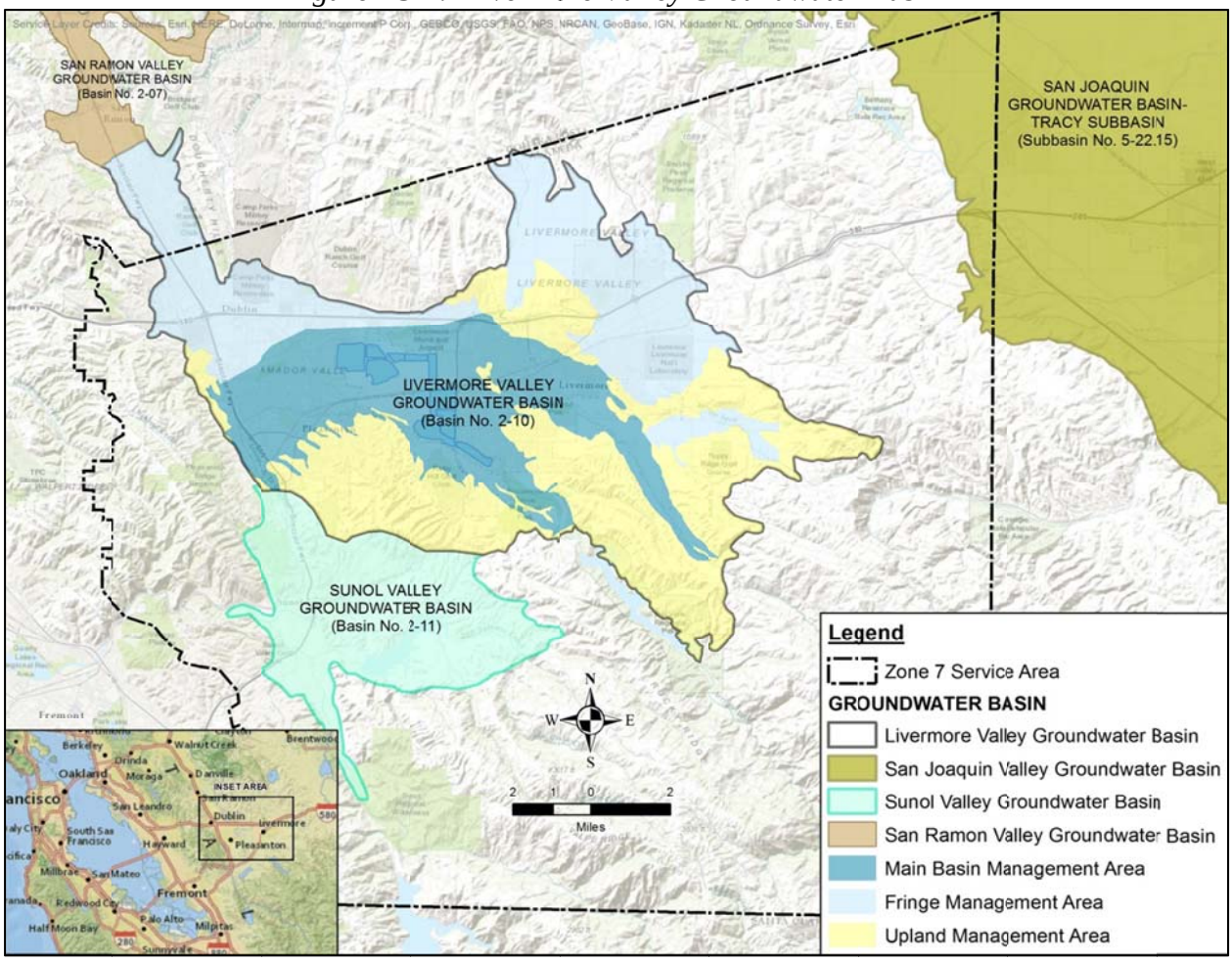
Executive Summary

Introduction

The Annual Report for the Groundwater Management Program for the 2016 Water Year (October 1, 2015 through September 30, 2016) summarizes this year's groundwater monitoring, evaluation, and management efforts in the Livermore Valley Groundwater Basin (*Figure ES-1*).

