the district or of common benefit to any land situated therein, or involving the wasteful use of water therein; to commence, maintain, intervene in, defend and compromise and to assume the cost and expenses of any and all actions and proceedings now or hereafter begun; to prevent interference with or diminution of, or to declare rights in the natural flow of any stream or surface or subterranean supply of waters used or useful for any purpose of the district or of common benefit to the lands within the district or to its inhabitants; to prevent unlawful exportation of water from said district; <u>to prevent contamination, pollution or otherwise rendering unfit for beneficial use</u> the surface or <u>subsurface water used</u> /emphasis added/ or useful in said district, and to commence, maintain and defend actions and proceedings to prevent any such interference with the aforesaid waters as may endanger or damage the inhabitants, lands, or use of water in, or flowing into, the district; provided, however, that said district shall not have power to intervene or take part in, or to pay the costs or expenses of, actions or controversies between the owners of lands or water rights which do not affect the interest of the district;" and

WHEREAS, Zone No. 7 has undertaken programs to manage the ground water resources of Livermore-Amador Valley for the benefit of the Zone and its inhabitants; and

WHEREAS, it is the intent of the Board of Directors of Zone No. 7 to continue its efforts in the development and implementation of a ground water management plan for the Livermore-Amador Valley;

NOW, THEREFORE, BE IT RESOLVED that the Zone No. 7 Board is cognizant of its power and duty to prevent contamination and pollution of the underground water basin; and

BE IT FURTHER RESOLVED that the Zone No. 7 Board construes its powers to include the authority to determine and define standards of ground water purity; and

BE IT FURTHER RESOLVED that it is the intent of the Zone No. 7 Board to take all necessary steps to protect the underground basin from contamination and pollution, including but not limited to:

1. To prepare criterion to determine if any proposed action of other agencies threaten this water resource;

2. Request any agency which plans a project which this Board determines may possibly threaten this water resource to submit evidence as to the project's anticipated affect on this water resource; and

3. Commence, maintain and defend actions including original actions to enjoin any proposed program by other agencies that the Board determines will threaten this water resource.

ADOPTED BY THE FOLLOWING VOTE:

AYES: Directors Becker, Harris, Pearson, Ryon, Zodtner and Chairman Concannon

NOES: None

ABSENT: Director Lydiksen

I certify that the foregoing is a correct copy of a resolution adopted by the Board of Directors of Zone No. 7 of the Alameda County Flood Control and Water Conservation District on October 30, 1974.

ATTEST: October 30, 1974.

BY: R. C. Dicks
SECRETARY

D3

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

BOARD OF DIRECTORS

ZONE NO. 7

RESOLUTION NO. 768

Introduced by Director Zodtner

Seconded by Director Becker

WHEREAS, Zone 7 is presently managing the ground water basin in the Livermore-Amador Valley, provides leadership in the measurement and monitoring of surface and ground waters, owns and operates a water importation, treatment and distribution system, maintains the major arroyos and waterways for flood control and drainage, operates ground water replenishment facilities, and otherwise acts to provide an overall water supply of good quality within its area; and

WHEREAS, Zone 7 encompasses the entire eastern portion of Alameda County including all of the Alameda Creek Watershed above Niles Canyon within Alameda County; and

WHEREAS, the Bay Area Sewage Services Agency (BASSA) has been in the process of determining and designating a responsible agency for waste water management for unurbanized areas of Alameda Creek Watershed above Niles and has inquired as to intentions of Zone 7; and

WHEREAS, the Alameda County Board of Supervisors, by Resolution No. 11265 of May 13, 1975, recognizes Zone 7 of Alameda County Flood Control and Water Conservation District as the most logical agency to serve as the overall water quality management planning agency for the Alameda Creek Watershed above Niles excluding therefrom those territories lying within the boundaries of the cities of Livermore and Pleasanton and Valley Community Services District and coordinate such overall watershed plan with the plans of other agencies including the Livermore-Amador Valley Water Management Agency and its constituent members and requested the Zone 7 Board of Directors to consider undertaking subject overall water quality management plan; and

WHEREAS, the California Regional Water Quality Control Board, San Francisco Bay Region, adopted a resolution on August 19, 1975 concurring in the Alameda County Board of Supervisors' resolution that Zone 7 of the Alameda County Flood Control and Water Conservation District be recognized as the most logical agency to serve as the overall water quality management planning agency for the Alameda Creek Watershed above Niles and urging the Zone 7 Board of Directors to consider proceeding with such planning including coordinating and/or entering any necessary agreements or contractual relations with other involved agencies;

NOW, THEREFORE, BE IT RESOLVED that it is the intention of the Zone No. 7 Board of Directors to proceed as follows:

1. To serve as overall water quality management planning agency for the Alameda Creek Watershed above Niles;

2. To cooperate and coordinate with the Livermore-Amador Valley Water Management Agency and other affected agencies in the development of an integrated water quality management plan;

3. To consider land development, financial and institutional factors and other environmental concerns in the development of a sound program for integrating various water quality management plans; and

BE IT FURTHER RESOLVED that upon completion and adoption of the integrated water quality management plan it is the intent of this Board to consider implementation of the plan by, but not limited to, contracting with others or by building and operating waste water collection systems, treatment works and disposal facilities to serve the area under consideration.

