

recharge of 1.05 cfs. The second survey was conducted with an initial flow of 6.0 cfs. It resulted in a total recharge of 1.48 cfs. These recharge rates are much lower than anticipated and might explain the lack of SWP water being detected at any of the observation wells.

3.3 Surface Water Monitoring Program

3.3.1 Program Description

The objectives of Zone 7's Surface Water Monitoring Program are:

- **Surface Water Flow Monitoring** – Quantify inflow and outflow of surface water to/from the groundwater basin. Also, to quantify the portions recharging the groundwater basin's aquifers and the amounts being discharged from the groundwater basin as a result of the gravel quarries' dewatering operations;
- **Surface Water Quality Monitoring** - Provide a record of water quality for the basin's recharge and discharge waters with which the groundwater basin's annual salt loading is calculated;
- **Del Valle Water Rights** - Satisfy the requirements of Zone 7's and Alameda County Water District's (ACWD) "water rights" for the Arroyo Valle. This involves quarterly sampling and continuous flow monitoring at two surface water stations; and
- **NPDES Permitting** - Monitor Zone 7's water discharges at the Del Valle Water Treatment Plant (DVWTP), and Patterson Pass Water Treatment Plant (PPWTP) (as required by National Pollutant Discharge Elimination System (NPDES) No. CAG382001, Order No. R2-2003-0062). Samples are taken above and below existing treatment plant discharge points during the first significant rainfall event of the season.

The Surface Water Monitoring Program focuses on the four main gaining and losing streams that impact the groundwater basin (i.e., Arroyo Valle, Arroyo Mocho, Arroyo Las Positas, and Arroyo De La Laguna), and the diversions and accretions that affect the flows into or from each of them. The program utilizes a network of telemetered recorder stations and meters (Figure 3.3-1 and Table 3.3-1) to compute the quantity of water flowing past each station. Once per year, water samples are collected from all ten recorder sites and four other NPDES sites in the program and submitted to Zone 7's laboratory for analysis of metals and minerals; the same parameters that are routinely analyzed in the Groundwater Monitoring Program.

3.3.2 2012 Water Year Results

3.3.2.1 General

The 2012 Water Year Surface Water Monitoring Program included ten surface water recorder stations (Table 3.3-2). Monthly total flows for the 2012 Water Year from the recording stations are presented in Table 3.3-3. All stations were maintained throughout the year and all records have been reviewed and

archived as part of the long-term historical record. For the 2012 Water Year, all ten recorder stations were sampled and routinely analyzed. These results are presented on Table 3.3-4.

The following sections outline the Surface Water Program activities for the 2012 Water Year (listed by stream), and highlight the findings and conclusions from these activities:

3.3.2.2 Arroyo Valle

The following are items of special note for the Arroyo Valle in the 2012 Water Year:

- During the 2012 Water Year, watershed runoff total into Lake Del Valle as recorded by the Arroyo Valle below Lang Canyon (AVBLC) stream gage was 1,557 AF, 6% of average (where the average is 25,700 AF for Water Years 1964-2011), and the lowest runoff total since the 1990 Water Year (815 AF).
- In the 2012 Water Year, Lake Del Valle flood releases (LDV_FLD_TTL) totaled 0 AF, however releases to the Arroyo Valle from the SBA (SBA_AV_TTL) totaled 6,575 AF.
- At the beginning of the 2012 Water Year, the Lake Del Valle elevation was 701.46 ft with a storage of 38,834 AF. At the end of the 2012 Water Year, the Lake Del Valle elevation was 699.76 ft with a storage of 37,663 AF.
- Cemex did not make any discharges into the Arroyo Valle in the 2012 Water Year (see Section 3.5.2).
- The peak flow recorded at the Arroyo Valle at Pleasanton (ADVP) stream gage in the 2012 Water Year was 122 cfs on January 21, 2012.
- For the 2012 Water Rights objective, recorder flow data was collected at both Arroyo Valle near Livermore (AVNL) and ADVP. In addition, four water quality grab samples were collected at both sites. Zone 7 is required to maintain a “live stream” condition on the Arroyo Valle whenever water stored under the permit is available in Lake Del Valle. Zone 7’s stream gage discharge record at ADVP verified that this permit condition was met during the 2012 Water Year. The discharge computations from the flow recorders and the water quality sampling are submitted to the State Water Resources Control Board each year to satisfy permit requirements.
- For Zone 7’s NPDES objective, Zone 7 is required to sample the South Tributary of the Arroyo Valle above and below the DVWTP following periods of high precipitation. During the 2012 Water Year, one water quality sample was taken above and below the DVWTP on March 28, 2012 while the South Tributary was flowing at about 0.04 cfs (estimated).
- For a Zone 7 aquatic habitat study required as part of the Zone 7 Water Rights application, nine locations now record water temperature along the Arroyo Del Valle above the confluence with Arroyo De La Laguna, up to Del Valle Dam Turnout 2 (see Figure 3.3-1). In July 2012, seven HOBO water temperature recorders were placed along the Arroyo Valle in various locations in

