

**Annual Report for the
Groundwater Management Program
2010 Water Year
Livermore Valley Groundwater Basin**

PREPARED BY:

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ES Executive Summary

This Annual Report for the Groundwater Management Program summarizes Zone 7's groundwater management and monitoring efforts provided for the Livermore Valley Groundwater Basin for the 2010 Water Year (October 2009 through September 2010). This report includes 2010 Water Year data sets, results, and interpretations for the monitoring, evaluation, and management programs outlined in the Groundwater Management Plan (GWMP) (2005). An update of the GWMP, and its incorporated Salt Nutrient Management Plan, is due for completion by May 2014.

ES 1 Overview

The 2010 Water Year hydrology was shaped by above-normal rainfall (110% of normal) and natural stream recharge (158% of normal). However, due to the limited surplus water available from the Department of Water Resources following three years of drought conditions, artificial recharge provided by Zone 7 was below-average for the year (78% of normal). Combined with the moderate groundwater demands (112% of normal) during the 2010 Water Year, the groundwater basin experienced a slight decrease in groundwater storage (less than 200 acre-feet). The volume of groundwater available above the 'historic lows' was estimated to be 84,000 acre-feet (about 67% of a full basin) at the end of the 2010 Water Year. Main Basin groundwater elevations generally remained the same as those at the end of the 2009 Water Year. There was no evidence that any inelastic subsidence occurred in the valley during the water year.

The Main Basin saw a net salt load of about 3,943 tons after accounting for the 2,760 tons removed by Zone 7's new Mocho Groundwater Demineralization Plant (MGDP) in the 2010 Water Year. The largest salt contributors were 'applied water recharge' and 'natural stream recharge' whereas the largest salt remover was 'municipal pumping.' This year's salt load results in a calculated basin-wide average TDS concentration increase of 16 mg/l; from 395 mg/l in 2009 to 411 mg/l in 2010.

There was no increase in the number of high priority toxic sites (11) that impact or are an immediate threat to potable water supply wells within the valley. None of the project referrals received by Zone 7 and reviewed by staff included unmitigated potentially significant impacts for groundwater supply or quality. During 2010, 130 well activity permits were issued, and a record number of well inspections were conducted due to the addition of a Construction Inspector to the Groundwater staff.

Zone 7 installed one new nested monitoring well-set (four wells total) in the southern portion of the Amador Subbasin during 2010 as part of a hydrostratigraphic investigation conducted in cooperation with the Department of Water Resources' Local Groundwater Assistance Program. The monitoring and sampling of these wells have been incorporated into Zone 7's 2011 Groundwater Monitoring Program.

ES 2 Monitoring Programs

Climatological – The 2010 Water Year rainfall in the valley was above average at 110% of normal (Figure ES-1 shows rainfall at Station 15E, which was 102% of normal). The evaporation for the Valley, represented by the Lake Del Valle Station, ended the year with 97% of normal evaporation.

Groundwater – In general, the 2010 Upper Main Basin groundwater levels mirrored the 2009 Upper levels throughout the water year (+/- 12 feet), and ended the year at approximately the same levels they ended the 2009 Water Year, except for in Mocho II Subbasin where they ended the year slightly higher than in 2009 along the Arroyo Mocho (Figure ES-4). The Lower Main Basin groundwater levels also tracked last year's levels (+/- 14 feet), ending the year with groundwater levels slightly lower than the previous year's in the Bernal and eastern Amador Subbasins and slightly higher in the Mocho II and western Amador Subbasins. The greatest difference was observed in the Mocho II Subbasin where parts of the subbasin experienced 15 to 30 feet of groundwater rise (Figure ES-5).

In the central and western portion of the Main Basin, in the areas around Zone 7's and City of Pleasanton's wellfields, groundwater levels ended the year at 40 to 95 feet above historical lows (Figure ES-6). Further to the southwest, in the central and southern portions of the Bernal Subbasin, water levels remain at greater than 100 feet above historical lows. Only SFPUC is using this part of the basin for municipal supply (supplying Castlewood). In the eastern part of the Main Basin (Mocho II Subbasin), where California Water Service wells are located, the end of year groundwater levels were 80 to 130 feet above their respective historical lows.

Groundwater quality in the Upper Main Basin (Figure ES-7) and Lower Main Basin (Figure ES-8) aquifers remained relatively unchanged from the 2009 Water Year. However, individual municipal supply wells in the Mocho Wellfield are experiencing higher than average increases in hardness and salinity. Staff is investigating whether these increases are due to poorly constructed wells in the area or consequences of natural 'leaky' aquitards between the upper aquifers with poorer water quality and the lower aquifers which are being pumped. There is also some indication that it may be a function of the three-year drought that the basin experienced the previous three years.

Surface Water - During the 2010 Water Year, watershed runoff total into Lake Del Valle was 12,914 acre-feet, approximately 60% of average. Flood releases from Lake Del Valle totaled 9,354 acre-feet. The total volume of State Water Project (SWP) water released from the South Bay Aqueduct (SBA) to the Arroyo Valle totaled 3,197 acre-feet, while the release from the SBA to the Arroyo Mocho totaled 4,765 acre-feet. No artificial recharge water was released to the Arroyo Las Positas this water year, however the arroyo flowed all year due to rising groundwater along its upper reaches and its tributaries.

Subsidence – There was no evidence of inelastic (permanent) subsidence due to groundwater pumping during the 2010 Water Year. Most of Zone 7's survey benchmarks increased slightly in elevation from Fall 2009 to Fall 2010 (up to 0.126 feet). This increase in land surface elevation is within the range of elastic subsidence observed over the life of the monitoring program. Elevation changes from Spring to Fall 2010, which varied from -0.048 to +0.037, were also within the range of elastic movement.

Mining Area - Mining activities continued for Vulcan Materials (formerly Calmat) and Cemex (formerly RMC and Lonestar). Vulcan Materials continued their mining in R28 located south of Stanley Boulevard

(future Lake D area) and increased dewatering from various ponds (e.g., R24 – future Lake E). Cemex continued mining in P42, located just north of Arroyo Valle (in the future Lake B area). As a result of these mining operations, about 1,996 acre-feet of the water they discharged to the Arroyo Mocho flowed out of the Valley. Evaporation from the mining ponds accounted for another 3,111 acre-feet of groundwater loss. TDS concentrations in the mining area pits ranged from about 300 mg/L to over 900 mg/L, with the better water quality 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 sealed ponds.

Land Use - For the 2010 Water Year, Main Basin land use remained relatively unchanged from the 2009 Water Year. Development continues to be slow due to the poor economy effect on real estate.

Groundwater Production - During the 2010 Water Year, about 16,200 acre-feet of groundwater was pumped from the Main Basin. Zone 7 produced approximately 8,890 acre-feet of the pumped groundwater (about 114% of normal). For the 2010 Calendar Year, California Water Service pumped 3,098 acre-feet of groundwater; 29 acre-feet more than their Groundwater Production Quota (GPQ). Pleasanton, which has a GPQ of 3,500 acre-feet and a 675 acre-feet carryover from 2009, pumped 3,507 acre-feet. Consequently, they will carryover 668 acre-feet into the 2011 Calendar Year. All other groundwater production from the Main Basin fell in the normal range for the individual basin pumpers.