ADOPTED BY THE FOLLOWING VOTE:

AYES: Directors Becker, Concannon, Lydiksen, Pearson, Ryon, Zodtner and Chairman Harris

NOES: None

ABSENT: None

ABSTAIN: None

I certify that the foregoing is a correct copy of a resolution adopted by the Board of Directors of Zone No. 7 of the Alameda County Flood Control and Water Conservation District on September 17, 1975.

ATTEST: September 17, 1975.

BY Robert M. Pearson
SECRETARY

Mr. Mar didn't feel that sending a more strongly worded letter would be a problem. Lone Star did retain a local counsel that gave them some advice on an earlier draft of the contract. That advice was that all of the details should be worked out and all of the engineering designs finalized before the contract is finalized. Mr. Mar indicated that his response to that idea was that we already have similar contracts with the other gravel companies, and we are dealing with these structures on a conceptual basis. The design will be based on engineering principles and practices in effect at the time. There is no need to complete the engineering before a contract is signed.

Director Walker pointed out that in order for Lone Star's mining permit to be valid, they must have a contract with us as required in the specific reclamation plan. Without an agreement with the Zone, then that specific plan is not in effect. He agreed with an earlier suggestion that we should ask the Board of Supervisors to revoke the permit unless Lone Star wants to sit down and talk about this agreement.

There was consensus on the Board to send concurrent letters to Planning and Lone Star regarding revocation of the Lone Star mining permit unless they proceed with finalizaton of an agreement with Zone 7.

ITEM 14a--GROUNDWATER COMMITTEE--DRAFT STATEMENT

Mr. Mar orally presented a few changes to the draft statement which had been suggested by staff. Other than that the draft statement as distributed at the last board meeting was acceptable.

Director McGrath moved for approval of the draft statement on groundwater policy as amended this evening. The motion was seconded by Director Tracy and passed by a vote of 7-0.

* * * * *

Item 15a was discussed earlier in the meeting.

ITEM 15b--CORRESPONDENCE LISTING

Staff then answered questions about the correspondence listing. Some of the topics covered included:

Item A.2, page 1: Relating to denial of appeal of Fayette Manufacturing over assessment of SDA 7-1 drainage fees--Mr. Wong advised that after denial of their appeal by both the Zone 7 Board and the District Board of Supervisors, Fayette is pursuing the matter in Superior Court. The amount in question from Fayette is about $67,000. The total amount we have collected from the wind farm industry is over $800,000.

I certify that the foregoing is a correct copy of a resolution adopted by the Board

STATEMENT ON ZONE 7 GROUNDWATER MANAGEMENT

August 19, 1987

Summary of Requirements and Policies

The groundwater basin, with its stored water, is a valuable resource and an integral part of the water supply system of the Livermore-Amador Valley. This resource is important because:

- It can be used conjunctively with other water supplies to improve the overall reliability of the Valley's water supply sources;
- It is a needed backup or reserve against infrequent but possibly extended periods of water shortages; and
- It is a very economical water source.

Therefore, it has been the Zone's goal to manage the basin so that it may be utilized for these purposes both now and in the future. Accordingly, general operational and maintenance policies are:

- To maintain the balance between the combination of natural and artificial recharge and withdrawal.
- To maintain water levels high enough to provide emergency reserves adequate for the worst credible drought.
- To protect and enhance the quality of the groundwater.
- To develop information, policies and procedures for the effective long-term management of the groundwater basin.
- To inform the public and relevant governmental agencies of the Zone's water supply potential and management policies, and to solicit their input and cooperation.

Background and Ongoing Activities

The central portion of the groundwater basin in Zone 7 underlies portions of the cities of Pleasanton and Livermore and is generally in the area between Vineyard Avenue and Interstate 580. This resource was the only water supply to the valley until the Zone began to import water via the State Water Project (SWP) in 1962. The need for the importation of water was created by a gradual depletion of the groundwater prior to 1960. To counteract this situation the Zone implemented a program of recharging imported water into the basin along with regulating municipal pumpage. It took several years to reverse the trend of dropping water levels.

After assignment of the Arroyo del Valle Water Rights Permit from the Pleasanton Township County Water District in the early 1970's, the Zone had an additional water source available for direct use or banking into the central portion of the groundwater basin. From 1978 to 1983 the recharge program was accelerated by using imported and local Arroyo del Valle waters to get the basin as full as possible and to avoid potentially higher costs for importing water after 1983. This returned the basin to an acceptable water level and for the last few years, the Zone has recharged only small quantities of local water.