the aforementioned reach. In addition, water temperature was added to the Zone 7 ADVP stream gage and the USGS added real time water temperature to the AVNL stream gage.

3.3.2.3 Arroyo Mocho

The following are items of special note for the Arroyo Mocho in the 2012 Water Year:

- There was no flow at the Arroyo Mocho near Livermore (AMNL) stream gage for about 22% of the 2012 Water Year from October 1 – October 7, 2011 and July 22 – September 20, 2012. The annual mean discharge was 0.74 cfs. The peak flow recorded was 120 cfs on April 13, 2012.
- 5,192 AF of SWP water was released from the SBA to the Arroyo Mocho (SBA_AM) during the 2012 Water Year as part of Zone 7's artificial recharge and conjunctive use programs.
- At the Arroyo Mocho near Livermore (AMHAG) stream gage, brand new electronics consisting of a recorder, a bubbler, a water temperature sensor, and a voice/data modem were installed and in use by November 19, 2011.
- There was no flow at AMHAG for about 67% of the 2012 Water Year. There was mostly no flow from November 2011 through February 2012 due to below normal rainfall for the 2012 Water Year (see Figure 3.1-2). Also, because Caltrans was building a new bridge for Highway 84, flow releases from the SBA were kept lower than normal to maintain dry conditions at Isabel Avenue for the bridge construction work from mid-May 2012 thru the end of September 2012.
- For the 2012 Water Year discharge computations, the Arroyo Mocho Pleasanton (AMP) stage-discharge rating curve was updated for flows from about 200 to 1,400 cfs to take into account improved rating definition based on a new 600 cfs discharge measurement made on November 11, 2012 of the 2013 Water Year. In addition, the AM_KB stage-discharge rating was updated for flows from about 100 to 600 cfs by extrapolation of new 187 and 238 cfs discharge measurements made at the upstream AMHAG stream gage in early 2013 Water Year.
- Vulcan Materials discharged 6,463 AF into the Arroyo Mocho (see Section 3.5.2).
- The peak flow recorded at the AMHAG stream gage was 416 cfs (poor) on January 21, 2012; at the Arroyo Mocho at Kaiser Bridge (AM_KB) stream gage the peak flow was 261 cfs (poor) on January 21, 2012; and at the AMP stream gage the peak flow was 716 cfs also on January 21, 2012. There will continue to be suspected inconsistencies between AMHAG and AM_KB peak flows until new high flow discharge measurements can be made.
- At the AMP stream gage, two new upper outside staff gages and crest stage gages were installed. The outside staff gages now cover a gage height range from 3.33 ft to 16.94 ft. The crest stage gages now cover a range from 6.91 ft to 18.41 ft.

- In February, the stilling well at the AMP stream gage was thoroughly flushed to allow for the reinstallation of a float at a later time. The stilling well intakes had completely filled in and were no longer useable after years of sediment accumulation and clogging.
- For the second year of a multi-year sediment transport study, automated turbidity-triggered auto-samplers were still in place at AMHAG and AMP. Bedload and suspended sediment samples were also collected on a couple of occasions during high flow events by Zone 7's consultant, San Francisco Estuary Institute (SFEI).
- Water temperature monitoring was added to the AMH, AM_KB, and AMP stream gages.

