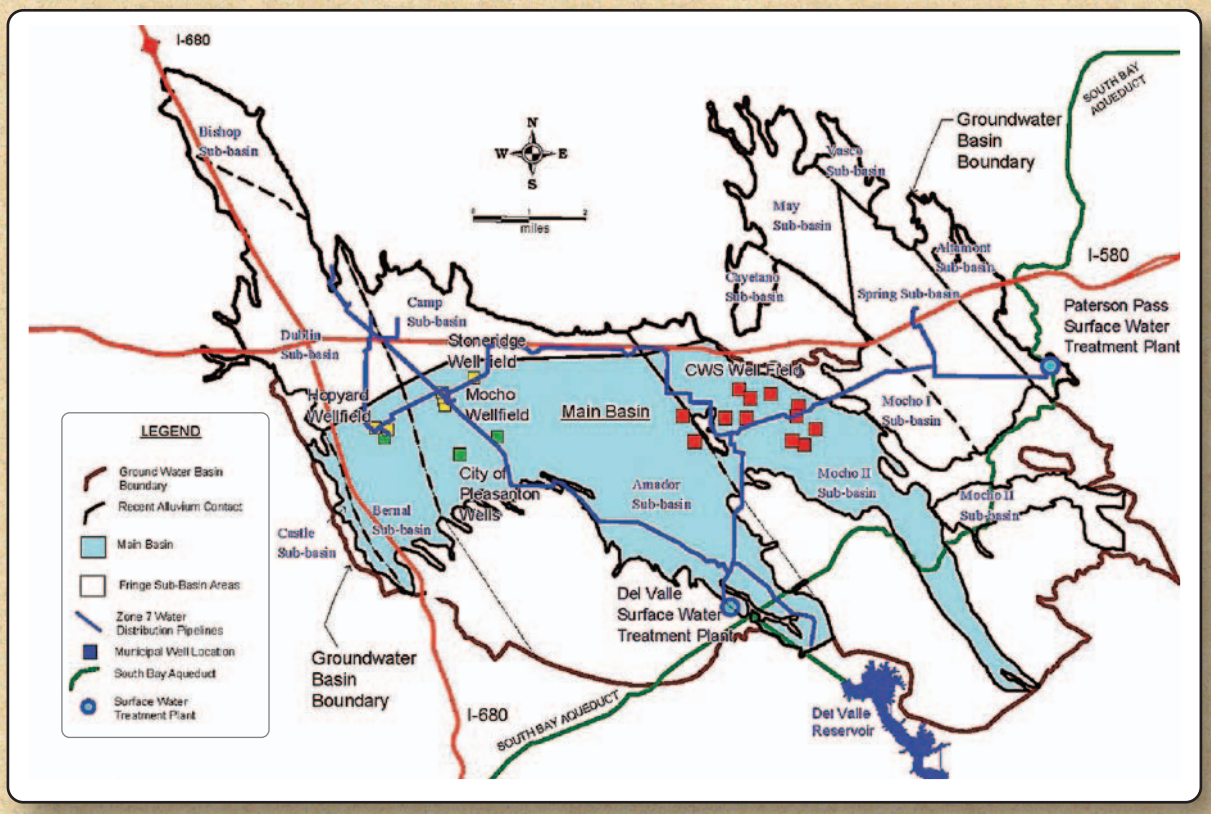
Groundwater Management Plan

for Livermore-Amador Valley Groundwater Basin



September 2005

Prepared for:

Zone 7 Water Agency

Prepared by:

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Groundwater Management Plan for Livermore-Amador Valley Groundwater Basin

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Acronyms and Abbreviations

µg/l	micro grams per liter
1987 GWMP	Statement on Zone 7 Groundwater Management, approved by the Zone 7 Board on August 19, 1987
AB	Assembly Bill
ACEH	Alameda County Environmental Health
ACFCWCD	Alameda County Flood Control and Water Conservation District
af/y	acre-feet per year
afa	acre feet annually
ASR	aquifer storage and recovery
bgs	below ground surface
BMOs	basin management objectives
Board	Alameda County Flood Control and Water Conservation District Zone 7 Board of Directors
BTEX	benzene, toluene, ethylbenzene, xylene
CEQA	California Environmental Quality Act
CIMIS	California Irrigation Management Information System
Corps	U.S. Army Corps of Engineers
CWS	California Water Service Company
Delta	Sacramento–San Joaquin River Delta
DERWA	Dublin–San Ramon Services District–East Bay Municipal Utility District Recycled Water Authority (the JPA that handles the San Ramon Valley Recycled Water Program)
DFG	California Department of Fish and Game
DHS	California Department of Health Services
District Act	California Uncodified Water Act
DSRSD	Dublin–San Ramon Services District
DWR	California Department of Water Resources
DWSAP	Drinking Water Source Assessment and Protection
EC	electrical conductivity
GAMA	Groundwater Ambient Monitoring and Assessment
GMAC	Groundwater Management Advisory Committee
GMP	Groundwater Management Plan (this document)
gpm	gallons per minute
GPP	Groundwater Protection and Projects Section at Zone 7

GWMP	1987 Groundwater Management Policy (Statement on Zone 7 Groundwater Management, adopted August 19, 1987)
LAVWMA	Livermore-Amador Valley Waste Management Agency
LDV	Lake Del Valle
LIA	local implementing agency
LLNL	Lawrence Livermore National Laboratory
LUFT	leaking underground fuel tanks
LWRP	Livermore Water Reclamation Plant
M&I	Municipal and Industrial
MCL	maximum contaminant limit
mg/l	milligrams per liter
MOU	Memorandum of Understanding
MtBE	Methyl tertiary-Butyl Ether (gasoline additive)
NPDES	National Pollutant Discharge Elimination System
O&M	operations and management
PCE	tetrachlorethene
QA/QC	quality assurance/quality control
RMC	Raines, Melton & Carella, Inc.
RWQCB	California Regional Water Quality Control Board—San Francisco Bay Region
SB	Senate Bill
SBA	South Bay Aqueduct
SFPUC	San Francisco Public Utilities Commission
SMMP	Stream Management Master Plan
SMP	Salt Management Plan
State Water Board	State Water Resources Control Board
Supply Reliability Policy	Resolution No. 04-2662, Reliability Policy for Municipal & Industrial Water Supplies, August 18, 2004
SWAMP	State Wide Ambient Monitoring Program
SWP	State Water Project
taf	thousand acre-feet
TAG	technical advisory group
TBA	tertiary-butyl alcohol
TCE	trichloroethene
TDS	total dissolved solids
TPHd	TPH from diesel
TPHg	total petroleum hydrocarbon from gasoline
TVG	Tri-Valley Retail Group
TVRGIS User Group	Tri-Valley Regional Geographic Information Systems User Group

USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VA	Veterans Administration
VOCs	volatile organic compounds
Water Quality Policy	Resolution No. 03-2494, Water Quality Policy for Potable and Non-potable Water, April 16, 2003
WMP	Wastewater Management Plan
WR	Water Rights
WRE	Water Resources Engineering Section at Zone 7
Z7sim	Zone 7's supply and demand simulation model
Zone 7	Zone 7 Water Agency

Executive Summary

The Zone 7 Groundwater Management Plan (GMP) is written to compile and document all of Zone 7's current groundwater management policies and programs in a single document and to satisfy the requirements set forth in the California Groundwater Management Planning Act (Water Code Sections 10750, et seq.). The GMP documents the starting point for local and surrounding agencies that are affiliated with Zone 7 to frame current groundwater management efforts and will be considered in developing future amendments to groundwater management policies and procedures.

Zone 7 works closely with the three tri-valley cities (Livermore, Pleasanton and Dublin), with the County, with agricultural land users, with its four major retail agencies and with other local agencies and groups to manage local groundwater resources. The Tri-Valley Water Retailers Group (TWRG) is a newly formed group, comprised of senior staff representing the four major retail agencies: Dublin–San Ramon Services District, City of Pleasanton, City of Livermore and California Water Service Company. Similarly, the Committee of Valley Water Retailers (CoVWR), composed of two elected officials or members of the governing body of each of the four retail water supply agencies. The TWRG and CoVWR serve as forums for the retailers to discuss regional retail issues. For decades, Zone 7 has actively solicited the cooperation and input of many groups and agencies within the area to most effectively manage the groundwater and to maintain beneficial uses for all residents of the tri-valley.

The GMP provides a detailed description of Zone 7's groundwater management practices throughout the Livermore-Amador Valley Groundwater Basin (DWR Basin No. 2-10) and a description of the regulatory setting that involves a GMP. In addition, this GMP contains the Zone 7 management plan elements, which involve the GMP goals, basin management objectives (BMOs), and stakeholder involvement. A large portion of this document addresses monitoring programs and protocols related to groundwater and conjunctive use of regional water supplies, ranging from groundwater level monitoring to recharge monitoring to groundwater quality monitoring to climatological monitoring to surface water flow and surface water quality monitoring.

Overall, this GMP characterizes the existing groundwater management efforts of Zone 7 to support existing and future beneficial uses of groundwater in the Livermore Amador Groundwater Basin. There are no new programs, policies or procedures in this Plan. Zone 7 considers this to be a compilation of existing policies and procedures as well as to serve as a living document which will provide background to future changes as new policies and procedures are

considered by Zone 7 working collaboratively with area stakeholders such as its four retail agencies.

The Board of Directors adopted a resolution of intent to draft and adopt a GMP pursuant to section 10753.2 of the California Water Code at its Regular Meeting held on August 17, 2005. Adoption of this resolution authorized staff to proceed with final preparation and distribution of this draft Groundwater Management Plan. Zone 7 tentatively plans to finalize the document and adopt the final GMP following a public hearing at its regular board meeting of September 21, 2005.

Table ES-1 provides a road map to this document, clarifying where each Groundwater Management Planning Act requirement (in relation to California Water Code sections) is addressed:

Table ES-1. Groundwater Management Planning Act Requirements

Water Code Reference	Requirement	Location in GMP
§10753.7(a)(3)	Description of groundwater area to be managed	
	• Map	Figures 1-1 and 1-2
	• Description	Overview located in Chapter 1; also see Section 3.1.1.
§10753.7(a)(1)	Basin Management Objectives	Section 1.3
§10753.7(a)(2)	Plan to involve other agencies and the public	Section 4.3
§10753.7(a)(4)	Monitoring protocols	Sections 3.2, 3.3, and 4.4
§10753.8	Plan components	
	• Control of saline water intrusion	Sections 4.6.5 and 5.1.2
	• Identification and management of wellhead protection areas and recharge areas	Sections 3.3, 5.1.4.2, and 5.1.4.4
	• Regulation of the migration of contaminated groundwater	Sections 3.5 and 5.1.4.5
	• Administration of a well abandonment and well destruction program	Section 5.1.4.2
	• Mitigation of conditions of overdraft	Sections 3.2, 3.3, 4.6.2, and 4.6.3
	• Replenishment of groundwater extracted by water producers	Sections 3.3, 4.5.7, 4.6.2, and 4.6.3
	• Monitoring of groundwater levels and storage	Section 4.5.2
	• Facilitating conjunctive use operations	Section 5.1.3
	• Identification of well construction policies	Section 5.1.4.2
	• Construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling and extraction projects	Section 5.1.4
	• Development of relationships with state and federal regulatory agencies	Section 4.4

Water Code Reference	Requirement	Location in GMP
	• Review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination	Section 4.5
§10753.2	Details of Public Hearing(s) and Plan Adoption	Section 5.3

Chapter 1
Introduction

Groundwater is one of California's most valuable natural resources and requires proper protection and management in order to maintain its beneficial uses. The California Department of Water Resources (DWR) defines groundwater management as the planned and coordinated monitoring, operation, and administration of a groundwater basin with the long-term goal of sustainability of the resources. In an average water supply year, groundwater meets about 30% of California's urban and agriculture demand and during drought years, 40% or more.[1] In 1995, approximately 43% of Californians used groundwater for at least a portion of their public supply needs.[2]

Many agencies managing groundwater resources lack the appropriate management and coordination between local agencies to properly manage their local groundwater basin. In the years to come, demand on groundwater is expected to increase significantly as the population in California is projected to reach nearly 46 million. Many agencies throughout California are unable to maintain beneficial uses of groundwater, with problems such as overdraft and poor water quality arising because of lack of management and/or coordination between agencies. The California Groundwater Management Planning Act (Water Code Sections 10750, *et seq.*) was adopted with the intent of encouraging local agencies to work cooperatively to manage groundwater resources within their jurisdictions. This Groundwater Management Plan is a compendium of Zone 7 Water Agency's existing groundwater management policies and programs, documenting Zone 7's compliance with the requirements of the Groundwater Management Planning Act.

1.1 Alameda County Flood Control and Water Conservation District

The Alameda County Flood Control and Water Conservation District (ACFCWCD) was created in 1949 by the state legislature through passage of Act 205 of the California Uncodified Water Act (District Act). ACFCWCD was formed to provide control of flood and stormwater and to conserve and manage local water for beneficial uses. ACFCWCD is vested with the power to store

[1] California Department of Water Resources 2003.
[2] Solley et al. 1998.

water in surface or underground reservoirs within or outside of the district for the common benefit of the district; to conserve and reclaim water for present and future use within the district; to appropriate and acquire water and water rights; and to import water into the district. ACFCWCD is further authorized by statute 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 and to prevent contamination, pollution or otherwise rendering unfit for beneficial use the surface or subsurface water used or useful in the district. ACFCWCD is also authorized to levy replenishment assessments upon the production of groundwater from all water-producing facilities, whether public or private, in the district.

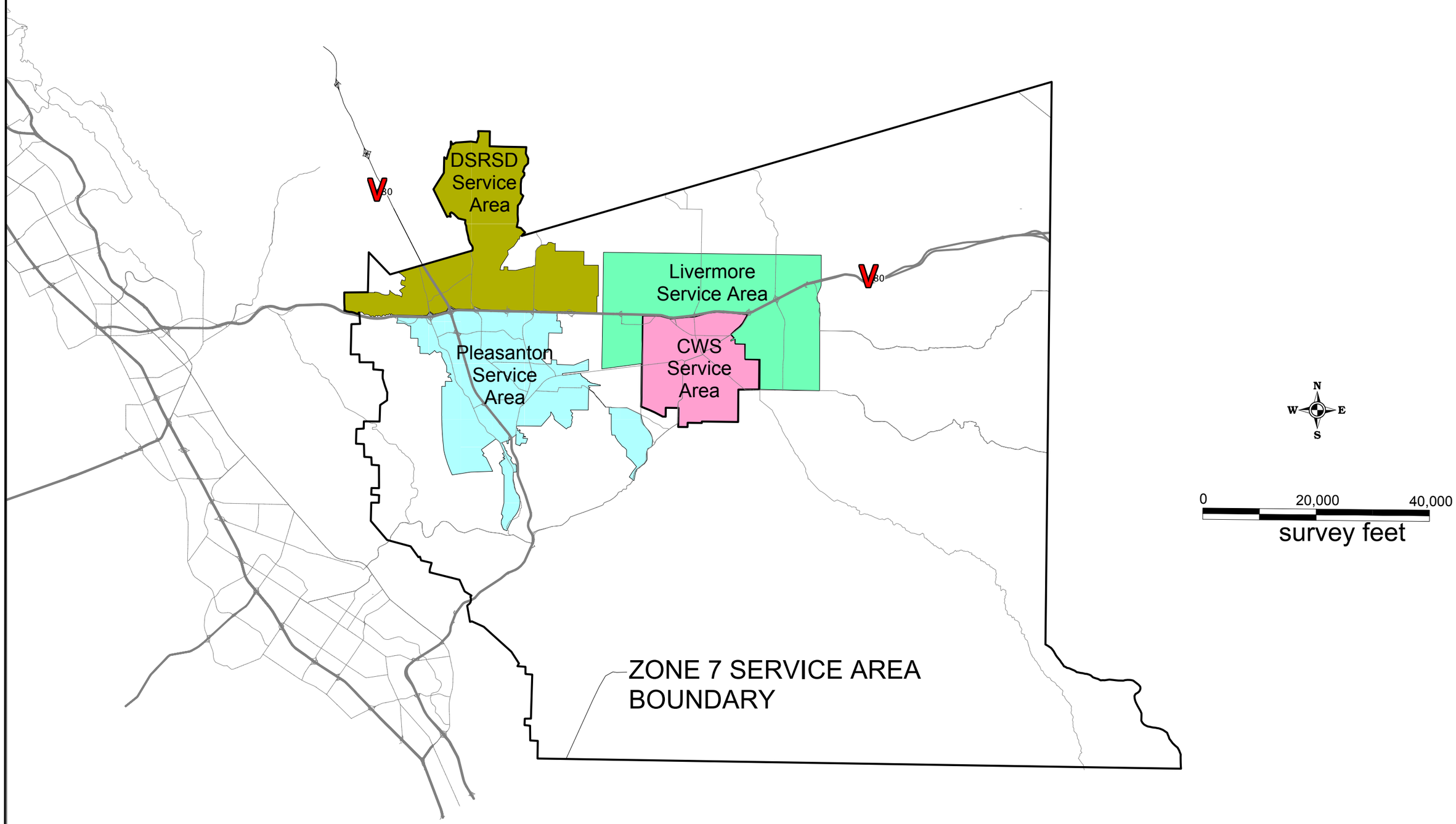
1.2 Zone 7 Water Agency

ACFCWCD comprises 10 active zones, of which Zone 7 covers the eastern portion of Alameda County, which includes the cities of Dublin, Pleasanton, and Livermore. Pursuant to Section 36 of the District Act, Zone 7 of the ACFCWCD (Zone 7 Water Agency, or Zone 7) was established in 1957 to address regional and water supply issues. Zone 7 is governed by an elected seven-member board of directors who, with the passage of Assembly Bill (AB) 1125 in 2003, have full authority and autonomy to govern matters solely affecting Zone 7, independent of the Alameda County Board of Supervisors who govern the other nine zones of the ACFCWCD.

As one of the 29 state water contractors, Zone 7 is the water wholesaler for the Tri-Valley Area (Dublin, Pleasanton, and Livermore; also known as the Livermore-Amador Valley), as well as the area's flood control agency. Zone 7 imports surface water from the State Water Project (SWP) through the South Bay Aqueduct (SBA) for treatment, storage, and recharge. Zone 7 Water Agency supplies treated drinking water to four water retail agencies: Dublin San Ramon Services District, the City of Pleasanton, the City of Livermore, and California Water Service Company (see Figure 1-1). These water retailers deliver water to homes in their specific service areas. The four retail agencies have formed both the Committee of Valley Water Retailers (CoVWR) and, on the staff level, the Tri-Valley Water Retailers Group (TWRG). The water retailers, in turn, deliver water to homes in their specific service areas. Zone 7 also supplies untreated water for local industry and agriculture. Thus, Zone 7 indirectly serves water to an area with a population of approximately 190,000 people.

One of Zone 7 Water Agency's main missions is to serve as guardian of the groundwater in the Tri-Valley (Livermore, Dublin, Pleasanton) area; this role is recognized by the California Regional Water Quality Control Board—San Francisco Bay Region (RWQCB). For more than thirty years, Zone 7 has managed regional water supplies, including DWR Basin 2-10, in a complex, interrelated program that defines groundwater extraction goals for major regional pumpers. Zone 7 also operates local flood control and recharge facilities to optimize instream recharge. In addition, Zone 7 works closely with DWR, which

Figure 1-1



ZONE 7 WATER AGENCY 100 NORTH CANYONS PKWY, LIVERMORE, CA 94551	DRAWN BY: Gerald Gates DESIGNED BY: Gerald Gates CHECKED BY: APPROVED BY:	WATER RESOURCES ZONE 7 SERVICE AREA BOUNDARY	SCALE: 1" = 6000' DATE: 18 FEBRUARY 2002 FILE NO.:

manages Lake Del Valle and dam to augment imported water supplies with local watershed runoff.

In summary, Zone 7 Water Agency imports surface water via the SWP's SBA, stores local runoff in Lake Del Valle, maintains flood control, maintains and operates recharge facilities in the area, manages both surface and groundwater supplies to maximize conjunctive use of the supplies, treats regional drinking water, and wholesales potable water to local retail water supply agencies, who in turn retail it to residents and other customers.

1.3 Zone 7's Groundwater Management

Zone 7 manages both surface and groundwater supplies to maximize conjunctive use and reliability of water supplies. Zone 7 has actively managed DWR Groundwater Basin Number 2-10, the Livermore-Amador Valley Groundwater Basin (underlying the Tri-Valley, as shown in DWR Bulletin118 Update 2003; see Figure 1-2, for more than 30 years. Groundwater typically makes up 20–25% of the water supplied by Zone 7 to its retail water supply agencies; in addition, two of the four retailers independently operate supply wells, so total groundwater makes up a higher percentage of the total regional supply (30%).

Over the 30 years of regional groundwater management, Zone 7 Water Agency has developed numerous interrelated programs to monitor, assess, and manage the basin. These programs are outlined below. The various existing programs and resolutions, taken together, satisfy the intent of the Groundwater Management Planning Act.

This document serves to clarify the various components of Zone 7's existing groundwater management and conjunctive use programs and policies, incorporate them by reference in this new Groundwater Management Plan, and to serve as the framework for discussing future changes to groundwater policy and procedures. Any such changes would be developed in a collaborative effort with the Tri-Valley Water Retailers Group (TWRG) and its member agencies.

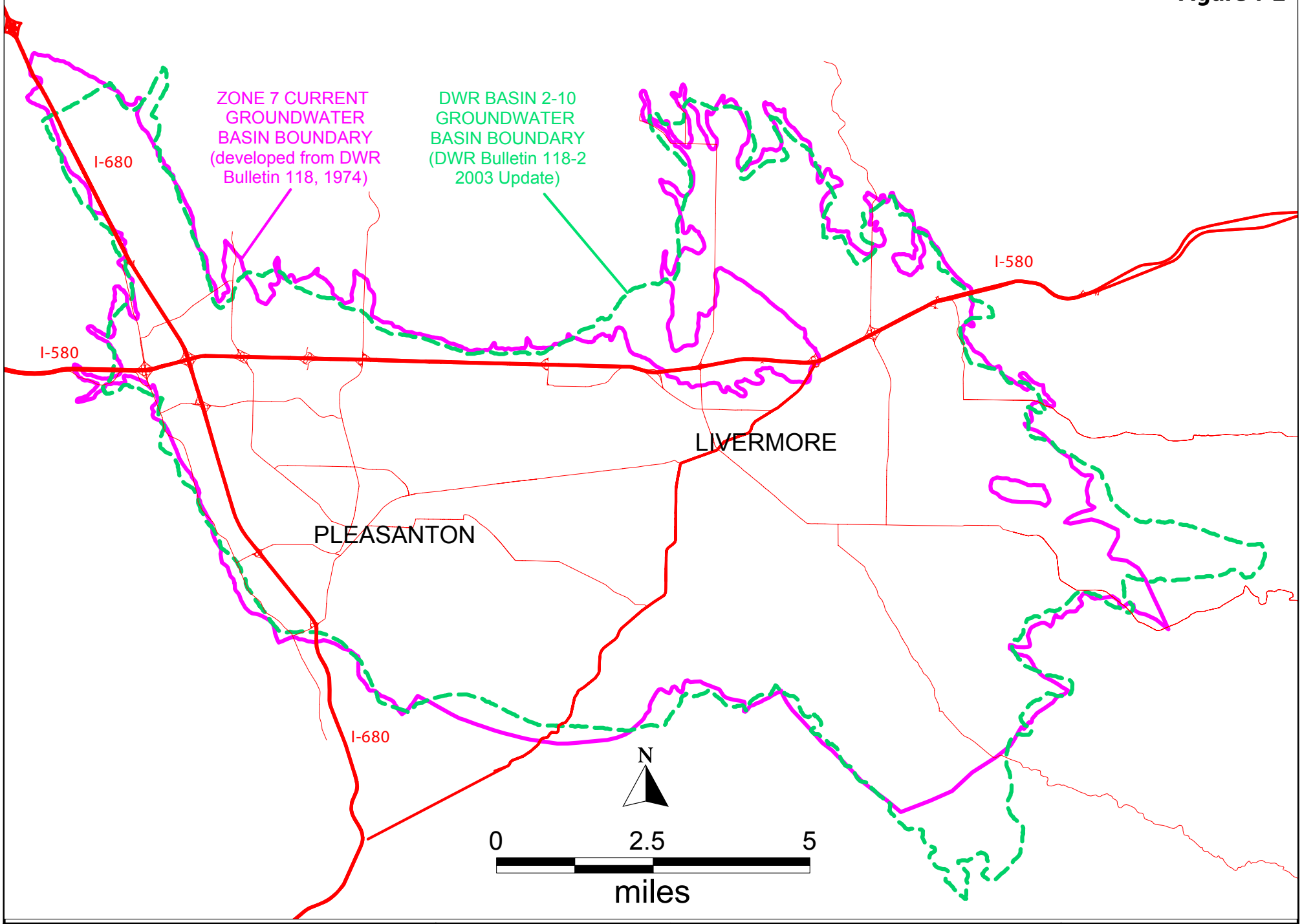
1.4 Groundwater Basin Management Objectives

The primary groundwater Basin Management Objectives (BMOs) of Zone 7 provide for the control and conservation of waters for beneficial future uses, the conjunctive use of groundwater and surface water, the importation of additional surface water, and the use of the groundwater basin to provide water storage for imported surface water used during drought periods.

The primary BMOs implemented by Zone 7 include:

- Monitoring and maintenance of groundwater levels through conjunctive use and management of regional water supplies:
  - maintain the balance between the combination of natural and artificial recharge and withdrawal,
  - maintain water levels high enough to provide emergency reserves adequate for worst credible drought and unplanned import outages,
  - store surface water supplies in the groundwater basin for use during emergencies and drought-related shortages,
  - allow for gravel mining by optimizing groundwater levels to allow for gravel mining while maintaining adequate reserves for municipal supply, and
  - prevent overdraft that would otherwise occur from too much pumping (maintain total pumping at or below sustainable/safe yields);
- Groundwater quality—monitoring and management, as well as tracking and addressing any degradation:
  - protect and enhance the quality of the groundwater,
  - halt degradation from salt buildup,
  - reduce flow of poor quality shallow groundwater into deep aquifers,
  - offset impacts of water recycling and wastewater disposal through integrated Salt Management Plan (SMP),
  - recharge with relatively low total dissolved solids (TDS)/hardness imported or storm/local surface water,
  - manage quality on a regional basis as measured at municipal wells (such as those operated by both the retail water agencies and Zone 7), protecting and improving groundwater quality within the Main Basin (as described in Chapter 3), and
  - minimize threats of groundwater pollution through groundwater protection;
- Monitor and prevent inelastic land surface subsidence from occurring as a result of groundwater withdrawals:
  - protect the storage capacity of aquifer,
  - maintain water levels above historic lows,
  - monitor and minimize any identified impacts of gravel mining on the upper aquifer by encouraging the implementation of mitigation measures by mining companies, and
  - monitor benchmark elevations and shift pumping to other wells if inelastic subsidence is detected;

Figure 1-2



ZONE 7 WATER AGENCY 100 N. CANYONS PARKWAY LIVERMORE CA 94551	DRAWN BY: Gerald Gates DESIGNED BY: Gerald Gates CHECKED BY: APPROVED BY:	WATER RESOURCES LIVERMORE-AMADOR VALLEY GROUNDWATER BASIN BOUNDARIES	SCALE: 1" = 2 MILES DATE: 22 JULY 2005 FILE NO.: MAPINFO\GEODATA\HYDROBASINS\DWR BASINS.WOR

- Monitor and manage changes in surface flow and surface quality, especially as they affect groundwater levels or quality, or are caused by groundwater pumping in the basin:
  - Augment stream flow through artificial recharge releases to improve groundwater supply and quality, and
  - monitor and protect recharge capacity of local arroyos.

Following is a list of some key Zone 7 objectives and policies that are included in Appendix E and which articulate objectives to:

- provide sustainable water supply,
- provide sustainable water quality,
- minimize operational costs, and
- manage the groundwater basin.