Wastewater and Recycled Water – In 2010, approximately 19,660 acre-feet of wastewater flowed to the two public-owned treatment works (POTWs; Livermore Water Reclamation Plant, and Dublin San Ramon Services District’ wastewater plant) as compared to 18,991 acre-feet in 2009. About 24% of the wastewater received by these two POTWs was recycled and used for irrigation projects, however only about 19% of the recycled water produced was applied over the Main Basin. Elevated salinity in the recycled water continues to be Zone 7’s primary groundwater quality concern for its use over the Main Basin; however, several constituents-of-emerging-concern (CECs) are being considered for future basin monitoring plans where recycled water is used for irrigation. Nitrate concentrations in the recycled water used by these two entities have consistently been below the MCLs; however, nitrates continue to be a groundwater quality concern for areas of high septic tank use, high livestock densities, and high fertilizer use.

ES 3 Basin Evaluation Programs

Recharge Calculations – For the 2010 Water Year, total natural recharge was about 15,090 acre-feet, approximately (122% of normal). This includes rainfall recharge of about 3,174 acre-feet (96% of normal), natural stream recharge of about 9,177 acre-feet (158% of normal), and applied water recharge at about 1,739 acre-feet (116% of normal). Artificial stream recharge for the 2010 Water Year was limited to only about 6,773 acre-feet (78% of normal) due to the low availability of SWP water during the year.

Groundwater Storage - At the end of the 2010 Water Year, the total groundwater in storage was estimated to be 212 TAF, and the total recoverable groundwater in storage was estimated to be about 84,000 acre-feet, which is about 67% of the basin’s capacity based on the 126,000 acre-feet difference in groundwater storage between the ‘low’ established in early 1960’s and the ‘high’ in 1983. This is roughly the same as that estimated for the 2009 Water Year (Figure ES-10).

Salt Loading Calculations – A net increase of approximately 3,943 tons of salt was calculated for the Main Basin for the 2010 Water Year . This year’s main contributors were ‘applied water recharge’ (8,323 tons), ‘natural stream recharge’ (6,690 tons), ‘basin inflow’ (1,997 tons), and ‘artificial stream recharge’ (1,690 tons). The main desalting components were ‘municipal pumping’ (13,206 tons including 2,760 tons removed by the Mocho Groundwater Demineralization Plant) and ‘mining export’ (1,428 tons). This year’s positive salt load gives rise to a calculated basin-wide average TDS concentration increase of 16 mg/l; from 395 mg/l in 2009 to 411 mg/l in 2010.

ES 4 Basin Management Programs

Most 2010 Basin Management Programs remained unchanged from 2009 except for:

Demineralization Plant – During the 2010 Water Year, 3,142 acre-feet of groundwater from the Mocho Wellfield was run through the Mocho Groundwater Demineralization Plant’s (MGDP) reverse osmosis membranes, producing 2,468 acre-feet of demineralized permeate and 675 acre-feet rejected high-salt brine. Permeate was blended with non-demineralized groundwater and pumped into Zone 7’s distribution system. The brine was disposed of through the LAVWMA and DERWA export pipelines which discharge to the San Francisco Bay. The 2010 MGDP operation resulted in the direct removal and disposal of about 2,760 tons of salt from the groundwater basin. These results were attained while operating the MGDP at about 49% of its capacity during the 2010 Water Year.

Monitoring Wells – Zone 7 installed one new nested well-set (four wells total) in the southern portion of the Amador Subbasin, west of the future Lake D, during 2010 as part of a hydrostratigraphic investigation performed in cooperation with the Department of Water Resources’ Local Groundwater Assistance Program. These wells have been incorporated into Zone 7’s Groundwater Monitoring Program.

Well Ordinance Program - Zone 7 issued 130 drilling permits in the 2010 Calendar Year, 30 more than what was issued in 2009.

Septic Tank Management - There were no new commercial septic tank applications in 2010; however, Zone 7 staff approved one application for a second residence on 8.7 acres with the condition that a nitrogen-reducing treatment system be installed on at least one of the residential septic systems to reduce the total onsite wastewater loading density to less than one rural residential equivalence per 5 acres.

Toxic Site Surveillance Program - In 2010, Zone 7 tracked the progress of 74 active sites where contamination has been detected or is threatening groundwater and eight cases were closed. Eleven of the sites are designated as ‘High Priority’ because they’ve impacted or are an immediate threat to potable water supply wells. Seven of the high priority sites are fuel leak cases, whereas the other four cases involve solvent contamination (tetrachloroethylene [PCE]). Alameda County Environmental Health (ACEH) is the lead agency overseeing the cleanup of all of the fuel leak sites. Two of the four PCE cases are being overseen by the Regional Water Quality Control Board (RWQCB). The other two are not being overseen by any of the Local Oversight Programs (LOP) agencies; however Zone 7 staff is working with the RWQCB on identifying potential responsible parties so that they can begin their correspondence and require further investigation of the contaminations’ extent.

Other Projects – Starting in the 2010 Water Year and continuing into the 2011 Water Year, Zone 7 conducted a *Hydrostatic Investigation of the Aquifer Recharge Potential for Lakes C and D of the Chain of Lakes* (Zone 7, May 2011) in cooperation with the Department of Water Resources’ Local Groundwater Assistance Program. The project investigated the potential connectivity between future Lakes C and D and the productive aquifers in the West Amador Subbasin. The scope of work included drilling one exploratory borehole, geophysical logging, the installation of four nested monitoring wells in the borehole, and a pumping test to verify connectivity of hydrostratigraphic units. The results of this study suggest that the future Lakes C and D would be effective aquifer recharge facilities for replenishing the upper portions of the Lower Aquifer, from which several of Zone 7’s and City of Pleasanton’s municipal supply wells pump groundwater.

Zone 7 continued its efforts on the Arroyo Mocho Diversion Project in 2010. During the year, a spreadsheet model was developed to evaluate the recharge potential and water losses associated with various operational criteria being considered for the pending resource agency permits. In addition to evaluating the differences between Zone 7’s and NMFS’s proposed dam operations, staff is also evaluating recharge potential and water losses associated with adding a fish ladder to the facility’s design, which would reduce the need for frequent dam deflations thus increasing the potential diversion capacity.

Zone 7 is also making progress on a collaborative effort with Vulcan Materials Co. to capture and re-percolate the groundwater they pump from their quarry pits to facilitate mining activities. For the project, Vulcan would pump the extracted groundwater into Lake I where it would percolate through the lake’s sidewall and into the western Amador Subbasin aquifers. Completion of this project is anticipated by the end of 2011.