3.3.2.4 Arroyo Las Positas

The following are items of special note for the Arroyo Las Positas in the 2012 Water Year:

- A total of 562 AF of artificial stream recharge releases were made into the Arroyo Las Positas (SBA_ALT) October 1 through November 15, 2011 and May 31 through September 30, 2012.
- At the Arroyo Las Positas near Livermore (ALPL) stream gage, brand new electronics consisting of a recorder, a bubbler, a water temperature sensor, and a voice/data modem were installed and in use by November 23, 2011.
- The peak flow recorded at ALPL during the 2012 Water Year was 311 cfs on October 6, 2011 and the peak flow recorded at the Arroyo Las Positas at El Charro station (ALP_ELCH) was 357 cfs on January 21, 2012.
- For the 2012 Water Year discharge computations, the ALPL stage-discharge rating was updated between 30 and 900 cfs to take into account control changes indicated by a new high flow discharge measurement of 410 cfs made on November 30, 2012 of the 2013 Water Year.
- The ALP ELCH stage-discharge rating that was updated for the 2011 Water Year from 0 to 500 cfs, based on 16 new discharge measurements ranging from 0.58 to 188 cfs, was continued in use for the 2012 Water Year.
- A HOBO water temperature recorder was added to ALP_ELCH on August 1, 2012.
- No water samples were collected along the Arroyo Las Positas above or below the PPWTP for the NPDES objective for the 2012 Water Year as no flow was observed during site visits.
- For the second year of a multi-year sediment transport study, turbidity-triggered auto-samplers were in place at ALPL. Bedload and suspended sediment samples were also collected on a couple of occasions during high flow events by Zone 7's consultant, San Francisco Estuary Institute (SFEI).

- On June 12, 2012, eight synoptic discharge measurements were made along the Arroyo Las Positas from just below the confluence with Altamont Creek to El Charro Road, an approximately 6.6 mile reach. The synoptic found that there is 1.05 cfs of recharge in this reach during this time of year when the ALPL stream gage is at 2.8 cfs.
- On August 6, 2012, six more synoptic discharge measurements were made along the Arroyo Las Positas at a slightly higher flow of 6.0 cfs at the ALPL stream gage. The discharge measurements were once again made from just below the confluence with Altamont Creek to El Charro Road. The synoptic found that there is 1.48 cfs of recharge along this reach during this time of year when the ALPL stream gage is at 6.0 cfs.
- On November 19, 2011 the Lawrence Livermore National Laboratory flushed their pipelines with approximately 500,000 gallons of water over the course of the day (daily average of 0.77 cfs). The majority of this water flowed to the Arroyo Las Positas. On January 26, 2012, 100,000 gallons of water was again flushed over the course of the day (daily average of 0.15 cfs). The ALPL stream gage did not record noticeable changes in the Arroyo Las Positas flow due to these pipeline flushes.

3.3.2.5 Arroyo De La Laguna

The following are items of special note for the Arroyo De La Laguna in the 2012 Water Year:

- Water flowed continuously down the Arroyo De La Laguna throughout the 2012 Water Year. The peak flow recorded at the Arroyo De La Laguna at Verona station (ADLLV) during the 2012 Water Year was 3,260 cfs on January 21, 2012.
- A total of 26,137 AF of water flowed out of the valley past ADLLV during the 2012 Water Year, 49% of average (where the average is 53,870 AF for Water Years 1970-2011).
- At the ADLLV stream gage, October 1 – October 21, 2011, daily discharge values were estimated because a 600 foot stream bank stabilization and restoration project at the Verona bridge (location of the stream gage) was still under way disrupting the normal stream gaging. The stabilization and restoration project had also caused the need for estimation of discharge daily values from August 20 – September 30 of the 2011 Water Year. The project was a collaboration of several regional agencies including the Alameda County Resource Conservation District, Natural Resources Conservation Service, the San Francisco Public Utilities Commission, Alameda County Public Works Department, Alameda County Flood Control and Water Conservation District, and Zone 7 Water Agency. Following the project, USGS restored the gage operations and continued to monitor and maintain it for Zone 7, ACWD, and U.S. Geological Survey (USGS) purposes.