In addition, Zone 7 has adopted policies related to protection of the groundwater basin through wastewater management. These include:

- Wastewater Management Policy (Resolution 1137), and
- prohibition against use of septic tanks for new development zoned for commercial or industrial use (Resolution 1165).

Zone 7's Board of Directors adopted the Water Quality Policy (Resolution 03-2494), as well as the Salt Management Plan, which includes:

- protect and enhance the quality of groundwater,
- offset current and future salt loading,
- maintain or improve groundwater mineral quality,
- provide more comparable delivered water quality to retailers, and
- utilize Water Operations Plan to achieve these goals.

Furthermore, Zone 7's Board of Directors adopted the Reliability Policy for Municipal and Industrial (M&I) Water Supplies (Resolution 04-2662), which includes:

- Meet 100% of its treated water customers' water supply needs in accordance with Zone 7's most current retail contracts.
- Provide sufficient treated water production capacity and infrastructure to meet at least 75% of Zone 7's maximum daily M&I contractual demands should any single one of Zone 7's major supply, production, or transmission facilities experience an extended, unplanned outage.

Zone 7 has also had a long-standing policy of managing the groundwater basin to maximize conjunctive use, reliability and storage opportunities. The "Statement on Zone 7 Groundwater Management" was adopted on August 19, 1987 and is incorporated herein by reference.

The Salt Management Plan (SMP), also incorporated herein by reference (see Executive Summary in Appendix D), was originally prepared in fulfillment of Master Water Recycling Permit Order No. 93-159 Provision D.1.c.ii and General Water Recycling Permit Order No. 96-011 Provision D.4. This document not only provides a comprehensive and effective approach for administering, regulating and encouraging water recycling in the Livermore-Amador Valley, it also provides guidance to the area's agencies in ways to address the historical trend of increasing TDS in the main groundwater basin. It was developed by Zone 7 staff and consultants in partnership with a technical advisory group (TAG) composed of local water retailers, and a Zone 7 citizens committee—the Groundwater Management Advisory Committee (GMAC). The RWQCB accepted the SMP in October 2004.

All Zone 7 objectives include a basic philosophy of working cooperatively with the public, the Tri-Valley Retail Group and the four individual retail agencies (Dublin San Ramon Services District [DSRSD], City of Livermore, City of Pleasanton and the California Water Service Company [CWS]). These objectives include:

- 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; and
- to work cooperatively with the gravel mining industry to implement the Chain of Lakes reclamation plan.

1.5 Purpose of Zone 7's GMP

The purpose of Zone 7's Groundwater Management Plan (GMP) is to document and compile in one place all of Zone 7's existing programs and policies that together serve as the basis for successfully manageing groundwater resources and to develop a framework for considering future amendments to policy and procedures collaboratively with other basin users such as the Tri-Valley Retail Group and its member agencies, DSRSD, CWS, Pleasanton and Livermore. Simply put, this GMP revises the Statement on Zone 7 Groundwater Management, approved by the Zone 7 Board on August 19, 1987 (1987 GWMP), incorporating by reference all current related programs and policies at Zone 7 (especially the SMP) and demonstrating overall program compliance with the requirements of the Groundwater Management Planning Act.

1.6 GMP Components

In developing GMP components, the California Department of Water Resources (DWR) recognizes that the goal of a GMP is to ensure a long-term, sustainable, reliable, high-quality groundwater supply. Of the required and recommended

components found in Appendix C of DWR Bulletin 118 Update, this Zone 7 GMP includes:

1. Control of saline water intrusion—although saline water intrusion, per se, is not an issue for Zone 7 (which is inland from bays and oceans), the level of salt and minerals in the groundwater basin is of significant concern to Zone 7. The following address salt management and are incorporated by reference:

    a. Salt Management Plan, approved by the California Regional Water Quality Control Board—San Francisco Bay Region, October 2004;

    b. Salt Management Program Implementation Plan (Zone 7 Resolution 99-2068);

    c. Master Water Recycling Permit (RWQCB–San Francisco Bay Region Order No. 93-159); and

    d. Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Watershed Above Niles and Related Policies (Resolutions 1037 and 1165).

2. Identification and management of wellhead protection areas throughout the whole basin and specific requirements for recharge areas. The following address wellhead protection and are incorporated by reference:

    a. Drinking Water Source Assessment and Protection (DWSAP) Plan for each Zone 7 well, as submitted to the California Department of Health Services (DHS) Division of Drinking Water;

    b. groundwater protection ordinance program;

    c. commercial septic tank program and related policy statements and resolutions, including Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Watershed Above Niles (WMP);

    d. mapping of known contamination plumes;

    e. referral program which includes ongoing reviews and coordination of proposed development projects through lead local land use and planning agencies (cities and county);

    f. sub-watershed–based monitoring of all recharge areas; and

    g. protection of key stream recharge reaches (i.e., creek cleanups, monitoring, kiosks).

3. Regulation of the migration of contaminated groundwater. The following programs have been developed to address contaminated groundwater:

    a. toxic site surveillance program, assisting lead agencies in groundwater cleanup efforts;

    b. Geotracker program (active participation in development and public outreach elements with Lawrence Livermore National Laboratory (LLNL) and GMAC which assisted Zone 7 in its development of the SMP); and

c. Groundwater Ambient Monitoring and Assessment (GAMA) program (active participation in development and public outreach elements with LLNL and GMAC).

4. Administration of a well-abandonment and well-destruction program:

   a. Well Ordinance Administration (Well Ordinance adopted 1973, County Ordinance No. 73-68; similar City Well Ordinances)—addresses well construction/destruction, soil borings, etc., in compliance with state standards and additional requirements as required (case-by-case basis);

   b. agreements with cities to administer City Well Ordinances; and

   c. identification of abandoned wells through development review process and subsequent issuance of requests for destruction.

5. Mitigation of conditions of overdraft through management, recharge and development of alternate water supplies. The following program components outline Zone 7's approach that has been developed over the years to mitigate historical conditions of overdraft:

   a. initial contractual groundwater pumping quotas established to manage retailer pumping/extractions from the main groundwater basin;

   b. manage Zone 7 pumping so groundwater levels do not fall below historic lows to recover from overdraft conditions;

   c. regional recycled water programs (DSRSD–EBMUD Recycled Water Authority [DERWA] and Livermore);

   d. chain of lakes/mining fees;

   e. SWP imports to reduce demand on groundwater supplies;

   f. use of SWP imports in temporary off-stream recharge facility in the 1960's and '70's (Las Positas Recharge Pit);

   g. instream natural and artificial recharge, latter using imported SWP water, allowing conjunctive use and storage of imported supplies in groundwater basin;

   h. expansion of existing recharge facilities to include off-stream storage and recharge (future Chain of Lakes);

   i. management of local runoff (Lake Del Valle);

   j. water conservation;

   k. maintain records of basin-wide groundwater pumping to guard against future overdraft conditions; and

   l. maintain records of groundwater basin safe/sustainable yield.

6. Replenishment of groundwater extracted by water producers. The following conjunctive use program components outline Zone 7's approach that has been developed over the years to replenish historically depleted groundwater

supplies. Note that Zone 7 has artificially recharged approximately 66,000 acre-feet more than has been extracted:

a. SWP imports,

b. instream recharge (natural and artificial),

c. annual hydrologic inventory monitoring in preparation of following year's water supply operations planning documents,

d. chain of lakes recharge program (future), and

e. groundwater model.

7. Monitoring of groundwater levels and storage (Appendix A). The following monitoring program components outline Zone 7's approach that has been developed over the years to track regional groundwater levels and storage:

   a. continuous monitoring of water levels in certain key wells;

   b. monthly and semiannual well monitoring programs;

   c. climatological monitoring program;

   d. recharge monitoring (both natural and artificial);

   e. metering and data management of groundwater pumping quantities (municipal);

   f. groundwater model and associated databases; and

   g. complete hydrologic inventory of basin supply, use, and storage.

8. Facilitating conjunctive use operations. The following conjunctive use program components outline Zone 7's approach that has been developed over the years to replenish historically depleted groundwater supplies:

   a. multi-year conjunctive use modeling for sustainable water supply report;

   b. water supply forecast to determine possible conjunctive use opportunities;

   c. integrated water supply operations plan to coordinate conjunctive use;

   d. artificial stream recharge program;

   e. flood control management such as Lake del Valle flood releases;

   f. expanded artificial recharge with chain of lakes (future);

   g. reporting of water supply operations and planning;

   h. stream recharge management/reporting (e.g., monthly groundwater supply and utilization report)—using imported water delivered from SWP;

   i. annual water balance/hydrologic inventory/water levels;

   j. monitor new supply well plans through well permit program;

   k. meet with local agency planners periodically; and

l. attend/participate in: agricultural committee meetings, Fisheries Restoration workgroups, Watershed Advisory Committee meetings.

9. Identification of well construction policies:

   a. well ordinance administration—addresses well construction/destruction, soil borings, etc., in compliance with state standards and additional requirements as required (case-by-case basis).

10. Construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects. The following programs have been developed to address contaminated groundwater remediation projects:

    a. monitoring through GPP and providing input/guidance to lead agencies, as necessary;

    b. water quality policy for potable and nonpotable water (Resolution 03-2494);

    c. groundwater demineralization project;

    d. well master plan;

    e. construction of production wells;

    f. construction of aquifer storage and recovery (ASR) wells for evaluation and potential future use;

    g. construction and/or replacement of monitoring wells, as needed;

    h. chain of lakes recharge facilities (future);

    i. investigating feasibility of recycled water storage facility at future chain of lakes site.

11. Development of relationships with state and federal regulatory agencies:

    a. DHS (regulating drinking water and municipal wells);

    b. DWR (state water project contract administrator; contributed to Bulletin 118-2 “Evaluation of Livermore Valley Groundwater Basin 1974; cooperative Well Sampling; joint management of local CIMIS station to enhance weather monitoring and improve water conservation efforts);

    c. RWQCB (lead agency for National Pollutant Discharge Elimination System [NPDES], recycled water, and basin planning; close cooperation over toxic spill sites; contributed to basin plan development; review all NPDES monitoring reports for mining discharges and wastewater dischargers; cooperate in State Wide Ambient Monitoring Program [SWAMP]);

    d. Alameda County environmental health (local implementing agency [LIA] for leaking underground fuel tanks [LUFT] sites where groundwater has been affected; septic tank ordinance update);

e. California Department of Fish and Game (DFG)/U.S. Fish and Wildlife Service (USFWS)—for recharge program operations and facilities;

f. U.S. Army Corps of Engineers (Corps)—for diversion and creek projects; and

g. Lawrence Livermore National Laboratory (LLNL)—for site cleanups, groundwater monitoring and scientific/technical support.

12. Review of land use plans and coordination with land use planning agencies to assess activities that create a reasonable risk of groundwater contamination and to assess groundwater use:

    a. DWSAP for each of Zone 7's wells;

    b. ongoing reviews and coordination through local land use and planning agencies (cities and county);

    c. development referrals; site review reporting, mapping and analysis;

    d. California Environmental Quality Act (CEQA) reviews (for new projects and developments);

    e. well permit and commercial septic tank programs;

    f. tracking and quantifying all groundwater pumping; and

    g. mapping, monitoring, and analyzing all recycled water use.

Chapter 2
Background

During the last few years, California has provided substantial funds to local agencies to enhance local groundwater management programs. One example is Proposition 13 (Water Bond 2000), which allocated $2 billion for groundwater feasibility studies and construction of groundwater recharge facilities. Additionally, the Local Groundwater Management Assistance Act of 2000 (AB 303) resulted in $15 million for groundwater studies and data collection in an effort to improve the quality of groundwater basins. AB 303 authorized grants to help local agencies develop better groundwater management strategies. AB 599 (2001) required the State Water Resources Control Board (State Water Board), in cooperation with other agencies, to develop a comprehensive monitoring program capable of assessing groundwater quality. These bills are significant with respect to groundwater because much of California's new development will rely on groundwater to satisfy its water needs.

Finally, the most relevant legislation passed in 2002 was Senate Bill (SB) 1938. SB 1938 was enacted to provide financial incentives to local agencies for improved groundwater management. The legislation modified the Water Code to require specific elements be included in a GMP for an agency to be eligible for such incentives, including possible award of AB 303 and Proposition 50 grant funds.

Zone 7 has a long history of groundwater basin management and a long history of cooperation with local and state agencies in the implementation of its basin management practices. This report is intended to compile the elements of the existing groundwater management programs and policies in a standardized format similar to other basin plans prepared in California. This Groundwater Management Plan (GMP) simply expands the goal stated in 1987 of "informing the public and relevant governmental agencies of the Zone's supply potential and management policies, and to solicit their input and cooperation" (1987 Statement On Groundwater Management).

2.1 History of Previous Area Investigations

In the early 1900's groundwater provided the majority of agricultural and domestic water demands of the Livermore Valley. Then, the Spring Valley Water Company collected hydrologic data on rainfall, streamflow, and groundwater levels. Spring Valley Water Company also pumped from wells in

Pleasanton and exported the water to provide a water supply for San Francisco. In 1930, San Francisco purchased Spring Valley Water Company. Early reports provide excellent descriptions of the sources and flow of groundwater. Early monitoring and development of the groundwater resources by Spring Valley helped early investigators understand the general structure of the groundwater basin. A key finding of these early studies was that the groundwater supply was not limitless but was actually less than about 20,000 acre-feet per year (af/yr). These early studies also concluded that the majority of supply was derived from stream recharge through the very gravelly streambeds that cross the valley floor. Based on the results of this study, San Francisco decided to look to the Tuolumne River and constructed the Hetch Hetchy system to provide a much larger supply for San Francisco. San Francisco purchased Spring Valley Water Company in 1930 and continues to pump small amounts of water from wells in Pleasanton to provide water for the Castlewood area west of Pleasanton.

In the mid-1940s, significant overdraft in the Livermore Valley resulted in a call from local farmers to the state. DWR's predecessor (Department of Public Works, Division of Water Resources) undertook studies of this area in addition to other similar basin conditions statewide. Report No. 3 was published in 1952 entitled, *Groundwater Basins in California*. Report No. 3 identified 223 alluvium-filled valleys that were believed to be basins with usable groundwater in storage. This report was a major stepping-stone for groundwater investigations in California.[1]

In the 1950s groundwater and small stream diversions were the only source of water supply to the Livermore Valley. The area experienced severe floods in the winter of 1951 and 1955 with excessive water, only to be followed by dry summers with falling groundwater levels. To address these issues of water supply and flood control, the voters of the Livermore Valley formed Zone 7 with powers to manage surface and groundwater resources.

Several cooperative DWR and Zone 7 studies in the 1960s and 1970s established the scientific foundations for the Zone 7 Groundwater Management Plan. In 1963 DWR published Bulletin No. 13, which compiled the results of the Alameda County investigations. In 1966 DWR published the geology appendix to 118-2, and in 1974 DWR published Bulletin No. 118-2, "An Evaluation of Ground Water Resources: Livermore and Sunol Valleys" in cooperation with Zone 7. In the following years, Zone 7 built upon the framework of Bulletin No. 118-2 and the DWR groundwater model. The current hydrologic inventory 1974–2004 is merely an extension of the lessons learned from this early work. The report concluded, "The results of operations-economics studies recommended will be of significant use to local government in making decisions on conservation, development and use of the county's water resources."

In 1975, DWR published its first version of Bulletin 118, *California's Ground Water*, a document that provided state-wide observations and findings. The original Bulletin 118 summarized available information from DWR, the U.S. Geological Survey (USGS), and other agencies dealing with individual

[1] California Department of Water Resources 2003.

groundwater basins. In contrast to basin-specific studies such as DWR Bulletin 118-2, the purpose of Bulletin 118 was to help decision-makers regarding the protection, use, and management of the state's groundwater resources. Subsequent joint investigations with USGS expanded on the monitoring programs. Zone 7 developed an interim groundwater basin management plan in the late 1970s.

Despite California's heavy reliance on groundwater, there was much basic information missing for many groundwater basins. In particular, data necessary to provide for both the protection and optimal beneficial use were not available for many areas. The California Legislature mandated in the Budget Act of 1999 that DWR update Bulletin 118. In response, DWR prepared Bulletin 118 Update 2003, which included important missing regulatory information, updates and data omitted from the original Bulletin 118.[2]

In the Livermore Valley, Zone 7 has built on the work of DWR and has continued to measure and compile important records and knowledge essential to good groundwater basin management. Prior to the 1960s, groundwater had been the only supply of water to meet urban and agricultural demands in the Livermore Valley. ACFCWC District Zone 7 (Zone 7 Water Agency) was created in 1957 by public vote. The intent of the formation was to resolve the water supply and flooding needs of the valley and in part to manage the groundwater basin and reverse the then-existing overdraft condition of the groundwater basin. In 1962 the first SWP water was imported into the watershed, and Zone 7 began providing wholesale treated water and water for groundwater basin recharge via stream recharge and off-site percolation ponds.

Currently, groundwater provides about one third of the urban and agricultural demands of the valley. Zone 7 Water Agency manages the groundwater basin and, through an active conjunctive use program, manages both the supply and demand of water from the basin and the long-term water quality of the basin. Several retail water supply agencies continue to pump water from the basin to supply about 12% of the urban demands, and Zone 7 provides the remaining wholesale supply to meet the full urban and agricultural demands of the valley. Zone 7's supply comes from local runoff captured by the Del Valle dam and imported surface water. The Zone 7 supplies are either used directly or artificially recharged into the groundwater basin for storage and subsequently pumped via Zone 7's production wells.

In the late 1980's Zone 7 developed a Statement on Groundwater Management that was approved by the Zone 7 Board on August 19 1987. See Appendix E.

In the 1990's Zone 7 started a decade-long investigation of basin water quality with the goal of halting the slow degradation of groundwater quality evidenced by rising hardness and TDS levels in the main basin. This resulted in the development of an SMP. The related implementation plan was adopted by the Zone 7 Board in August 1999, expanded in the full SMP in early 2004 and approved by the RWQCB in September 2004. The Groundwater Basin is

[2] California Department of Water Resources 2003.

managed as part of a basin-wide integrated water management process. The goals are implemented primarily through the Zone 7 Water Operations Plan through an adaptive management process that integrates groundwater basin management with the conjunctive use of surface water and other available water resources.

2.2 Zone 7 Water Supply and Management

Zone 7 provides water resources management services to about 190,000 residents of the Livermore Valley. Zone 7 serves a large population as a water wholesaler of potable water to its retail contractors for municipal and industrial (M&I) use. In addition, Zone 7 supplies untreated water for agriculture, golf courses, and other nonpotable uses. The four major retail water supply agencies to which Zone 7 supplies treated water are the City of Pleasanton, the DSRSD, the City of Livermore, and California Water Service Company. Zone 7's water supply comes from three sources: (1) imported surface water from the SWP, (2) local runoff into Lake Del Valle, and (3) surface water stored in the groundwater basin.[3] Several retailers also pump water from the groundwater basin and have been doing so for at least four decades. Zone 7 provides groundwater basin management services to ensure that the historical pumping can continue as a reliable supply for the retailers.

Currently, Zone 7 has a contract with DWR for water deliveries through the SWP facilities. The SWP facilities include imported water from Lake Oroville via the Sacramento River, Sacramento–San Joaquin River Delta (Delta), and the SBA. In 2004, Zone 7 had an annual maximum allocation of 80,619 af/yr. Zone 7 has also contracted with Byron-Bethany Irrigation District and DWR for an additional 2,000–5,000 af/yr through SWP facilities. In addition, Zone 7 has also purchased water storage rights (65 thousand acre-feet [taf]) in the Semitropic Water Storage District groundwater basin located in south-central California, near Bakersfield, which will allow up to 3,250 afa minimum pumpback. Zone 7 is also negotiating for future purchased water storage rights for drought year protection with Cawelo Water District (up to 10,000 afa minimum pumpback).

Zone 7 shares the water rights of local runoff from Lake Del Valle with Alameda County Water District. The average local runoff into Lake Del Valle is about 22,000 af/yr. The average take of Lake Del Valle runoff by Zone 7 is approximately 8,000 af/yr, and is expected to rise to 9,300 af/yr with projected increases in local demand.[4]

The Zone 7 local groundwater basin has a storage capacity of over 240,000 acre-feet, with an annual average natural recharge into the basin of about 13,000 acre-feet. One method of artificial recharge used by Zone 7 is to release water into various streambeds (with extremely high percolation rates) managed by Zone 7.

[3] Salt Management Plan 2004a.
[4] Salt Management Plan 2004a; water can be captured as storage only to the extent that storage is available. Additional water can be captured if there is a place to use the water ("direct use"). The increase is based on a projected increase in demands through "direct use" rather than any change in storage capacity.

The amount of release is carefully monitored and various flows along the streams are measured to quantify the condition of the streambeds and the amount of water being introduced into the groundwater basin. A future recharge project will add the Chain of Lakes system, which are old mining pits where surface water can be stored and recharged. For more information about natural and artificial recharge into the groundwater basin, refer to Section 3.3, Groundwater Recharge.

2.3 Overview of Zone 7's Basin Management

Zone 7 manages the groundwater basin as part of a basin wide–watershed wide integrated water management process. The short-term goals are conveyed to the participants primarily through the Zone 7 Water Operations Plan and through an adaptive management process that integrates groundwater basin management with the conjunctive use of surface water and other available water resources. However, there are six key documents that provide the framework for Zone 7's groundwater management policies and programs, in general, and specifically for the preparation of such operational planning documents. These four documents are included in Appendix E and are incorporated by reference:

1. *Statement on Zone 7 Groundwater Management*, August 19, 1987 (1987 GWMP);
2. Resolution No. 1037, Adoption of *Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Watershed Above Niles*, May 19, 1982;
3. Resolution No. 1165, *Prohibition on Use of Septic Tanks in New Commercial and Industrial Developments*, August 28, 1985;
4. Resolution No. 03-2494, *Water Quality Policy for Potable and Non-Potable Water*, April 16, 2003 (Water Quality Policy);
5. Resolution No. 04-2662, *Reliability Policy for Municipal & Industrial Water Supplies*, August 18, 2004 (Supply Reliability Policy); and
6. *Salt Management Plan*, May 2004—note that the SMP Executive Summary is included in the appendix for reference; this document is fairly lengthy and a complete copy of the SMP can be reviewed upon request at the Zone 7 office.

The various programs that make up the overall basin management program of Zone 7 are divided into four focus categories: water supply objectives, water quality objectives, operational goals and groundwater protection objectives.

Water Supply Objectives:

- To maintain the balance between the combination of natural and artificial recharge and withdrawal (1987 GWMP).

- To maintain water levels high enough to provide emergency reserves adequate for the worst credible drought (1987 GWMP).
- Meet 100% of Zone 7's treated water customers' water supply needs, including existing and projected demands for the next 20 years, as set forth in Zone 7's 2005 Urban Water Management Plan (Supply Reliability Policy).
- Provide sufficient treated water production capacity and infrastructure to meet at least 75% of the maximum daily contractual demands with any one major supply, production or transmission facility experience an extended unplanned outage (Supply Reliability Policy).

Water Quality Objectives:

- Zone 7 shall continue to meet all state and federal primary standards for potable water deliveries (Water Quality Policy).
- Zone 7 shall meet all state and federal secondary (aesthetic) standards and, within technical and fiscal constraints, proactively reduce hardness levels to "moderately hard (75 to 150 milligrams per liter [mg/l]).
- Protect, enhance and improve the quality of the groundwater, including mineral quality (1987 GWMP; Water Quality Policy).
- Offset current and future salt loading (2004 SMP).

Operational Goals:

- Pump groundwater for municipal use in a way that, to the extent feasible, provides comparable delivered potable water quality to all retailers in the Zone 7 service area (2004 SMP).
- Utilize the Water Operations Plan to achieve water supply goals (2004 SMP).
- Inform the public and relevant governmental agencies of the Zone's supply potential and management policies, and to solicit their input and cooperation (1987 GWMP)
- Minimize water and operational costs through an adaptive management plan (2004 SMP).

Groundwater Protection Objectives:

- Require adequate well seals between surface level and well completion zone through imposition of appropriate well permitting conditions.
- Require destruction of abandoned wells to eliminate potential to act as a conduit for contaminant migration.

- Prevent build-up of nitrates through implementation of Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Watershed Above Niles.
- Identify high risk contamination cases and coordinate with lead oversight agency to require timely assessments and cleanups.

Note that *1987 GWMP* refers to the Board-approved 1987 Statement on Zone 7 Groundwater Management and *2004 SMP* refers to the Board-approved and RWQCB-accepted SMP.

Chapter 3
Water Resources

3.1 Description of Zone 7 Groundwater Basin

3.1.1 Overview

The Livermore Valley, an east-west trending, inland structural basin located in northeastern Alameda County, is surrounded primarily by north-south trending faults and hills of the Diablo Range. The valley covers about 42,000 acres, extends approximately 14 miles in an east-west direction and varies from 3 to 6 miles in width. It is separated from San Francisco Bay by several northwesterly trending ridges of the California Coast Ranges, including the Pleasanton Ridge. The valley floor slopes gently west and southwest from an elevation of approximately 700 feet above sea level in the east to approximately 320 feet above sea level in the southwest.

The Livermore Valley Watershed covers more than 400 square miles (250,000 acres) and extends north almost to Mt Diablo and south almost to Mt Hamilton. Six principal streams flow into and/or through the valley, and join in the southeast where the Arroyo de Laguna flows out of the valley. The other five arroyos, namely the Arroyo Valle, Arroyo Mocho, Arroyo Las Positas, Tassajara Creek, and Alamo Creek, are essentially tributaries to the Arroyo de Laguna. Average precipitation rates range from 16 inches per year at the valley floor to over 20 inches per year in the southeast and northwest portions of the valley.

The Livermore-Amador Valley Groundwater Basin is located in the heart of the Livermore Valley and watershed and extends south into the hills south of Pleasanton and Livermore. It includes 65,000 acres occupied by both the Livermore Valley (42,000 acres) and the Livermore uplands (23,000 acres). The Basin is designated DWR 2-10 in Bulletin 118 and includes the areas occupied by both Livermore Valley and Livermore uplands (see Figure 3-1).

The Main Basin is bounded on the:

- west by northwesterly trending ridges of the California Coast Ranges (including Pleasanton Ridge) and the Calaveras fault,
- north by the Tassajara Uplands and the steeply dipping east west trending Tassajara Formation,

- east by the Greenville Fault and by the marine formations exposed in the Altamont Hills, and
- south by the Verona Fault and Livermore Uplands and the steeper Livermore Highlands.

The Main Basin (described in more detail in the following subsections) is a portion of the Livermore-Amador Groundwater Basin (DWR 2-10). The Main Basin covers 17,000 acres and contains the highest yielding aquifers and best quality water within the DWR Basin 2-10.