The current estimated annual groundwater use is nearly equal to the average annual natural replenishment of 14,000 acre-feet annually (AFA). About half of this amount is pumped by the City of Pleasanton and California Water Service Company for distribution in their respective service areas; this amount of pumpage is generally referred to as the Independent Quota (IQ) agreed to by Zone 7. The remaining portion is used by the Zone, County Fairgrounds, Castlewood, agricultural irrigators, sand and gravel producers and other individuals and entities. It is important to note that individuals and entities are entitled to withdraw groundwater for "beneficial use" on their own land under California law. The Zone monitors, but does not directly control, such uses.

Quantity

The various sources of water supply in the Zone 7 area include State Water Project (SWP) imported water, groundwater, conserved local runoff and reclaimed wastewater. The amount of groundwater can be increased by artificial recharge with either imported water or local runoff.

It is the policy of Zone 7 to ensure that the average annual withdrawal of groundwater does not exceed the average annual natural and artificial recharge. Depletion of the resource will be prevented by using groundwater levels and estimates of withdrawals to manage the Zone's artificial recharge program. With the presently adequate supply of imported water the Zone has only had to use the groundwater basin for peaking during summer high demand periods and for emergencies. Therefore, the artificial recharge program has been reduced to maintenance levels.

In the future, additional withdrawals may be required, dependent upon availability of SWP imported and other waters and demands of population growth. If water consumption increases and approaches the quantity of available water, there will be greater reliance on the groundwater basin for banking and storing suitable waters for subsequent withdrawal; however, basin management cannot increase the total amount of water available, and other additional supplies may have to be acquired.

The Zone is looking for ways and opportunities to increase existing supplies to ensure a more adequate and reliable future supply for the Valley. Potential sources include, but are not limited to, entitlement transfers and exchanges with other SWP contractors and other water suppliers, the proposed Los Vaqueros Project, federal water, reclamation of wastewater, and undeveloped local water. Completion of the State Water Project could improve the quantity and reliability of existing supplies; however, there are no immediate projects to accomplish this, except for a groundwater banking project and off-aqueduct storage project which could provide a measure of help.

Zone 7 considers an interim groundwater elevation range of 280 feet to 300 feet in the Alameda Fairgrounds area to be an acceptable operating level. This is but one indicator selected to provide a simplified reference point. In practice, year-to-year variations in natural recharge, in the availability of water for artificial recharge, and in groundwater withdrawal cause the water levels to vary over a much wider range. The specific location of recharge and withdrawals in addition to the geologic makeup of the groundwater basin are other variables affecting water levels. The normal acceptable lower limit on the water table elevation is determined by the groundwater reserves required to sustain the Zone through the worst credible drought. Again using the simplified reference point, this is presently estimated to be approximately 250 feet at the Fairgrounds.

It has been estimated that an extended drought lasting for 6 years has a 0.25-1.0% probability of beginning in any given year. In such a drought, which the Zone defines as the worst credible drought, an extra 75,000 to 130,000 AF would have to be pumped from the groundwater basin to compensate for the reduced availability of imported water and local runoff. This amount of water is within the capacity of the basin if the groundwater level is maintained at or above 250 feet at the Fairgrounds.

The Zone will acquire in the future a chain-of-lakes, the product of the completion of mining sand and gravel in the Valley. Zone 7 will use it for water management purposes. Such a facility will enable the Zone to capture storm runoff which is now lost from the valley and to store and to transport stored water for subsequent recharge into the groundwater basin beneath Pleasanton. Zone 7 will permit a temporary lowering of the water table in order to facilitate deep gravel mining and development of the chain-of-lakes. This short-term accommodation entails minimal risk to the water supply, since it is expected to be completed well before water demand approaches the limits of our SWP imported water supply. The Zone will receive fees from the quarry operators in proportion to lost water to purchase water for recharge in the future.

Quality

While the natural quality of groundwater pumped for municipal purposes is good, it is generally harder and contains more dissolved minerals than imported supplies. The Zone has effected and will continue to effect programs to improve the quality of water. The artificial recharge program, in addition to maintaining quantity, improves quality by replacing withdrawn groundwater with surface water containing fewer dissolved salts. The policy of maintaining relatively high water levels also serves to slow the intrusion of saline water from the fringe areas of the basin.

In addition to these ongoing programs, the Zone's policy is to investigate and plan for possible active programs for the future. These include: (1) Recharging high quality filtered water into Zone 7 production wells when excess water treatment plant capacity is available for subsequent extraction during high demand summer months; (2) Demineralizing groundwater for use with disposal of the concentrated salts by export; and (3) Selectively recharging into the groundwater when the available water is of the highest quality.

In addition to natural water quality, the impact of human activities is a matter of concern. As part of its Wastewater Management Plan, the Zone has set water quality targets and criteria for various parts of the basin, and has developed policies relating to the use of septic tanks and local reuse or disposal of sewage effluent. In general, any practice which results in the recharge of reclaimed wastewater to the groundwater is discouraged as being potentially detrimental to groundwater quality.