**TABLE 3.3-1
SURFACE WATER MONITORING STATIONS
AND MONITORING FREQUENCIES
2012 WATER YEAR**

Station ID	Description	Gage Type	Program and Frequency				
			Groundwater Management		Other Programs		
			Flow	Wtr Temp	Sample	Wtr Rights	NPDES
ARROYO VALLE - LINE E							
AVBLC	Arroyo Valle Below Lang Canyon	Recorder	R		A		
LDV_FLD_GATE	Lake Del Valle Flood Gate	Meter	D				
LDV_FLD_TTL	Lake Del Valle Total Flood Release	None	D				
AVRUNOFF	Arroyo Valle Runoff	None	D				
SBA_TO2_AV	SBA Turnout 2 to Arroyo Valle	Meter	D				
AVTO2	Arroyo Valle below Turnout 2	Recorder		R			
AVCAT	Arroyo Valle along Camp Arroyo Trail	Recorder		R			
AVNL	Arroyo Valle Near Livermore	Recorder	R	R	Q	Q	
SBA_TO1_AV	SBA Turnout 1 to Arroyo Valle	Meter	D				
SBA_AV_TTL	SBA Turnouts to Arroyo Valle - Total	None	D				
AVDCC	Arroyo Valle at Dry Creek Confluence	Recorder		R			
AVSGP	Arroyo Valle at Sycamore Grove Park	Recorder		R			
STRIB_ADVWTP	South Tributary Above DVWTP	None					A
DVWTP_DISCH	DVWTP Discharge to South Tributary	Meter	D				
STRIB_KB	South Tributary at Kalthoff Bridge	None					A
AV_ISABEL	Arroyo Valle at Isabel Avenue	Recorder		R			
MA_LS_SC	Lonestar Discharge to Shadow Cliffs	Meter	D				
MA_LS_AV	Lonestar Discharge to Arroyo Valle	Meter	D				
AV_DIV_SC	Arroyo Valle Diversion to Shadow Cliffs	Meter	D				
AVSCP18	Arroyo Valle at Shadow Cliffs Pond K18	Recorder		R			
ADVP	Arroyo Valle at Pleasanton	Recorder	R	R	Q	Q	
AVADLL	Arroyo Valle above Arroyo De La Laguna	Recorder		R			
ARROYO MOCHO - LINE G							
AMNL	Arroyo Mocho Near Livermore	Recorder	R		A		
SBA_AM	SBA Turnout to Arroyo Mocho	Meter	D				
WEN_DIV_AM	Wente Diversion from Arroyo Mocho	Meter	D				
AMHAG	Arroyo Mocho At Livermore	Recorder	R	R	A		
MA_CM_AM	Calmat Dishcharge to Arroyo Mocho	None	D				
AM_KB	Arroyo Mocho at Kaiser Bridge	Recorder	R	R	A		
AMP	Arroyo Mocho Near Pleasanton	Recorder	R	R	A		
ARROYO LAS POSITAS - LINE H							
SBA_ALTC	SBA Turnout to Altamont Creek	Meter	D				
LIV_DIV_BPT	Livermore Diversion from Brushy Peak Trib	Meter	D				
ALP_APPWTP	Arroyo Las Positas above PPWTP	None					A
PPWTP_DISCH	PPWTP Discharge to Arroyo Las Positas	Meter	D				
ALP_BPWTP	Arroyo Las Positas below PPWTP	None					A
LLNL_ALP	LLNL Treated Groundwater Discharge to ALP	Meter	D		D		
LLNL_SECO	LLNL Treated Groundwater Discharge to ALP	Meter	D		D		
ALPL	Arroyo Las Positas at Livermore	Recorder	R	R	A		
ALP_ELCH	Arroyo Las Positas at El Charro	Recorder	R	R	A		
ARROYO DE LA LAGUNA - LINE B							
ADLLV	Arroyo De La Laguna at Verona	Recorder	R	R	A		