3.1.2 Hydrogeology

Structural uplift of the entire Coast Ranges occurred during the late middle Pliocene and Pleistocene, causing extensive folding and faulting of the region. The Livermore Valley, a structural valley, formed by a faulted asymmetric syncline, was created as a result of downwarping of the Miocene-Pliocene sandstones and conglomerates between the western bordering Calaveras Fault and the eastern bordering Greenville Fault. Continued deposition, uplift, and faulting have led to the current Livermore Valley stratigraphy.[1]

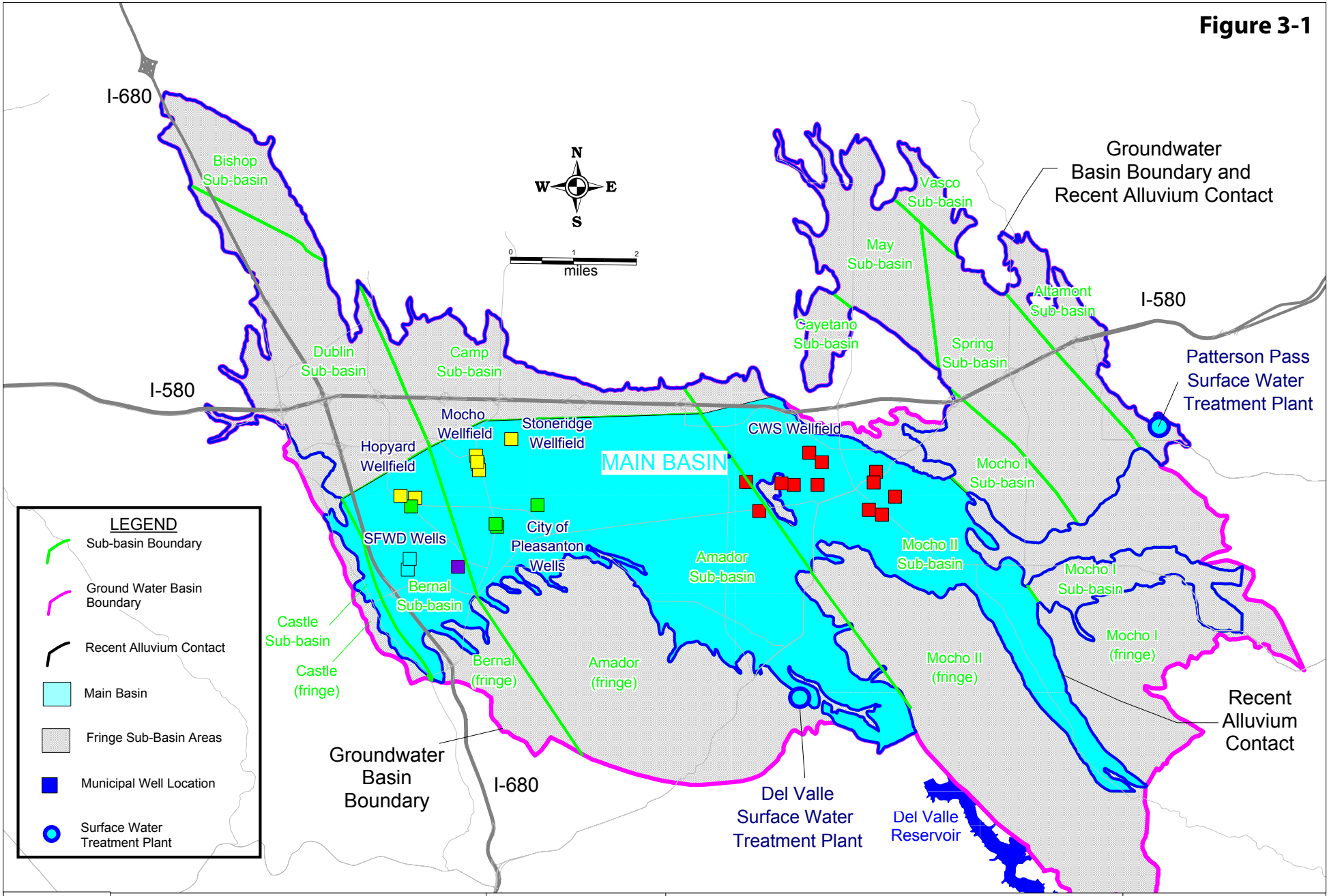
The valley is partially filled with Pleistocene-Holocene age (recent alluvium) alluvial fan, stream and lake deposits, which range in thickness from a few feet along the margins to nearly 400 (and possibly 800) feet in the west-central portion. The alluvium consists of unconsolidated gravel, sand, silt, and clay. The southern region of the Livermore Valley, the most important groundwater recharge area, consists mainly of sand and gravel that was deposited by the ancestral and present Arroyo Valle and Arroyo Mocho.

The eastern and northern regions of the valley contain thinner deposits and consist of alternating layers of gravel, sand, silt, and clay that are laterally discontinuous and resulted from the deposition of smaller streams. The western region of the valley has extensive gravel layers alternating with thick clay beds totaling approximately 400 feet in thickness. The alternation of sand/gravel layers and silt/clay layers form the basic aquifers for the area.[2]

In general, multiple aquifers are recognized in the alluvium of the Livermore Valley. The alluvium increases in thickness from east to west across the basin and thins both north and south at its boundaries. The alluvium also thickens from north to south to the central portion of the groundwater basin and then thins from the center toward the south. Although the upper portions of the alluvium appear to be very thick and continuous in the middle of the basin, the deeper aquifers are often discontinuous and/or poorly interconnected.

The Livermore Formation consists of beds of clayey gravels and sands, silt, and clay that are unconsolidated to semi-consolidated and estimated to be 4,000 feet

[1] California Department of Water Resources 1964b, 1974; Crane 1988; Hall 1958.
[2] California Department of Water Resources 1966, 1974, and Zone 7.



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APPROVED	DAVID LUNN

GROUNDWATER BASIN MAP

Groundwater Annual Monitoring Report

SCALE	1" = 2 Miles
DATE	October 31, 2003
FILE NO.	E:\monitor\GM\2004wy\Annual\Figures

thick in the southern and western portion of the basin.[3] These sediments display lower yields in the upland areas. Groundwater from this formation is sodium bicarbonate in nature and of moderately good quality. Minor amounts of groundwater are believed to move along the strike of the beds to the northwest and enter the Main Basin (see detailed description below) at the southern portions of the Bernal and Amador sub-basins.

The Tassajara and Green Valley Formations, located in uplands north of the valley, are roughly Pliocene in age and were deposited under both brackish and freshwater conditions. They basically consist of sandstone, tuffaceous sandstone/siltstone, conglomerate, shale, and limestone. Water movement from these formations to the Main Basin is precluded by either structural alteration where beds dip away from the general groundwater flow of the valley or by non-water bearing stringers (tuff and clay particles). The near-vertical structural dip of the Tassajara and Green Valley formations is believed to prevent the commingling of waters among these formations and the alluvium, essentially cutting this water off from the groundwater basin.[4] Groundwater from these formations is sodium bicarbonate in nature and of moderately good quality.

3.1.3 Aquifer Zones

Within the groundwater basin, there is often a difference in water level fluctuations and water quality with depth. This difference is attributable to the existence of multiple aquifers that are poorly interconnected. Although multiple aquifers have been identified, wells have been classified generally as being in one of two aquifer zones, primarily to simplify the description of this complex basin:

- **Upper Aquifer Zone**—The upper aquifer zone consists of alluvial materials, including primarily sandy gravel and sandy clayey gravels. These gravels are usually encountered underneath the surficial clays (typically 20 to 40 feet below ground surface [bgs]) to about 80–150 feet bgs. This aquifer extends throughout the majority of the groundwater basin. Groundwater in this zone is generally unconfined. In the center portion of the groundwater basin, the upper aquifer is underlain by a relatively continuous, silty clay aquiclude up to 50 feet thick which is underlain by the Lower Aquifer Zone. In the eastern portion of the groundwater basin, the Livermore Formation underlies the upper aquifer. In the Zone 7 groundwater model, the Upper Aquifer Zone is referred to as Layer 1.
- **Lower Aquifer Zone**—Because of a lack of detailed hydrostratigraphic evaluation, all materials encountered below the clay aquiclude/aquitard in the center portion of the basin have been known collectively as the Lower Aquifer Zone. The aquifer materials consist of semi-confined to confined, leaky, coarse-grained, water-bearing units interbedded with relatively impermeable, fine-grained units. Based on localized hydrostratigraphic evaluation in the vicinity of Zone 7 well fields and as additional geologic

[3] California Department of Water Resources 1964b.
[4] California Department of Water Resources 1966, 1974; Zone 7 files.

information and hydrologic data become available, it is possible that this zone can be further subdivided into more laterally extensive, distinct hydrostratigraphic units. Currently the Zone 7 groundwater model groups the entire lower aquifer zone into Layer 3, with the aquiclude/aquitard zone as Layer 2.

3.1.4 Main Basin

The groundwater basin has been divided into two major parts based on importance. For the past 20 years the term *Main Basin* has been used for that portion of the groundwater basin covering the 17,000 acres that contain the highest-yielding aquifers and best quality water within the Livermore-Amador Valley Groundwater Basin. The less important area is called the fringe basin. The Main Basin is located in the central and southwestern portion of the groundwater basin. This area has a much larger capacity than the surrounding areas to store and convey groundwater, particularly in the lower zone. Since the early 1900s, this area has been very significant for the local groundwater supply. Between about 1980 and 1988, this area was called the central basin. Since 1988, the central basin, except for the eastern portion of Livermore, has been referred to as the Main Basin (see Figure 3-1).

Several subsurface barriers to lateral groundwater movement form the boundaries of the Main Basin. Observations and investigations by Zone 7 and others continue to confirm the existence of these groundwater barriers. Faults are the major structural features known to have marked effects on the movement of groundwater in this region. Faults in this region tend to act as barriers to the lateral movement of groundwater.

The Main Basin is comprised of the Castle, Bernal, Amador and Mocho II Sub-Basins and is bounded on the:

- north by the Parks Boundary (which was initially considered to be fault-related, but may actually be a depositional boundary between recent alluvium and older material);
- east by shallow bedrock separating Mocho I from Mocho II sub-basins;
- south by shallow bedrock and the Livermore Uplands; and
- west by the Coastal Ranges and the Calaveras Fault.

Particular Sub-Basin boundaries and features are shown on Figure 3-1 and described in more detail, below.

The portion of the groundwater basin that is outside the Main Basin is called the fringe basin. The majority of the connectivity between the fringe and Main Basins is through the Upper Aquifer Zone. Subsurface inflow from the Lower Aquifer Zone is considered negligible.

3.1.5 Main Basin Sub-Basins

3.1.5.1 Castle Sub-Basin

The Castle sub-basin is a thin strip that extends along the southwestern portion of the Main Basin. It is bounded to the south, west, and north by marine sediments of the Coastal Range and to the east by the Calaveras Fault. While usually included in the Main Basin, this sub-basin is not used for municipal groundwater production. Only small production wells are located in this area. Water occurs in both shallow valley fill sediments and the Livermore Formation. The water from the Livermore Formation is of a sodium bicarbonate nature. This sub-basin functions as a westward extension of the Bernal sub-basin.

3.1.5.2 Bernal Sub-Basin

The Bernal sub-basin is located in the southwestern portion of the groundwater basin and is bounded to the west by branches of the Calaveras Fault, to the east by the Pleasanton Fault, to the north by the Parks Boundary, and to the south in part by contact with non-water-bearing formations and partly by contact with the Verona Fault. Both unconfined and confined aquifers exist in the water-bearing sediments. Waters from the northern and central portions of this sub-basin are of fair to excellent quality. However, much of the upper aquifer water has high TDS exceeding 600 mg/l. The water from the northern and southern portions of the sub-basin are of sodium bicarbonate nature, while the central portion is of the magnesium bicarbonate type and the western and south-central portions are of calcium bicarbonate character.

The area overlying the Bernal sub-basin is the point of convergence for all major streams that drain the Livermore Valley. The area overlying the sub-basin is subsequently drained by the Arroyo de la Laguna. Like surface water, groundwater also historically converges in this sub-basin, which allows for the mixing of the dominant cations of sodium, magnesium, and calcium.

The Quaternary alluvium is estimated to have a thickness of at least 800 feet in this sub-basin and overlies the Livermore Formation. Well production (primarily by Zone 7) in this sub-basin currently ranges up to 3,500 gallons per minute (gpm), and specific capacities range from 3 to 260 gpm per foot of drawdown. Other basin pumpers include the City of Pleasanton (although much of City of Pleasanton's pumping has shifted to the West Amador sub-basin, discussed below), San Francisco PUC (supplying the Castlewood area) and the Alameda County Fairgrounds. Historically, this Sub-Basin was overdrafted but has since been partially refilled and is used less for regional supply due to Zone 7's groundwater management efforts, including the importation of surface water from the SWP.

3.1.5.3 Amador Sub-Basin

The Amador sub-basin is located in the west central portion of the groundwater basin and is bounded to the west by the Pleasanton Fault, to the east by the Livermore Fault, to the north by a permeability barrier of inter-fingering of alluvial deposits and partly by the Parks Boundary, and to the south by the drainage divide and partly by contact with non-water-bearing formations. This sub-basin is host to the majority of high production wells and has both unconfined and confined aquifers. Waters from this sub-basin are of good to excellent quality, characterized by sodium bicarbonate, magnesium bicarbonate, and calcium bicarbonate with few instances of elevated levels of boron and nitrate.

This sub-basin of Quaternary alluvium has a maximum thickness of approximately 800 feet and overlies the Livermore Formation, which may be up to 4,000 feet thick. Well production (primarily by Zone 7 and the City of Pleasanton) in this sub-basin ranges from 42 to 2,820 gpm and specific capacities of 1.1 to 217 gpm per foot of drawdown.

3.1.5.4 Mocho II Sub-Basin

The Mocho sub-basin has been divided into two distinct areas, Mocho I and Mocho II, by a line of very low hills thought to be exposures of the Livermore Formation. The basins are further distinguished by a change in aquifer characteristics from a sodium bicarbonate (Mocho I) to a magnesium bicarbonate water type (Mocho II).

Of the entire Mocho sub-basin, only a portion of the Mocho II sub-basin is in the Main Basin. This portion of the Mocho II sub-basin is located in the east central portion of the groundwater basin and is bounded to the west by the Livermore Fault, to the east by thinning young alluvium and exposed Livermore Formation, to the north by the Tassajara Formation that is not hydraulically connected to the sub-basin and the Parks Boundary, and to the south by the Livermore Uplands and contact with non-water-bearing marine formations.

Both unconfined and confined aquifers exist in the water-bearing sediments. Waters from this sub-basin are of fair to excellent quality sodium bicarbonate (Mocho I) and magnesium bicarbonate character (Mocho II), with some instances of elevated boron and sodium ions.

The recent alluvium ranges in thickness from approximately 10–50 feet in Mocho I and up to 150 feet in Mocho II. In both sub-basins the alluvium overlies the Livermore Formation, both conformably and unconformably. The silty/clayey overburden is mostly missing. The Upper Aquifer is exposed at the surface in much of the area. Mocho I and Mocho II appear to be hydraulically connected only in the shallow alluvial deposits. Well production in this sub-basin (primarily by CWS) ranges up to 950 gpm with specific capacities of 2 to 50 gpm per foot of drawdown.

3.2 Groundwater Levels and Storage

Historically, much of the Main Basin experienced artesian conditions. In the late 1800s, the 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 in the Arroyo de la Laguna. In the early and mid-1900s, groundwater began to be extracted in appreciable quantities, causing groundwater levels to drop throughout the basin. As a result, groundwater levels dropped below the point where groundwater would naturally rise into Arroyo de la Laguna and exit the basin via streamflow.[5] Water levels continued to drop in the Main Basin through the 1960s. The trend began to reverse in 1962 when Zone 7 Water Agency began importing water from the State Water Project (SWP) and later in the 1960s when Zone 7 began capturing and storing local runoff in Lake Del Valle. The first imports were utilized in an off-stream recharge facility called Las Positas Pit. This facility was operated from 1962 until the late 1970s and again, briefly, in the 1980s.

Thus, after experiencing historical groundwater lows in the 1960s (see Figure 3-2), Main Basin water levels stabilized in the late 1960s and started to rise in the early 1970s with the advent of regional groundwater management programs. Groundwater levels approached the "historic low" again during the 1977 and 1987–1992 droughts, although 1992 water levels in many monitoring wells were significantly below the previous historic lows of the 1960s.

Today groundwater in both aquifer zones generally follows a westerly flow pattern, like the surface water streams, along the structural central axis of the valley toward municipal pumping centers. The majority of subsurface inflow, however, occurs across the northern boundaries of the Main Basin—in particular the Dublin and western Camp sub-basins—and flows in a southerly direction.[6] These sources of groundwater commingle in the Bernal and Amador sub-basins and have a general flow toward municipal or gravel mining company groundwater pumping wells or pits.[7]

The relatively low hydraulic conductivity of the aquitard layers impedes the vertical movement of groundwater between the Upper and Lower Aquifer Zones. The exchange between the two aquifers, as indicated by the groundwater monitoring data, varies depending upon the thickness and permeability of the separating aquitard and the potential gradient. Even though the movement of water and salts from the upper aquifer to the lower aquifer is slow, it is still the major sources of recharge to the lower aquifer.[8]

The Main Basin has a storage capacity of more than 250,000 acre-feet. The Main Basin was full in early 1900 and full again in 1983. Groundwater has been withdrawn down to historical low storage in 1962 and 1966 with an estimated remaining storage of 128,000 acre-feet. (Groundwater levels approached the

[5] Zone 7 2004b.
[6] Zone 7 2004b.
[7] Zone 7 2004b.
[8] Zone 7 2004b.

"historic low" in some parts of the basin during the droughts of 1977 and 1987–1992.) In 1987, Zone 7 adopted a Groundwater Management Policy (see Appendix E) that included maintaining groundwater levels high enough to provide emergency reserves adequate for the worst credible drought. For planning purposes, Zone 7 maintains this reserve above historical lows. The remaining half of the groundwater (that portion above historical lows) is actively managed for supply reliability and is used for water supply storage, and recovery during times of drought or emergency.[9] In 2002, as part of the development of Zone 7's Well Master Plan, Zone 7 further defined "historic lows" as a piezometric surface used to manage groundwater levels.

3.3 Groundwater Recharge

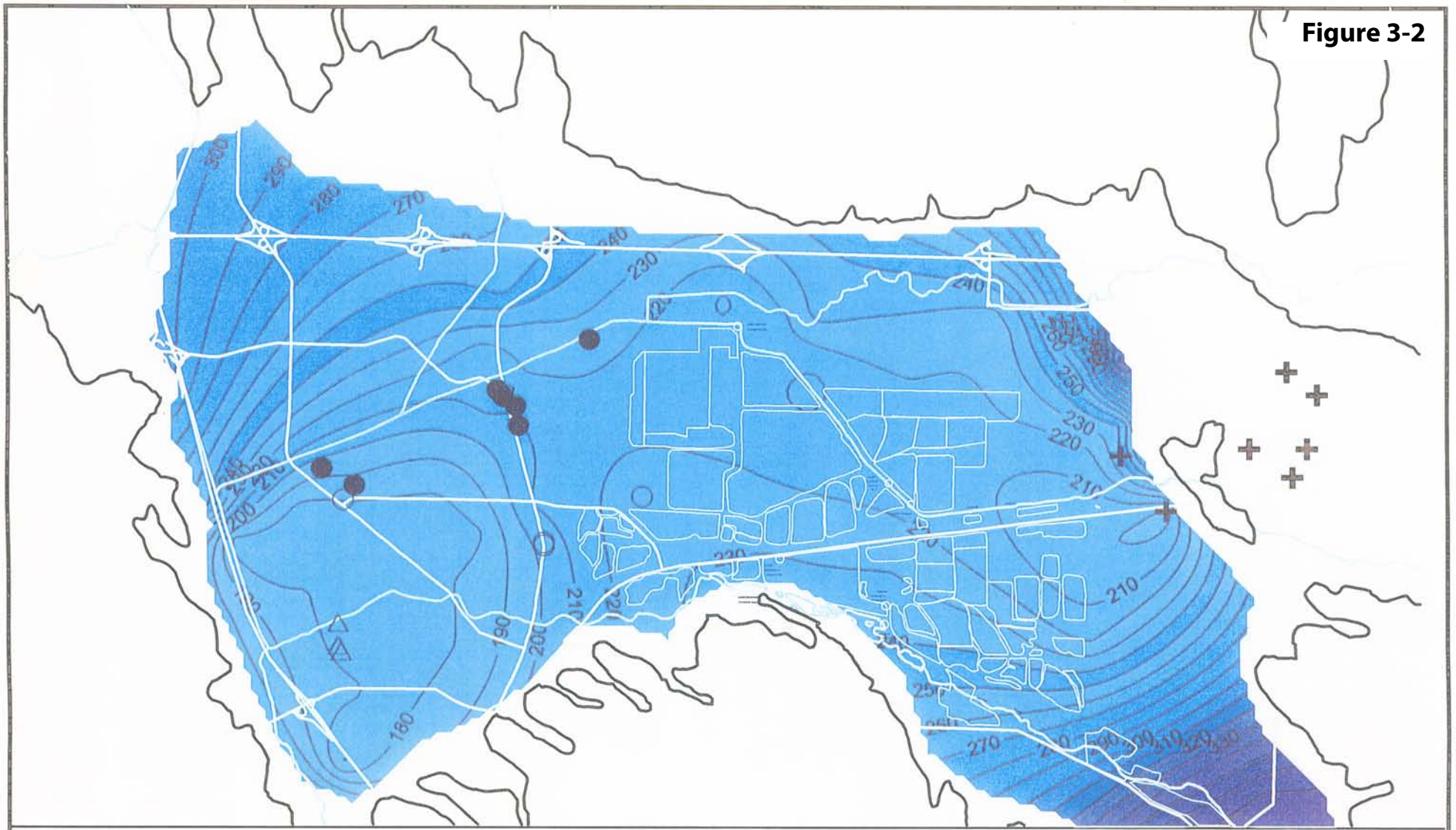
Management of groundwater recharge involves both quantity and quality aspects. The annual average natural recharge into the groundwater basin is approximately 13,400 af/y. Zone 7 artificially recharges the basin with additional surface water supplies by releasing water into the Arroyo Mocho and Arroyo Valle. The existing artificial recharge capacity ranges from 12,300 af/y to 20,000 af/y. In years when the streams are dry, there is more capacity. Adding artificial recharge essentially doubles the natural yield of the basin.[10] In addition, Zone 7 actively monitors the quality of water at many of the key stream recharge areas to ensure the protection of the quality of both surface and ground water.

Groundwater recharge from streams has the following components:

- natural recharge—rain runoff into streams,
- artificial recharge—releases from the SBA or Lake Del Valle into recharge streams, and
- gravel mining recharge—recharge from gravel mining pits or discharges into the streams.

Figure 3-3 shows the relative groundwater recharge capacity associated with each major stream in the watershed and the associated water quality (represented as concentration of TDS in mg/l). Note that the dashed lines represent areas of rising groundwater rather than areas of stream recharge. TDS in the local surface water varies significantly throughout the watershed from approximately 350 mg/l TDS to more than 1,000 mg/l. The highest quality surface water recharging the basin occurs through Arroyo Mocho and Arroyo Valle where the TDS is generally less than 500 mg/l. The poorest quality surface water recharging the basin has a TDS of approximately 1,000 mg/l and occurs in Arroyo Las Positas. On average, given 1997 land use conditions, approximately 2,700 af/y of natural recharge occurs via Arroyo Mocho, 1,200 af/y via Arroyo Las Positas, and 2,700 af/y via Arroyo Valle.

[9] Zone 7 2004b.
[10] Salt Management Plan 2004a.



LEGEND

- Zone 7 wells
- City of Pleasanton wells
- City of San Francisco wells
- Cal-Water wells

N

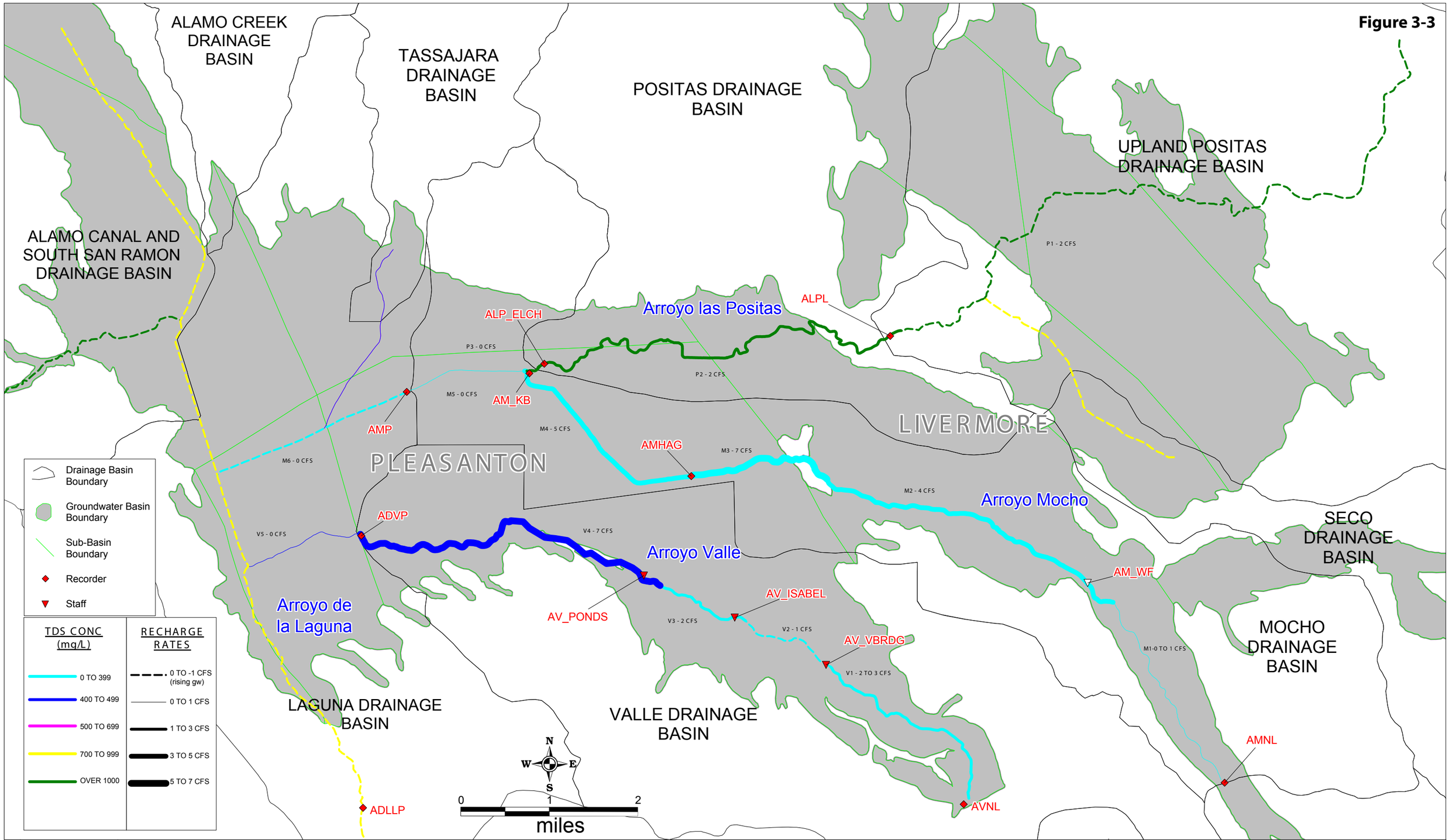
0 feet 5280 feet 10560 feet 15840 feet

HISTORIC LOW WATER LEVELS IN THE DEEP AQUIFER

ZONE 7 WATER AGENCY
WELL WATER PLAN

CH2MHILL

163304.WM.06_W102003001SFO_Z7 FIGURE ES-2-2_10/10/03_ccc



ZONE 7 WATER AGENCY

100 NORTH CANYONS PKWY, LIVERMORE, CA 94551

DRAWN BY: GG/TR	SCALE: 1" = 1 MILE	WATER RESOURCES ENGINEERING
DESIGNED BY: GERALD GATES	Apr 7, 2005	STREAM RECHARGE RATES AND TDS
CHECKED BY: DAVID LUNN	REVISED BY: TR	
FILE: E:\MONITOR\SW\2004wy\annual\FigsTbls\Fig2-StreamRecharge.wor		

The Proposed Chain of Lakes Recharge Project will provide benefits by creating additional surface water storage and recharge capacity. This is a long-term project that involves Zone 7 acquisition of quarry pits dug by local mining companies. These former mining pits, as they get turned over to Zone 7, are incorporated into the regional water management programs. During wet weather, potentially low-cost, low-TDS surface water and/or runoff could be purchased/captured and stored/ recharged for future treated or untreated supply. Demineralized recycled water could potentially be stored in the Chain of Lakes area. The first two former mining pits, Lake-H and Lake-I, became available in May 2003. Plans for a diversion structure (to divert water from the stream into the Chain of Lakes) are still needed and are not anticipated to be completed until 2008. The complete Chain of Lakes (all nine lakes) will not be available until about 2030.