Industrial chemicals and toxic wastes are also of concern, although the Zone does not have primary responsibility for monitoring or correcting problems of this sort. Zone 7 maintains close contact with the Regional Water Quality Control Board and the County Health Department, and closely monitors the progress of groundwater problem assessments and remediation.

The Zone does administer and enforce the Groundwater Protection Ordinance (73-68) to ensure the proper construction and destruction of wells. This reduces the potential for surface and near-surface toxic chemical problems to contaminate the groundwater resource.

Management

To enhance the understanding of the behavioral characteristics of the groundwater basin, collection and evaluation of water quality and quantity data are essential. Reliable bases for future groundwater management decisions are necessary if we are to ensure the greatest possible supply of good quality groundwater at a sustainable rate. Annual reports of the Zone's water data collection and evaluations programs include the following:

- Precipitation monitoring
- Surface water monitoring
- Groundwater level monitoring
- Groundwater quality monitoring
- Del Valle Reservoir operations
- Groundwater basin hydrologic inventory
- Mining area monitoring
- Groundwater Protection Ordinance enforcement
- Groundwater basin land and water use
- Groundwater level contours
- Groundwater basin natural yield

In addition to the above annual reports, the Zone maintains records on wells, precipitation and streamflow, geologic data, recharge capacities, evaporation, sand and gravel mining, storage factors, water level and quality variations, and toxic site investigations and drainage. These data are available for review on request and are used by Zone 7 staff to develop and refine management strategies, particularly when water supply limitations and future water demands will require more stringent management techniques.

ZONE 7
ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

BOARD OF DIRECTORS

RESOLUTION NO 04-2662

INTRODUCED BY DIRECTOR MARCHAND
SECONDED BY DIRECTOR CONCANNON

Reliability Policy for Municipal & Industrial Water Supplies

WHEREAS, the Zone 7 Board of Directors desires to maintain a highly reliable Municipal and Industrial (M&I) water supply system so that existing and future M&I water demands can be met during varying hydrologic conditions; and

WHEREAS, the Board has an obligation to communicate to its M&I customers and municipalities within its service area the ability of the Zone's water supply system to meet projected water demands.

WHEREAS, the Board on May 15, 2002 adopted Resolution No. 02-2382 setting forth its Reliability Policy for Municipal & Industrial Water Supplies; and

WHEREAS, the Zone's current water supply policy includes a provision for a valley-wide groundwater production capability to meet 75% of valley-wide M&I demand in the event of an outage of the South Bay Aqueduct; and

WHEREAS, the Board desires to revise the Reliability Policy to include all Zone 7 water supply facilities and to clarify demand levels for planning purposes;

NOW, THEREFORE, BE IT RESOLVED that the Board hereby rescinds Resolution No. 02-2382 adopting the May 15, 2002 Reliability Policy for Municipal & Industrial Water Supplies; and

BE IT FURTHER RESOLVED that the Board hereby adopts the following policy goals regarding reliability[1] to guide the management of the Zone's M&I water supplies as well as its Capital Improvement Program (CIP)[2]:

GOAL 1. Meet 100% of its treated water customers water supply needs in accordance with Zone 7's most current Contracts for M&I Water Supply, including existing and projected demands for the next 20 years as specified in Zone 7's Urban Water Management Plan, (UWMP), which will be coordinated with Zone 7's M&I water Contractors. Zone 7 will endeavor to meet this goal during an average water year[3], a single dry water year[4], and multiple dry water years[5], and

GOAL 2: Provide sufficient treated water production capacity and infrastructure to meet at least 75% of the maximum daily M&I contractual demands should any one of Zone 7's major supply, production or transmission facilities experience an extended unplanned outage.

BE IT FURTHER RESOLVED that to ensure that this Board policy is carried out effectively, the Zone 7 General Manager will provide a water supply status report to the Board every five years with the Zone 7 Urban Water Management Plan that specifies how these goals can be, or are being, achieved.

If the General Manager finds that the goals might not be met, then the Board will hold a public hearing within two months of the General Manager's finding to consider remedial actions that will bring the Zone into substantial compliance with the stated reliability goals. Remedial actions may include, but are not limited to, voluntary conservation or mandatory rationing to reduce water demands, acquisition of additional water supplies, and/or a moratorium on new water connections. After reviewing staff analyses and information gathered at the public hearing, the Board shall, as expeditiously as is feasible, take any additional actions that are necessary to meet the reliability goals during the following five-year period; and

BE IT FURTHER RESOLVED that the Zone 7 General Manager shall prepare an Annual Review of the Sustainable Water Supply Report which includes the following information:

(1) An estimate of the current annual average water demand for M&I water as well as a five-year projection based on the same information used to prepare the UWMP and CIP;

(2) A summary of available water supplies[6] to Zone 7 at the beginning of the calendar year;

(3) A comparison of current water demands with the available water supplies; and

(4) A discussion of water conservation requirements and other long-term water supply programs needed to meet Zone 7 M&I water demands for a single dry water year and multiple dry years, as specified in the Zone's UWMP.