Attached Figures

- Figure ES-1: Graph of Livermore Rainfall
- Figure ES-2: Key Well Hydrographs-Western Portion of Main Basin
- Figure ES-3: Key Well Hydrographs-Eastern Portion of Main Basin
- Figure ES-4: Groundwater Gradient Map, Upper Aquifer, Fall 2010
- Figure ES-5: Groundwater Gradient Map, Lower Aquifer, Fall 2010
- Figure ES-6: Groundwater Levels above Historical lows, Lower Aquifer, Fall 2010
- Figure ES-7: TDS Concentrations, Upper Aquifer, 2010 Water Year
- Figure ES-8: TDS Concentrations, Lower Aquifer, 2010 Water Year
- Figure ES-9: Ground Surface Elevation Change, Fall 2009 to Fall 2010
- Figure ES-10: Graphs of Historical Main Basin Hydrologic Inventory, 1974 to 2010 Water Years
- Figure ES-11: Graphs of Salt Loading and Salt Concentrations

FIGURE ES-1
ZONE 7 WATER AGENCY
Graph of Livermore Rainfall (Station 15E NOAA)

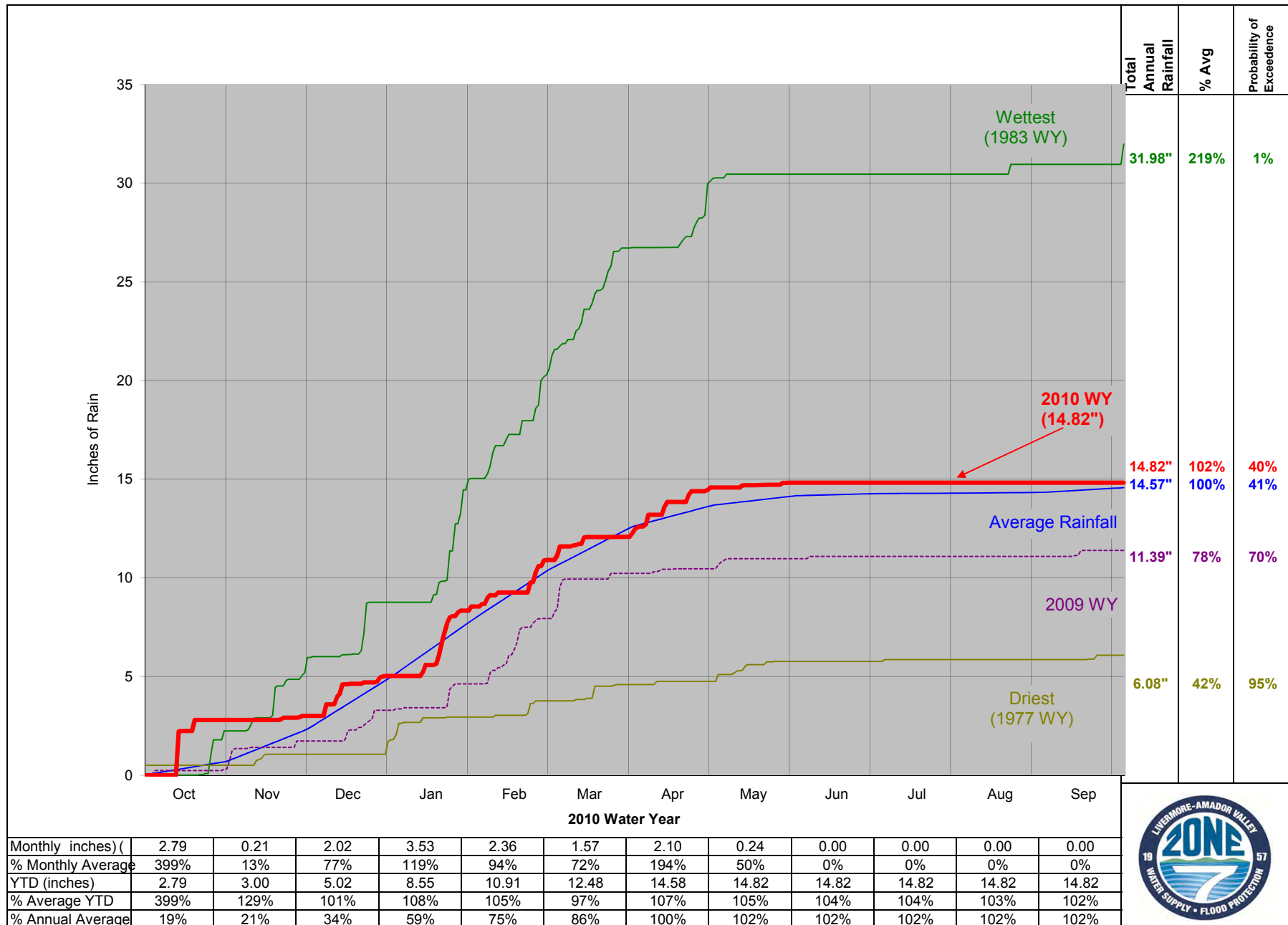


Figure ES-1
 By: M. Garguilo
 05/30/2011

FIGURE ES-2
ZONE 7 WATER AGENCY
Key Well Hydrographs - Western Portion of Main Basin
2010 Water Year