3.4 Water Use

Zone 7 monitors water usage to ensure that sufficient supply and adequate quality is delivered to all its water retailers. Stored water pumped from the groundwater basin (resulting from the artificial recharge program discussed above) is a critical component of Zone 7's water supply. On average, 25% of the potable water produced by Zone 7 is this groundwater supply. However, including pumping by other entities, on the average, over 35% of Valley-Wide potable water is from the groundwater basin. A conceptual diagram of the Livermore-Amador Valley water supply and use is included in Figure 3-4. This figure demonstrates how Zone 7's water sources are integrated with other pumping to meet regional water demands.

In addition to Zone 7's groundwater pumping (about 12,000 af/y), groundwater extractions from the basin include:

- Evaporative losses of mining water from the gravel pits (~3,000 af/average year);
- municipal pumpage (~7,200 af/y) by several retailers;
- private pumpage (Fairgrounds, San Francisco Public Utilities Commission [SFPUC], industrial supply, domestic supply, others, ~1,200 af/y); and
- agricultural pumpage for irrigation (~500 af/y);

3.5 Groundwater Quality

In general, groundwater quality throughout most of the Main Basin is suitable for most types of urban and agriculture uses with some minor localized water quality degradation. The primary constituents of concern are high TDS (or hardness), nitrate, boron, and organic compounds.[11] In the western Main Basin,

[11] California Department of Water Resources 2003.

groundwater is a calcium-magnesium-bicarbonate water type and has historically been considered "hard." The rising salinity is associated with several factors (see Section 4.6.5, Salt Balance) but is primarily associated with the saline fringe basin shallow groundwater flowing into the basin or flowing into recharging streams. Imported water brings additional salts into the basin some of which are left in the soil as evapotranspiration occurs (subsequent leaching with rain or further application of irrigation water transports salts to the groundwater table). Increased salinity attributable to irrigation in a semi-arid region is another major issue (see Salt Balance Section).

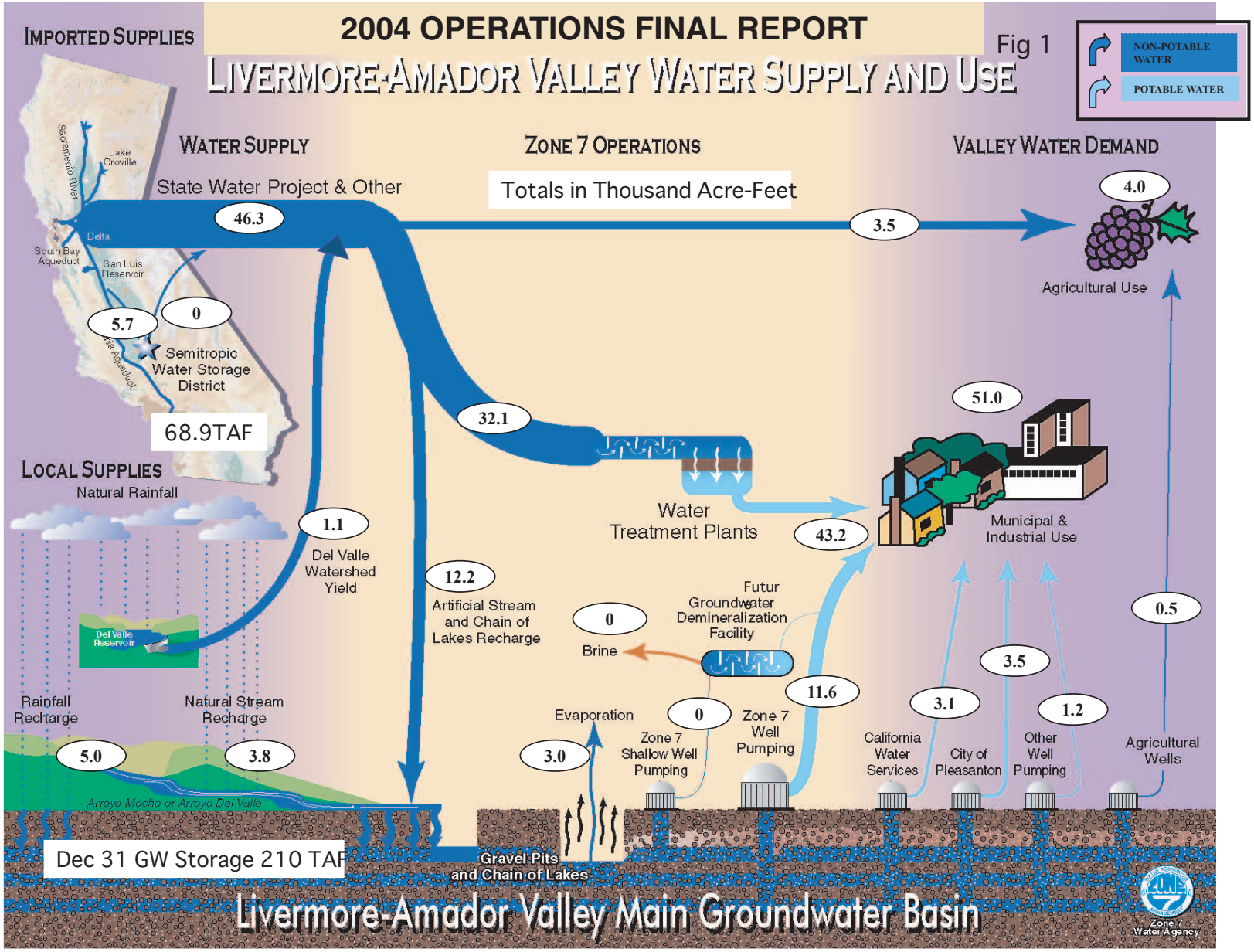
Trace amounts of boron are present in the eastern fringe basins (associated with marine formations) and with shallow groundwater in the northern fringe basins. High boron levels and lower yields can limit the use of some fringe basins for extensive agricultural irrigation.[12] Zone 7 monitors all the wells in its groundwater quality monitoring program for major minerals and select metals, including boron. Water quality samples are analyzed by the Zone 7 Water Quality Laboratory located at the Del Valle Water Treatment Plant.

The northern extent of the Livermore-Amador Valley is dominated by a sodium-rich water, while much of the western part of the basin near Pleasanton has a magnesium-sodium characteristic (i.e., both magnesium and sodium are dominant cations). The area along the eastern portion of the basin, beneath the Livermore area, has magnesium as the predominant cation.[13] Local impairments include some areas with boron concentrations exceeding 2 mg/l.

Nitrates have also impaired portions of the Main Basin, especially in the east. Nitrate levels between 30 and 65 mg/l have been identified in the nitrate study area, which covers an area of 670 acres of unincorporated residential and agricultural land in the South Livermore area. Nitrates from in-Basin wastewater disposal (less common since 1980) contributed to this problem historically. This issue is discussed in more detail in Section 5.1.4.4, Wastewater Management.

Releases of fuel hydrocarbons from leaking underground storage tanks and spills of organic solvents at industrial sites have caused minor-to-significant groundwater impacts in specific parts of the region. Detailed discussion is presented in Section 5.1.4.5. Zone 7 participated in the development of the GAMA project, which analyzed water from municipal wells for volatile organic compounds (VOCs) at ultra-low levels not detectable by standard laboratory analysis. The results showed that very low levels of MTBE and other gasoline components were detected in a handful of wells. There are five fuel contamination sites within 2,000 feet of a municipal supply well that are being closely monitored. Proactive cooperation with regulatory agencies on prevention, early detection and site cleanup is helping to protect the basin from fuel contamination (additional information on the Toxic Site Program is presented in Section 5.1.4.5, Toxic Site Management).

[12] California Department of Water Resources 2003.
[13] California Department of Water Resources 2003.



04727.04 GMP Final 08/05

Jones & Stokes

Figure 3-4
Water Operations Plan

Chlorinated organic solvent releases to soil and groundwater are an issue in the region,[14] primarily in fringe basins and in upper aquifers. Again, detailed description is provided in Section 5.1.4.5. Cleanup programs at LLNL are in place to remediate this large superfund site from a 50-year-old plume associated with World War II activities. Zone 7 assisted LLNL during the initial year of cleanup and has been working cooperatively with them since. During the past decade LLNL has been providing valuable assistance to Zone 7 in the monitoring and analysis of groundwater conditions within the basin. The GAMA project and the Geotracker project have made significant contributions to groundwater basin monitoring and to the groundwater protection effort. The GAMA project detected tetrachloroethene (PCE), a chlorinated solvent commonly used in dry cleaning, in nine of the 12 municipal wells tested in Livermore. Two of these wells have PCE levels detectable by standard laboratory procedures. The water from these two wells is currently either blended with clean water or treated at the well head to reduce the levels of PCE. One supply well at the Alameda County Fairgrounds in Pleasanton has been impacted by PCE. The water from this well is treated to remove the PCE prior to use.

Zone 7 samples approximately 250 wells under the groundwater quality monitoring program (described in Chapter 4) and reviews results from site cleanup projects made available through Geotracker and from cleanup reports routinely sent to Zone 7 for review (again, additional information on the Toxic Site Program is presented in Section 5.1.4.5, Toxic Site Management).

[14] California Department of Water Resources 2003.

Chapter 4

Management Plan Elements

4.1 Groundwater Management Goal

The management elements of this GMP include the primary goal of adequately addressing Zone 7's Groundwater Basin Management Objectives or BMOs (see Section 1.4): to provide for the control and conservation of waters for beneficial future uses, the conjunctive use of groundwater and surface water, the importation of additional surface water, and the use of the groundwater basin to serve as water storage for drought periods. This is accomplished through a set of Resource Management and Other Planning Efforts (described below) and a group of management plan components that identify the necessary actions for meeting goals and objectives. The purpose of this GMP is to compile and document the existing successful programs and policies for management of groundwater resources and to develop a framework for the implementation of future activities to ensure reliability and quality of regional groundwater.

4.2 Resource Management and Other Planning Efforts

Zone 7's primary groundwater BMOs provide for control and conservation of waters for beneficial future uses, conjunctive use of groundwater and surface water, importation of additional surface water, and use of the groundwater basin to serve as water storage for drought periods. According to the 1987 "Statement on Zone 7 Groundwater Management" located in Appendix E, Zone 7's groundwater management goals include:

- 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 effective long-term management of the groundwater basin; and

- to inform the public and relevant governmental agencies (including the TVG) and the four individual retailers, DSRSD, CWS, Livermore and Pleasanton) of the Zone's water supply potential and management policies, and to solicit their input and cooperation.

Examples of current groundwater basin management operations include:

- **Monitoring and maintenance of groundwater levels**—a long-term conjunctive use program at Zone 7. Underneath the Tri-Valley lies a groundwater basin that contains about 250,000 acre-feet of usable groundwater. An acre-foot is about 326,000 gallons, enough water to supply two households for a year. The groundwater basin provides the community with a "water savings account," which serves as a hedge against a prolonged dry period or a temporary inability to import surface water. In the event of a prolonged drought, this amount of water is enough to sustain the entire Tri-Valley for up to 6 years, depending on the amount of surface water available and the conservation efforts of water users.

  Zone 7 accesses the groundwater through wells at aboveground pumping facilities. Zone 7 pumps more groundwater during peak demand periods or in dry years when imported supplies are low. Local water retailers also access the groundwater basin for drinking water.

- **Artificial Recharge Program**—The groundwater basin is naturally refilled, or "recharged," by streamflow, underground flows, rainfall, and applied irrigation water seeping into the ground. Zone 7's groundwater management program ensures that water levels in the basin will remain at or above acceptable levels.

  In addition to natural recharge, Zone 7 manages an artificial recharge program. During spring, summer, and fall when the streams are typically dry, Zone 7 releases some of its purchased imported water into the Arroyo Valle and Arroyo Mocho. By allowing the water to flow through sections of these arroyos where the creek bottoms are very porous, the water quickly seeps into the ground, replenishing the groundwater basin. By artificially refilling or recharging the groundwater basin, and monitoring water levels throughout the valley, Zone 7 ensures that the water demands of the community are met.

  Specific objectives include managing the groundwater basin to:

  - maintain "emergency reserve" by keeping water levels above historical lows,
  - allow for gravel mining,
  - prevent overdraft from pumping (maintain total pumping at or below sustainable/safe yields), and
  - reserve storage for drought events.

- **Groundwater quality**—monitoring and management, as well as protection against any degradation:

  - mitigate degradation from salt buildup;

- minimize flow of poor quality shallow groundwater into deep aquifers;
- offset impacts of water recycling and wastewater disposal through integrated SMP;
- recharge with low TDS/hardness water;
- manage quality on a regional basis as measured at municipal wells, thus allowing localized degradation as long as the overall basin is protected
- minimize threats of groundwater pollution through groundwater protection;
- monitor and prevent inelastic land surface subsidence; and
- monitor changes in surface flow and surface quality, especially as they affect groundwater levels or quality or are caused by groundwater pumping in the basin.

4.3 Stakeholder Involvement

4.3.1 Involving the Public

A key purpose of this Groundwater Management Plan is to compile and document existing groundwater management plans and policies. One of the more recent contributions to this groundwater management toolbox is the development of the Salt Management Plan (SMP).

The SMP, incorporated herein by reference (a copy of the executive summary is included in Appendix D), was prepared in fulfillment of Master Water Recycling Permit Order No. 93-159 Provision D.1.c.ii and General Water Recycling Permit Order No. 96-011 Provision D.4. This document not only provides a comprehensive and effective approach for administering, regulating and encouraging water recycling in the Livermore-Amador Valley, it also provides guidance to the area's agencies on ways to address the historical trend of increasing TDS in the main groundwater basin. It was developed by Zone 7 staff and consultants in partnership with a TAG composed of local water retailers, and a Zone 7 citizens committee—the GMAC. The RWQCB approved the SMP in October 2004.

As with the formal process utilized in developing the SMP, Zone 7 actively involves the public in all its programs through a variety of meetings, and through media such as the Internet. This approach has been included as an explicit operational policy in Zone 7's 1987 Statement on Groundwater Management (again incorporated herein by reference; a copy is included in Appendix E). Zone 7 holds monthly Board meetings that are open to the public and conducts frequent meetings with its water retailers. The public can also access the Zone 7 website for general information or download reports on a variety of topics. In addition, the public can get involved with Zone 7 planning and management through the RWQCB Basin Planning process. The Zone 7 website can be accessed at <http://www.zone7water.com>.

Examples of the different types of public involvement in Zone 7's groundwater management programs include:

- retailer contracts (including pumping quotas);
- meetings with retail water agencies (DSRSD, CalWater, Pleasanton and Livermore);
- Memorandum of Understanding (MOU) for well ordinance administration within respective city limits;
- stakeholders meetings (e.g., Alameda Creek Watershed Management Program);
- data-sharing with retailers, public and other agencies (RWQCB, DHS, and County Environmental Health);
- reports at public board meetings (three formal presentations to Board and public in 2004 on groundwater basin management);
- website postings, including annual reports, quarterly groundwater reports and water awareness fact sheets;
- kiosk stations (watershed, groundwater basin and artificial stream recharge information along footpaths that border key recharging streams), county fair booths, Earth Day events, etc.;
- press releases, Water Ways newsletter;
- Groundwater Management Advisory Committee or GMAC—10-member citizens committee formed 1995–2002 primarily in relation to the demonstration RO/groundwater injection project; however also assisted in the major review and update of the 1987 GMP, as reflected in the newly created Salt Management Plan or SMP;
- Technical Advisory Committee or TAC (technical staff from the four retail water agencies) formed in 1995–2002 in conjunction with GMAC to assist in the development of the SMP which included major review and update of the 1987 GMP;
- elementary school (K-8) program, using consultants; and
- secondary school science program—cooperative program with Zone 7 staff, LLNL, retailers, Tri-Valley ROP; brings water science and water industry career information into the high schools.

4.4 Development of Relationships with State, Federal, and Local Agencies

Working relationships between Zone 7 and the state, federal, and local agencies are critical to developing and implementing the various groundwater management strategies and actions detailed in this GMP.

Zone 7 has, and will continue to develop, an excellent working relationship with DWR, RWQCB and any relevant federal agency for the necessary means of protecting the beneficial uses of the Livermore-Amador Valley groundwater basin. For example, Zone 7 in conjunction with DWR wrote *Evaluation of the Groundwater Resources: Livermore and Sunol Valleys* in 1974. In addition, Zone 7 plans to continue working with DHS on regulating drinking water and municipal wells; the RWQCB on NPDES and Basin Planning (such as the SMP); Alameda County Environmental Health on issues where groundwater has been affected; DFG and USFWS on recharge program operations; and the Corps on diversion and creek projects.

Over the years, Zone 7 has fostered excellent working relationships with local entities through contracts, policies and resolutions such as those included in Appendix E of this document. In particular, Zone 7 solicits input from the TVRG and its four member agencies, DSRSD, CWS, Pleasanton and Livermore. As with the SMP, any future changes to this Groundwater Management Plan and Zone 7's existing groundwater management policies and procedures would be the result of collaboration with the TVRG and its member agencies.

Zone 7 also maintains relationships with the local water retailers and Planning Agencies (such as the County and the City of Dublin) to ensure that adequate land use planning and protocols are up to date to ensure the beneficial use of the groundwater basin. Zone 7 reviews CEQA documents for all new developments and coordinates with cities and counties to ensure accurate planning.

In addition, Zone 7 is a member of the Tri-Valley Regional Geographic Information Systems User Group (TVRGIS User Group). The TVRGIS was formed to address the electronic sharing of spatial data (e.g., parcel base-maps, centerlines, public trails, drainages, ortho-photography, zoning and general plan land use) and to minimize the overlap in spatial data that each agency uses. The TVRGIS, which includes GIS coordinators from the Town of Danville, City of Dublin, City of Livermore, City of Pleasanton, and Zone 7, addresses the sharing of spatial data for local and regional planning, management, and public safety purposes.

4.5 Monitoring Programs and Protocols

Zone 7 currently monitors the conditions of the groundwater basin. This section of the GMP describes Zone 7's monitoring programs. Standard Operating Procedures (SOPs) can be seen in Appendix C. Table 4-1, below, summarizes details regarding these programs.

Table 4-1. Monitoring Programs and Protocols

Monitoring Type	Location	Measurement Type	Date Started	Frequency	Notes
Climatological Monitoring Program					
Precipitation	9 stations including 8 with storage gages and 5 with recorders	Storage Gage (8) Recorder (5)	Jan 1871	Daily Continuous	Reported in: Climatological Reports (monthly/annually) and Stream Reports (daily/monthly/annually)
Evaporation	Lake Del Valle	Pan Evaporation	October 1969	Daily	Reported in: Climatological Reports
Evapotranspiration	CIMIS Station (Fairgrounds, Pleasanton)	Automated active weather station	June 2004	Daily	Reported in: Climatological Reports
Surface Water Monitoring Program					
Streamflow	47 Stations including 10 recorder stations on three streams: Arroyo Valle Arroyo Mocho Arroyo De Las Positas	 Stream Gages Meters Recorders	1912	 Daily Daily Continuous	Reports: Annual Stream Recharge Report; Daily Stream Flow Reports; Quarterly Water Supply Report; Monthly Groundwater Supply and Utilization Report
Surface Water Quality	16 stations		1948	Annually	Monitoring performed by Zone 7 beginning in 1974; Stormwater Quality Management Plan and Program, as required by RWQCB Orders R2-2003-0021 and 93-159; reported in SW Annual Report
Recharge	Three streams: Arroyo Valle Arroyo Mocho Arroyo Las Positas	Metered and gaged records	1974	Monthly	DWR calculated various forms of stream, artificial and natural recharge in 1966; currently reported in Monthly Groundwater Supply and Utilization Report
Groundwater Monitoring Program					
Well Inventory	By Township/Range: 2S/1E, 2S/2E, 2S/1W, 3S/1E, 3S/2E, 3S/1W	Data Base and Hard Copies	1973 Historic from 1906	Ongoing	Zone 7 began collecting and maintaining well inventory information in about the mid-1970's; information was initially collected by DWR for regional studies published in 1953, 1955, 1963, 1966 and 1974. Zone 7 obtained all historic well records and since 1973 has obtained all well records through the drilling permit process.

Monitoring Type	Location	Measurement Type	Date Started	Frequency	Notes
Groundwater Levels	Currently 224 wells measured semi-annually; 80 wells measured monthly; 9 wells continuously monitored	Pressure transducers Steel and electrical tapes	1946 Historic from 1900	Recorder, monthly and semiannual	Data collection began with three wells in about the mid-1940's when multi-year drought resulted in groundwater level drops and DWR began taking an interest in the area; Zone 7 has managed the program for the last 30 years, adding other wells to its growing program; reported in Groundwater Level Report (monthly/semi-annual)
Groundwater Quality	Currently 218 wells sampled and analyzed for TDS, major minerals and metals.	Analytical	1946 Historic to 1908	Annually	Focus has been on salt (mineral) concentrations, as represented by TDS levels; subsequently, program expanded to included pollutants and other WQ parameters; reported in Annual Groundwater Report, semiannual Groundwater Quality Summary; Monthly Municipal Groundwater Quality Report
Land Surface Elevation Monitoring Program					
Land Surface Elevations	50 Benchmarks	Surveying	Historic 1912 Elastic seasonal 2002	Periodic and Semiannually	Land Surface Elevation Report
Groundwater Production Monitoring Program					
Pumpage	Major pumping wells (Zone 7, retailers, etc.)	Metered	1974	Monthly	Reported in Water Users Reports; Annual groundwater Supply and Use Forecast Report; Monthly Municipal Water Supply Reports
Other Programs					
Wastewater Export/Disposal			1979	Monthly	Outside Agency Jurisdiction (Managed by DSRSD and City of Livermore; data includes flow, TDS, major minerals & metals)
Recycled Water Production & Use		Metered		Monthly	Outside Agency Jurisdiction (Managed by DSRSD and City of Livermore)

Zone 7's key monitoring programs include (and are described in detail below and on Table 4-1):

- climatological monitoring,
- groundwater elevation and quality monitoring,
- surface water flow and quality monitoring,
- land surface elevation and inelastic subsidence monitoring,
- mining area monitoring,
- land use monitoring,
- groundwater production monitoring, and
- wastewater disposal.

Figure 4-1 shows the entire basin well-monitoring program.

4.5.1 Climatological Monitoring

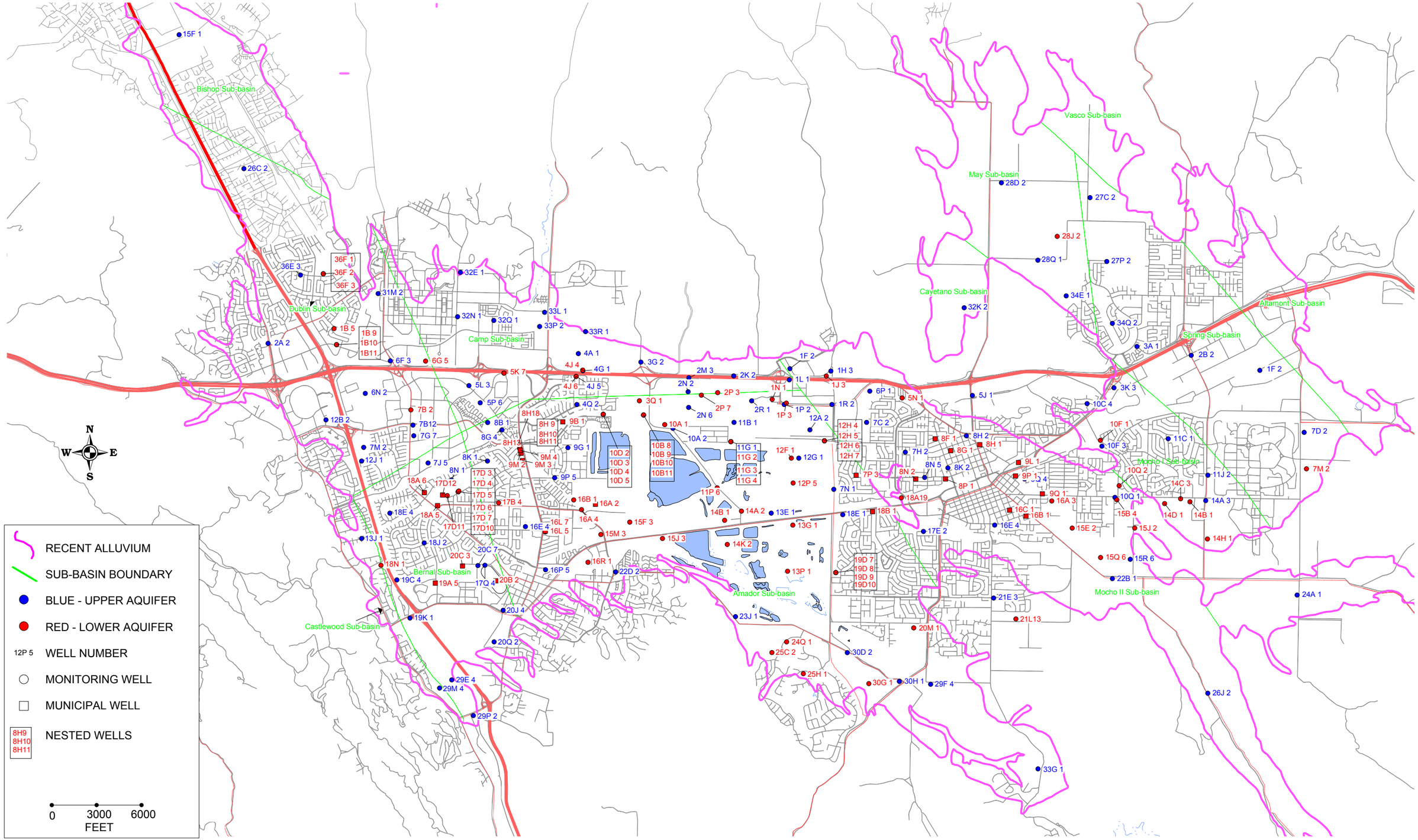
4.5.1.1 Background/Introduction

Zone 7 actively monitors and compiles climate data from a network of rainfall and evaporation stations throughout the Livermore-Amador Valley watershed. Climatological data are used to calculate specific components of the annual recharge totals, evaporative losses, and evapotranspiration demands.