R = Recorder
D = Daily
Q = Quarterly
A = Annual



**TABLE 3.3-2
STREAM GAGE DETAILS
RECORDER TYPE STATIONS
2012 WATER YEAR**

	Station Name	Site ID	Parameters Recorded	Data Collected By	Drainage Description	Drainage Area (mi ²)	Gage Datum	Location* Lat. Long	
Arroyo Valle (AV)	Arroyo Valle below Lang Canyon	AVBLC	Gage Height	USGS	Upland Valle Drainage Basin	130	750.00'	2029018	6218632
	Arroyo Valle near Livermore	AVNL	Gage Height, Water Temperature	USGS	Valle below dam and SBA Releases; (regulated flow due to dam)	147	510.44'	2051872	6197234
	Arroyo Valle at Pleasanton	ADVP	Gage Height, Water Temperature	Zone 7	Valle Drainage Basin	171	312.66'	2068336	6161483
Arroyo Mocho (AM)	Arroyo Mocho near Livermore	AMNL	Gage Height	Zone 7	Upland Mocho Drainage Basin	38.2	746.47'	2052947	6212841
	Arroyo Mocho at Livermore	AMHAG	Gage Height, Water Temperature, Turbidity	Zone 7	AM before mining discharges	50.8	374.78'	2071596	6181235
	Arroyo Mocho at Kaiser Bridge	AM_KB	Gage Height, Water Temperature	Zone 7	AM before confluence with ALP	60.2	325.47'	2077841	6171655
	Arroyo Mocho near Pleasanton	AMP	Gage Height, Water Temperature, Turbidity	Zone 7	Mocho Drainage Basin	141	323.77'	2076846	6164322
Arroyo Las Positas (ALP)	Arroyo Las Positas at Livermore	ALPL	Gage Height, Water Temperature, Turbidity	Zone 7	Upland Positas Drainage Basin	53.3	460.99'	2079760	6193222
	Arroyo Las Positas at El Charro	ALP_ELCH	Gage Height, Water Temperature	Zone 7	Positas Drainage Basin	75	338.82'	2078400	6172552
Arroyo De La Laguna (ADLL)	Arroyo de la Laguna near Verona	ADLLV	Gage Height, Water Temperature, Specific Conductance, pH	USGS	Laguna Drainage Basin	403	280.00'	2053613	6161313

* State Plane Coordinates Ca. Zone III, NAD83



**TABLE 3.3-3
MONTHLY STREAM FLOWS (ACRE-FEET)
RECORDER STATIONS
2012 WATER YEAR**

MONTH	ARROYO VALLE Below LANG CANYON* AVBLC	ARROYO VALLE Near LIVERMORE* AVNL	ARROYO VALLE At PLEASANTON ADVP	ARROYO MOCHO Near LIVERMORE AMNL	ARROYO MOCHO At LIVERMORE AMHAG	ARROYO MOCHO At KAISER BRIDGE AM_KB	ARROYO MOCHO Near PLEASANTON AMP	ARROYO LAS POSITAS At LIVERMORE ALPL	ARROYO LAS POSITAS At EL CHARRO ALP_ELCH	ARROYO DE LA LAGUNA At VERONA* ADLLV
OCT	0	536	179	4	111	633	1,230	588	518	2,311
NOV	4	379	165	11	22	552	985	349	353	1,670
DEC	15	320	119	28	0	469	621	165	149	813
JAN	207	271	331	73	77	560	1,194	364	426	3,666
FEB	115	1,186	676	57	0	285	480	188	185	2,124
MAR	367	875	816	98	240	511	1,302	495	591	5,462
APR	787	403	315	227	250	804	1,526	490	599	5,453
MAY	64	428	98	28	33	337	465	150	109	1,129
JUN	0	436	111	7	21	317	442	176	124	1,009
JUL	0	586	155	1	14	355	491	174	120	1,047
AUG	0	621	122	0	0	106	227	167	112	716
SEP	0	585	99	0	10	205	308	135	86	738
TOTAL	1,557	6,626	3,188	534	779	5,132	9,271	3,443	3,372	26,137