Figure ES-1: Livermore Valley Groundwater Basin



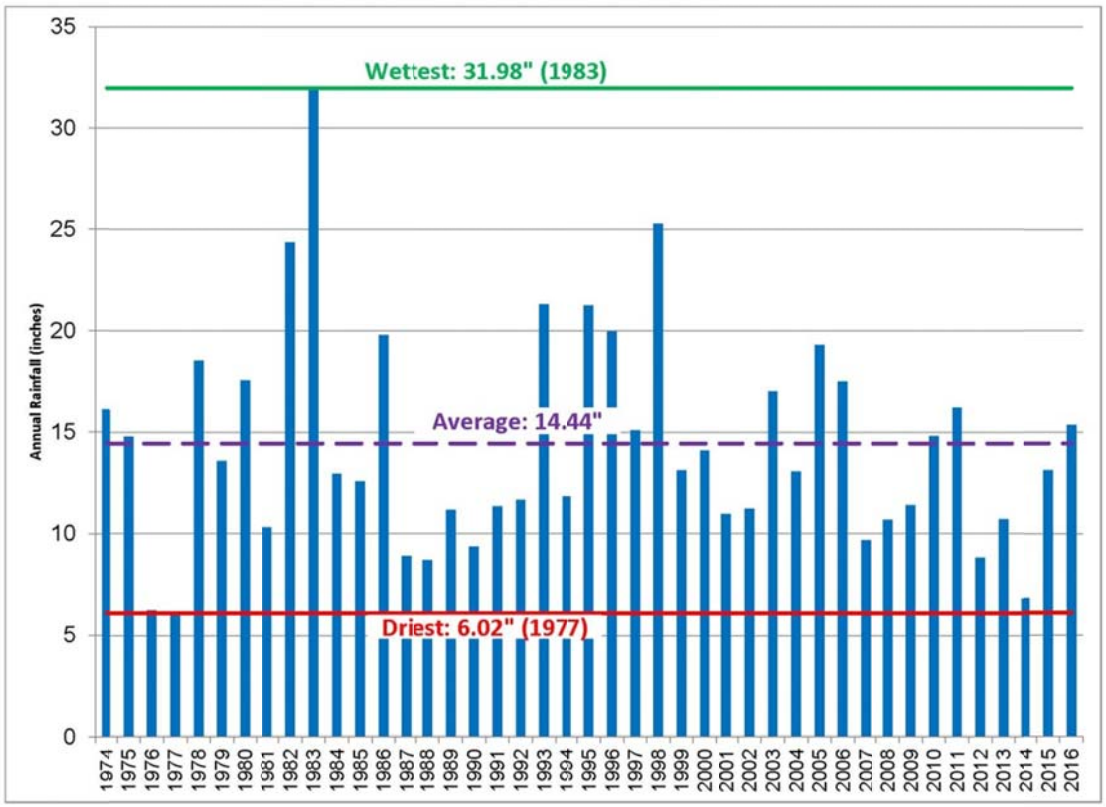
Results for each of the monitoring, evaluation, and management programs are summarized in this Executive Summary, while the details are provided in the sections that follow.

All of the data included in this report are based on the Water Year (WY) (i.e., October 1, 2015 through September 30, 2016); however, due to other reporting obligations, some information in *Section 11* regarding retailer pumping is also compiled and reported on a Calendar Year (CY) basis (i.e., January 1, 2016 through December 31, 2016).

Precipitation and Evaporation (Section 2)

For the 2016 WY, rainfall in the Livermore-Amador Valley was slightly above average, after four water years in a row with below-average rainfall (*Figure ES-2*). The total rainfall for Monitoring Station 15E in Livermore was 15.35 inches for the 2016 WY which was 116% of average for that station. This station had rainfall distributed evenly throughout the rainy season and mimicked the average curve on the rainfall graph. The aquifer replenishment from percolating rainfall was estimated to be 6,554 acre-feet (AF) which is about 152% of normal.

Figure ES-2: Station 15E Rainfall (inches), 1974-2016 Water Years



The Zone 7 network average evapotranspiration (ETo) was approximately 46.75 inches in the 2016 WY, which is equal to the historical network average.

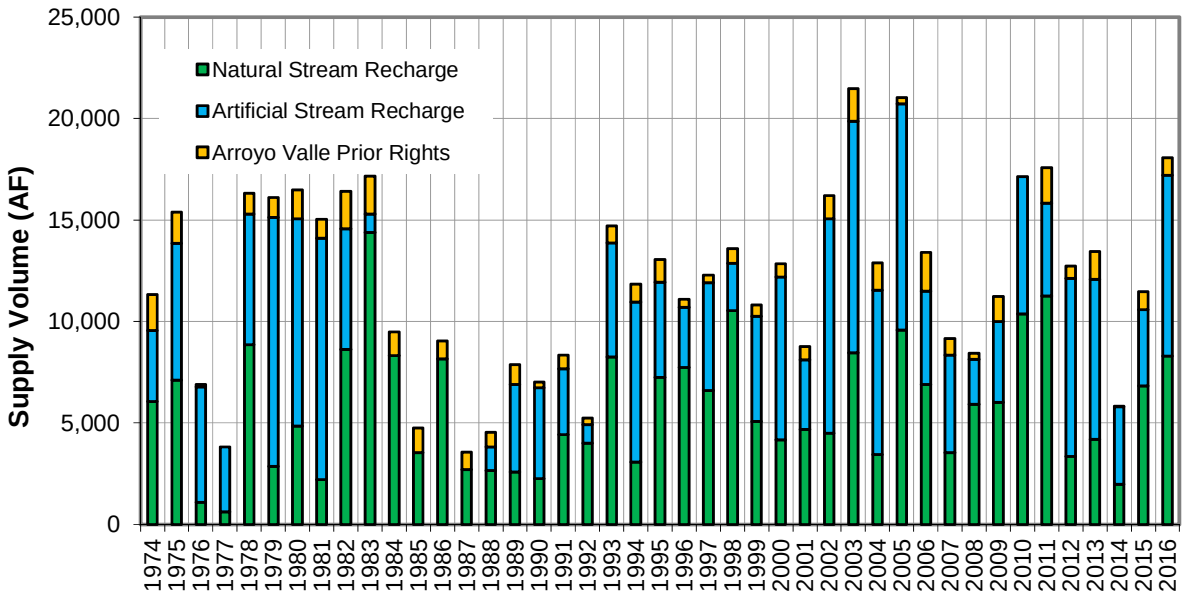
Surface Water Contributions and Losses (Section 3)

Due to the average rainfall and available water from the State Water Project (SWP) allocations during the 2016 WY (20% in the 2015 CY and 60% in the 2016 CY), natural and artificial streamflows in the Valley's arroyos were back to normal or above normal. For the 2016 WY natural stream recharge was above average because of the above-average rainfall for the year. Because of the water available through the SWP, Zone 7 was also able to artificially recharge about 9,794 AF for the water year, of which 884 AF was allocated to Arroyo Valle Prior Rights (*Figure ES-3*). 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. Streamflow was recorded

at the downstream Arroyo del Valle Pleasanton (ADVP) gauge for all but five days (June 27, 2016 thru July 1, 2016) compared to 116 days in the 2015 WY when the stream was dry due to the drought.