4.5.1.2 Program Description

The Zone 7 climatological monitoring program network consists of nine rainfall stations and two pan evaporation stations located within the 400-square-mile Livermore Valley watershed (Tables 4-2 and 4-3). The locations of the stations and the lines of equal mean annual rainfall (isohyetals) are shown in Figure 4-2. There are three types of precipitation stations in the network:

- Four Daily Record Stations—consist of a storage gage that measures the depth of rain that has fallen during the preceding 24 hours. Three of these stations are operated by private observers.
- Four Recorder Stations—consist of a storage gage (same as those described above) and a computerized tipping bucket recorder that continuously record hourly rainfall. All four stations are operated by Zone 7.
- One California Irrigation Management Information System (CIMIS) Station—installed and operated with assistance from DWR, this station collects/records/calculates data for precipitation, air temperature, soil temperature, wind speed, wind direction, solar radiation and evapotranspiration



ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE, PLEASANTON CA 94588

DRAWN BY: G GATES/T ROOZE

DESIGNED BY: GERALD GATES

FILE NO.: \\Zone7-file\wre\MONITOR\GM\2003wy\Annual\Figures\Fig3ProgramWells.WOR

WATER RESOURCES

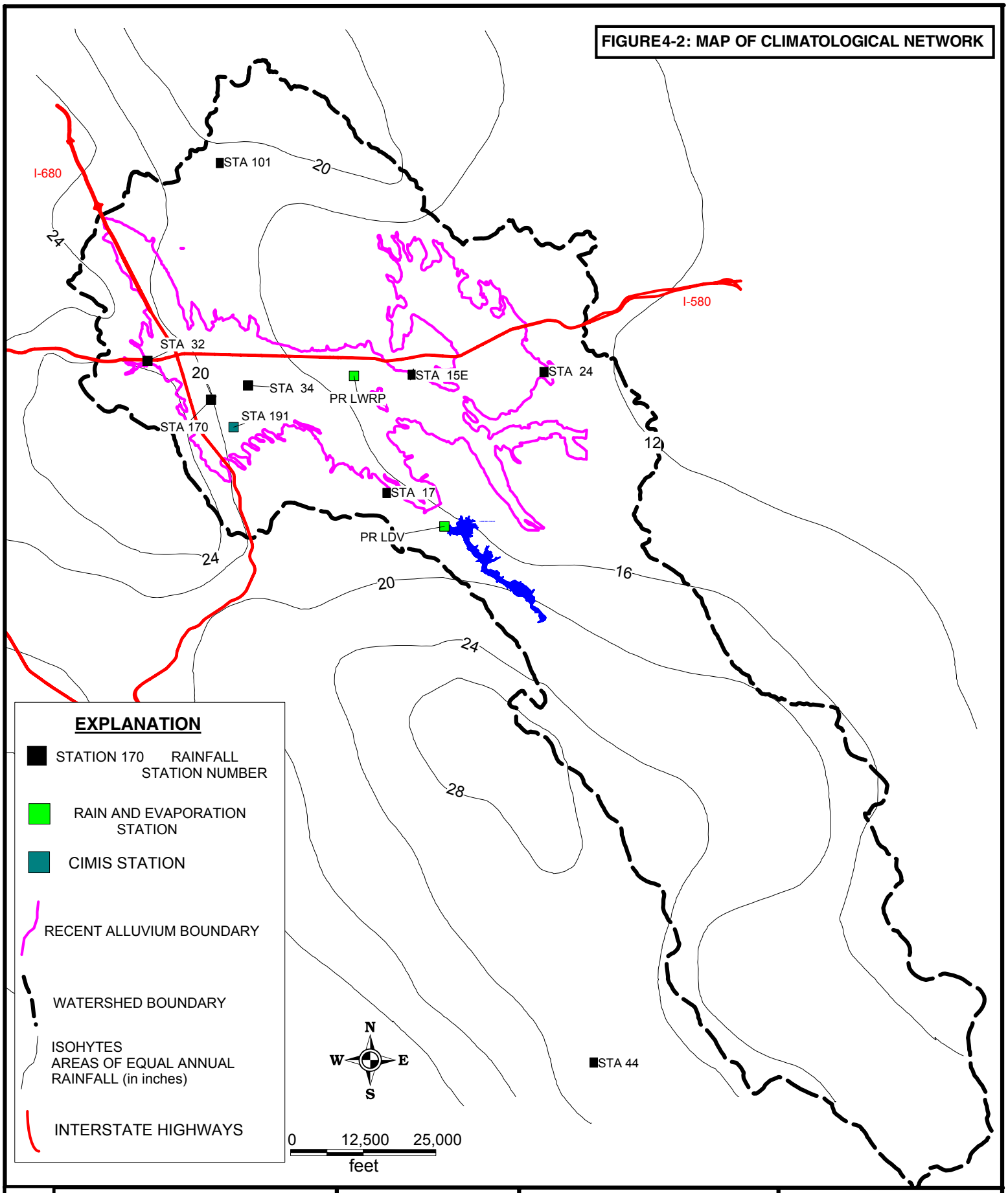
GROUNDWATER PROGRAM WELLS

2003 WATER YEAR

SCALE: 1" = 6000'

DATE: August 9, 2004

FIGURE 4-1



ZONE 7 WATER AGENCY 5997 PARKSIDE DRIVE, PLEASANTON CA 94588	DRAWN BY: MIKE GARGUILO DESIGNED BY: MIKE GARGUILO CHECKED BY: GERALD GATES APPROVED BY:	WATER RESOURCES CLIMATOLOGICAL MONITORING NETWORK 2004 WATER YEAR	SCALE:1" = 24,000' DATE: 21 NOVEMBER 2003 FILE NO.: E:\MONITOR\PR\NETWORK03X.WOR

The program also includes two evaporation stations that collect data with an evaporation pan. The Lake Del Valle (LDV) station, operated by DWR is a part of LDV operations. The Livermore Water Reclamation Plant (LWRP) operates the LWRP station as part of their wastewater treatment plant operations.

Table 4-2. Precipitation Network

Station ID	Site ID	Station Name	Location	Observer	Elevation	Station Established		Mean Annual Precipitation Inches
						Storage Gage (Daily)	Recorder Record	
15E	CM_STA 15E	NOAA Livermore	Wellingham Drive, Livermore CCN: 2077172 CCE: 6194524	Mr. Ron Hafner	480	1871	–	14.60
17	CM_STA 17	Del Valle Plant	Vallecitos Road, Livermore CCN: 2054906 CCE: 6189667	Zone 7 Staff	640	1974	1978	16.26
24	CM_STA 24	Patterson Plant	Patterson Pass Road, Livermore CCN: 2077605 CCE: 6219168	Zone 7 Staff	680	1963	1969	13.09
32	CM_STA 32	Dublin Canyon	Dublin Canyon Road, Pleasanton CCN: 2079706 CCE: 6144577	Mr. H.W. Kolb	450	1937	–	23.27
34 and 34TB	CM_STA 34	Mocho Well Field	Santa Rita Road, Pleasanton CCN: 2075106 CCE: 6163467	Zone 7 Staff	340	1968	1970	17.88
44	CM_STA 44	Mt Hamilton	Lick Observatory, Mt Hamilton CCN: 1947881 CCE: 6228576	Lick Observatory Staff	4209	1881	–	24.63
101	CM_STA 101	Tassajara	Camino Tassajara Road, Danville CCN: 2116905 CCE: 6158368	Mrs. Joan Hansen	800	1912	–	18.34
170	CM_STA 170	Zone 7 Office - old	Parkside Drive, Pleasanton CCN: 2072426 CCE: 6156517	Zone 7 Staff	330	1986	1986	20.63

Station ID	Site ID	Station Name	Location	Observer	Elevation	Station Established		Mean Annual Precipitation Inches
						Storage Gage (Daily)	Recorder Record	
191	CM_STA 191	CIMIS Station	Alameda County Fairgrounds, Pleasanton CCN: 2067061 CCE: 6161028	DWR and Zone 7 Staff	335	–	2004	19.39

Table 4-3. Evaporation Network

Station ID	Site ID	Station Name	Location	Observer	Elevation	Station Established	Mean Annual Evaporation Inches
LDV	CM_EV_LDV	Lake Del Valle	Arroyo Road, Livermore CCN: 2048605 CCE: 6200367	DWR Staff	760	1969	65.84
LWRP	CM_EV_LWRP	Livermore Water Reclamation Plant	Kitty Hawk Road, Livermore CCN: 2076905 CCE: 6183367	LWRP Staff	405	1967	73.01

4.5.1.3 Reporting

Throughout the water year several reports are generated to display, review, and discuss the data that was gathered:

- Climatological Data Monthly Report,
- Climatological Monitoring Annual Report, and
- Climatological Monitoring Program Design Report—Annual Program Update.

The results of this monitoring program are used for operational decisions, monitoring decisions, and in recharge calculations (Section 4.6.2).

4.5.2 Groundwater Elevation and Quality Monitoring

4.5.2.1 Background/Introduction

Since the early 1900s there has been a long history of groundwater use, level measurements, and water quality testing in the Livermore-Amador Valley. Zone 7 has compiled a historical database of available water level and quality

data pertaining to the groundwater basin. Zone 7's historical database contains records compiled from many sources consisting of major mineral water quality data from 1,122 wells and groundwater level data from 2,319 wells.

Zone 7's groundwater monitoring program includes the monitoring of:

- groundwater elevations to determine the volume and movement of groundwater within the basin, and
- groundwater quality to determine the status of current water quality and long-term trends.

4.5.2.2 Program Description

Zone 7 monitors approximately 225 wells in the Main Basin. Groundwater wells in this program are defined as one of the following types:

- monitoring—used only for monitoring (i.e., no groundwater extraction), including at least 11 nested well sets for monitoring specific water bearing units;
- municipal—municipal water supply well owned by Zone 7, San Francisco Water District, City of Pleasanton, or Cal Water Service;
- potable—drinking water supply well for residences (potable domestic) or non-municipal public supply (potable public); or
- agriculture—extraction well for agriculture use.

Zone 7's Groundwater Monitoring Program includes monitoring for the following reasons:

- **Monthly basin levels**—includes a network of wells that are monitored, reported, and reviewed monthly for groundwater levels. These data are used for ongoing studies of subsurface inflow, identification and confirmation of hydrostratigraphic units, monitoring of groundwater extraction by others, tracking pumping and static water levels, and determining pumping costs.
- **Groundwater basin seasonal extremes**—to determine basin-wide water levels at the two extremes of the annual cycle.
- **Groundwater basin quality**—to track water quality in the groundwater basin and migration patterns of minerals and metals towards pumping wells.
- **Geologic Evaluation**—to identify geologic conditions of the basin and surrounding areas. This evaluation is preformed constantly and includes compiling historic geologic maps by others, evaluation of drilling logs and elogs, identifying water level and quality trends, and making outcrop field visits.
- **Water rights**—The conditions of this permit require that Zone 7 conduct a groundwater investigation that includes sampling of four groundwater wells along the Arroyo Valle semi-annually, measuring water levels from a

specific set of wells collected monthly, and collecting water level recorder measurements from two wells.

- **DWR**—in a cooperative agreement with the DWR, Zone 7 takes split groundwater samples from some wells to supply DWR with groundwater quality data and to supply quality assurance/quality control (QA/QC) data for Zone 7 sampling.

All of the wells to be monitored in the program fulfill some of the needs for a basin evaluation or a regulatory objective. Some wells are assigned to multiple purposes depending on the suitability of the well.

The program includes the monthly measurement of groundwater levels in about 80 wells and semiannual measurements in about 224 wells. Approximately 200 wells are sampled annually. These samples are tested in the field for EC, pH, and temperature. The samples are then submitted to the Zone 7 laboratory and are analyzed with various minerals, metals, and other parameters including those seen in Table 4-4.

Table 4-4. Water Quality Monitoring Constituents

Minerals	Metals	Other
Calcium	Boron	Total Dissolved Solids
Magnesium*	Arsenic	Total Hardness
Sodium	Chromium	Electrical Conductivity
Potassium	Manganese	Alkalinity
Bicarbonate*	Selenium	Calcium Hardness
Sulfate	Iron	
Chloride	Lead	
Nitrate	Copper	
Silica	Mercury	
Carbonate*	Others	
* Calculated		

The Monitoring Protocols Table (Table 4-1) identifies the number of wells that are measured for groundwater levels and sampled for groundwater quality and the associated objective.

4.5.2.3 Reporting

Throughout the water year several reports are generated to display, review, analyze, and discuss the data that were gathered both internally and with interested stakeholders:

- Key Well Report—submitted to Zone 7 Board quarterly

- Groundwater Level Monitoring Monthly Report
- Quarterly Municipal Groundwater Quality Report
- Semi-Annual Groundwater Level Report
- Groundwater Annual Monitoring Report
- Groundwater Program Design Report—annually

Internal reports are also generated to review the data:

- Groundwater Level Hydrograph Report
- Groundwater Hydrochemograph Report (semiannually)
- Groundwater Quality Summary Report (semiannually)

The results of this program are used for groundwater storage calculations, supply and demand inventory, recharge calculations, salt management, and groundwater modeling.

4.5.3 Surface Water Flow and Quality Monitoring

4.5.3.1 Background/Introduction

Surface water in the Livermore-Amador Valley consists of:

- watershed runoff into Lake Del Valle;
- local natural runoff into four major streams (Arroyo Valle, Arroyo Mocho, Arroyo Las Positas, and Arroyo de la Laguna);
- rainfall and urban runoff;
- water from several quarry ponds (mining area);
- applied irrigation water seepage and runoff; and
- imported water conveyed in the SBA and released into local arroyos.

As part of its Groundwater Management Program, Zone 7 operates a surface water–monitoring program in the valley to measure the quantity and quality of stream water recharging the groundwater basin and to provide sufficiently detailed data to manage the local water supply. The monitoring program focuses on the streams that recharge the groundwater basin (Arroyo Valle, the Arroyo Mocho, the Arroyo Las Positas, and the Arroyo de la Laguna; see Figure 4-3) and the diversions and accretions that affect the flow along them. Zone 7 has compiled water flow data from these streams back to 1912 and water quality data back to 1948.

Zone 7, which is also responsible for streamflow management of controlled releases to various streams, has implemented a surface water monitoring program that includes a network of recorder, meter, and staff gage sites that monitor the

quality and quantity of stream flow 365 days a year. This network characterizes the flow and water quality in all major tributaries of the watershed.

4.5.3.2 Program Description

There are about 120 existing surface water monitoring sites in the Livermore Valley. For its surface water program, Zone 7 monitors 47 of these sites for flow and 16 for quality (see Figure 4-3 and Table 4-1). Sites are classified as:

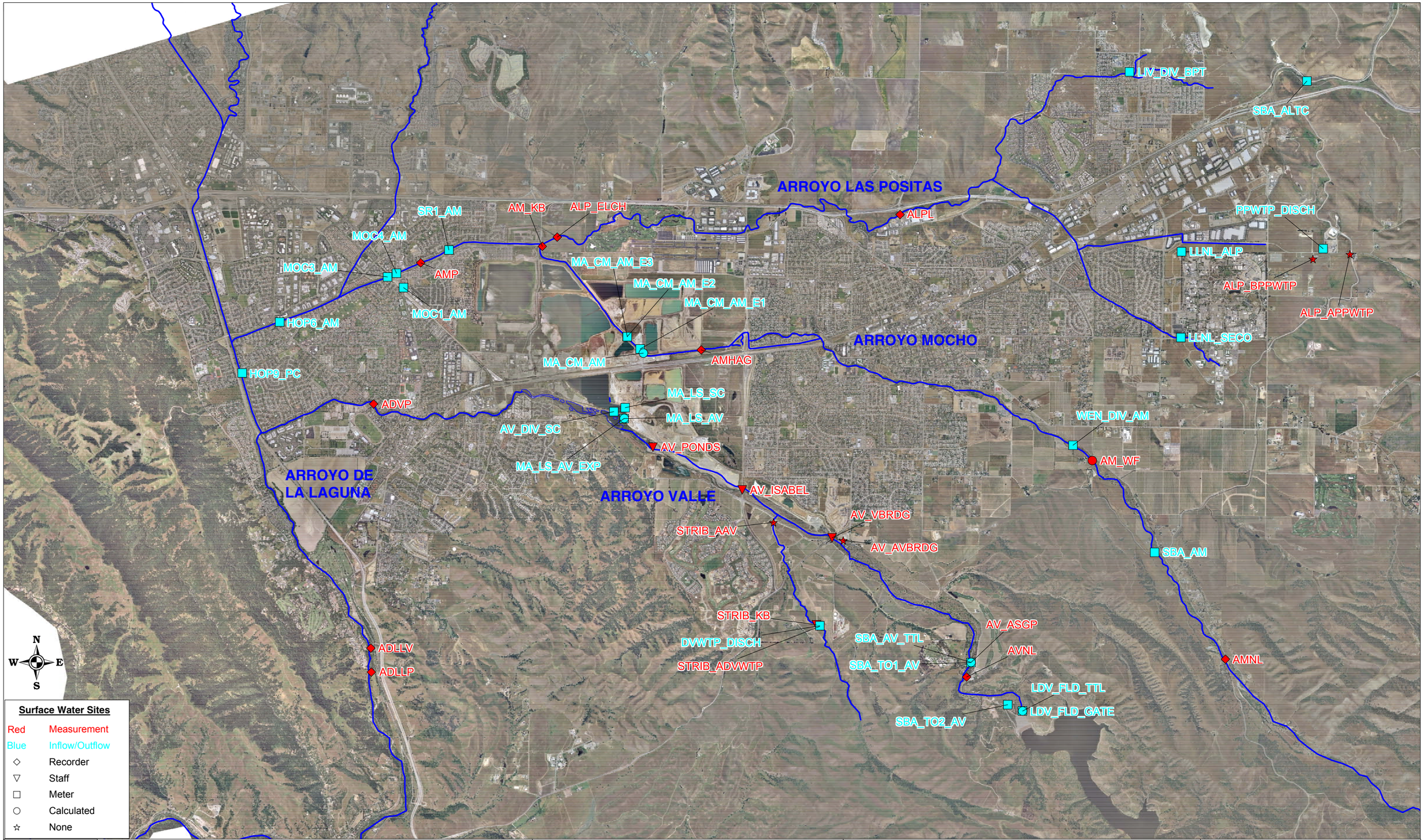
- inflow/outflow—represents discharge or diversion sites where there is an inflow into or outflow from the stream, or
- monitoring—represents sites where flow and/or water quality monitoring occurs in the stream.

Sites have a measurement device to directly or indirectly record flow and/or water quality. These are listed in Figure 4-3 and Table 4-5 as:

- continuous recorder station—produces a continuous (15-minute) record of stream gage height and/or quality,
- meter—meter that records the volume of water flow,
- staff gage—a graduated tape or pole that measures the stream gage-height,
- calculated—virtual site where flow or quality is calculated,
- none/other—none of the above.

Table 4-5. 2004 Surface Water Program Sites

				Objectives					
				Std		Wtr Rts		NP	
Site	Location	Type	Device	Flw	Qlty	Flw	Qlty	Qlty	Notes
Arroyo De La Laguna—Line B									
HOP9_PC	Hopyard 9 Waste to Pleasanton Canal (ADLL)	Inflow/ Outflow	Meter	D					
ADLLV	Arroyo De La Laguna at Verona	Measurement	Recorder	R	A				Started in 2004. Std Analysis
ADLLP	Arroyo De La Laguna near Pleasanton	Measurement	Recorder	R					Discontinued in 2004
Arroyo Las Positas—Line H									
ALP_APPWTP	Arroyo Las Positas above PPWTP	Measurement	None					A	Dry in 2004
PPWTP_DISCH	PPWTP Discharge to Arroyo Las Positas	Inflow/ Outflow	Meter	D					
ALP_BPPWTP	Arroyo Las Positas Below PPWTP	Measurement	None					A	Dry in 2004



ZONE 7 WATER AGENCY

100 NORTH CANYONS PKWY, LIVERMORE CA 94551

DRAWN BY: MG/TR

DESIGNED BY: MIKE GARGUILO

FILE: \\Zone7-file\wre\MONITOR\SW\2004wy\annual\FigsTabls\Fig4-2004SWStations.WOR

Locations of Sites in 2004 Surface Water Program

SCALE: 1" = 1 MILE

DATE: Apr 7, 2005

FIGURE 4-3

				Objectives					
				Std		Wtr Rts		NP	
Site	Location	Type	Device	Flw	Qlty	Flw	Qlty	Qlty	Notes
LLNL_ALP	LLNL Treatment Effluent Discharge to ALP	Inflow/ Outflow	Meter	D	D				EC only, supplied by LLNL & annually by Zone 7 lab
LLNL_SECO	LLNL Treatment Effluent Discharge to SECO	Inflow/ Outflow	Meter	D	D				EC only, supplied by LLNL & annually by Zone 7 lab
ALPL	Arroyo Las Positas at Livermore	Measurement	Recorder	R	A				Std Analysis, Also EC Recorder data
ALPL_ELCH	Arroyo Las Positas at El Charro	Measurement	Recorder	R	A				Std Analysis
Altamont Creek—Line R									
SBA_ALTC	SBA Turnout to Altamont Creek	Inflow/ Outflow	Meter	D					
LIV_DIV_BPT	Livermore Diversion from Brushy Peak Trib	Inflow/ Outflow	Meter	D					
Arroyo Mocho—Line G									
AMNL	Arroyo Mocho near Livermore	Measurement	Recorder	R	A				Std Analysis, Also EC Recorder data
SBA_AM	SBA Turnout to Arroyo Mocho	Inflow/ Outflow	Meter	D					Std Analysis, Also EC Recorder data
AM_WF	Arroyo Mocho at Wente Ford	Measurement	Calculated	D					
WEN_DIV_AM	Wente Diversion from Arroyo Mocho	Inflow/ Outflow	Meter	D					
AMHAG	Arroyo Mocho at Livermore (Hagemann)	Measurement	Meter	R	A				Std Analysis, Also EC Recorder data
MA_CM_AM_E1	Calmat Discharge to AM at Site E1	Inflow/ Outflow	Recorder	D					Quality monitored at source in MA Program
MA_CM_AM_E2	Calmat Discharge to AM at Site E2	Inflow/ Outflow	Meter	D					Quality monitored at source in MA Program

				Objectives					
				Std		Wtr Rts		NP	
Site	Location	Type	Device	Flw	Qlty	Flw	Qlty	Qlty	Notes
MA_CM_AM_E3	Calmat Discharge to AM at Site E3	Inflow/ Outflow	Meter	D					Quality monitored at source in MA Program
MA_CM_AM	Calmat Discharge to Arroyo Mocho	Inflow/ Outflow	Calculated	D					Quality monitored at source in MA Program
MA_CM_AM_EXP	Calmat Discharge to AM—Exported from basin	Inflow/ Outflow	Calculated	D					Quality monitored at source in MA Program
AM_KB	Arroyo Mocho at Kaiser Bridge	Measurement	Calculated	R	A				Std Analysis
SR1_AM	Stoneridge 1 Waste to Arroyo Mocho	Inflow/ Outflow	Recorder	D					
AMP	Arroyo Mocho near Pleasanton	Measurement	Meter	R	A				Std Analysis; also EC Recorder
MOC1_AM	Mocho 1 Waste to Arroyo Mocho	Inflow/ Outflow	Recorder	D					
MOC3_AM	Mocho 3 Waste to Arroyo Mocho	Inflow/ Outflow	Meter	D					
MOC4_AM	Mocho 4 Waste to Arroyo Mocho	Inflow/ Outflow	Meter	D					
HOP6_AM	Hopyard 6 Waste Arroyo Mocho	Inflow/ Outflow	Meter	D					
Arroyo Valle—Line E									
AVBLC	Arroyo Valle below Lang Canyon	Measurement	Recorder	R	A				Std Analysis
LDV_FLD_GATE	LDV Flood Gate	Inflow/ Outflow	Meter	D					
LDV_FLD_TTL	LDV Total Flood Release	Inflow/ Outflow	Calculated	D					
SBA_TO2_AV	SBA Turnout 2 to Arroyo Valle	Inflow/ Outflow	Meter	D					
AVNL	Arroyo Valle Near Livermore	Measurement	Recorder	R	A	R	Q		Std Analysis
SBA_TO1_AV	SBA Turnout 1 to Arroyo Valle	Inflow/ Outflow	Meter	D					
SBA_AV_TTL	SBA Turnouts to Arroyo Valle Total	Inflow/ Outflow	Calculated	D					
AV_ASGP	Arroyo Valle above	Measurement	Calculated	D					

				Objectives					
				Std		Wtr Rts		NP	
Site	Location	Type	Device	Flw	Qlty	Flw	Qlty	Qlty	Notes
	Sycamore Grove Park								
AV_AVBRDG	Arroyo Valle above Vallecitos Bridge	Measurement	None	D					
AV_VBRDB	Arroyo Valle at Vallecitos Bridge	Measurement	Staff	D					
AV_ASTRIB	Arroyo Valle above South Trib	Measurement	None	D					
AV_ISABEL	Arroyo Valle at Isabel	Measurement	Staff	D					
AV_PONDS	Arroyo Valle at Ponds	Measurement	Staff	D					
MA_LS_SC	Lonestar Discharge to Shadow Cliffs	Inflow/ Outflow	Meter	D					
MA_LS_AV	Lonestar Discharge to Arroyo Valle	Inflow/ Outflow	Meter	D					
AV_DIV_SC	Arroyo Valle Diversion to Shadow Cliffs	Inflow/ Outflow	Meter	D					
MA_LS_AV_EXP	Lonestar Discharge to AV—exported from basin	Inflow/ Outflow	Calculated	D					
ADVP	Arroyo Valle at Pleasanton	Measurement	Recorder	R	A	R	Q		Std Analysis, Also EC Recorder data
South Tributary									
STRIB_ADVWTP	South Trib above DVWTP	Measurement	None					A	Dry in 2004
DVWTP_DISCH	DVWTP Discharge to South Trib	Inflow/ Outflow	Meter	D					Sample in February 2004
STRIB_KB	South Trib at Kalthoff Bridge	Measurement	Staff					A	Sample in February 2004
STRIP_AAV	South Trib above Arroyo Valle	Measurement	None	W					Sample in February 2004
Number of Sites in 2004 Programs: 51			**Totals:**	**47**	**12**	**2**	**2**	**4**	

Abbreviations: Objectives: Std = Standard; Wtr Rts = Water Rights; NP = NPDES; Flw = Flow; Qlty = Quality. Frequencies: A =Annual; Q = Quarterly; M = Monthly; W = Weekly; D = Daily; R = Recorder (15 minutes). Std Analysis = EC, T, pH, Minerals; EC = Electrical Conductivity, T = Temperature.

Updated Friday, May 20, 2005.

Zone 7's Surface Water Monitoring Program includes the monitoring of surface water stations for the following reasons and/or regulatory objectives:

- **Watershed Monitoring (Std in Table 4-5)**—to calculate the quantity and quality of surface water (natural and artificial) recharging into the main

basin, characterize seasonal water quality variations, and develop a historical database of base-flow water quality.

- **Water Rights (Wtr Rts in Table 4-5)**—The conditions of Zone 7's water rights permit require that Zone 7 conduct a groundwater investigation that includes quarterly sampling and continuous flow recording at two surface water recorder stations.
- **NPDES (NP in Table 4-5)**—The conditions of Zone 7's Water Treatment Facilities General NPDES permit and NPDES Storm Water (Non-Point Discharge) permit require that Zone 7 sample above and below existing treatment plant discharges to the streams and at other relevant points in the watershed.

Ten sites in the program are equipped with recorders that produce a continuous gage-height record (15-minute intervals), seven of which are operated by Zone 7, and the other three are owned and operated by the USGS. The other sites in the program (staff gages, meters, calculated, or other) have daily values for flow (except for STRIB_AAV which has weekly values).

Currently three recorder sites record 15-minute data sets for electrical conductivity (EC). Because of the recent relocation and maintenance issues, four other recorder stations are currently not configured to record EC, but are expected to be updated soon. The three USGS recorder stations are not configured for recording EC because they are in areas that have limited impacts on basin water quality.

Grab samples are taken monthly from all stations and field tested for EC. All ten recorder sites and four NPDES sites in the program are sampled annually and submitted to the laboratory for analysis. Zone 7 also collects an annual grab sample from two Lawrence Livermore National Laboratory (LLNL) discharge sites for laboratory analysis in addition to reviewing weekly EC data and monthly laboratory data reported by LLNL. Most of the LLNL water used on site for irrigation and is of adequate quality to be used off-site for irrigation of parks, landscaping or vineyards, if desired by the community.

As necessary, Zone 7 also performs synoptic studies designed to monitor the exchange of ground and surface waters, the rates of recharge along stream reaches, and the areas of basin or sub-basin groundwater outflow. These studies consist of a series of measurements made during periods of stable flow. The variations in flow from station to station generally represent steady-state groundwater recharge or discharge (rising water). Flow and water quality data are collected as part of each synoptic study.

4.5.3.3 Reporting

As part of the surface water program, Zone 7 compiles available current and historical data. The following reports are generated to present the data:

- Daily Stream Flow Report (internal use—primarily to manage the artificial stream recharge program),
- Weekly Surface Water Report (internal use only),
- Monthly Surface Water Report (includes a summary of stream flows from recorder stations, averaged and recorded daily, and a tabulation of stream conductivity),
- Surface Water Annual Monitoring Report, and
- Program Design Report for Surface Water Program.

The results of this program are used for the supply and demand inventory, recharge calculations, salt management, and groundwater modeling.