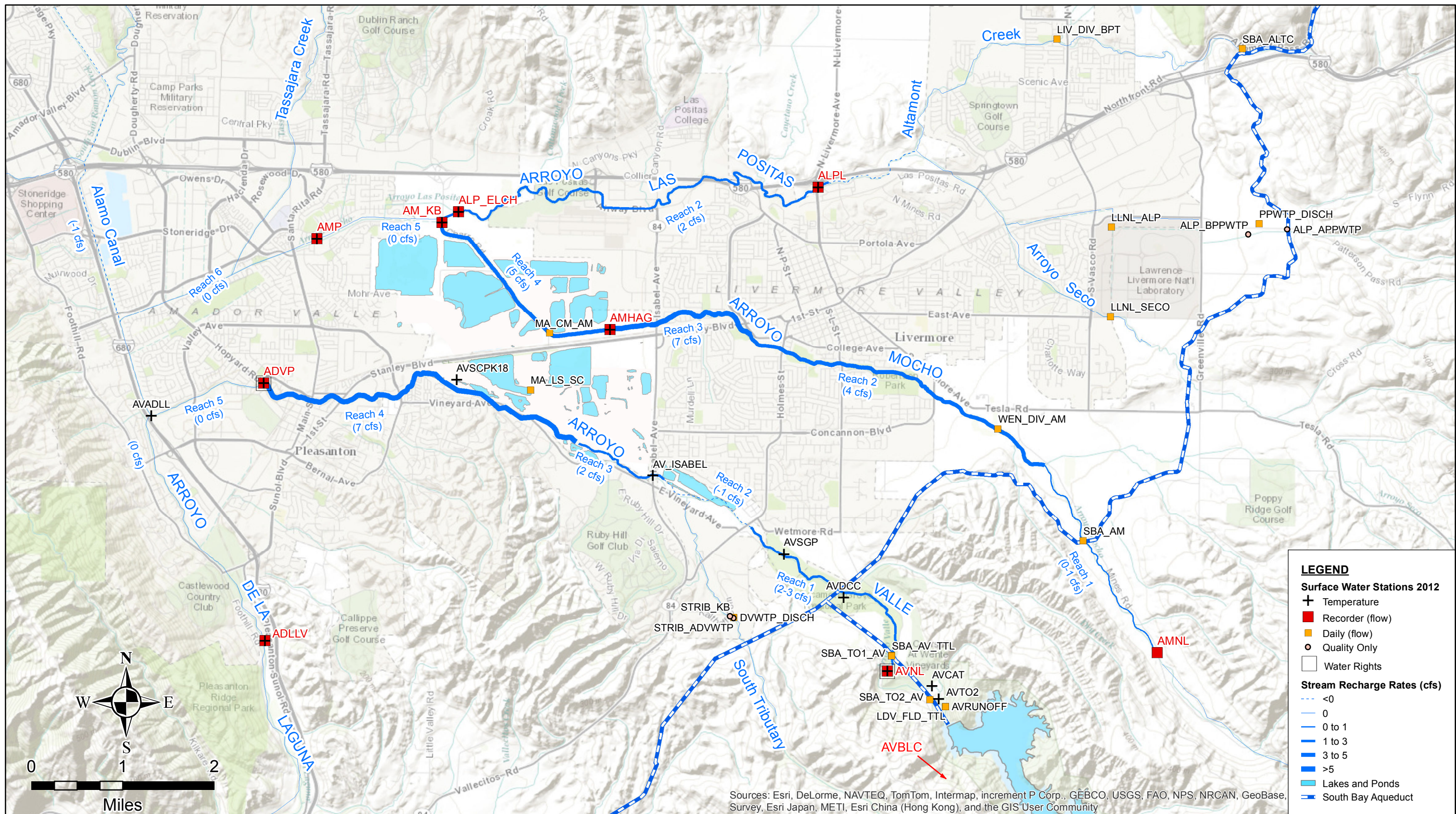
* USGS Stations



**TABLE 3.3-4
SURFACE WATER QUALITY
SURFACE WATER MONITORING STATIONS
2012 WATER YEAR**

			FLOW	TEMP.	EC		Mineral Constituents (mg/L)									Select Metals (mg/L)				TDS	Hard
SITE ID	DATE	TIME	(cfs)	°C	umhos/cm	pH	Ca	Mg	Na	K	HCO3	SO4	Cl	NO3	SiO2	B	As	Fe	Mn	mg/L	mg/L
ADLLV	1-Oct-12	16:21	8.9	23.5	1044	8.4	62	37	114	2.7	295	110	141	0.62	12.4	0.72	0.003	<0.05	<0.01	632	305
ADVP	14-Feb-12	13:15	14	10.8	423	7.2	35	18	33	3.1	186	33	31	<0.44	7.8	0.23	0.0011	<0.05	<0.01	253	162
ADVP	23-May-12	14:23	0.64	20.1	550	8.2	34	23	42	1.8	157	41	70	<0.44	5.7	0.23	0.0012	<0.05	<0.01	297	182
ADVP	3-Aug-12	15:20	2.1	22.3	531	8.0	30	20	47	1.9	152	41	72	<0.44	8.6	0.27	0.0019	<0.05	<0.01	297	158
ADVP	28-Sep-12	17:35	1.9	18.9	494	8.0	29	16	47	2.0	152	28	64	<0.44	5.1	0.24	0.0015	<0.05	<0.01	267	139
ALP_ELCH	30-Nov-11	15:35	2.6	9.7	1510	8.4	78	49	176	1.9	427	99	231	16.92	22.9	2.89	0.0026	<0.05	<0.01	895	397
ALP_ELCH	9-Jan-12	15:50	2.2	7.9	1509	8.5	81	47	183	2.1	419	101	222	16.92	20.7	2.98	0.0025	<0.05	<0.01	892	396
ALPL	30-Nov-11	17:00	3.6	11.5	1432	8.2	81	43	163	1.9	418	87	216	21.08	27.4	2.62	0.002	<0.05	<0.01	852	379
AM_KB	11-Oct-12	14:58	0.12*	16.2	581	8.0	22	18	61	3.1	117	22	106	3.90	13.1	0.15	0.0017	<0.05	<0.01	308	132