A summary of this review will be provided to M & I customers.

Definitions

[1]**Reliability**—the ability of a water supply system to provide water during varying hydrologic conditions without the need for reductions in water use.

[2]**Capital Improvement Program (CIP)**—the CIP is the Zone's formal program for developing surface and ground water supplies, along with associated infrastructure, including import water conveyance facilities, surface water treatment plants, groundwater wells, and M&I water transmission system to meet projected water demands.

[3]**Average water year**—the statistical average quantity of water from all of the water supplies available to Zone 7 on a contractual or legal basis (e.g., surface water runoff to Del Valle reservoir), based on the historical hydrologic records available to Zone 7.

[4]**Single dry water year**—for the purposes of meeting the requirements of the UWMP, the Zone 7 staff will identify and justify the selection of a calendar year from the historic record that represents the lowest yield from all normally contracted or legally available supplies.

[5]**Multiple dry water years**—for the purposes of meeting the requirements of the UWMP, the Zone 7 staff will identify and justify the selection of three or more consecutive dry years from the historic record that represent the lowest yields from all normally contracted or legally available supplies.

[6]**Available water supplies** consist solely of (1) water supplies that the Zone 7 has contracted for (e.g., listed under Schedule A of the State Water Contract, dry-year water options, special contracts with other water districts, etc.) and (2) water actually stored in surface and subsurface reservoirs.

ADOPTED BY THE FOLLOWING VOTE:

AYES: DIRECTORS CONCANNON, GRECI, KOHNEN, MARCHAND, QUIGLEY

NOES: NONE

ABSENT: DIRECTORS KALTHOFF, STEVENS

ABSTAIN: NONE

I certify that the foregoing is a correct copy of a resolution Adopted by the Board of Directors of Zone 7 of Alameda County Flood Control and Water Conservation District on

August 18, 2004

By _____

Vice - President, Board of Directors

ZONE 7
ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

BOARD OF DIRECTORS

RESOLUTION NO 03-2494

INTRODUCED BY DIRECTOR MARCHAND
SECONDED BY DIRECTOR KALTHOFF

Water Quality Policy for Potable and Non-potable Water

WHEREAS, the Zone 7 Board of Directors is committed to delivering high quality water supplies, to its potable (treated drinking water) and non-potable water Contractors, that meet or exceed the California Department of Health Services and the United States Environmental Protection Agency's public health requirements in accordance with existing water supply agreements, in a manner that is fiscally responsible, proactive, and environmentally sensitive; and

WHEREAS, the Board desires to deliver potable water of an approximately equal quality to each Municipal and Industrial (M&I) Contractor without diminishing their existing water quality; and

WHEREAS, the Board desires to deliver non-potable water of an appropriate quality for irrigation users from current surface and ground water supplies, and as a blended source of untreated and recycled water, when available.

NOW, THEREFORE, BE IT RESOLVED that the Board hereby adopts the following policy goals regarding water quality to guide the Zone 7 potable and non-potable water operations and its Capital Improvement Program:

GOAL 1 – Zone 7 shall continue to meet all state and federal primary Maximum Contaminant Levels[1] (MCLs) for potable water delivered to the M&I Contractors' turnouts, in accordance with existing water supply agreements. In addition, Zone 7 shall deliver potable water of a quality that is as close as technically feasible and fiscally responsible to the Public Health Goals[2] (PHGs) and/or Maximum Contaminant Level Goals[3] (MCLGs). To ensure a margin of safety, the delivered water shall generally be of a quality that contains no greater than 80 percent of the applicable state or federal primary MCLs.

GOAL 2 – Zone 7 shall meet all state and federal secondary MCLs[1] in the potable water delivered to its M&I Contractors' turnouts. In addition, Zone 7 shall, within technical and fiscal constraints, proactively mitigate earthy-musty taste and odor events from surface water supplies and reduce hardness levels to "moderately hard", defined as 75 to 150 mg/L. Also, Zone 7 shall optimize its treatment processes to minimize chlorinous odors by maintaining consistent disinfectant dosage and residual.

GOAL 3 – Zone 7 shall endeavor to deliver to its non-potable Contractor turnouts, from a variety of sources, water of a quality that meets the irrigation needs of its Contractors and does not negatively impact vegetation, crops, or soils.

GOAL 4 – In order to achieve Goals 1 through 3, Zone 7 shall continue to work to improve the quality of its source waters. This may be achieved through Zone 7's Salt Management Plan, which will maintain or improve the water quality in the groundwater basin, and through advocacy of improvements in the State Water Project, its facilities and their operations, which may improve the source water of Zone 7's surface water supplies. In addition, Zone 7 will encourage the retailers to take similar steps as those outlined in this policy to improve the quality of the retail customers' water.