4.5.4 Land Surface Elevation and Inelastic Subsidence Monitoring

4.5.4.1 Background/Introduction

In accordance with DWR requirements for GMPs, Zone 7 established a formal Land Surface Elevation Monitoring Program in November 2002. The program, which focuses on identifying possible changes in land surface elevations resulting from groundwater pumping, is designed to document long-term land surface elevation changes and determine whether these changes are elastic and/or inelastic.[1]

4.5.4.2 Program Description

The program includes:

- compiling historical records of benchmark elevations;
- compiling any records of infrastructure failures that could possibly be associated with subsidence. This has included monitoring for surficial signs of possible subsidence (e.g., hardscape cracking, well casing failures, damaged pipelines); and
- semiannual surveying of a network of about 80 benchmarks and other survey points.

The majority of the points consist of a main circuit (A1) that:

- begins on Livermore Formation on the west side of the valley floor (Site A1-1.0),

[1] Zone 7 2004e.

- transverses the main basin across the Bernal and West Amador sub-basins to the northern boundary of the Main Basin (to Site A1-9.0), and then
- traverses to the southern boundary of the Main Basin on Livermore Formation (to Site A1-17.0).

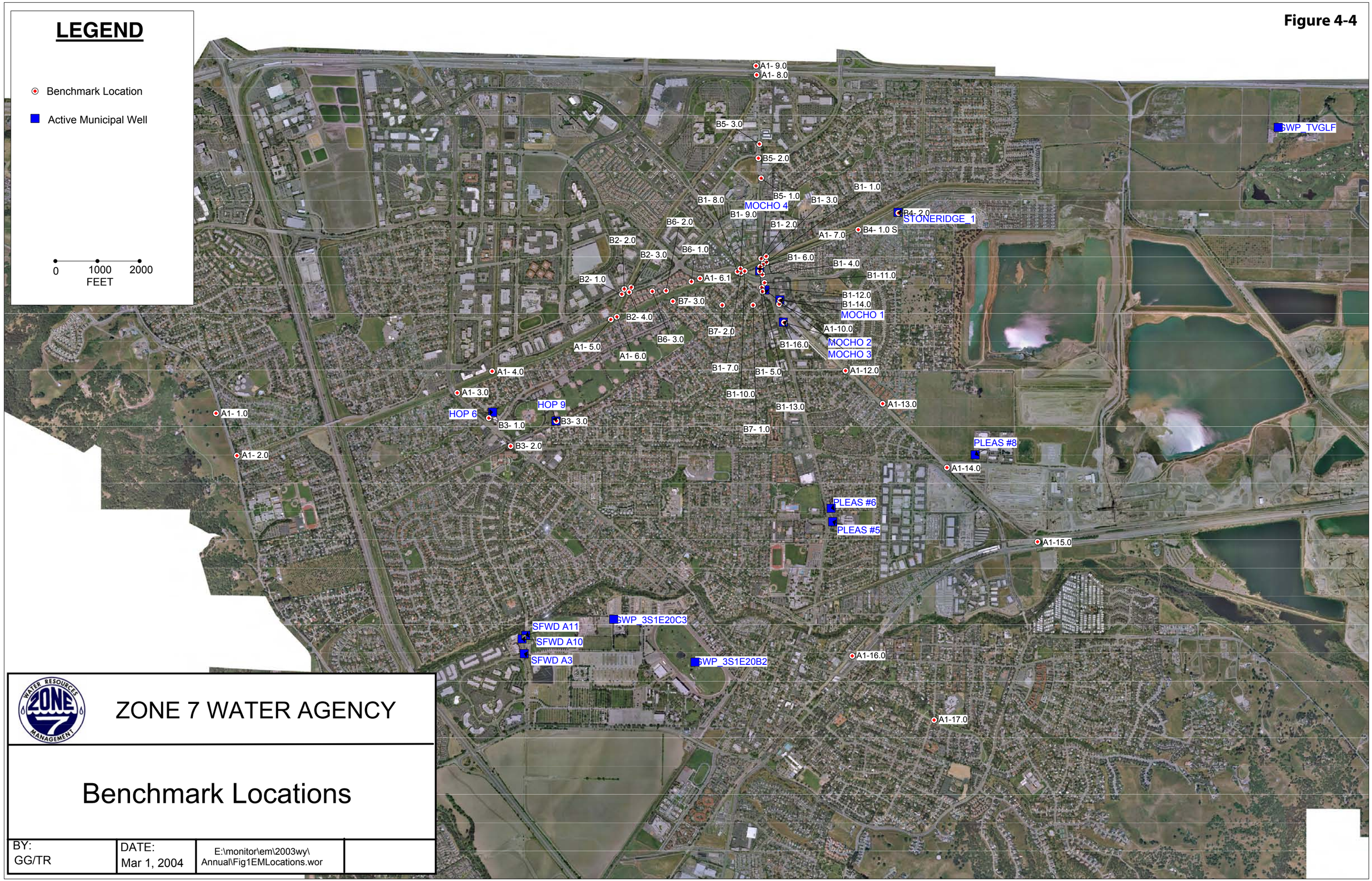
Several smaller circuits (B1 to B7) branch off of this main circuit. Table 4-5, above, lists the sites in the programs. Figure 4-4 shows the locations of the circuit benchmarks and active municipal pumping wells in the area.

For groundwater elevation reference points, Zone 7 also surveys small circuits in and around Zone 7 pumping wells. These small circuits, described in Table 4-6, branch off of the circuits discussed above. For map clarity, these points are not shown on Figure 4-4.

Table 4-6. Land Surface Elevation Monitoring Survey Points and Descriptions

Sites Monitored by Keir and Wright				Additional Well Sites Monitored by Zone 7			
Site ID	Well ID	Survey Points	Description	Site ID	Well ID	Survey Points	Description
A1-1.0*		G972	Brass disk located in sidewalk	AW1-P	3S/1E 8H 2	Army Well 1, Pedestal	Army Well 1 well pedestal
A1-2.0		Foot-La-Pos	Chisel mark on bridge footing	AW1-RP	3S/1E 8H 2	Army Well 1, RP	Army Well 1 reference point
A1-3.0		C972	Brass disk mounted on bridge platform	AW2-P	3S/1E 8H 3	Army Well 2, Pedestal	Army Well 2 well pedestal
A1-4.0		Mocho-Chabot	Brass disk located on access road	AW3-P	3S/1E 8H 4	Army Well 3, Pedestal	Army Well 3 well pedestal
A1-5.0		Mocho-Tass-W	Brass disk located on access road	H6-C	3S/1E 18A 6	Hopyard 6, Casing	Hop 6 casing/flange
A1-6.0		Mocho-Tass-E	Brass disk located on access road	H6-D	3S/1E 18A 6	Hopyard 6, Drain	Hop 6 drain
A1-7.0		Mocho_CB	Chisel mark on catch basin	H6-F	3S/1E 18A 6	Hopyard 6, Floor	Hop 6 chisel mark on pumphouse floor
A1-8.0		M1257	Brass disk mounted on bridge platform	H6-P	3S/1E 18A 6	Hopyard 6, Pedestal	Hop 6 well pedestal
A1-9.0*		Tass_Rose	Proposed disk on bridge foundation	H6-RP	3S/1E 18A 6	Hopyard 6, RP	Hop 6 reference point Hop 9 transformer pad
A1-10.0		L1257	Disk	H9-T	3S/1E 17D12	Hopyard 9, Transformer	
A1-11.0		Vine-Pipe	Brass disk in concrete	H9-C	3S/1E 17D12	Hopyard 9, Casing	Hop 9 casing/flange
A1-12.0		Mohr-RR	Spike at Mohr Ave and RR	H9-F	3S/1E 17D12	Hopyard 9, Floor	Hop 9 chisel mark on pumphouse floor
A1-13.0		TBM2		H9-P	3S/1E 17D12	Hopyard 9, Pedestal	Hop 9 well pedestal
A1-14.0		Bush-Valley	Brass disk (?) City benchmark	H9-RP	3S/1E 17D12	Hopyard 9, RP	Hop 9 reference point

Figure 4-4


LEGEND
Benchmark Location
Active Municipal Well
0
1000
2000
FEET
A1- 9.0
A1- 8.0
B5- 3.0
B5- 2.0
B5- 1.0
B1- 1.0
B1- 3.0
B1- 8.0
MOCHO 4
B1- 9.0
B4- 2.0
STONERIDGE_1
B6- 2.0
B1- 2.0
A1- 7.0
B4- 1.0 S
B2- 2.0
B6- 1.0
B2- 3.0
B1- 6.0
B1- 4.0
B1-11.0
B2- 1.0
A1- 6.1
B7- 3.0
B1-12.0
B1-14.0
MOCHO 1
B2- 4.0
B7- 2.0
A1-10.0
B6- 3.0
B1-16.0
MOCHO 2
MOCHO 3
A1- 5.0
A1- 6.0
B1- 7.0
B1- 5.0
A1-12.0
A1- 4.0
A1- 3.0
B1-10.0
B1-13.0
A1-13.0
A1- 1.0
HOP 6
HOP 9
B3- 1.0
B3- 3.0
B7- 1.0
B3- 2.0
PLEAS #8
A1- 2.0
A1-14.0
PLEAS #6
PLEAS #5
A1-15.0
SFWD A11
SFWD A10
SFWD A3
A1-16.0
A1-17.0
ZONE 7 WATER AGENCY
Benchmark Locations
BY:
GG/TR
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Mar 1, 2004
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Annual\Fig1EMLocations.wor

Sites Monitored by Keir and Wright				Additional Well Sites Monitored by Zone 7			
Site ID	Well ID	Survey Points	Description	Site ID	Well ID	Survey Points	Description
A1-15.0		D8	Brass disk on bridge foundation	M1-C	3S/1E 9M 2	Mocho 1, Casing	Mocho 1 casing/flange
A1-16.0		V1	Brass disk	M1-P	3S/1E 9M 2	Mocho 1, Pedestal	Mocho 1 well pedestal
A1-17.0*		K2	Brass disk (?) NGVD Benchmark	M1-RP	3S/1E 9M 2	Mocho 1, RP	Mocho 1 reference point
B1-1.0		Mocho-san MP3	Proposed disk on bridge Platform	M1-T	3S/1E 9M 2	Mocho 1, Transformer	Mocho 1 transformer pad
B1-2.0		Mocho-san MP2	Proposed disk on bridge Platform	M3-C	3S/1E 9M 4	Mocho 3, Casing	Mocho 3 casing/flange
B1-3.0		Mocho-san MP1	Proposed disk on bridge Platform	M3-P	3S/1E 9M 4	Mocho 3, Pedestal	Mocho 3 well pedestal
B1-4.0	3S/1E 8H 3	Army Well 2, Floor	Chisel mark on pumphouse floor	M3-RP	3S/1E 9M 4	Mocho 3, RP	Mocho 3 reference point
B1-5.0	3S/1E 8H 18	Mocho 4, Floor	Shiner at entrance door	M3-T	3S/1E 9M 4	Mocho 3, Transformer	Mocho 3 transformer pad
B1-6.0	3S/1E 8H 2	Army Well 1, Floor	Chisel mark on pumphouse floor	M4-C	3S/1E 8H18	Mocho 4, Casing	Mocho 4 casing/flange
B1-7.0		Mocho-Stone MP1	Proposed disk on bridge Platform	M4-P	3S/1E 8H18	Mocho 4, Pedestal	Mocho 4 well pedestal
B1-8.0		Mocho-Stone MP2	Proposed disk on bridge Platform	M4-RP	3S/1E 8H18	Mocho 4, RP	Mocho 4 reference point
B1-9.0		Mocho-Stone MP3	Proposed disk on bridge Platform	M4-T	3S/1E 8H18	Mocho 4, Transformer	Mocho 4 transformer pad
B1-10.0		Mocho-Stone MP4	Proposed disk on bridge Platform	S-D	3S/1E 9B 1	Stoneridge, Drain	Stoneridge drain
B1-11.0	3S/1E 8H 4	Army Well 3, Floor	Chisel mark on pumphouse floor	S-P	3S/1E 9B 1	Stoneridge, Pedestal	Stoneridge well pedestal
B1-12.0	3S/1E 8H 13	Obs. Well, Casing	Chisel mark on casing	S-RP	3S/1E 9B 1	Stoneridge, RP	Stoneridge reference point
B1-13.0	3S/1E 9M 4	Mocho 3, Shiner	Shiner at entrance door	S-C	3S/1E 9B 1	Stoneridge, Casing	Stoneridge casing/flange
B1-14.0	3S/1E 9M 2	Mocho 1, Floor	Chisel mark on pumphouse floor				
B1-16.0	3S/1E 9M 3	Mocho 2, Floor	Chisel mark on entrance door				
B2-1.0		Tass-Las-Pos MP1	Proposed disk on bridge Platform				
B2-2.0		Tass-Las-Pos MP2	Proposed disk on bridge Platform				
B2-3.0		Tass-Las-Pos MP3	Proposed disk on bridge Platform				
B2-4.0		Tass-Las-Pos MP4	Proposed disk on bridge Platform				
B3-1.0		Mocho-Park	Brass disk on concrete vault				
B3-2.0		1H ALA	County Benchmark				
B3-3.0	3S/1E 17D12	Hop 9 BM	Benchmark, rod in access road				

Sites Monitored by Keir and Wright				Additional Well Sites Monitored by Zone 7			
Site ID	Well ID	Survey Points	Description	Site ID	Well ID	Survey Points	Description
B4-1.0		AMP-Ctl S	Brass Disk on Control				
B4-2.0	3S/1E 9B1	Stoneridge, Floor	Chisel mark at entrance door				
B5-1.0		OSRR-BC	New Monument Disk				
B5-2.0		OSRR-Andrew	New Monument Disk				
B5-3.0		OSRR-Café	New Monument Disk				
B6-1.0		5608 Belleza	New Monument Disk				
B6-2.0		FLORA-end	New Monument Disk				
B6-3.0		Belleza-Verd	New Monument Disk				
B7-1.0		Larame-Larame	New Monument Disk				
B7-2.0		Suttr-Larame	New Monument Disk				
B7-3.0		Suttr-Jones	New Monument Disk				
* Probable bedrock sites.							

Measurement Frequency

Circuit	Frequency
A1 Circuit	Semi-annually
B1 Mocho loop	Semi-annually
B2 Tassajara loop	Semi-annually
B3 Hopyard wells loop	Semi-annually
B4 Stoneridge well loop	Semi-annually
B5 Tassajara—Rosewood	Semi-annually
B6 Verona loop	Discontinued in 2004
B7 Suttergate loop	Discontinued in 2004
Additional Well Sites	Semi-annually

4.5.4.3 Reporting

Throughout the water year several reports are generated to display, review, and discuss the data that were gathered:

- Land Surface Elevation Semiannual Monitoring Report,
- Land Surface Elevation Monitoring Report—annually, and
- Land Surface Elevation Monitoring Program Design Report—annually.

The results of this monitoring program are used to measure and document any changes in land surface elevation that could possibly be associated with elastic or inelastic subsidence. The oldest benchmark in the program dates back to 1912 and has moved possibly about 3 inches. These records are used to help identify whether there are any negative impacts from groundwater pumping on ground surface elevations.

4.5.5 Mining Area Monitoring

4.5.5.1 Background/Introduction

Mining of sand and gravel in the Livermore-Amador Valley began prior to 1900. As demands continued to grow, and larger areas and volumes of sand and gravel were removed, the need for a regulatory system became apparent. In 1956 the County of Alameda adopted Ordinance 181 N.S. Ordinance 181 N.S. prohibited

pollution or contamination of usable water-bearing strata.[2] In addition, the early permits, as well as later permits, limited the mining to the uppermost aquifer. More recent permits, beginning in 1965, contained more specific language for protecting water resources and reclamation plans. In 1977, Alameda County adopted a new surface mining ordinance updating the 1956 Quarry Ordinance and incorporated reclamation requirements.[3]

In 1980 a gravel mining reclamation plan was adopted by Alameda County and local mining companies. The plan called for the completion of a "chain of inter-connected ponds which would allow routing of storm waters through the mining area and subsequent recharge in the west." This plan was designed to mitigate the loss of stream recharge capacity, loss of groundwater basin storage, loss of water through increased evaporation and loss of groundwater transport through the upper aquifer towards the sub-basins on the west side of the basin. When completed in 2030, Zone 7 will own and operate this "Chain of Lakes" for groundwater basin management purposes.

4.5.5.2 Program Description

Since gravel-mining operations have had an appreciable effect on groundwater levels and quality in the main groundwater basin, Zone 7 has incorporated a mining component into the monitoring network. A pit numbering system was developed by Zone 7 staff in 1972 and is still used today to identify active and inactive pit areas.

The current program consists primarily of monthly and semiannual monitoring. Monthly observations include determination of water surface elevations and water quality from twelve major pits. In addition, monthly observations included recording any change in mining operations. Water surface elevations and EC readings are done for each of the monthly pits. A TDS value is estimated based on the EC readings. Twice a year, in the spring and fall, all monthly monitored ponds are sampled for a complete mineralogical analysis at the Zone 7 laboratory. Monthly monitoring also includes a review of stream discharge reports received from the mining companies, which includes a compilation of daily and monthly stream discharge meters and data. The semiannual monitoring consists of a more extensive inventory of all significant pits and ponds in the mining areas. Semiannual monitoring includes surface water elevation measurements, EC, and determination of evapotranspiration rates. In addition, a water quality sample for laboratory analysis is collected from each pond on an annual basis. Figure 4-5 shows the location of the gravel mining pits.

[2] Alameda County 1981.
[3] Alameda County 1981.

4.5.5.3 Reporting

Throughout the water year several reports are generated to display, review, and discuss the data that were gathered:

- Gravel Mining Groundwater Export and Evaporation Report—monthly,
- Mining Area monthly and semiannual reports (internal), and
- Mining Area Annual Report.

The results of this program are used for the supply and demand inventory, recharge calculations, salt management, and groundwater modeling.

4.5.6 Land Use Monitoring

4.5.6.1 Background/Introduction

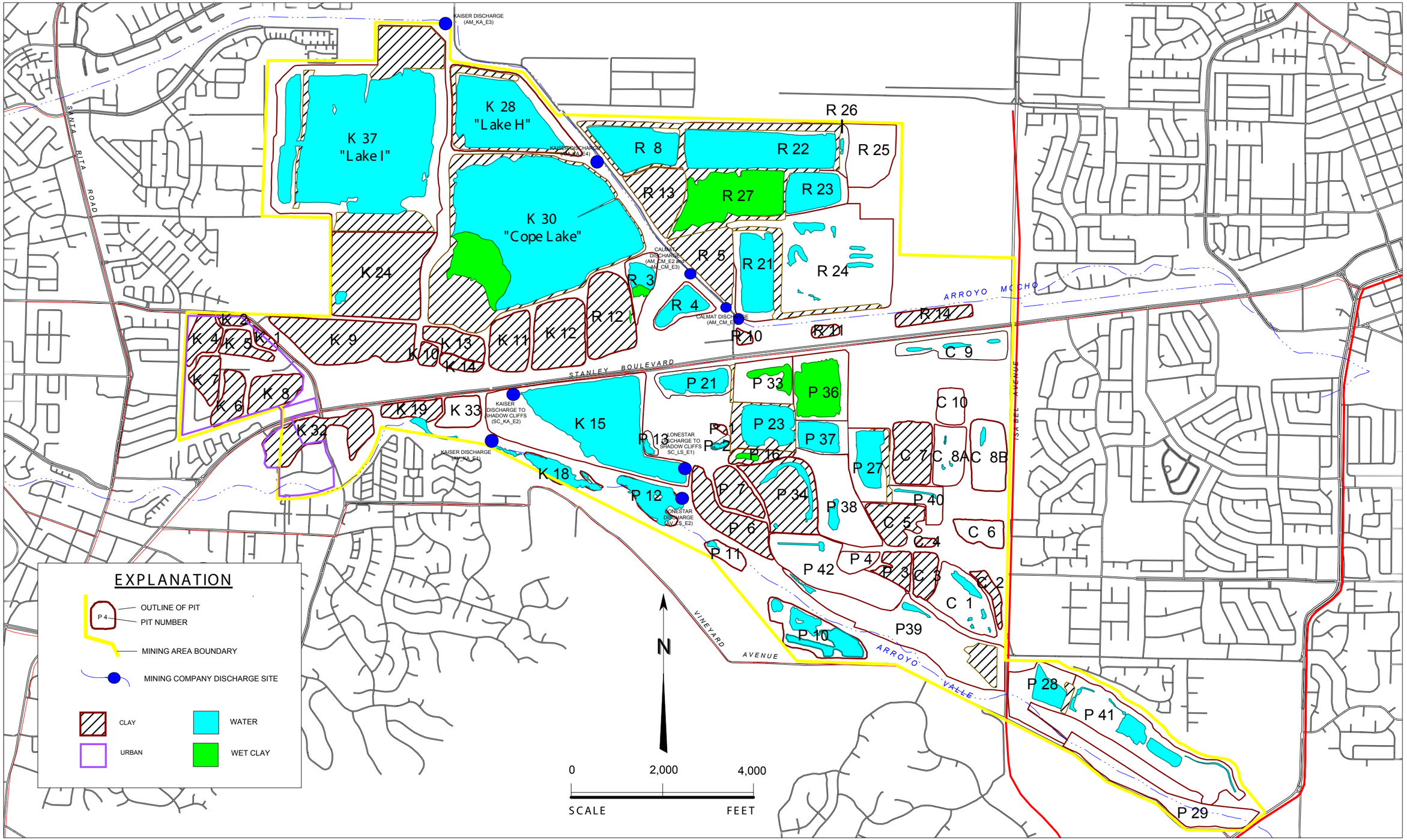
Collection of land use data is essential in understanding changes in land and water use over time that may affect infiltration and water quality in the groundwater basin. To properly assess water supply and water quality conditions and trends in the groundwater basin, accurate records of land and water use changes are needed. Zone 7 identifies and quantifies different types of land uses with irrigation significant enough to contribute groundwater recharge and affect the salt loading of the Main Basin. The program also identifies the type of water (potable, groundwater, or recycled) for use in the computation of salt loading to the Main Basin.

4.5.6.2 Program Description

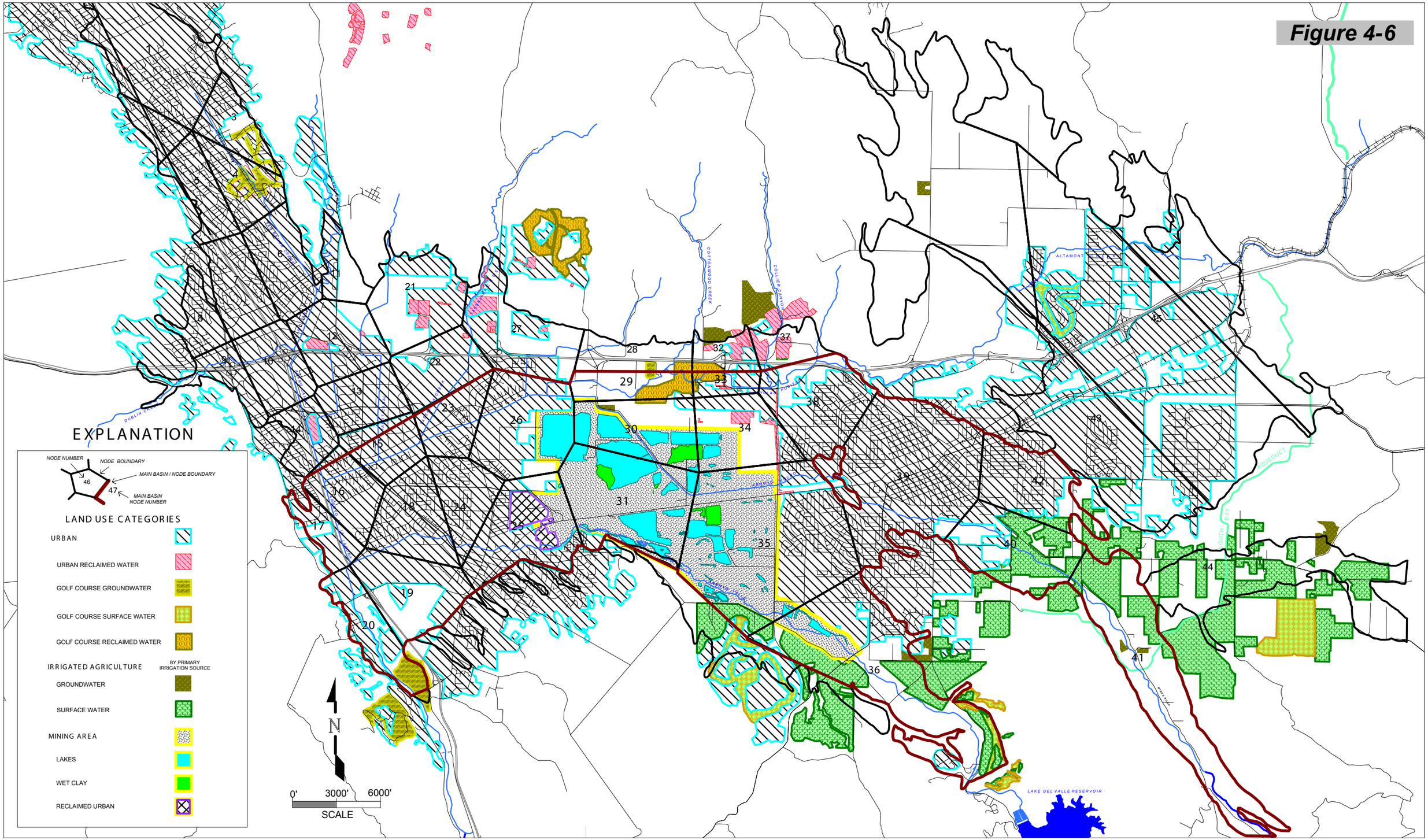
As part of Zone 7's long-term monitoring program, land use in the Livermore-Amador Valley is monitored. Zone 7's Land Use Monitoring Program includes the identification of the following different land use type (see Figure 4-6):

- **Urban** land use includes residential and commercial areas, which typically are irrigated. Small vacant lots, non-irrigated fields and other undeveloped areas are included as urban land if they are smaller than about 20 acres and are located in urban areas.[4] Each urban classification is composed of several subcategories. For example, Urban Reclaimed Water lands are urban areas subject to reclaimed wastewater irrigation. Such urban areas include landscaped regions surrounding the valleys, two wastewater treatment facilities, the Livermore Airport, the Dublin Sports Grounds, parts of east Dublin and the area north of Interstate 580 along Canyons Parkway, including Las Positas College. Golf courses are included in the urban category and are divided into three subcategories: golf course groundwater, golf course surface water, and golf course reclaimed water.

[4] Zone 7 2003, 2004f.



ZONE 7 WATER AGENCY 5997 PARKSIDE DRIVE PLEASANTON CA 94588	DRAWN TODD WENDLER DESIGNED T.WENDLER CHECKED JARNAIL CHAHAL APPROVED	WATER RESOURCES MINING AREA MONITORING PROGRAM LOCATION OF GRAVEL MINING PITS	SCALE 1" = 2,000' DATE 12 January 2003 FILE NO. B - h:\ma\2003\maF03.mapinfo



ZONE 7 WATER AGENCY
5997 PARKSIDE DRIVE PLEASANTON CA 94588

DRAWN	TODD WENDLER
DESIGNED	TODD WENDLER
CHECKED	
APPROVED	

WATER RESOURCES
LIVERMORE VALLEY LANDUSE
2004 WATER YEAR

SCALE	1" = 6000'
DATE	29 November 2004
FILE NO.	B-140 | LU_04.WOR

- **Irrigated/Agriculture** land use consists of irrigated farmland such as vineyards, field crops, vegetable crops and pastures. Excluded from this category is agricultural land that is dry-farmed or minimally irrigated during the growing season. Irrigated areas, also shown in Figure 4-6, have been subdivided by primary water sources as groundwater or surface water. The vineyard areas are irrigated primarily with surface water obtained from the SBA. Some groundwater can be used in the vineyards to supplement the SBA water, but because the amount used is proportionally small, these areas are listed as surface water irrigated. Beginning in 2001, Zone 7 maps included agricultural lands irrigated with recycled water.
- **Gravel Mining Area** land use includes all lands that have been mined or are scheduled to be mined. Mining area "ponds" include all areas of ponded water or wet silt. The wet silt areas are counted as ponded area because evaporative losses from wet silt are similar to evaporation that occurs in open ponds. Mining area "reclaimed" includes all lands mined and refilled or partially refilled with clay. Mining area "urban" includes lands within the mining area that have been reclaimed and developed into industrial parks or similar urban uses. The "irrigated agriculture" category is located outside of the mining area. Mining area "other" includes excavations, earthworks, and undisturbed lands within the mining area that do not belong in any other mining area classification.