A total of 30,762 AF flowed past Arroyo De La Laguna at Verona (ADLLV) and out of the Valley in the 2016 WY. This is about 61% of the average outflow between 1970 and 2016.

Figure ES-3: Stream Recharge Volumes (AF), 1974 to 2016 Water Years



Chain of Lakes and Quarry Operations Impacts (Section 4)

Aggregate mining activities continued by Vulcan Materials (formerly Calmat) and CEMEX (formerly RMC and Lonestar) in the central part of the groundwater basin in the 2016 WY. Vulcan Materials completed their mining in pit R24 (future Lake E) and will move on to mining in future Lake D in the 2017 WY. CEMEX moved their processing plant location and started mining the area east of Shadow Cliffs (future Lake J not part of the Chain of Lakes).

In the 2016 WY, 7,782 AF of Vulcan's de-silted mining water was captured in Cope Lake. Approximately 5,954 AF of the captured water was transferred through a pipeline from Cope Lake to Lake I for groundwater recharge. CEMEX did not discharge any groundwater to Arroyo Valle in the 2016 WY; however, evaporation from all the mining pits accounted for approximately 2,897 AF. Exportation of moisture contained in the mined aggregate accounted for an additional estimated 700 AF of groundwater loss in the 2016 WY.

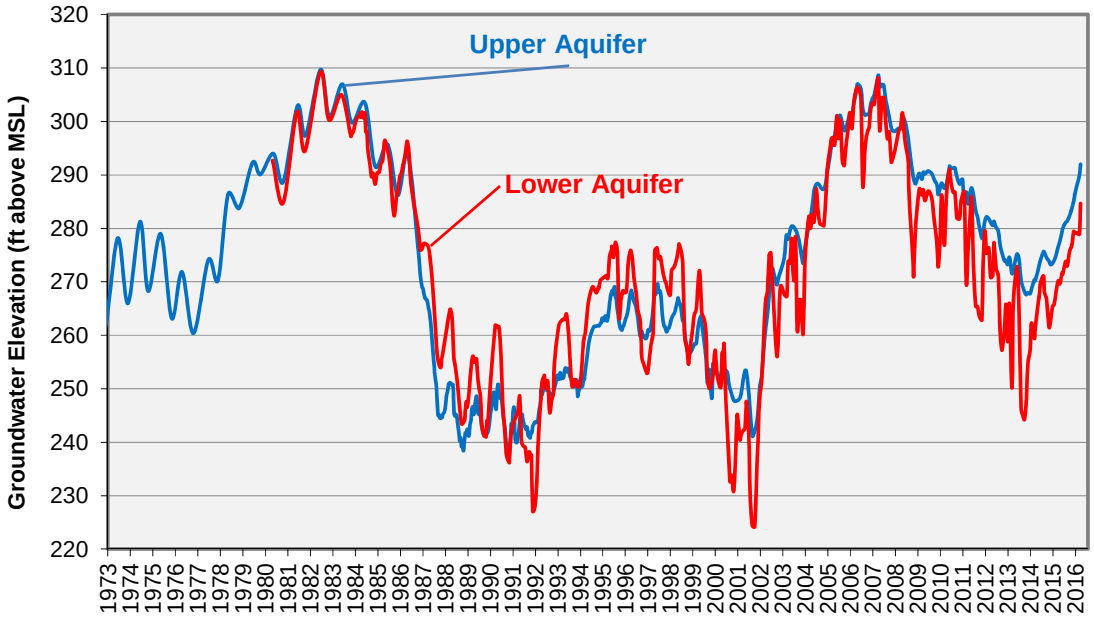
Total dissolved solids (TDS) concentrations in the mining area pits ranged from about 294 milligrams per liter (mg/L) to over 1,000 mg/L, with the better water quality (lower TDS concentrations) found in the ponds that are intercepting groundwater and artificially recharged

surface water. The higher TDS concentrations are found, for the most part, in the clay-lined ponds, where evaporation is concentrating the minerals in the water.