BE IT FURTHER RESOLVED that this Board policy be reviewed and updated as needed. Also, to ensure that this Board policy is carried out effectively, the Zone 7 General Manager shall implement the following actions:

- An Implementation Plan shall be prepared as a part of the Water Quality Management Program to implement treatment or other processes necessary to meet the water quality policy goals. Optimization of system operations will be recommended, wherever possible, prior to the identification of the need for capital improvements;

- The Implementation Plan shall be reviewed and updated every two years, or sooner if required, to reflect any emerging water quality issues and other relevant regulatory and/or technology development; and

- The Implementation Plan, and any subsequent updates, shall be incorporated into the annual updates of Zone 7's Five-year Capital Improvement Plan, as feasible.

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[1] Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

[1] Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

[1] Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the United States Environmental Protection Agency.

ADOPTED BY THE FOLLOWING VOTE:

AYES: DIRECTORS CONCANNON, GRECI, JOHNSTON, KALTHOFF, LAYTON, MARCHAND

NOES: NONE

ABSENT: DIRECTOR STEVENS

ABSTAIN: NONE

I certify that the foregoing is a correct copy of a resolution Adopted by the Board of Directors of Zone 7 of Alameda County Flood Control and Water Conservation District on

April 16, 2003

By _____
President, Board of Directors

MINUTE BOOK — Board of Directors, Zone No. Seven,
Alameda County Flood Control and Water Conservation District.

REGULAR MEETING - CONTINUED

SEPTEMBER 6, 1960

The Board discussed the need for formally stating their policy in regard to the service of water from the facilities proposed in the Zone No. 7 Project. Since members of the city councils of both Livermore and Pleasanton have requested that such a policy be stated by resolution, Mr. Wente moved and Mr. Nielsen seconded that Resolution No. 38, which reads as follows be adopted.

RESOLUTION NO. 38

BE IT RESOLVED that it is the intention of this Board that Zone No. 7 will make available a wholesale, municipal, and industrial water supply to retail water agencies in the zone; and

BE IT FURTHER RESOLVED that it is the intention of this Board to encourage the development of the retail water distribution systems through the existing retail agencies; and

BE IT FURTHER RESOLVED that it is also the intention of this Board to encourage the use of water from the South Bay Aqueduct for agricultural purposes throughout the zone.

Adopted this 6th day of September, 1960, by the following vote:

AYES : Directors Callaghan, Chance, Koopmann, Lund, Nielsen, Taylor, and Wente

NOES : None

ABSENT: None

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

BOARD OF DIRECTORS

ZONE NO. 7

RESOLUTION NO. 311

Introduced by Karl L. Wente

Seconded by Hermann F. Koopmann

WHEREAS, one of the basic objectives of Alameda County Flood Control and Water Conservation District is to prevent waste of water or diminution of water supply in said District; and

WHEREAS, Zone No. 7 of said District is the holder of a permit from the State Water Rights Board for the conservation and beneficial use of surplus waters of Arroyo Mocho and Arroyo las Positas; and

WHEREAS, Zone No. 7 of said District is party to a contract with the State of California providing for delivery of imported water from the State Water Project into the Livermore Valley; and

WHEREAS, Zone No. 7 of said District operates artificial ground water recharge facilities diverting natural and imported waters of Arroyo las Positas into the Santa Rita Subbasin of the Livermore Valley Ground Water Basin for subsequent beneficial use; and

WHEREAS, the City of Livermore is currently discharging treated sewage effluent intermittently to Arroyo las Positas upstream from the Zone No. 7 diversion point and proposes to discharge treated sewage effluent continuously; and

WHEREAS, the City of Pleasanton is currently discharging treated sewage effluent to land surface disposal which land is a portion of the Alameda Creek watershed; and

WHEREAS, the Livermore-Amador Valley is currently unable to finance the disposal of its sewage effluent by means of an outfall pipeline, which therefore requires the investigation of reclamation of said effluent utilizing currently available techniques; and

WHEREAS, the unrestricted discharge of mineral waste into Livermore-Amador Valley sewage collection systems must be controlled in order that the feasibility of said reclamation be possible;

NOW, THEREFORE, BE IT RESOLVED that the San Francisco Bay Regional Water Pollution Control Board and all dischargers of sewage effluent within the Livermore-Amador Valley are urged by the Zone No. 7 Board of Directors to take positive action to eliminate sources of mineral degradation of such effluent to the fullest practicable extent; and

BE IT FURTHER RESOLVED that it is urged that said action specifically include the elimination, within a reasonable time period, of the discharge of mineral wastes from the regeneration of water softeners and other known discharges of mineral waste.

ADOPTED BY THE FOLLOWING VOTE:

AYES: : Directors Callaghan, Koopmann, Wente and Nielsen

NOES : Director Chance

ABSENT: None

ABSTAIN: Director Lund

I certify that the foregoing is a correct copy of a resolution adopted by the Board of Directors of Zone No. 7 of the Alameda County Flood Control and Water Conservation District on May 3, 1965.