Land use data are derived from aerial photography (annual), interviews with landowners, and field observations. Land use changes are monitored and evaluated in a monthly site review report. This report tracks all new land use changes and is used to coordinate Zone 7 concerns to the land use planning agencies.

4.5.6.3 Reporting

The Livermore Valley Land Use Report is generated annually to display, review, and discuss changes in land use and water use that may impact the regional water supply or the groundwater basin. In addition, a site review report of all potential land use changes that may impact the groundwater basin is compiled and reviewed each month. The results of this program are used for the recharge calculations (of rainfall recharge and applied water recharge).

4.5.7 Groundwater Production

4.5.7.1 Background/Introduction

The extraction of groundwater for municipal, industrial, domestic and agricultural use represents more than 80% of the groundwater flow through the basin. Maintaining accurate records of the quantity and location of all groundwater extractions is critical for basin evaluations and modeling. This program compiles daily, monthly, and annual records of groundwater extraction

from all significant wells within the groundwater basin. More specifically, this program includes groundwater levels, monthly production amounts, and water quality analyses for all municipal supply wells to determine the amount and quality of water that is being extracted from the groundwater basin for municipal and/or agricultural use.

Accurate records have been kept on monthly production quantities since 1974. The records are vital to accounting of groundwater use and to the proper allocation of waters recharged artificially and subsequently pumped by Zone 7 versus waters naturally recharged into the groundwater basin and subsequently pumped by retailers or others.

Historical records prior to 1974 are incomplete and use prior to the 1960s must be estimated based on land use mapping and limited pumping records.

4.5.7.2 Program Description

Zone 7 collects and compiles monthly records for all large pumping wells within the Main Basin. Zone 7 meters all Zone 7 pumping and requires metered pumping records from all retailer wells. Records of other pumping wells are obtained from well owners when available. Pumping records from smaller wells or wells without meters are calculated from power records or from land use data. Zone 7 obtains these records as part of the land use mapping program and the groundwater level-monitoring program.

4.5.7.3 Reporting

Zone 7 tracks and reviews Zone 7 pumping each day and reports the amount in a daily production report. The Monthly Municipal Water Supply report compiles reviews of municipal pumping from all wells valley-wide. Any discrepancies or lapses in the data stream are resolved to prevent the loss of well pumping data. The records from local retailers are compared to contractual pumping limits (formerly referred to as Independent Quotas) and, in the event of overpumping, the retailers are billed for the excess water.

4.5.8 Wastewater and Recycled Water Monitoring

4.5.8.1 Background/Introduction

Wastewater disposal from domestic and commercial sites can have a significant impact on water resources and a groundwater basin. While wastewater disposal can contribute a significant quantity of water to recharging the basin, it can also be a potential source of contamination, primarily from salts, nitrates and chlorides.

Zone 7 completed numerous studies of wastewater disposal and water quality management including an early study entitled, "Water Quality Management Plan for the Alameda Creek Watershed above Niles," in September 1972. Subsequent joint studies by USGS and Zone 7, along with actions by the California Regional Water Quality Control Board—San Francisco Bay Region and the Zone 7 Board resulted in the creation of the Livermore Amador Valley Water Management Agency (LAVWMA) which eventually constructed an export pipe. Since 1979, the LAVWMA export pipe has exported most urban wastewater out of the watershed and into the San Francisco Bay. The remainder of the locally-sewered water receives tertiary treatment and is currently distributed as recycled water for landscape irrigation (for additional discussion of wastewater management, see Section 5.1.4.4).

Figure 4-7 shows the land use and wastewater disposal changes over the past 35 years. Note that prior to the LAVWMA pipeline construction, all urban wastewater was disposed in the valley with significant amounts of wastewater either flowing out of the basin via the local arroyos or percolating into the groundwater basin. The Wastewater Management policies established by Zone 7 in the 1970s successfully supported regional sewering for the majority of developed lands overlying the entire groundwater basin and for essentially all of the lands overlying the Main Basin. Thus wastewater from the majority of sewered areas is exported out of the basin via the LAVWMA export pipeline.

As discussed in Sections 3.5 and 5.1.4.4, there is a groundwater contamination plume containing high levels of nitrates existing in the eastern portion of the Main Basin. There have been several evaluations suggesting a variety of sources for these nitrates. There remain a few localized unsewered areas with a high density of residential septic tanks (i.e., Buena Vista Avenue near the upper end of this plume, along with both the Happy Valley and Sunol areas which are separate from the above-described plume) that may or may not be contributing to nitrate loading within the basin. Since these areas are relatively rural and are typified by various livestock (both currently and historically), nitrate remains a concern.

In some areas, large tracts of land have been dedicated as permanent open space, which is unlikely to generate much urban wastewater on site (although application of recycled water for landscape or agricultural irrigation is potentially possible, as are on-site septic tanks, fertilizer applications, winery wastes used to augment irrigation water, etc.). These lands include large regional parks and areas within agricultural land trusts. The other large area within the Main Basin that is excluded from significant in-valley wastewater disposal is the Mining Area, which will either be developed and sewered (with wastewater exported from watershed) or be left as permanent open space.

4.5.8.2 Program Description

Zone 7 currently tracks wastewater disposal on a monthly basis. NPDES permits for the City of Livermore and the DSRSD wastewater treatment plants are reviewed monthly. Flow and quality data are evaluated for impacts to the groundwater basin. In the future the wastewater flows will be tracked on a daily

basis so that the Concentrate from the Groundwater Demineralization projects can be coordinated with wastewater discharges into the LAVWMA pipeline. Recycled water use is also tracked monthly for water use, flow and location of use. Additional description of Zone 7's wastewater management program is contained in Section 5.1.4.4.

4.5.8.3 Reporting

The flow and quality data is compiled in a monthly Wastewater and Recycled Water Report for internal use by Zone 7 staff and the location of recycled water applications are mapped in the Land Use Annual Report. The data are used for hydrologic inventory calculations, salt balance calculations, and groundwater modeling.

4.6 Basin Evaluation Programs

4.6.1 Introduction

The data and results of Zone 7's monitoring programs are used to evaluate the conditions of the groundwater basin. This section of the GMP describes Zone 7's programs designed to evaluate the conditions of the basin using data collected from the monitoring described above. Following data collection and reporting for the monitoring programs, Zone 7 performs detailed evaluations and analyses that include data from more than one monitoring program. These data are described below and include:

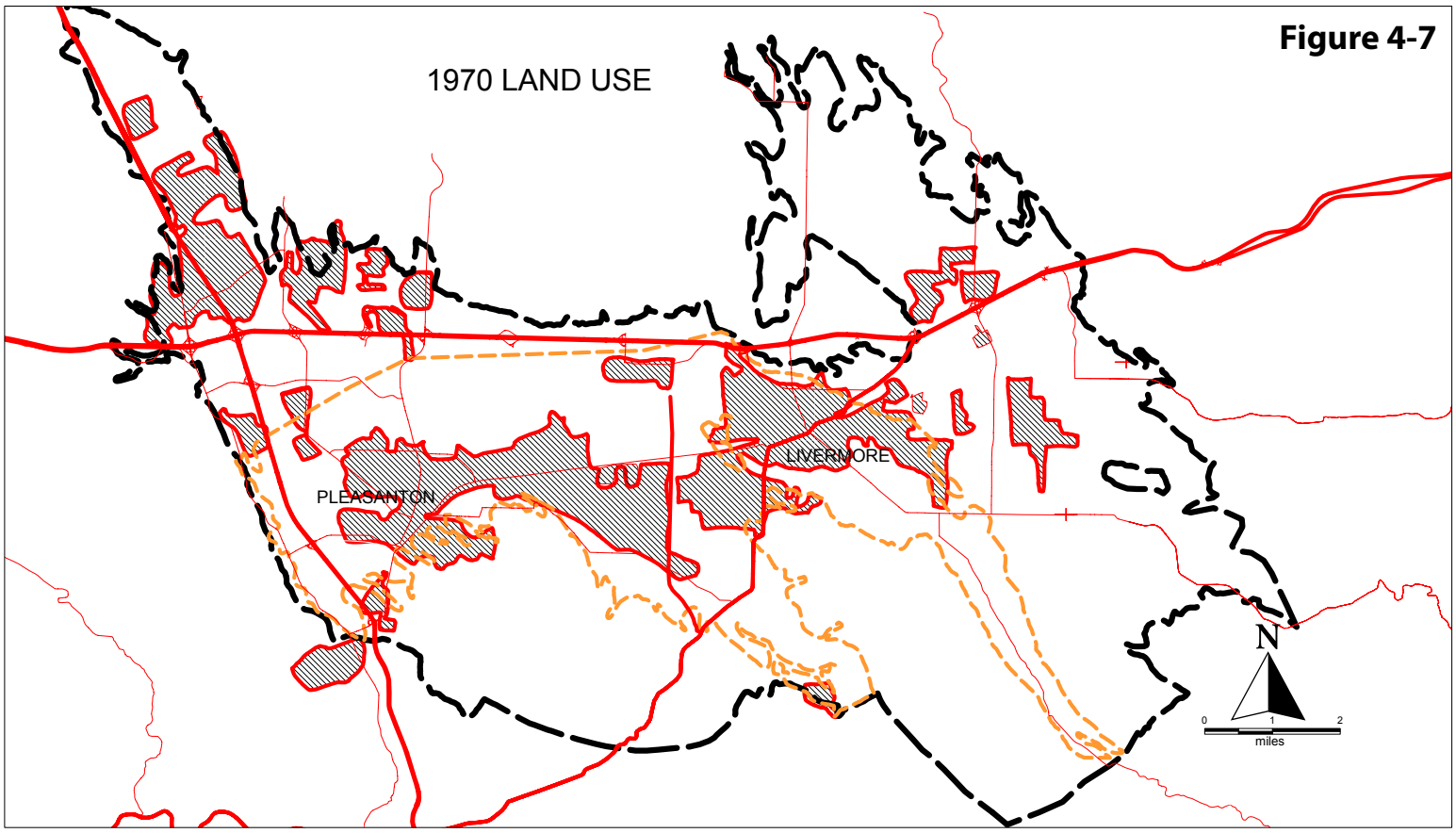
- recharge calculations,
- hydrologic inventory,
- groundwater basin storage,
- salt balance calculations, and
- municipal water supply.

4.6.2 Recharge Calculations

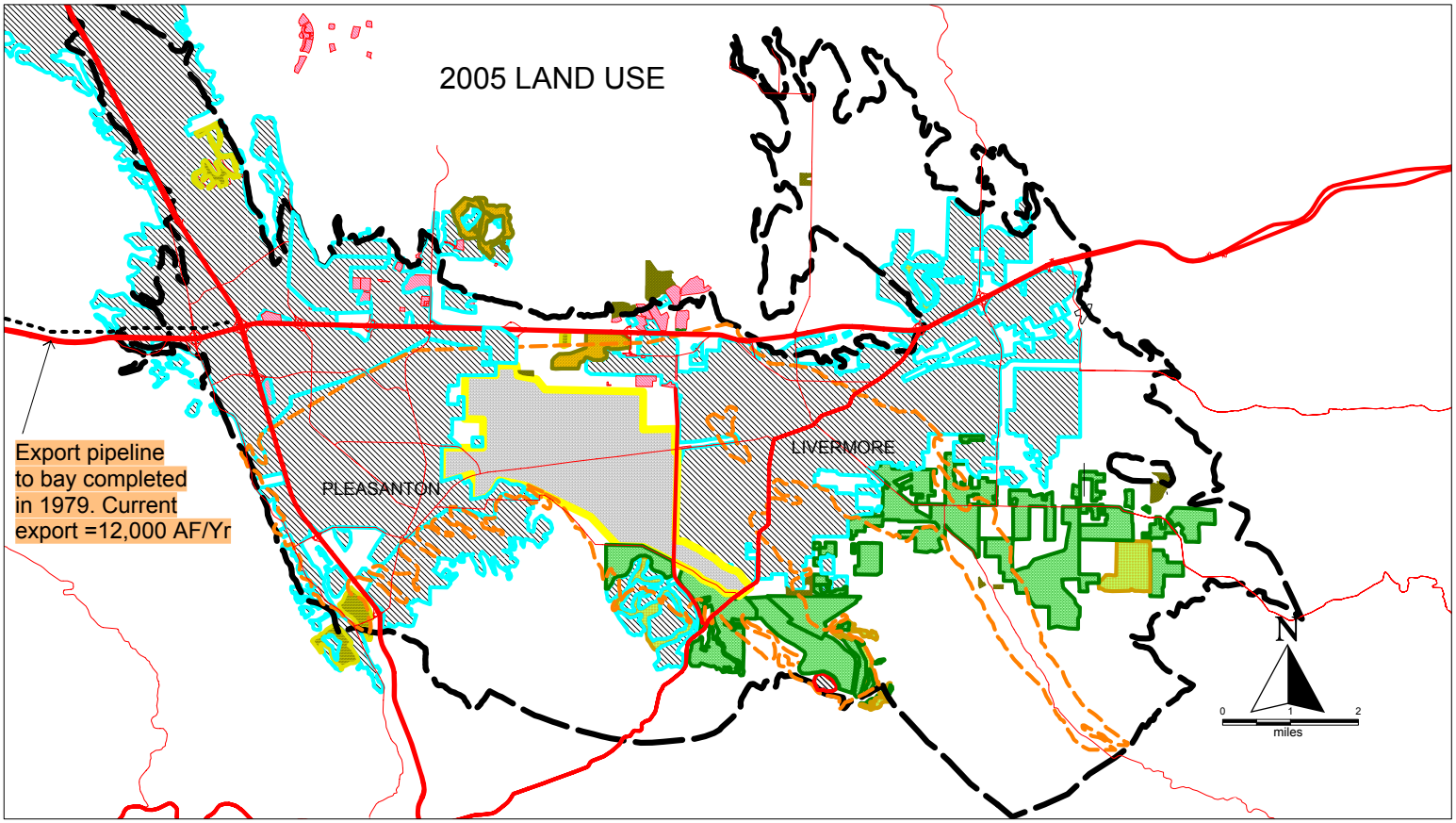
Groundwater recharge occurs from rainfall, applied water, and streams, all of which are calculated by Zone 7. In the future, Zone 7 also plans to use mining area lakes as recharge ponds.

Zone 7 has developed a recharge calculation model that calculates both rainfall and applied water recharge rates for all locations in the groundwater basin. The recharge model, which includes results from the climatological and land use monitoring programs, includes parameters for soil type and hydrologic conditions

LAND USE & WASTEWATER DISPOSAL CHANGES OVER 35 YEARS



SEWERED- In Valley Disposal | SEWERED- Exported from Watershed | DEDICATED OPEN SPACE | MINING AREA (OPEN SPACE)



throughout the valley. For modeling the groundwater basin, rainfall and applied recharge are combined as a real recharge.

Groundwater recharge from streams includes the following components:

- natural recharge—rain runoff into the streams, including both urban runoff from rainfall and upper watershed runoff that recharge into the streambeds;
- artificial recharge—SBA or Lake del Valle water that is released into the streams; and
- gravel-mining recharge/discharge—recharge from gravel mining pit discharges or discharges into the streams.

Stream recharge is calculated from daily streamflow and stream discharge records. The three primary recharge streams have upstream and downstream gages, and the recharge typically is calculated as the difference between upstream inflows and downstream outflows.

4.6.3 Hydrologic Inventory and Water Balance

Zone 7 compiles a detailed hydrologic inventory or water balance of monthly and annual supply and demand components for the Main Basin. The hydrologic inventory represents the water balance between groundwater supply and groundwater demand. The inflow and outflow components of the Main Basin budget are presented in Table 4-7. Monthly inventory summaries are compiled each quarter and reported in the quarterly water supply report that is presented to the Zone 7 Board each quarter. The hydrologic inventory is the easiest way to keep track of changes in groundwater storage. Experience gained through the analysis of the hydrologic inventory allows Zone 7 staff to predict and model long-term basin response to changing hydrologic conditions.

Table 4-7. Annual Supply and Demand

	2003 Water Year (acre-feet)	Normal Water Year (acre-feet)
Inflows		
Natural Stream Recharge	4,629	4,766
Artificial Stream Recharge	9,588	11,379
Rainfall Recharge	2,041	3,910
Applied Water Recharge	949	1,719
Subsurface Inflow	720	756
Inflow Total	17,926	22,530
Outflows		
Municipal Pumping	13,471	13,456
Agricultural Pumping	118	1,066
Mining Use	2,233	2,236
Subsurface Outflow	0	405
Outflow Total	15,822	17,163
Net Recharge (Inflow – Outflow)	**2,104**	**5,367**

4.6.4 Groundwater Basin Storage

The amount of water in storage is a critical component of water supply management and drought planning. Zone 7 computes groundwater storage using two methods. The inventory method uses the hydrologic inventory to calculate storage changes. The groundwater level method uses groundwater level data and geologic information on aquifer properties to compute storage. Zone 7 has been using both methods for more than 20 years, and they are in close correlation. Each year Zone 7 completes a storage report that reviews the storage calculation based on the inventory method and the groundwater level measurement. Zone 7's experience with these methods allows staff to report with confidence the amount of water within the basin. Knowledge of this information allows Zone 7 staff to plan for extracting a known volume of water without risking lowering the basin below historical lows.

4.6.5 Salt Balance

Saline waters can slowly degrade the quality of groundwater (represented by a rise in basin salinity and/or hardness) and ultimately render part or all of a groundwater basin unusable. In the semi-arid Livermore Valley, multiple sources can contribute to increased salinity in groundwater: use and reuse of the water supply, lateral or upward migration of saline water, downward seepage of industrial or agricultural water, downward seepage of mineralized surface water from streams or lakes, interaquifer migrations of saline water and especially the

evapotranspiration of irrigation water (some of which is relatively high TDS recycled water). The primary purpose of the salt balance evaluation is to investigate the change in the amount of salt in the basin and calculate the basinwide change in water quality.

The Livermore groundwater basin has been experiencing slowly degrading water quality each decade, as evidenced by increasing TDS levels. Preventing the buildup of salts (calcium, magnesium, sodium, chloride, and other minerals) is a key Zone 7 water quality objective. Zone 7 calculates a salt balance to determine whether it is meeting long-term water quality objectives of non-degradation. Under full implementation of the Salt Management Plan (SMP), Zone 7 will increase recharge, increase pumping and bring the salt balance into a non-degradation range.

A salt balance is a calculation of the amount of salts and minerals entering or leaving a groundwater basin. If the balance is positive, the regional water quality will degrade. If the balance is negative, then basin quality will improve. However, for decades, the Groundwater Basin Salt Balance has been positive, confirming the reason basin water quality has continued to decline. Multiple sources can contribute to increased salinity in groundwater. In the semiarid Livermore Valley, the evapotranspiration of irrigation water, especially higher-TDS recycled water, has been the greatest long-term concern from a salt-management perspective.

Currently, the salt balance calculations are based on results from:

1. 45 monitoring wells to track groundwater levels and quality.
2. Six surface water recorder stations to track streamwater flow and quality in three major waterways in the watershed (Arroyo Valle, Arroyo Mocho and Arroyo Las Positas).

Additional wells and surface water recorder stations are under consideration to improve Zone 7's understanding of salt migration from fringe basins and concentration in the Main Basin.

All wells and surface waters used for the evaluation are sampled and analyzed annually for major ions (e.g., Ca, Mg, Na, K, HCO_3, SO_4, Cl, NO_3, SiO_2), boron, manganese, selenium, chromium, arsenic, EC, pH, TDS, alkalinity, and hardness. As surface water monitoring stations are upgraded with automated water quality measuring instruments, EC, temperature, and pH will be recorded on a nearly continuous basis.[5]

Sources of salt loading to the main basin for the 1998 water year are shown in Table 4-8. The table shows that urban irrigation represents a significant portion of the potentially "controllable" portion of the total salt loading to the basin. There is a limit to which the other sources can be controlled, with the possible exception of shallow groundwater pumping that might reduce high TDS subsurface inflow and recharge on Las Positas.

[5] Zone 7 2004a.

Table 4-8. Main Basin Relative Salt Loading Sources, 1998 Water Year Controllable Portion of the Total Salt

Sources	Relative Salt Load on the Basin
Urban Irrigation	33%
Natural Recharge on Arroyo Mocho	18%
Subsurface Inflow	13%
Natural Recharge on Arroyo Las Positas	14%
Natural Recharge on Arroyo Valley	13%
Agricultural Irrigation	3%
Artificial Recharge	6%

Reports summarizing results of the salt balance evaluation are planned to be generated initially on a quarterly and annual basis. The data collected as part of the salt balance evaluation will be used to identify changes in groundwater quality throughout the watershed, to refine salt loading estimates, and to provide input to the water resource allocation and groundwater models.

Given that the salt balance evaluation program was established in part to identify and fill existing data gaps and to provide a venue to evaluate the long-term effectiveness of the SMP, an annual critique and refinement of the monitoring and data collection effort is anticipated.

Data collected as part of this evaluation will be used to critically evaluate the usefulness of the data collected relative to making salt management control measure decisions. The groundwater model and this monitoring program will be used in a complementary fashion, where monitoring program results are used as input to the model and the monitoring program subsequently uses the output from the model to help determine additional (or reduced) data needs. This approach will help achieve long-term SMP goals without consuming excessive resources that could otherwise be used directly to implement salt management measures.

4.7 Basin Management

4.7.1 Introduction

A groundwater basin is a large natural complex reservoir. Zone 7 regulates more than half of the inflow and outflow from the basin and strives to make the basin function indefinitely to provide a sustainable supply of high quality water to the residents of the Tri Valley.

The basin needs to be managed as a system in order to be operated in an optimal way but the groundwater basin is just a part of a larger complex system that includes the SWP, local watershed runoff, Semitropic storage and treatment

plants. A community of about 190,000 people depend upon optimal use and proper management of the groundwater basin.

Zone 7 uses the information and knowledge gained from monitoring and from conducting the basin evaluation programs to create several models. These models are used to evaluate different basin management scenarios and to test out strategies. Zone 7 then creates a basin management operations plan based on the results of two types of modeling: water operations modeling and groundwater modeling. The modeling uses water supply forecasts from:

- supply and demand modeling,
- groundwater modeling,
- water supply forecasts,
- data from basin evaluation programs,
- knowledge gained by decades of studying the basin, and
- forecasts of potential water supply and demand conditions.

The basin management operations plan is a part of water supply planning and is included in the Annual Water Operations Plan.

4.7.2 Key Wells

Zone 7 has identified key index wells in each significant water-producing region of the Main Basin as general indicators of groundwater levels in the Main Basin. The data from these wells are evaluated quarterly using monthly water level data. The results from this evaluation are assembled onto easy-to-read graphs that can be displayed to the general public (see Figure 4-8).

4.7.2.1 Groundwater Storage

Zone 7 actively monitors groundwater storage in the basin to ensure that future demands are met during dry years. Zone 7 keeps groundwater storage above the main basin historical low, preserving all groundwater underneath the historical low for emergency use. Zone 7 is able to keep the storage above the historical low by importing surface water. Groundwater storage calculations help Zone 7 determine the amount of existing groundwater availability, and future availability, thus providing vital information about the hydrologic inventory of the basin.

4.7.3 Supply and Demand Simulation Modeling

Zone 7's supply and demand simulation model, Z7sim can model the entire Zone 7 system over an 80-year hydrologic period to evaluate long-term strategies or

any deficiencies in resources that would limit providing a reliable supply of water.

The Zone 7 simulation model has a groundwater basin component that calculates the recharge and extraction and change of storage for the Main Basin. Calibrations are ongoing and involve matching model projections to actual groundwater recharge, storage change and groundwater levels.

Through groundwater elevation/storage monitoring and retailer demands, Zone 7 is able to predict the supply of the groundwater basin in relation to the current and future demand.

Zone 7 compiles a detailed hydrologic inventory of annual supply and demand components for the Main Basin and computes the end-of-year storage. The hydrologic inventory represents the water balance between groundwater supply and groundwater demand.

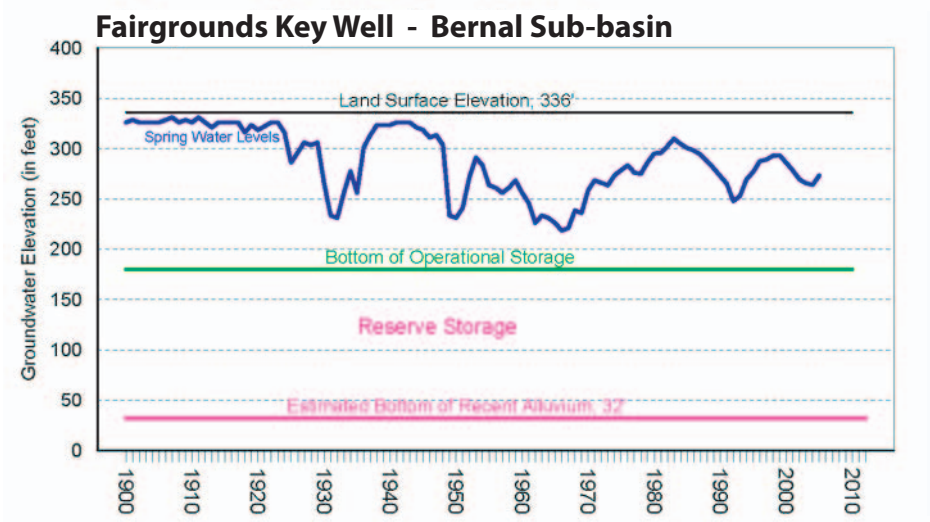
4.7.4 Groundwater Modeling

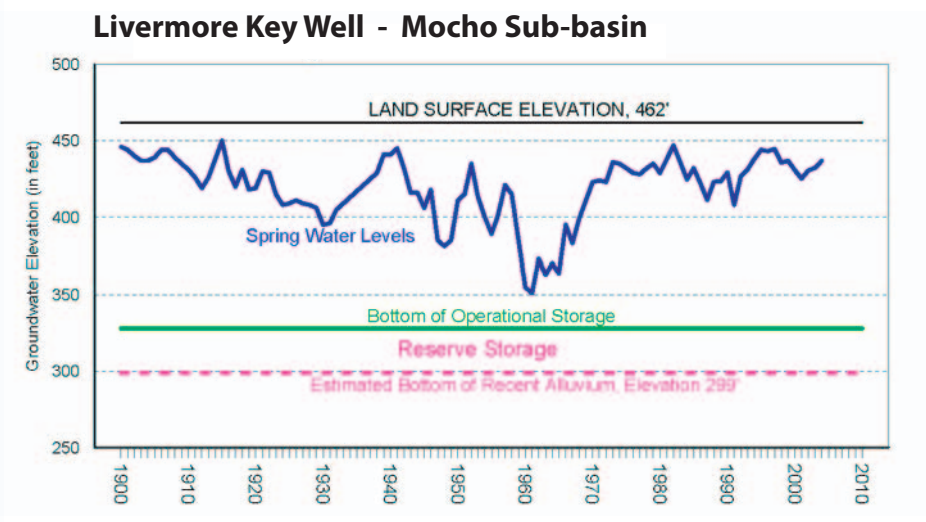
A groundwater model is a device that represents an approximation of a groundwater basin. Physical models such as laboratory sand tanks simulate groundwater flow directly. A mathematical groundwater model simulates groundwater flow indirectly by means of equations to represent the physical processes that occur in the groundwater basin. A mathematical model can be used analytically or numerically. As analytical solutions are not suitable because of complexities in the groundwater flow modeling, numerical groundwater modeling is more often used for groundwater basin modeling.