Groundwater Elevations (Section 5)

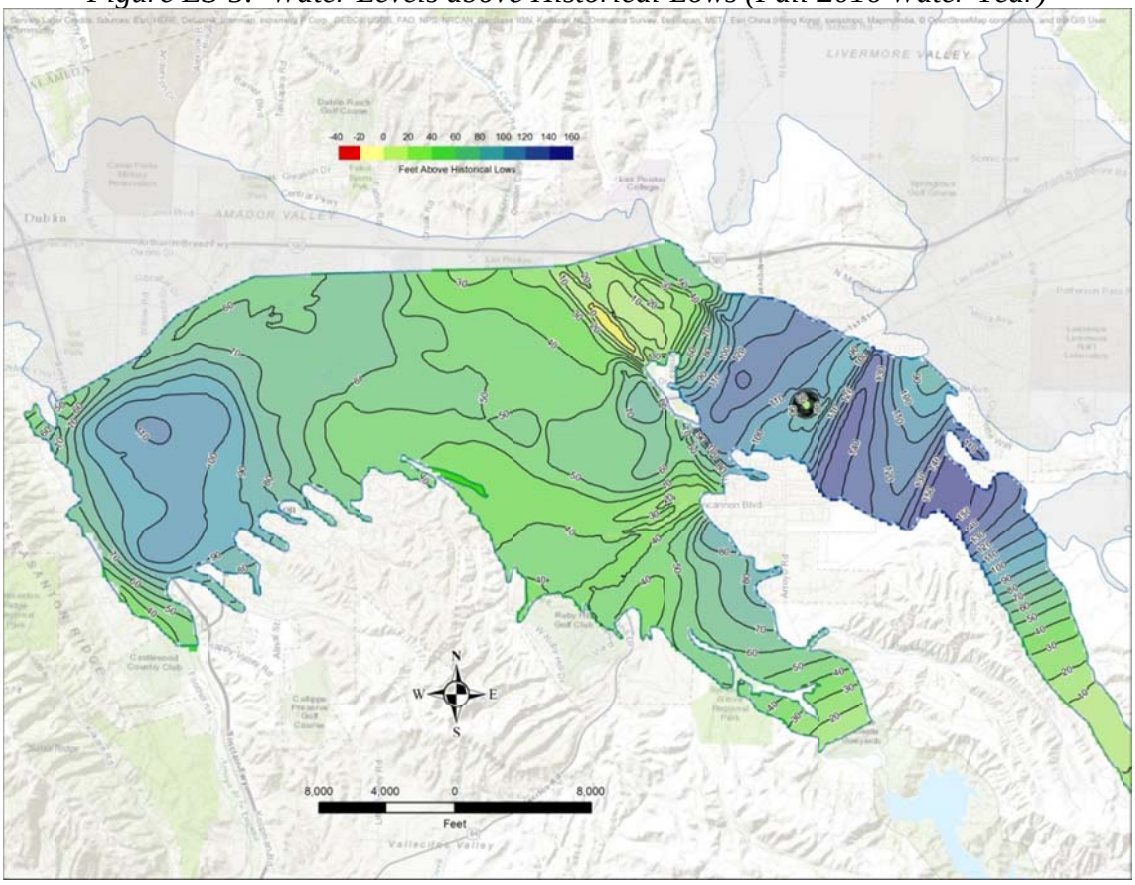
As is usually the case, the 2016 WY groundwater levels varied with seasonal recharge and extraction. Generally the highest water levels are found in spring, at the end of the rainy season, and lowest at the end of the high demand summer/fall seasons. During the first half of the 2016 WY, groundwater elevations rose due to rainfall recharge and reduced water pumping. During the second half of the water year, water elevations leveled off and then dropped as rainfall decreased and water demand increased. For the 2016 WY, water levels generally ended higher than they were at the end of the 2015 WY (*Figure ES-4*).

Figure ES-4: Key Well Water Levels in Amador West Subarea (1973 to 2016)



At the end of the water year, groundwater levels in the lower aquifer in the vicinity of Zone 7's municipal wells were 35 to 104 ft above historical lows, in the vicinity of the City of Pleasanton's wells were at least 42 feet above historical lows, and in the central portion of the Mocho II Subarea, where the majority of the California Water Service (CWS) wells are located, the end of year groundwater levels were 58 to over 130 feet above historical lows (*Figure ES-5*).

Figure ES-5: Water Levels above Historical Lows (Fall 2016 Water Year)



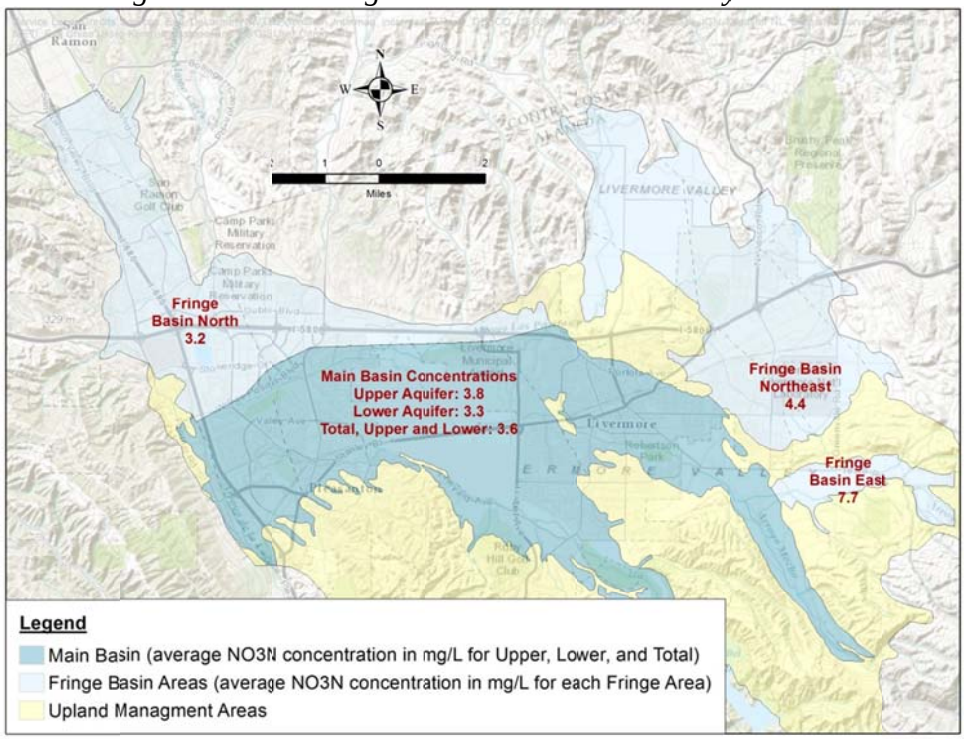
Groundwater Quality/Inorganics (Section 6)