ATTEST: May 3, 1965.

BY : Elmer E. Chance
SECRETARY

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

ZONE NO. 7

BOARD OF DIRECTORS

Resolution No. 1165

Introduced by: Director Schock
Seconded by: Director Tracy

WHEREAS, it is well established that although domestic septic tanks represent a source of degradation of the groundwater within Zone 7 some are permitted under strict conditions; and

WHEREAS, it may reasonably be anticipated that commercial and industrial facilities may generate sewage of higher toxicity and in larger volumes than domestic septic tank users; and

WHEREAS, the Zone has a policy of groundwater protection as expressed in the Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Watershed Above Niles, dated May 19, 1982, with strict controls on the disposal of treated sewage which may affect the quality of the groundwater; and

WHEREAS, such plan focused on the use of septic tanks for rural residential units and did not consider their use on new developments zoned for industrial or commercial use;

NOW, THEREFORE, BE IT RESOLVED that the Zone 7 Board of Directors of Alameda County Flood Control and Water Conservation District hereby finds that the use of septic tanks for new development zoned for commercial or industrial uses generally produces unacceptable risk to the quality of the groundwater resources; and

BE IT FURTHER RESOLVED that this Board hereby establishes a policy of prohibition to the use of septic tanks for new development zoned for commercial or industrial uses which overlies the central groundwater basin, any of its fringe areas or subbasins, or any body of groundwater hydrologically connected with the central basin unless it can be satisfactorily demonstrated to the Board that the wastewater loading will be no more than the loading from an equivalent rural residential unit and said septic tanks will be in compliance with all other conditions and provisions.

ADOPTED BY THE FOLLOWING VOTE:

AYES: DIRECTORS BUDDEMEIER, CONCANNON, SCHNEIDER, SCHOCK, TRACY, WALKER

NOES: NONE

ABSENT: DIRECTOR WENTE

ABSTAIN: NONE

I certify that the foregoing is a corre
copy of a resolution adopted by the Boa
of Directors of Zone No. 7 of the Alame
County Flood Control and Water Conserva
tion District on AUG 28 1985

ATTEST:

BY :

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

BOARD OF DIRECTORS

ZONE NO. 7

RESOLUTION NO. 1548

INTRODUCED BY Director Shulenberger

SECONDED BY Director Hagemann

ZONE 7 RESOLUTION OF INTENT
TO AFFIRM WATER RECYCLING PROGRAM

WHEREAS, Zone 7 of Alameda County Flood Control and Water Conservation District is the primary supplier to the water retailers of the Livermore-Amador Valley; and

WHEREAS, the groundwater basin of the Livermore-Amador Valley is a significant potable water source, and Zone 7 has assumed primary responsibility for the proper management and protection the basin; and

WHEREAS, Zone 7, the City of Livermore, and the Dublin San Ramon Services District have funded a study to develop a Valley-wide water recycling program, said study conducted by Brown & Caldwell Consultants in association with Eisenberg, Olivieri, & Associates, Inc. and David Keith Todd Engineers; and

WHEREAS, said study concluded that properly treated recycled water can be a safe and cost effective means to provide for additional water supply and wastewater disposal in the Livermore-Amador Valley; and

WHEREAS, said study also concluded that, with additional treatment over what would be required to meet State Department of Health Services and Regional Water Quality Control Board requirements, recycled water can improve the salt balance of the Livermore-Amador Valley groundwater basin; and

WHEREAS, said study recommended adoption of Policies and Implementation Strategies to advance proper water recycling programs and projects in the Livermore-Amador Valley;

NOW, THEREFORE BE IT RESOLVED, that the Board of Directors of Zone 7 of Alameda County Flood Control and Water Conservation District does hereby acknowledge the Policies and Implementation Strategies as recommended in the May 1992 Water Recycling Study by the Brown & Caldwell study team; and

BE IT FURTHER RESOLVED, that Zone 7 intends to work cooperatively with Livermore, Dublin San Ramon Services District, and any other entities to encourage the proper and orderly development of water recycling projects in the Livermore-Amador Valley to avoid degradation of groundwater quality; and

BE IT FURTHER RESOLVED, that the General Manager of Zone 7 is hereby directed to negotiate a Memorandum of Understanding with the City of Livermore, the Dublin San Ramon Services District, and other entities to jointly apply for a Valley-wide blanket permit from the Regional Water Quality Control Board for water recycling projects; and

BE IT FURTHER RESOLVED, that the General Manager is further directed to develop the contractual framework to jointly undertake water recycling projects with the City of Livermore and with the Dublin San Ramon Services District.