AMHAG	1-Oct-12	16:58	4.1*	24.1	651	8.2	22	18	80	3.5	157	27	131	<0.44	10.5	0.15	0.002	<0.05	<0.01	372	130
AMNL	23-May-12	12:28	0.28	19.2	999	8.1	50	89	38	2.4	564	52	40	<0.44	12.6	0.80	<0.001	<0.05	0.013	568	494
AMP	1-Oct-12	15:25	1.7*	26.3	1351	8.5	64	42	148	4.3	303	77	226	12.84	19.0	1.38	0.0029	<0.05	<0.01	751	332
AVBLC	23-May-12	11:55	<0.1	24.3	604	8.2	55	31	28	1.8	291	56	23	<0.44	10.8	0.98	<0.001	<0.05	<0.01	353	264
AVNL	14-Feb-12	14:25	26	11.2	453	7.4	35	17	41	3.1	163	39	43	1.42	11.0	0.23	0.0018	<0.05	<0.01	271	155
AVNL	23-May-12	13:50	14	20.1	380	8.0	22	11	33	2.0	85	35	46	2.04	12.2	0.19	0.0019	0.051	0.013	206	101
AVNL	3-Aug-12	15:58	10	24.4	351	8.0	15	10	37	2.0	74	19	60	<0.44	10.5	0.11	0.0026	<0.05	<0.01	191	77
AVNL	28-Sep-12	17:02	10	18.4	426	8.2	30	17	34	1.8	149	32	45	0.49	10.5	0.20	0.0016	<0.05	<0.01	246	144
STRIB_ADVWTP	28-Mar-12	15:55	~0.04	14.4	604	7.7	38	16	55	6.5	118	63	98	4.43	20.0	0.17	0.0016	0.21	0.01	360	158
STRIB_KB	28-Mar-12	15:40	~0.03	17.6	611	8.1	42	16	59	9.7	124	69	98	3.50	24.6	0.22	0.0027	0.18	0.04	384	170

* Daily Average



ZONE 7 WATER AGENCY
100 North Canyons Parkway
Livermore, CA

DRAWN: TR

REVIEWED: RG/CW

FILE: E:\MONITOR\SW2012WY\Fig3.3-1-SWStations12.mxd

SCALE: 1 in = 1 Mile

DATE: Mar 21, 2013

FIGURE 3.3-1
Surface Water Monitoring Program
Surface Water Sites in 2012 Program
Livermore Valley Groundwater Basin