Groundwater quality is generally good in the Main Basin. The main constituents of concern identified in the Regional Water Quality Control Board's (RWQCB's) Basin Plan Objectives are salts (TDS) and nitrate.

The calculated basin-wide average TDS concentration at the end of the 2016 WY was approximately 602 mg/L, with the upper aquifer averaging 697 mg/L and the lower aquifer averaging 490 mg/L. The Basin Plan objective is 500 mg/L for the Main Basin. Zone 7's approved Salt Management Plan (SMP) provides a long-term plan for meeting this objective.

There are plume-like nitrate "hot spots" distributed across the Main and fringe basins, however the aquifer weighted basin-wide average nitrate concentration is 3.6 mg/L (as N), well below the Basin Plan objective of 10 mg/L (*Figure ES-6*). For the 2016 WY, the average nitrate concentration was 3.8 mg/L in the upper aquifer and 3.3 mg/L in the lower aquifer.

Figure ES-6: Average Nitrate Concentrations by Subarea



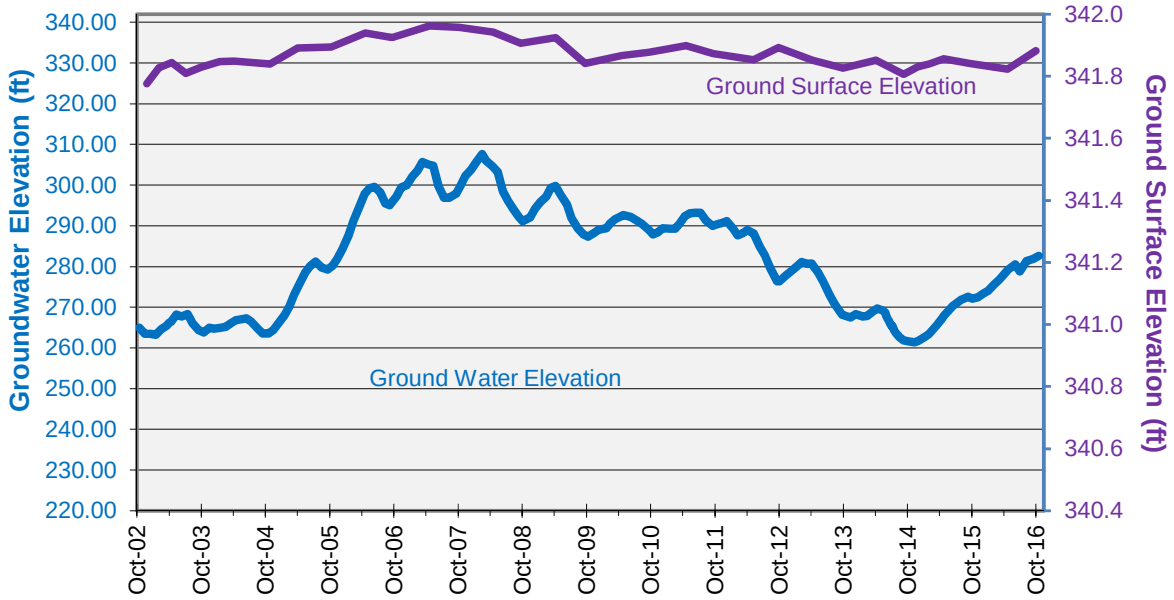
Boron is a naturally-occurring element typically found at very low concentrations in groundwater from the Livermore Groundwater Basin. While there is no maximum contaminant level (MCL) for boron, it is a problem for some irrigated crops when it exceeds 1 or 2 mg/L, depending on the crop's sensitivity. Boron concentrations in the lower aquifers of the Main Basin are generally below 2 mg/L throughout the lower aquifers, but boron exists at elevated concentrations (up to 31 mg/L) in the upper aquifer mainly in two areas of the groundwater basin: 1) in the eastern fringe basin area, and 2) along the boundary between the Main Basin and the Dublin and Camp fringe basins. The occurrences of boron in groundwater are depicted in *Figure 6-8 and Figure 6-9* of the main report.

Chromium is also a naturally occurring element found in groundwater from the Livermore Groundwater Basin. While total chromium has always been included in the groundwater sampling program it is being monitored more closely due to a new MCL of 0.01 mg/L for hexavalent chromium (CrVI) that was established in July 2014. To be conservative, the Groundwater Quality Program assumes that the total chromium concentration is made up of exclusively CrVI. Chromium concentrations were detected above the new MCL in four areas of the upper aquifer at concentrations up to 0.051 mg/L and in three areas in the lower aquifer at concentrations up to 0.075 mg/L. The occurrences of chromium in groundwater are depicted in *Figure 6-10* and *Figure 6-11* of the main report.