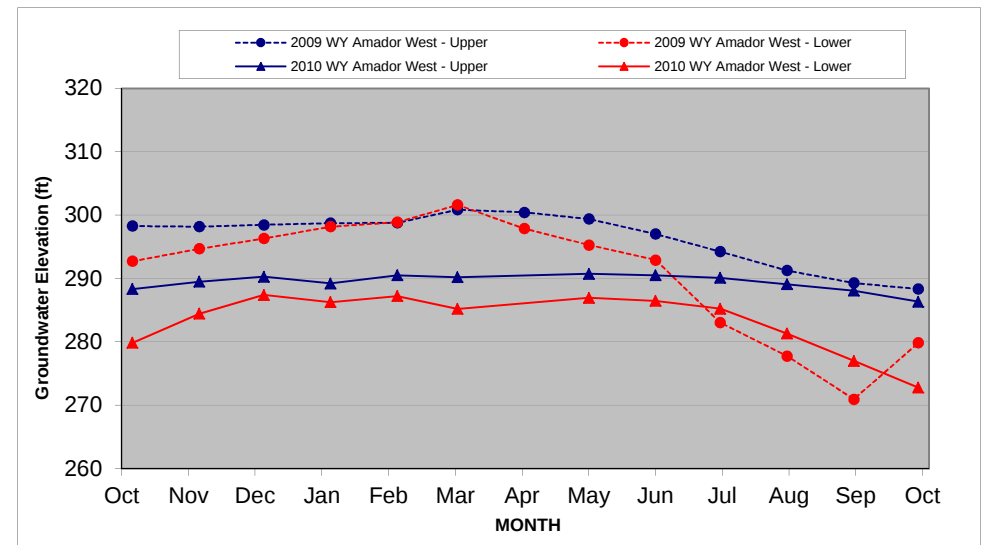
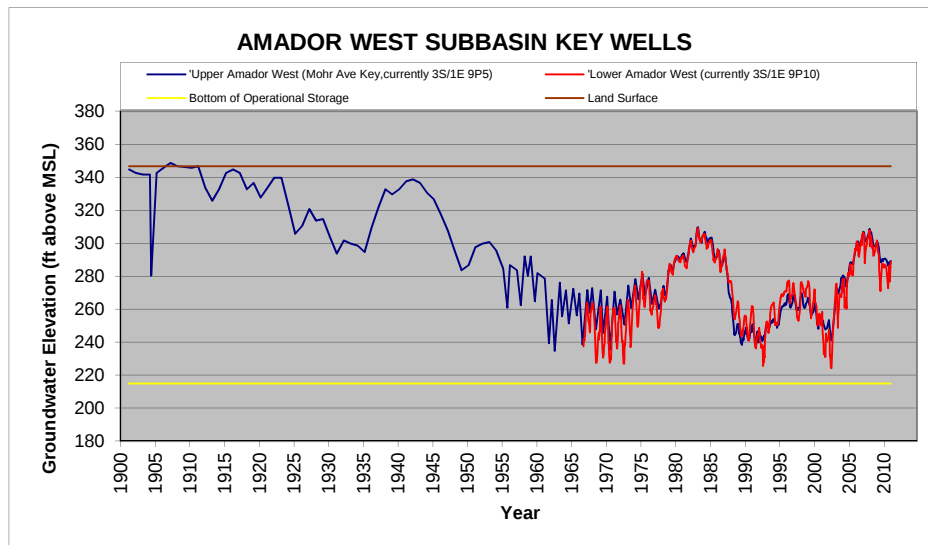
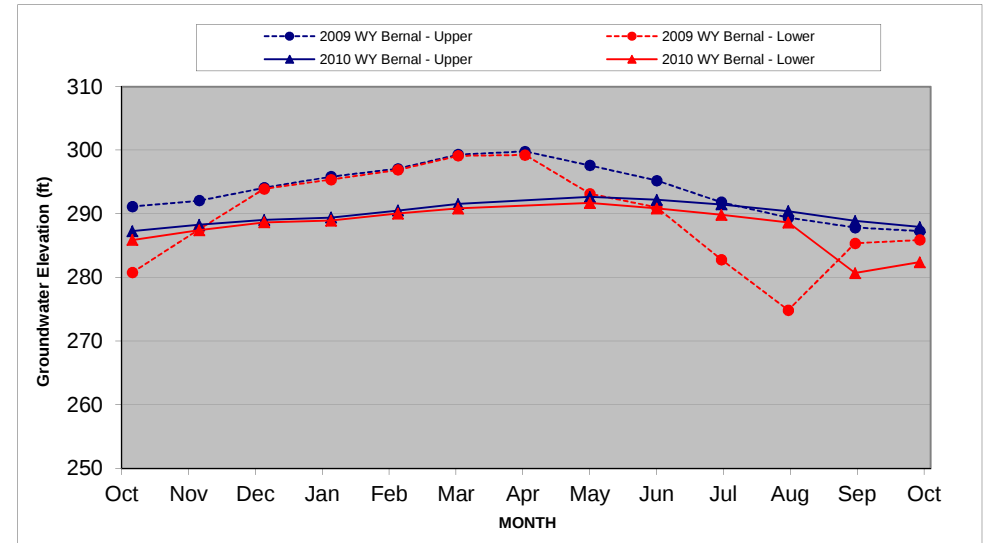
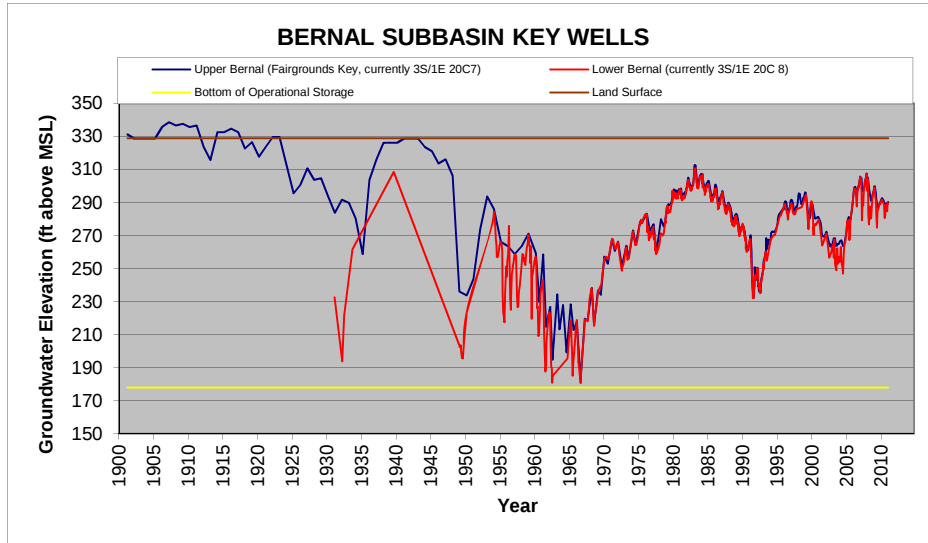
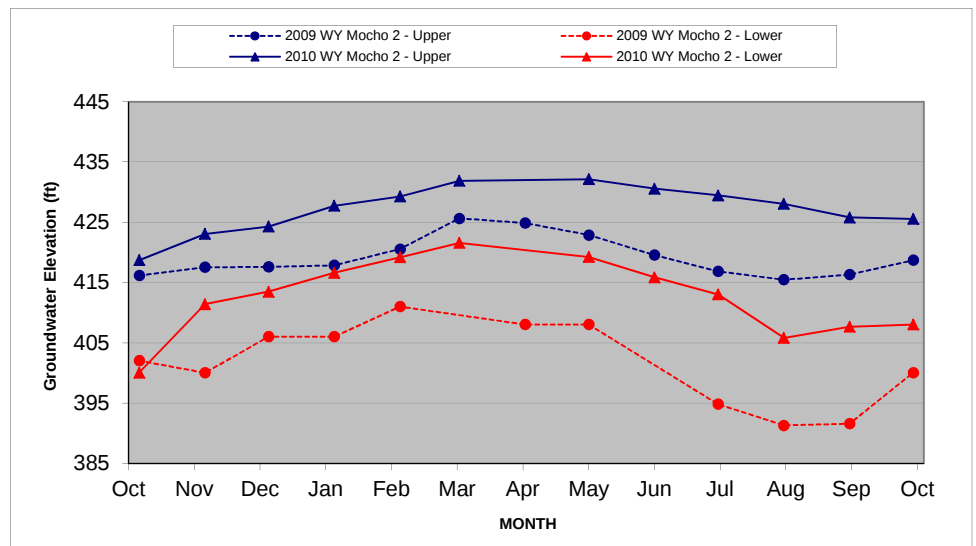