ADOPTED BY THE FOLLOWING VOTE:

AYES: Directors Concannon, Figuers, Hagemann, Marchand, Shulenberger, Tracy

NOES: None

ABSENT: Director Wente

I certify that the foregoing is a corre copy of a resolution adopted by the Boa of Directors of Zone No. 7 of the Alame County Flood Control and Water Conserva tion District on JUN 17 1992

ATTEST: JUN 25 1992

BY Sandra Francis

ZONE 7
ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

BOARD OF DIRECTORS

RESOLUTION NO. 99-2068

INTRODUCED BY DIRECTOR LAYTON

SECONDED BY DIRECTOR MARCHAND

WHEREAS, Zone 7 serves as the overall water quality management agency for the Alameda Creek watershed above Niles and has primary responsibility for management of the Livermore-Amador Valley's surface and groundwater resources;

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors of the Zone 7 Water Agency does hereby support the proposed Salt Management Program Implementation Plan and inclusion of the following policy goals in the Zone 7 annual operations plan:

- Offset the current 2200 tons per year of salt loading plus approximately 200 tons per year current projected annual increase;
- Maintain or improve groundwater mineral quality;
- Maintain or improve delivered water quality;
- Provide comparable delivered water quality to all retailers;
- Provide a mechanism for mitigation of all salt loading associated with recycled water use;
- Minimize total operational and maintenance costs through an adaptive management process.

BE IT FURTHER RESOLVED that the Zone 7 General Manager is hereby authorized to proceed with the recommended year 2000-2002 Salt Management Implementation Plan.

ADOPTED BY THE FOLLOWING VOTE:

AYES: DIRECTORS CONCANNON, FIGUERS, LAYTON, MARCHAND, STEVENS

NOES: NONE

ABSENT: DIRECTORS GRECI, KALTHOFF

ABSTAIN: NONE

I certify that the foregoing is a correct copy of a resolution adopted by the Board of Directors of Zone No. 7 of the Alameda County Flood Control and Water Conservation District on AUG 18 1999

ATTEST: _____

BY : Sandy Figuers

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ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

BOARD OF DIRECTORS

ZONE NO. 7

RESOLUTION NO. 1037

Introduced by DIRECTOR WENTE

Seconded by DIRECTOR PHILCOX

WHEREAS, Zone 7 of Alameda County Flood Control and Water Conservation District has declared its intent with regard to protection of the surface and ground water resources within the Zone; and

WHEREAS, this declaration is expressed in Zone 7 Board Resolution No. 728 adopted on October 30, 1974, a copy of which is attached hereto and made a part hereof; and

WHEREAS, Zone 7 has an interim policy on wastewater reclamation expressed in Zone 7 Board Resolution No. 823 adopted on June 15, 1977, a copy of which is attached hereto and made a part hereof; and

WHEREAS, Zone 7 has expressed its intent to serve as the overall water quality management planning agency for the Alameda Creek Watershed above Niles, as expressed in Zone 7 Board Resolution No. 768 adopted on September 17, 1975, a copy of which is attached hereto and made a part hereof; and

WHEREAS, the California Regional Water Quality Control Board, San Francisco Bay Region, in their Resolution 75-16, and the Alameda County Board of Supervisors, by their Resolution No. 11265 of May 13, 1975, have expressed concurrence for having Zone 7 as the overall water quality management planning agency for the Alameda Creek Watershed above Niles; and

WHEREAS, on March 2, 1981, Zone 7 executed an agreement with the consulting engineering firm of Camp Dresser & McKee, Inc. (CDM), of Walnut Creek, California, to develop the Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Watershed Above Niles (WMP), and

WHEREAS, CDM completed the Draft WMP on March 3, 1982, with the results presented at the final public hearing on April 15, 1982, and comments have been received; and

WHEREAS, the public hearing process is now concluded;

NOW, THEREFORE, BE IT RESOLVED, that consistent with the information presented above, the Board of Directors of Zone 7 of Alameda County Flood Control and Water Conservation District does hereby adopt the final Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Watershed Above Niles (WMP) consisting of the Draft WMP and the modifications to the Draft WMP of May 12 and May 19;

BE IT FURTHER RESOLVED that the final WMP supersedes Zone 7 Board Resolution No. 823 where there is a conflict; and

BE IT FURTHER RESOLVED that the Board of Directors of Zone 7 of Alameda County Flood Control and Water Conservation District does hereby direct CDM to incorporate said modifications with the Draft WMP to produce the final WMP, and to thence make and present to Zone 7, 100 copies of said final WMP, at which time their work under Agreement No. A4-7.674 will thereby be completed.

ADOPTED BY THE FOLLOWING VOTE:

AYES: DIRECTORS DZAKOWIC, HAGEMANN, PHILCOX, TRACY, WALKER, WENTE, WILLIAMS

NOES: NONE

ABSENT: NONE

ABSTAIN: NONE

I certify that the foregoing is a correct copy of a resolution adopted by the Board of Directors of Zone No. 7 of the Alameda County Flood Control and Water Conservation District on MAY 19 1982

ATTEST:

BY