Land Surface Elevation (Section 7)

Overall, ground surface elevations rose 0.01 ft to 0.04 ft in most of the monitored area during the 2016 WY, either due to the rise in water levels or the re-wetting of expansive soils present in the area as rainfall returned to normal and irrigation partially resumed. *Figure ES-7* shows the variation in land surface elevations observed near the Mocho Wellfield from 2002 through the 2016 WY. Based on the data collected for the Surface Elevation Monitoring Program, there was no indication that inelastic subsidence occurred anywhere in the valley during the water year due to groundwater pumping.

Figure ES-7: Surface Elevation and Groundwater Levels at Mocho Wellfield



Wastewater and Recycled Water (Section 8)

Approximately 5,300 AF of the 17,647 AF of the wastewater produced in the Valley (about 30%) was recycled and used for landscape irrigation in the 2016 WY. The City of Livermore (LWRP) produced and applied about 1,930 AF of the recycled water while Dublin San Ramon Services District (DSRSD) generated and used about 3,681 AF. About 26% (504 AF) of the recycled water produced by LWRP was applied over the Main Basin; whereas the remainder was applied on areas outside of the Main Basin primarily on fringe basin areas and upland areas north of the Main Basin. All of DSRSD's recycled water was applied on areas north of the Main Basin. The recycled water from both wastewater plants met the State Division of Drinking Water "Title 22" water quality standards for irrigation uses during the 2016 WY.

It is estimated that less than 1% of the Main Basin's groundwater inflow component (i.e., recharging waters) in the 2016 WY was the result of applied recycled water percolating beyond the root zones. More important, however, the use of recycled water to irrigate urban landscape

conserved up to 5,611 AF of groundwater storage, assuming that the irrigation demand would have been met with groundwater supplies in the 2016 WY.

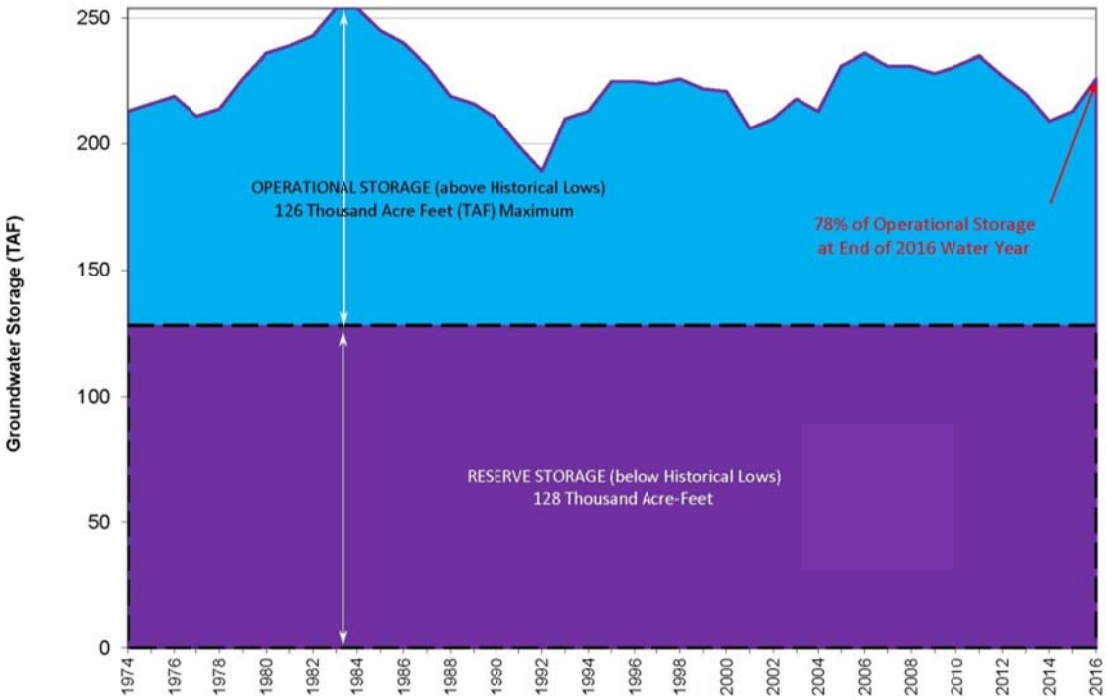
Land Use (Section 9)

The biggest change in land use over the last several years was the commercial and residential development along El Charro Road in Livermore and Fallon Road in Dublin (both, north and south of Interstate 580), and the addition of some irrigated vineyards in South Livermore. Otherwise land use remained similar to the 2015 WY.

Water Budget (Section 10)

During the 2016 WY, groundwater supplies stored locally in the Main Basin increased by approximately 13,000 AF. As a result, the 2016 WY ended with an estimated 226,000 AF of groundwater in total storage with 98,000 AF considered operational storage (available above historical lows). This represents about 78% of the Main Basin's operational storage capacity (*Figure ES-8*).