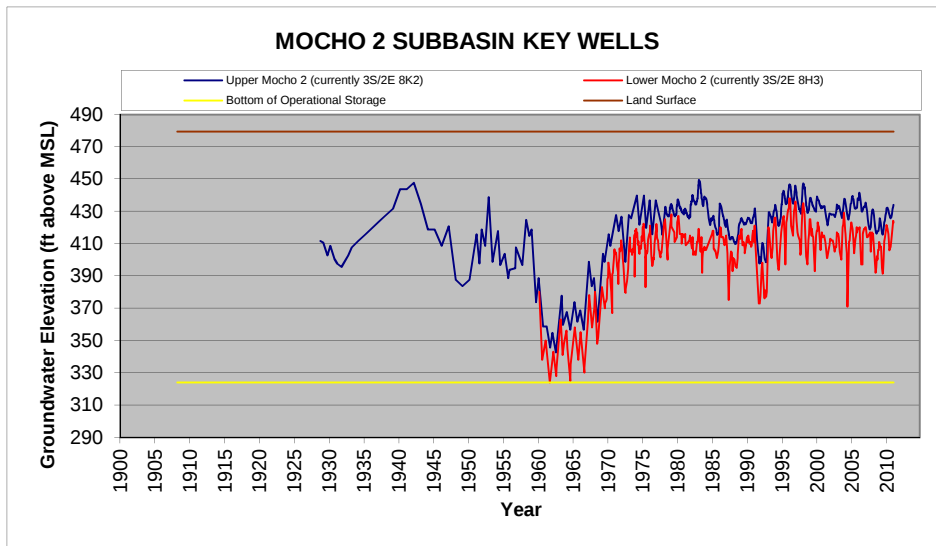
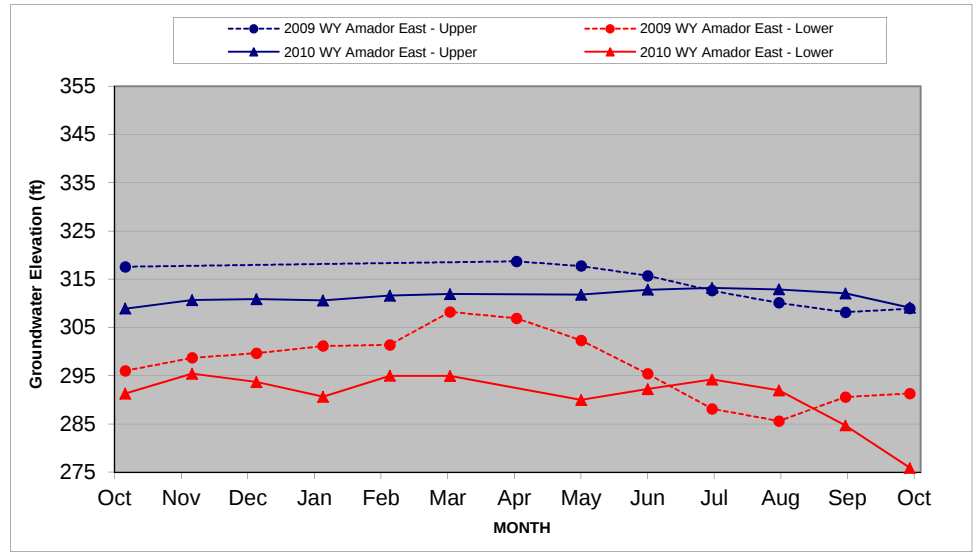
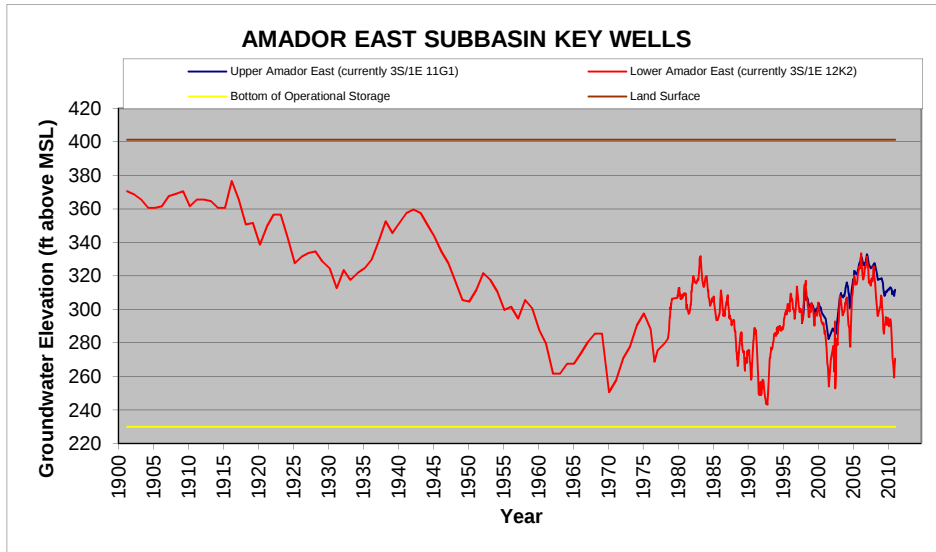
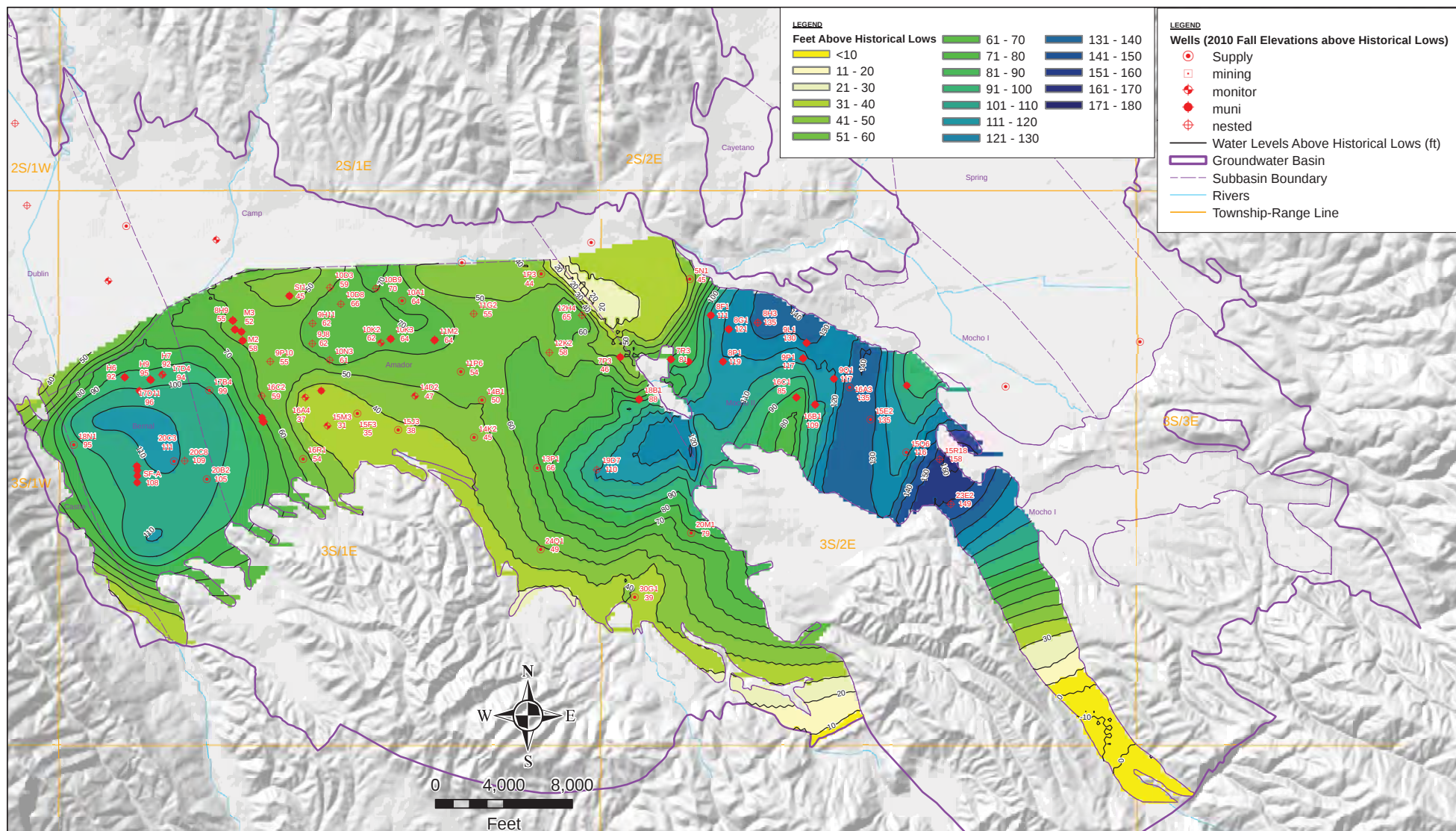


FIGURE ES-3
ZONE 7 WATER AGENCY
Key Well Hydrographs - Eastern Portion of Main Basin
2010 Water Year





ZONE 7 WATER AGENCY
100 North Canyons Parkway
Livermore, CA

DRAWN: TR/CW

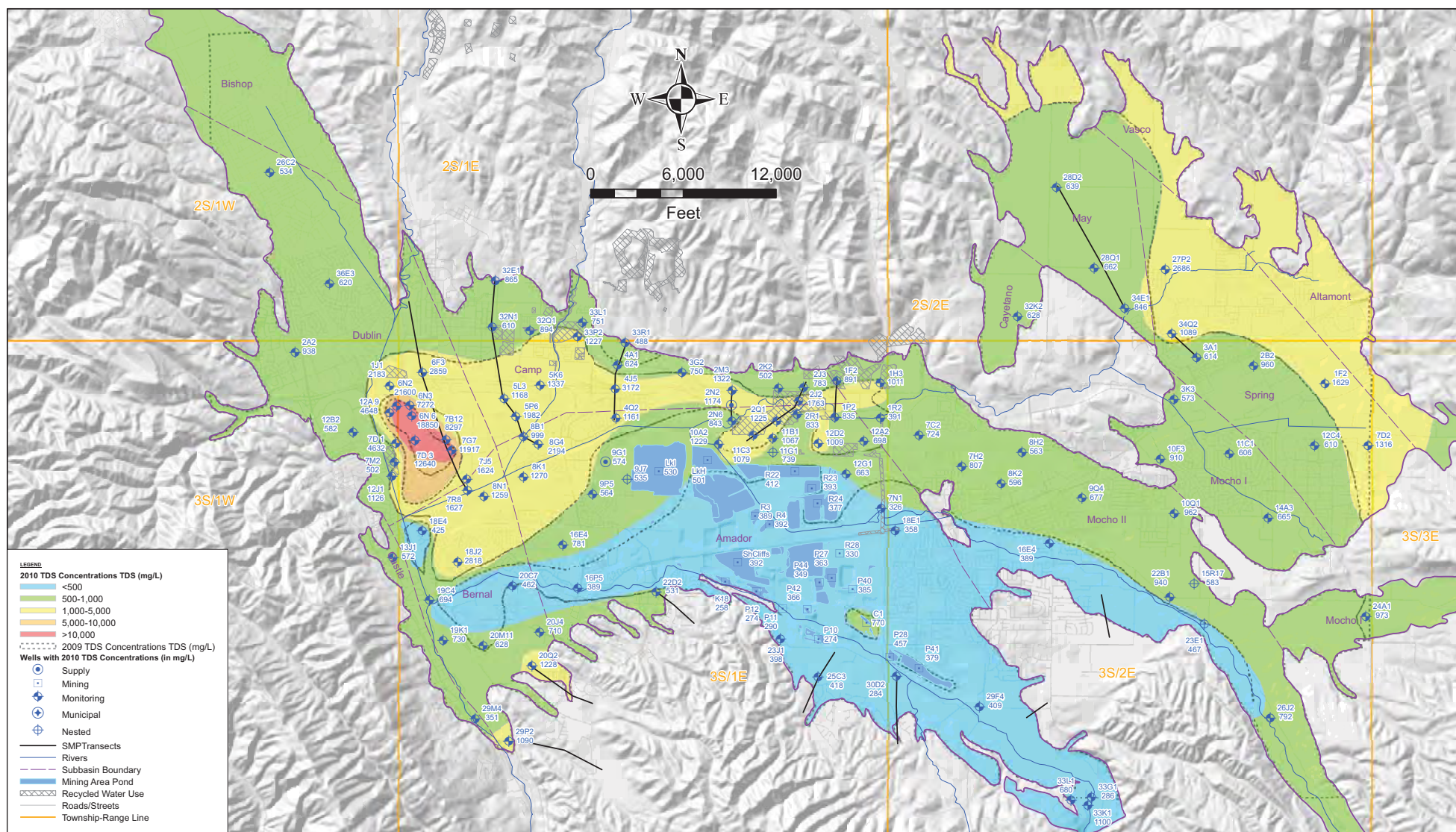
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SCALE (orig): 1 in = 4,000 ft

DATE: June 5, 2011

Figure ES-6
Groundwater Levels Above Historical Lows
Lower Aquifer; Fall 2010 (September)
Livermore Valley Groundwater Basin



ZONE 7 WATER AGENCY
100 North Canyons Parkway
Livermore, CA

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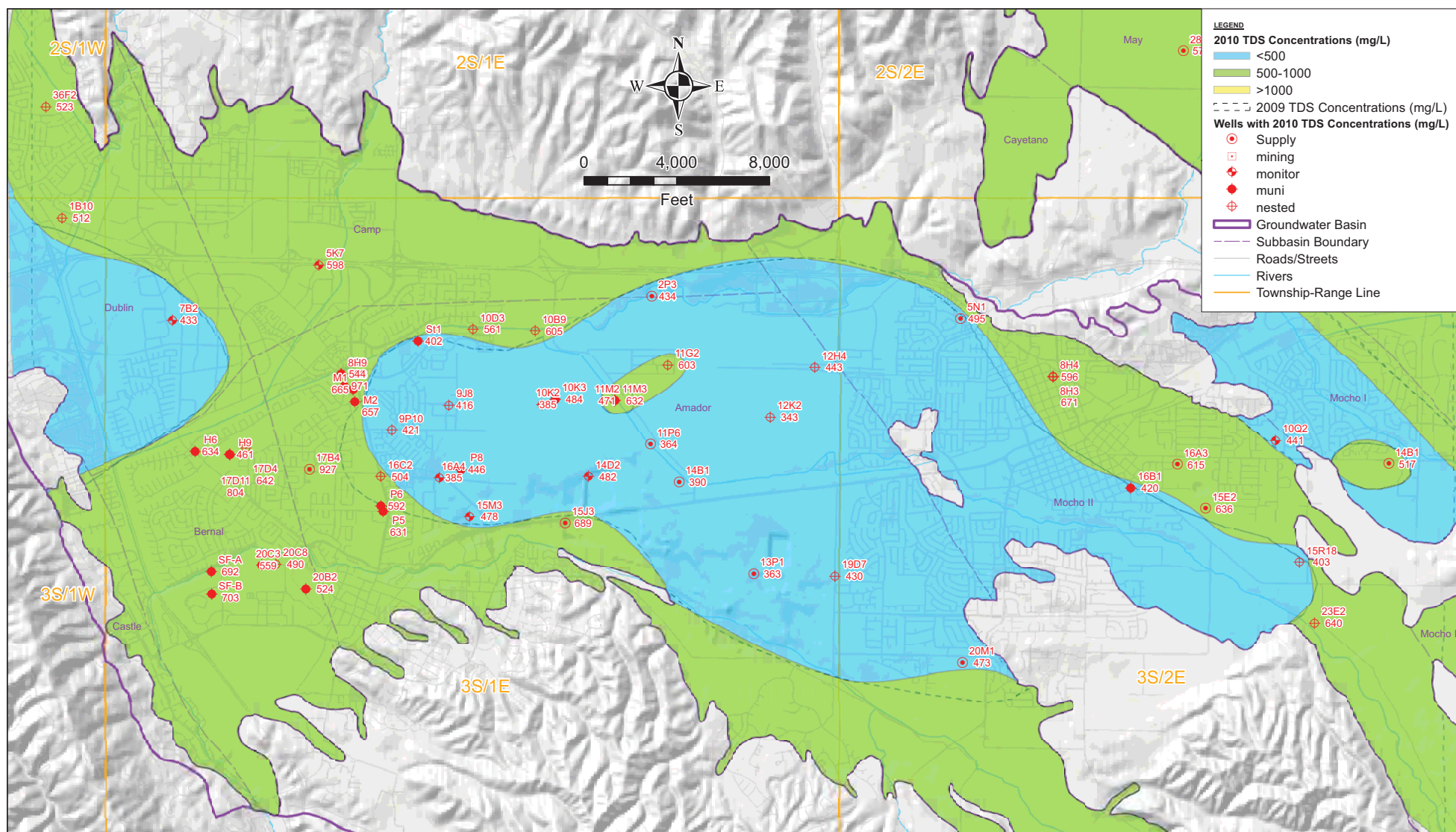
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DATE: June 2, 2011