Figure ES-8: Groundwater Storage (1974 to 2016 Water Years)



Groundwater Supply Sustainability (Section 11)

Zone 7 has been sustainably managing the Livermore Valley's groundwater storage and use for over 40 years. Zone 7 adaptively manages its groundwater supply with regard to current hydrologic conditions, water demands, water quality conditions, and future water supply/demand forecasts. Groundwater supply sustainability is evaluated as two main components:

- Natural Sustainable Yield Supply and Demand
- Zone 7 Supply and Demand

The Natural Sustainable Yield Supply components include the aquifer recharge derived from natural stream flows, rainfall, irrigation percolation, and subsurface inflow. The demand components assigned to the Natural Sustainable Yield include all groundwater pumping except Zone 7 pumping. The Zone 7 Supply and Demand components refer to the artificial recharge (supply) and municipal pumping (demand) that Zone 7 achieves each water year.

In the 2016 WY, the total Natural Sustainable Yield demand was 11,531 AF, while the total Natural Sustainable Yield supply was 18,426 AF. For the Zone 7 components, 2,002 AF was pumped from the Main Basin compared to 8,910 AF that Zone 7 artificially recharged in the 2016 WY.

Figure ES-9: Groundwater Inflows and Outflows Since 1974

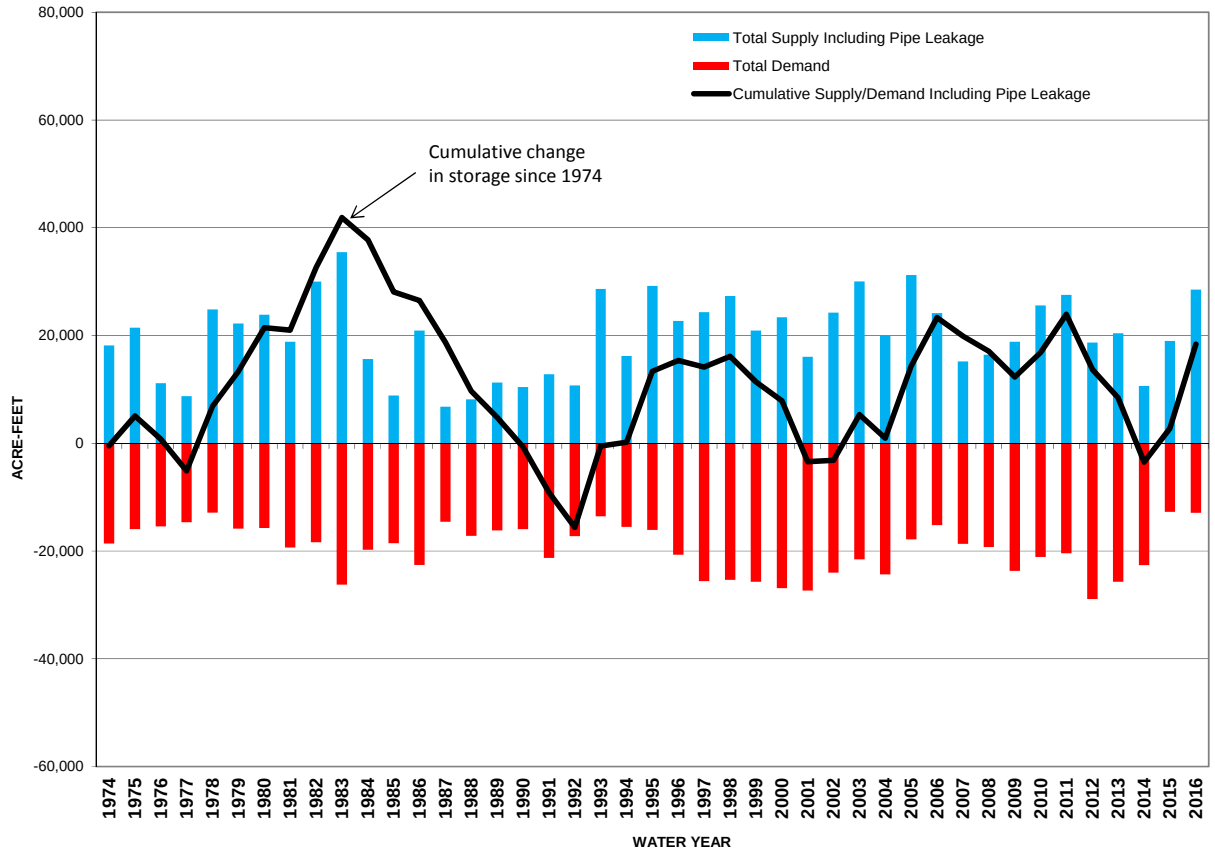


Figure ES-9 above portrays the results of more than 40 years of Zone 7's groundwater supply management activities for the Main Basin. As demonstrated by the graph, any given year may have an imbalanced inflow and outflow, but long-term sustainability has been achieved; in this