Figure ES-7
TDS Concentrations (mg/L)
Upper Aquifer; 2010 Water Year
Livermore Valley Groundwater Basin



ZONE 7 WATER AGENCY
100 North Canyons Parkway
Livermore, CA

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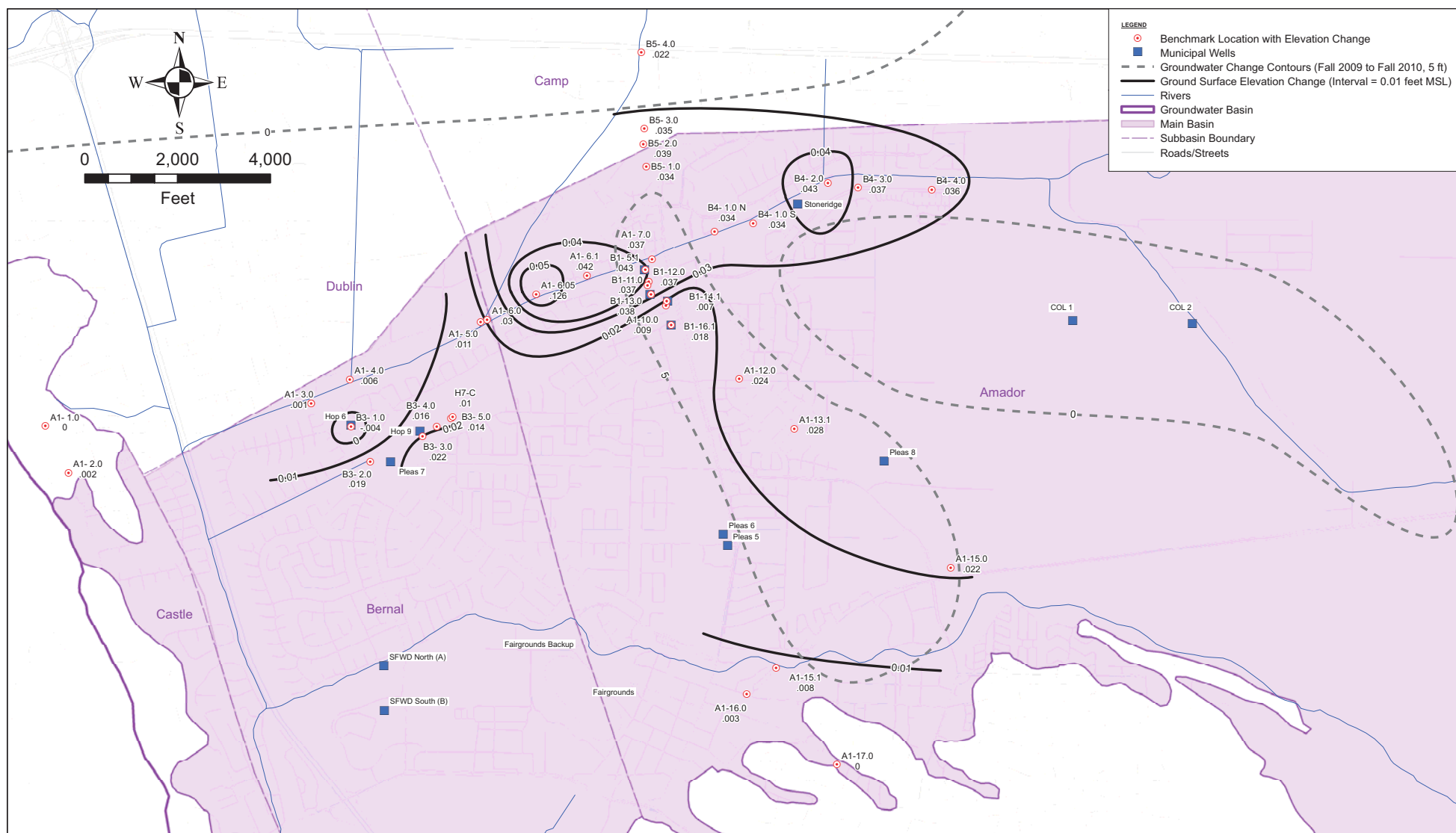
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DATE: June 2, 2011

Figure ES-8
TDS Concentrations (mg/L)
Lower Aquifer; 2010 Water Year
Livermore Valley Groundwater Basin



ZONE 7 WATER AGENCY
100 North Canyons Parkway
Livermore, CA

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Figure ES-9
Ground Surface Elevation Change (ft)
Fall 2009 to Fall 2010
Livermore Valley Groundwater Basin

Figure ES-10
Graphs of Historical Main Basin Hydrologic Inventory
1974 to 2010 Water Years

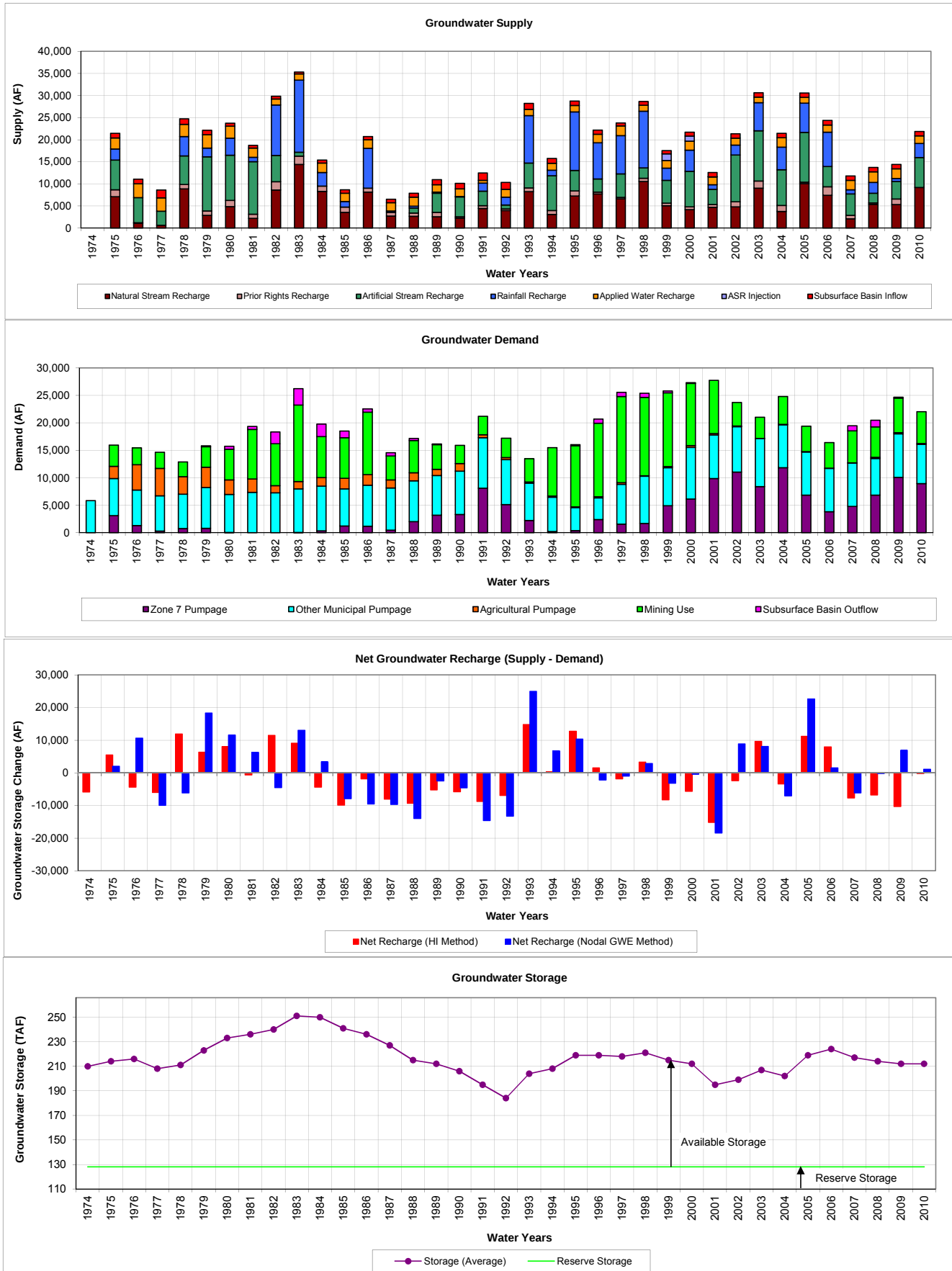


Figure ES-11
Graphs of Salt Loading and Salt Concentrations (1974-2010)

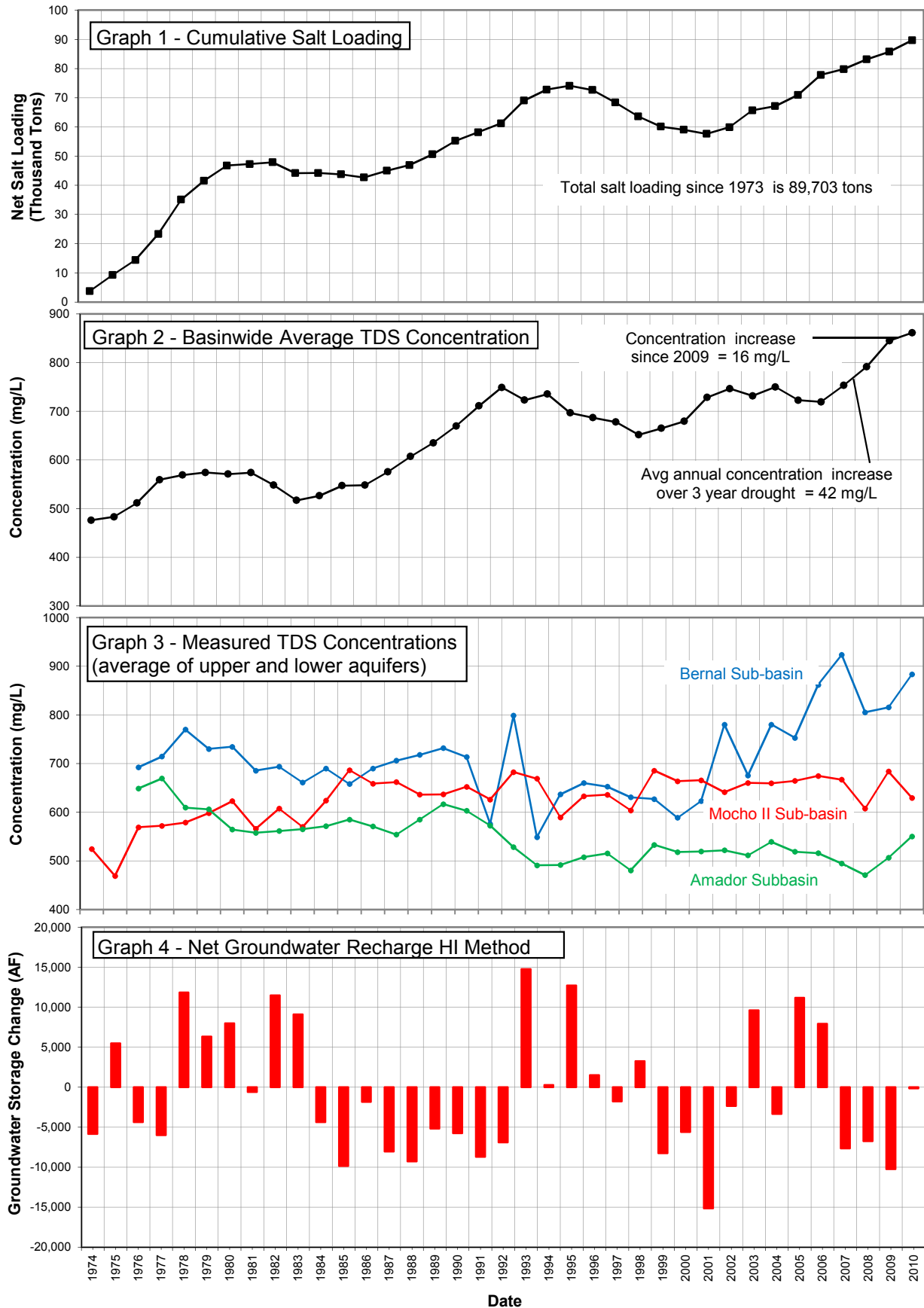


Figure ES-11
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