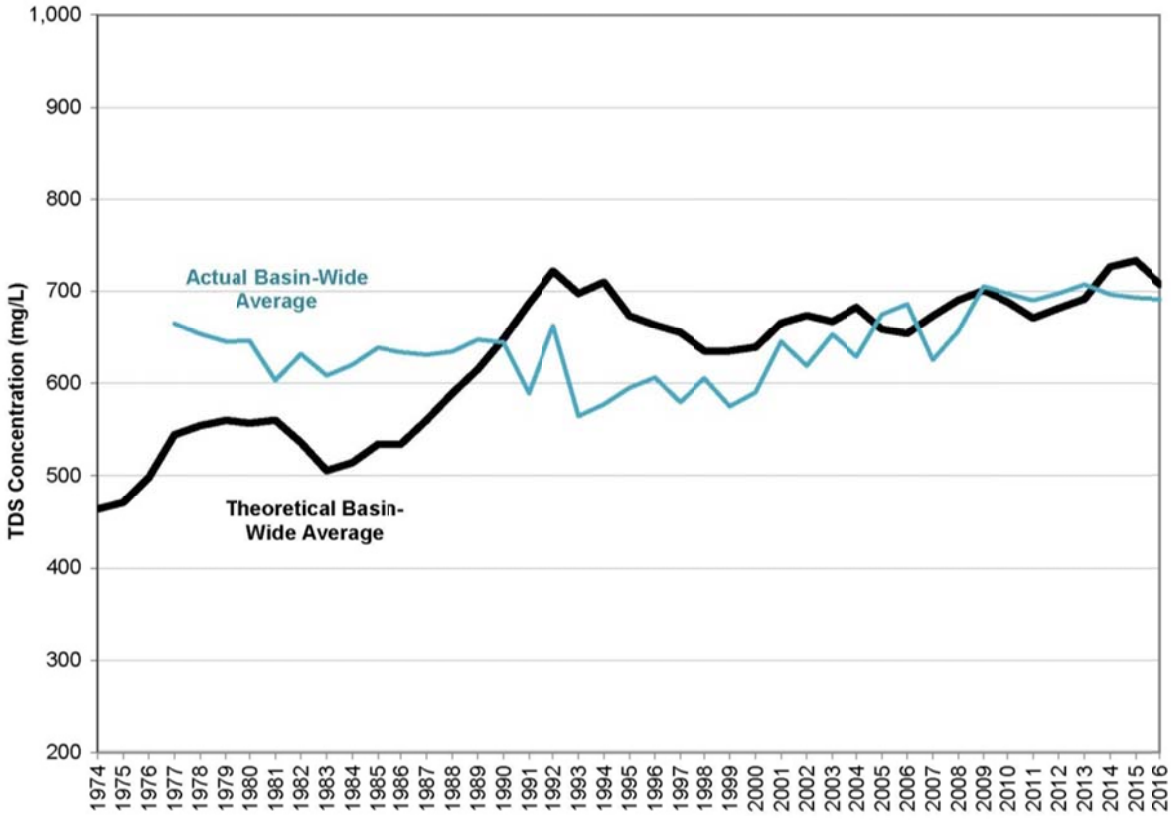
case, for 42 years. The sustainability for each supply and demand component is discussed in *Section 11.4*.

Water Quality Sustainability (Section 12)

Zone 7's water quality sustainability program for the Livermore Valley Groundwater Basin consists of four components: salt management, nutrient management (including onsite wastewater treatment system (OWTS) management), well ordinance, and toxic sites surveillance. A description of each program and a summary of the 2016 WY results are provided in *Section 12*.

The net Main Basin salt loading for the 2016 WY increased by 7,688 tons of salt, but the theoretical average TDS concentration of the entire groundwater basin decreased by about 25 mg/L. This is because much of the net increase of water in the basin came from low-TDS rainfall and imported water. In an attempt to increase basin storage as quickly as possible following the drought, Zone 7's MGDP operations (*Section 12.1.6*) were minimal for a second consecutive year. The MGDP operations accounted for only 183 tons of salt being exported from the Valley in the 2016 WY, as compared to 76 tons in the 2015 WY and 1,049 tons in the 2014 WY.

Figure ES-10: Main Basin Average Actual vs. Theoretical TDS Concentration (1974 to 2016 Water Years)



In addition to calculating the average TDS concentration in the upper and lower aquifers from

the monitoring well samples (see Groundwater Quality Section above), Zone 7 tracks a running theoretical basin-wide average TDS concentration by dividing the inventoried salt load at the end of each water year by the year-end inventoried groundwater storage (*Figure ES-10*).

Zone 7 also tracks nutrient concentrations in groundwater, primarily nitrate and phosphate. In general, there is not a nutrient loading problem in the groundwater basin; however, there are a few areas with high nitrate concentrations (NMP Areas of Concern) that are believed to have been caused mainly by historical agricultural and municipal wastewater practices that are no longer being employed over the groundwater basin.

On the recommendation of staff, the Zone 7 Board authorized three new commercial OWTS uses and one increased OWTS use for an existing commercial site in the 2016 WY on the basis that they met either the one RRE per 5 acres standard or the stricter NMP standard if the site was located in one of the NMP Areas-of-Concern.

In the 2016 WY, Zone 7 issued 163 drilling permits, three less than were issued in the 2015 WY. Zone 7 permit compliance staff inspected approximately 63% of all permitted well work in the 2016 WY. The remaining well work was allowed to self-monitor with required reporting. In June 2015, Alameda County and Zone 7 entered into a memorandum of understanding (MOU) that delegates the administration and issuing of water well permits to Zone 7 for all wells within Zone 7's service area. The implementation of the County fee program for permits started in the 2016 WY.

Zone 7's Toxic Site Surveillance program tracked the progress of 38 active contamination cases where contamination has been detected in groundwater or is threatening groundwater. Eight of the sites are designated as "High Priority" because they have impacted or are an immediate threat to potable water supply wells or surface water. Five of the high priority sites are fuel leak cases; the other three cases involve solvent contamination (tetrachloroethylene [PCE]). Five contamination cases were closed during the 2016 WY after they were determined to no longer pose a threat to drinking water. At the end of the water year, six other toxic site cases were being considered for closure. One new case was added to the program.