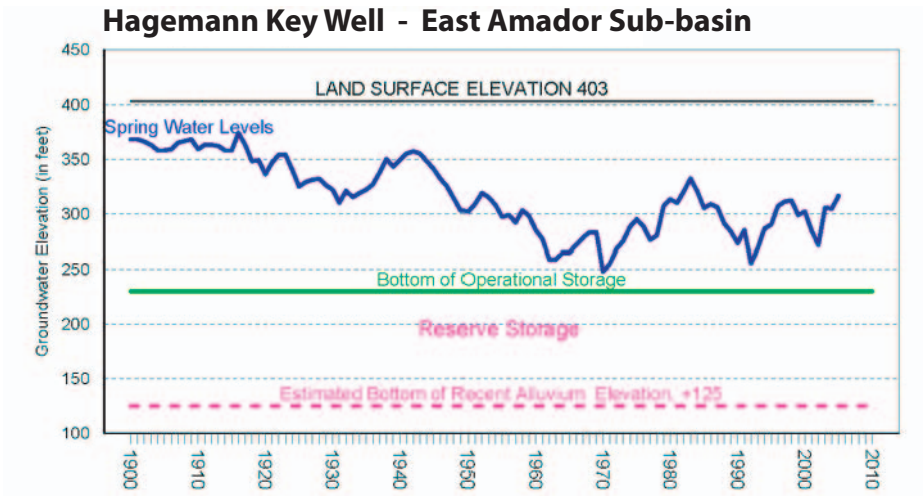
Groundwater models are useful for predicting the consequences of a proposed groundwater basin management action. Groundwater models can also be used to learn about the controlling parameters in a site-specific setting such as establishing locations and characteristics of aquifer boundaries.

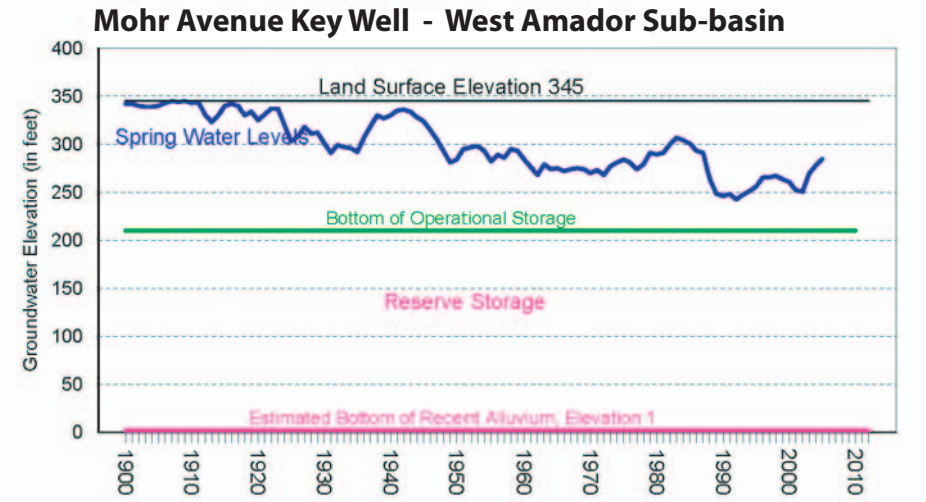
The original Main Basin groundwater model was developed by Zone 7 and DWR in the 1970s and is documented in DWR Bulletin 118-2. Davies (a Stanford graduate student) developed a groundwater model of the Amador sub-basin in 1981. Danskin (another Stanford graduate student) extended this model into the Bernal sub-basin in December 1985 and calibrated the model for average fluxes for the period 1977–1981. Although these models and the associated documentation provided some useful technical information, Zone 7 did not use them for basin management studies.

In 1996, Zone 7 retained consultant CH2M Hill to assist Zone 7 Staff with the development of a groundwater flow and solute (salt) transport model for the main groundwater basin. The model was designed to be usable by Zone 7 Staff or evaluating alternative SMP strategies and future Main Basin management options. The model was originally developed using Visual MODFLOW for Windows version 2.61 by Waterloo Hydrologic, Inc. package and M+3D for









04727.04 GWMP (09/05)

Jones & Stokes

Figure 4-8
Key Index Wells

solute transport. In the late 1990s, the model was converted to Groundwater Vistas using MODFLOW-SURFACT for simulate groundwater flow and MT3D to simulate solute transport.

The model is currently being updated and recalibrated to include recent data sets. The original model was calibrated using data from 1974 to 1994; the updated includes data sets through 2004.

Chapter 5

Plan Implementation

5.1 Groundwater Management Program

5.1.1 Introduction

Zone 7 has been actively monitoring and managing the groundwater basin for more than 30 years. Many of the various policies guiding the groundwater program were formalized in the 1987 Statement on Zone 7 Groundwater Management, incorporated herein by reference and included in Appendix E. This plan was partially revised and updated as part of the development of Zone 7's SMP, which was formally adopted by Zone 7 and approved by the RWQCB in October 2004; the SMP is also incorporated herein by reference and a copy of the Executive Summary is included in one of the Appendices. This Groundwater Management Plan serves to document the various existing groundwater management program components and how they are being implemented.

5.1.2 Salt Management

5.1.2.1 Background/Introduction

Zone 7's Salt Management Plan (SMP) was designed to comply with the requirements of the Master Water Recycling permit, RWQCB Order No. 93-159, issued jointly to Zone 7, the City of Livermore, and Dublin San Ramon Services District.[1] In May 2004, Zone 7, in cooperation with others, published the SMP to address the increasing level of TDS in the main groundwater basin. The SMP was approved by the RWQCB in October 2004. The SMP is incorporated herein by reference and a copy of the Executive Summary is included in Appendix D.

Zone 7 has define potential salt management strategies to offset the calculated long-term average salt loading to the main groundwater basin of approximately 2,200 tons per year.[2] The available alternatives are defined as those capital facilities and/or operational strategies already included in Zone 7's capital

[1] Zone 7 2004a.
[2] Zone 7 2004a.

improvement program or under evaluation in the Facilities Master Plan, and the Well Master Plan. In addition Zone 7 operates the groundwater basin conjunctively to remove salts as well as to maintain reliability of its supply.

Zone 7 has historically managed water deliveries and artificial stream recharge in accordance with its water supply operations planning program that consists of the following three major components:

1. Five-Year Demand Projections and DWR delivery scheduling;
2. Annual Water Supply and Storage Probability Analysis (also called the water supply forecast); and
3. Annual and Monthly Water Supply Operations Plans.

The Water Supply Forecast is prepared in December of each year for the following calendar year. The Water Supply Forecast shows how Zone 7 would operate to make full deliveries under a wide range of hydrologic conditions ranging from critically dry to extremely wet.

The Water Supply Forecast provides the framework for water management decisions. The Water Supply Operations Plans provide additional guidance for monthly supply goals (i.e., balancing surface and groundwater supplies). Each year in July, Zone 7 prepares preliminary versions of the Water Supply Operations Plans for the following three years. In September of each year, these three-year Water Supply Operations Plans are updated to reflect the latest demand requests received from Zone 7's retail water supply agencies. In January of each year, the Water Supply Operations Plan for the current year is updated with more accurate DWR water supply projections for most probable conditions. In April of each year, after DWR has announced the firm rest-of-year deliveries, Zone 7 develops a Monthly Water Supply Operations Working Plan. This Monthly Plan is then updated monthly for the rest of the year with actual year-to-date data and, as such, reflects adjustments made to meet water supply operational objectives.

The primary goal of historic water supply planning efforts was to minimize operations and maintenance costs by delivering the maximum amount of surface water available and pumping groundwater only to supplement surface water supplies during peak demand and drought periods. This historic approach successfully provided sustainable water supply at a minimum cost but did not specifically address salt loading, groundwater quality or delivered water quality.

The Water Supply Operations Plans now incorporate the Salt Management Plan (SMP) goals and an adaptive management approach to selecting the combination of salt management strategies to be implemented in a given year. Zone 7 determines the optimum combination of strategies to use in a given year. Multiple variables are balanced in making decisions and variables change from year to year, hence the need for a so-called adaptive or iterative management approach.

Factors used to track salt loading include data and information collected from the various monitoring programs described in Chapter 4. The existing monitoring programs are sufficient for tracking salt loading from existing sources and for existing land use conditions. Future land use changes and any increase used of recycled water may require additional monitoring to track the resultant additional salt loading. The monitoring component of the SMP facilitates tracking any progress in salt removal. No significant change is anticipated until groundwater demineralization begins (anticipated in around 2009).

5.1.2.2 Demineralization

To maintain delivered water quality (i.e., acceptable total dissolved solids or "TDS" and hardness) during future periods of increased groundwater pumping, Zone 7 has plans for constructing groundwater demineralization facilities.[3] The primary advantages of wellhead demineralization are that significant salt loading benefits may be realized (by exporting the brine concentrate from the groundwater basin) while concurrently improving delivered water quality by lowering TDS and hardness. Depending on the capacity installed, wellhead demineralization allows one to "dial-in" desired delivered water quality (i.e., by adjusting flows between demineralization treatment unit and bypass to achieve target hardness and/or TDS levels) and to reduce seasonal and drought-related variability. The primary disadvantages of wellhead demineralization are the moderately high operations and management (O&M) costs for pumping energy and the costs for brine disposal.

Groundwater demineralization will also allow Zone 7 to pump from water-bearing zones containing higher levels of minerals (expressed as TDS and hardness). In addition, Zone 7 will be able to pump increased volumes of groundwater (taking advantage of "banked" water in the basin) without impacting delivered water quality.

Demineralization will use a reverse osmosis (RO) membrane-based treatment system producing product water with extremely low TDS. The demineralized water will then be blended with other groundwater (non-demineralized) and/or surface water prior to delivery to achieve a target delivered water TDS or hardness and to reduce aggressiveness to distribution lines. The brine concentrate from the RO process will be exported out of the watershed via the regional wastewater export pipeline operated by the LAVWMA.

5.1.3 Integrated Water Resources/ Conjunctive Use

Historically throughout California, surface water and groundwater have been managed as separate resources because water law treats groundwater and surface

[3] Zone 7 2004a.

water as two separate resources. Such management does not represent hydrologic reality. As a result, DWR recommends monitoring surface water and groundwater resources as an integrated program that includes conjunctively managing groundwater with surface water.

DWR provides examples of planning efforts that should be integrated with groundwater management. These might include surface water flow/quality monitoring, wellhead protection management, agriculture/salt management, urban water management, flood management, and toxic site management.

For many years, Zone 7 has actively embraced a conjunctive use program by integrating management of local and imported supplies. Natural and artificial recharge utilizing releases of surface water to recharging streams is a key component of this program. To track the conjunctive use effort, Zone 7 actively monitors all of the following components:

1. natural inflow, including groundwater seepage (i.e., rising groundwater);
2. releases of imported water from the SBA;
3. urban run-off;
4. groundwater discharges from aggregate mining operations;
5. flood control releases from Lake del Valle; and
6. discharges from other artificial releases, including LLNL treated groundwater, well tests, or treated water discharges.

Zone 7 monitors the quantity and quality of each of the previous components. EC, pH, and temperature are measured monthly at stream-gaging stations throughout the basin and daily at various SBA turnouts to the Zone 7 treatment plants. The EC measurements are used to estimate TDS content using the formula TDS = 0.56 x EC. Additionally, surface water samples are collected periodically and analyzed for major and total ion content.

5.1.4 Groundwater Resource Protection

Zone 7 considers groundwater resource protection to be one of the most critical components of ensuring and managing groundwater resources. This GMP identifies resource protection by preventing contaminants from entering the groundwater basin and remediation of existing contamination.

5.1.4.1 Protection of Supply

Zone 7 ensures adequate water supply by importing a large amount of surface water into the valley through the SWP. In 2004, Zone 7 had an annual maximum entitlement of 80,619 af/y. Zone 7 also has a contract with Byron-Bethany Irrigation District for an additional 2,000 acre-feet. Zone 7 has also purchased water storage rights (65 taf) in the Semitropic Water Storage District

groundwater basin located in south-central California near Bakersfield. Artificial recharge of available supply allows the main groundwater basin to remain above the historical low level with good quality water.

The natural supply of groundwater replenishment to the basin needs to be protected. Urban development can reduce the amount of water recharging the basin. If left unmitigated, the natural safe yield of the basin would decline. Zone 7 monitors the natural recharge and reviews development plans to evaluate any impacts on the recharge capacity of the basin.

Currently, the largest potential negative impacts to recharge are the operation of the Del Valle Dam and the extensive gravel mining activities. To mitigate the impacts of the construction of the Del Valle Dam, Zone 7 makes releases from below the dam to maintain the stream flow and recharge through stream beds that would have occurred had the dam not been constructed. These releases are called "Prior Rights Releases." To satisfy these prior rights requirements, Zone 7 evaluates the Pre-Del Valle Dam (Pre-Project) and Post-Del Valle Dam (Post-Project) recharge. Recharge releases are made into the Arroyo Valle to ensure that the same amount of water recharges the basin as would have recharged if the dam had not been constructed.

Regional gravel mining activities have a significant impact on stream recharge and on the loss of groundwater through evaporation and mining company discharges to the arroyos. The Mining Area Reclamation Plan calls for the creation of a Chain of Lakes (see Section 3.3) that will allow the recapture of some of the lost recharge capacity associated with the mining impacts on stream recharge. In addition the Chain of Lakes project will mitigate the impacts from the increased evaporative losses associated with the creation of large lakes within the basin.

When all mining activities are completed in 2030 Zone 7 will own the Chain of Lakes area in fee and will utilize the chain of lakes for water resources management purposes to protect the natural recharge capacity of the groundwater basin and to mitigate the loss of groundwater from evaporation and reduced stream recharge capacity. In these ways, Zone 7 protects the natural supply of groundwater which is then used primarily by the retailers to provide the water that they appropriate from the groundwater basin.

5.1.4.2 Wellhead Protection/Permit Program

DHS administers the Drinking Water Source Assessment and Protection Program that requires the identification of wellhead protection areas. A DWSAP evaluation has been conducted for all Zone 7 supply wells and will be conducted for all future Zone 7 supply wells. The DWSAP identifies areas of protection for each wellhead area. These areas are incorporated into other Groundwater Protection Programs of Zone 7, as discussed elsewhere in this chapter.

Both the County and the three local cities (Dublin, Livermore and Pleasanton) have well ordinances, all of which are administered by Zone 7 Water Agency by agreement. As a result of these Well Ordinances, any planned new well construction, soil-boring construction, or well destruction must be permitted by Zone 7 before the work is started. There is currently no fee for the Zone 7 permits. Additionally, all unused or abandoned wells must be properly destroyed, or, if there are plans to use the well in the future, a signed statement of future intent must be filed at Zone 7.

A copy of the Zone 7 drilling permit applications is available for download from the Zone 7 website. Zone 7 must receive permits at least 5 days prior to beginning any drilling. Well construction/ destruction permit requirements are determined on a case-by-case basis but generally follow DWR's California Well Standards (Bulletins 74-81 and 74-90).

5.1.4.3 Water Conservation

Because water is a limited and precious resource that must be used wisely, Zone 7 makes water conservation an integral part of its daily operations and water management approach—not just an emergency response to recurring droughts.

Zone 7 promotes the Ultra-Low-Flow Toilet Rebate Program, which began in 1994, and is a water conservation success story for Zone 7 and Tri-Valley households. The program offers rebates to households when they replace their old toilets with new water-conserving ultra-low-flow toilets. Almost 11,000 ultra-low-flow toilets have been installed in the valley, for an annual water-savings of 480 acre-feet. Each ultra-low-flow toilet will save an estimated average of 38 gallons per day.

Zone 7 also promotes the Residential Clothes Washer Rebate Program, which involves the purchase of high-efficiency, Energy Star® labeled clothes washing machines. These high-efficiency washing machines use up to 50% less energy and up to one-third less water relative to most other new washers. Zone 7 has given out approximately 4,000 rebates since this program began in 1998. This program is a regional partnership with other Bay Area water agencies, including Alameda County Water District, Contra Costa Water District, East Bay Municipal Utility District, and Santa Clara Valley Water District.

5.1.4.4 Wastewater Management

Zone 7 Board of Directors adopted an interim policy on wastewater reclamation (Resolution No. 823, 1977) and a "Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Watershed Above Niles" (WMP) (Resolution No. 1037, 1982). (See Appendix E.) The 1982 WMP encompasses the unsewered, unincorporated area above Niles situated outside the sewered urban areas in the Livermore-Amador Valley. The primary purpose of this WMP was to identify, assess, and recommend solutions to local septic tank

problems, and recommend wastewater management policies to prevent degradation of surface waters and groundwater.[4] The recommended policies of the WMP were adopted along with the WMP, itself, by the Zone 7 Board of Directors in Resolution 1037 (see Appendix E). Among the most important is B.4 in the WMP: "If more intense development proposing septic tanks is to be authorized in any area and/or when land use zoning is changed to rural residential use with septic tanks: (a) the minimum generally acceptable lot size should be five (5) acres."

A separate policy was established that prohibits the use of septic tanks for new developments zoned for commercial or industrial uses (Resolution No. 1165, Appendix E). This prohibition can be waived by the Zone 7 Board if "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."

These policies have been adopted in large part to protect the groundwater basin from contamination from untreated sewage. For many years Zone 7 has been monitoring a persistent plume of high nitrate concentrations in the Main Groundwater Basin that extends from south Livermore six miles northeast to Livermore's airport. A preliminary study was conducted in April, 1980. Nitrate concentrations within this plume typically range from 30 mg/l to 65 mg/l and have been somewhat stable for the last three decades or more. The drinking water standard or maximum contaminant level (MCL) for nitrates (as nitrate or NO_3) is 45 mg/l. CWS operates several municipal supply wells within the affected area, however, the well water that contains nitrates greater than the MCL is blended with imported water to lower the nitrate concentrations below the MCL prior to distributing it to their customers.

In 2002, Zone 7's consultant, Raines, Melton & Carella, Inc. (RMC) conducted a reconnaissance level evaluation of the nitrate sources which may be responsible for the high nitrate concentrations found in the South Livermore area. In general, in this draft report RMC concluded that the rural residential livestock manure and septic tank leachate provide over 90% of the current nitrate loadings in the study area which was comprised of 670 acres of agricultural land and rural residential area. The study area is upgradient of the affected CWS wells, and currently includes approximately 100 rural homes along Buena Vista, Almond and East Avenues and Calvary Lane that use septic tank systems for sewage disposal. The majority of the homes are on Buena Vista Avenue. In addition, there are six wineries (including one with a full-scale restaurant), commercial and private horse stables, a dog kennel and approximately 460 acres of vineyards within the study area. Historically, there was extensive chicken and row crop farming along Buena Vista Avenue that continued until the 1950s.

RMC evaluated the potential nitrogen sources in the study area. Nitrogen loadings and losses from multiple sources were estimated to determine a net mass balance for nitrogen entering the groundwater. The volume of water recharged to the groundwater basin was estimated to determine the resulting concentration of

[4] Camp Dresser and McKee 1982.

nitrate in the groundwater. The nitrogen mass balance model predicts that livestock manure is providing 50–55% of the current nitrate loadings within the study area and that septic tank leachate is providing 40–45%. On the other hand, the nitrate contributions from winery process wastes and urban and agricultural fertilizers make up less than 10% of the total.

Zone 7 continues to work with the City of Livermore, Alameda County Planning Department, the Buena Vista and Almond Avenue residents and the property and business owners along Tesla Road, to develop strategies to mitigate the regional nitrate issues.

Recycled Water Use

Overall it is anticipated that use of recycled water for irrigation purposes will increase in the future. Within the Zone 7 service area, two retail water supply agencies (DSRSD and the City of Livermore) plan to use or are currently using recycled water for the following projects:

- **Livermore Golf Course**—The Livermore Airport and Golf Course use about 400 acre-feet of recycled water annually for irrigation. The current monitoring program consists of 10 wells installed jointly by Zone 7 and the USGS in the late 1970s. The collection and analysis of groundwater data were initially done by the USGS and Zone 7, but the collection was taken over by the City of Livermore in 1985. The RWQCB established monthly monitoring and reporting requirements in Water Reclamation Permit No. 90-102 issued to the Livermore Water Reclamation Plant. The requirements in Permit No. 90-102 were superseded in January 2005 when the RWQCB issued Livermore General Order 96-011. Order 96-011 does not contain groundwater monitoring requirements. However, Livermore continues to support Zone 7 in collection and analysis of groundwater samples. In 2003, four additional shallow monitoring wells were installed and are monitored by Zone 7 to help evaluate the effect of the recycled water use on groundwater. Three of the wells are located at the Livermore Golf Course, one upgradient of the irrigation area (to establish background water quality conditions) and the others downgradient. Zone 7 reviews the groundwater quality data submitted by the City of Livermore to the RWQCB and makes additional water level and groundwater quality measurements. Zone 7 maintains records on monthly recycled water use, recycled water quality, and the application areas and rates.
- **Public Parks**—It is recommended that two shallow wells be constructed at a large park, such as the Pleasanton Sports Park, Dublin Sports Grounds, or Emerald Glen Park, that is irrigated with recycled water. One upgradient well would monitor background conditions and the other downgradient well would monitor the effects of irrigation with recycled water. The wells would be monitored quarterly for approximately 1 year and then annually once baseline conditions were established.
- **Veterans Administration Hospital**—The Veterans Administration (VA) Hospital wastewater treatment system and percolation ponds are located at

the southern edge of the Main Basin. This system is also regulated by RWQCB Waste Discharge Requirements that include groundwater monitoring and reporting requirements. For consistency and completeness, it is recommended that the existing requirements be reviewed to evaluate the usefulness of the information being collected. As appropriate, recommendations could then be made for monitoring changes to best document the current and future impacts of percolation on groundwater quality.

5.1.4.5 Toxic Site Management

Background

Zone 7 documents and tracks sites across the groundwater basin that pose a potential threat to drinking water. Information on these sites is gathered from state, county, and local agencies, as well as from Zone 7's well permitting program. This tracking program is designated the "Toxic Site Surveillance Program" and a report is generated biannually to update the progress of investigations and clean-ups. Each site has been assigned a Zone 7 number, which corresponds to the file number containing reports or other information about the site. In addition, all sites are reviewed and given a ranking based on criteria used by the RWQCB and Alameda County Environmental Health (ACEH) that have been modified to meet Zone 7 standards.

Program Description

A GIS database and map was developed to show the locations of these sites and to provide basic information including; priority, status, owner/contact, contaminants of concern, concentrations of contaminants in groundwater, proximity to supply wells, lead agency and date last reviewed. This database is maintained by Zone 7 staff to help assess the potential threat to our drinking water posed by a given site.

Each site is assigned a priority designation of high, moderate or low. The priority can change as conditions change at the site. A site is designated as a high priority site if the following conditions occur:

1. contamination at the site is in groundwater at concentrations greater than the MCL, and
2. a water supply well is within 2,000 feet downgradient of the site, or
3. it is shown that drinking water will likely be impacted by the contamination at the site.

A secondary ranking is used to represent the remedial status of the site. These codes differ slightly from those used by ACEH and RWQCB to better meet the needs of Zone 7. For example, a closed case is listed as a Status "CL" in the Toxic Site program database, instead of the RWQCB's code of "9".

In general, the Toxic Site Surveillance Program has found two types of contamination threatening groundwater in the Livermore-Amador Valley Groundwater Basin: fuels and industrial chemicals

The petroleum-based fuel products include total petroleum hydrocarbon as gasoline (TPHg), TPH as diesel (TPHd), benzene, toluene, ethylbenzene, xylene (collectively known as BTEX), and oxygenates added to fuel including methyl tertiary-butyl ether (MtBE) and tertiary-butyl alcohol (TBA). California has assigned clean-up standards for the BTEX compounds and fuel oxygenates. However, a cleanup standard for total petroleum (TPHg or TPHd) has not officially been established.

The industrial chemical contaminants of concern are tetrachlorethylene (PCE), trichloroethylene (TCE), and their by-products and degradation products. This latter group of contaminants consists of chlorinated solvents. PCE is common in the dry cleaning business, and TCE is commonly used as a degreaser for electronics. Both PCE and TCE have an established MCL of 5 micrograms per liter (µg/l).

Zone 7 is currently tracking 76 active sites where contamination has been detected in groundwater across the groundwater basin. Ten of these sites are designated as high priority, five in Livermore, four in Pleasanton, and one in Sunol.

When there are sites that are of particular concern and/or are a potential threat to the drinking water supply staff will work closely with the lead agency (RWQCB or ACEH) to ensure that Zone 7's concerns are addressed.

Reporting

A report is generated biennially to update the status of the sites in the program. This report is submitted to the Zone 7 Board. The report includes a detailed summary of the background information of each high priority site along with any special notes and the current actions taking place at the site. In addition, a summary table of all the active sites is included in the biennial report. This table includes a brief summary of the current status of each active site. A map is generated for each main area within the groundwater basin, Livermore, Pleasanton, and Dublin, to show the site locations, their priority and their proximity to municipal supply wells (Figures A, B, and C in Appendix B).

5.2 Future Review of This Groundwater Management Plan

This GMP is the framework for regionally coordinated groundwater management efforts within the Livermore-Amador Valley. Many of the components described in this GMP will likely further evolve with future management efforts in the

basin. Any such future changes will involve a collaborative effort involving Zone 7 and its four agencies (Dublin-San Ramon Services District, City of Pleasanton, City of Livermore and California Water Service Company), as well as the Tri-Valley Retailers Group, in which all four retailers participate. Key resources for evaluation are the annual monitoring and measurement reports described above. As a result, the GMP is intended to be a living document, where the components will be evaluated over time to determine whether they are meeting the overall goal of the plan, and revisions will be proposed and adopted, as appropriate.

5.3 Public Hearings and Plan Adoption

- Interim GMP presented at public meeting to Zone 7 Board in 1987.
- Original Groundwater Management Program adopted in 1987 following hearings, contributions from stakeholder-based groundwater advisory committee, etc. ("Statement on Zone 7 Groundwater Management," 8/19/87.)
- Groundwater Management Advisory Committee (GMAC) formed primarily in relation to the demonstration RO/groundwater injection project; however also assisted in evaluating the 1987 Statement on Zone 7 Groundwater Management and helping develop and review the salt management elements of a new plan reflected in the eventual adoption of the Salt Management Plan. (10 Citizen effort 1995–2002.)
- Salt Management Plan Outlining Conjunctive Use to Enhance Groundwater Quality (adopted by Zone 7 with stakeholder input via public interest group, the GMAC, as well as a Technical Advisory Group, discussions at public meetings and subsequent approval by RWQCB in October 2004).
- January 2004 Zone 7 Board notice of plan to review Groundwater Management Plan in a series of three public presentations.
- February, April, and August 2004 public presentations on groundwater basin supply, quality, and management.
- July 2005 distribution of Administrative Draft Groundwater Management Plan to Retail Water Agencies to solicit preliminary comments and input.
- August 3, 2005 meeting with retail water agencies (DSRSD, CWS, Livermore and Pleasanton) to review Administrative Draft Groundwater Management Plan.
- August 17, 2005 public hearing followed by adoption of Resolution of Intent to Adopt Groundwater Management Plan, completion of Draft Groundwater Management Plan and opening of public review and comment period (draft plan was made available to the public in area libraries and on the Zone 7 website), with all associated publications of notice.
- Receipt of comments followed by revisions to Draft Groundwater Management Plan to reflect input received.

5.4 Actions

The Zone 7 Board of Directors will be asked to adopt the Groundwater Management Plan following a public hearing at the September 21, 2005 Regular Board Meeting, following all required publications of notice.

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

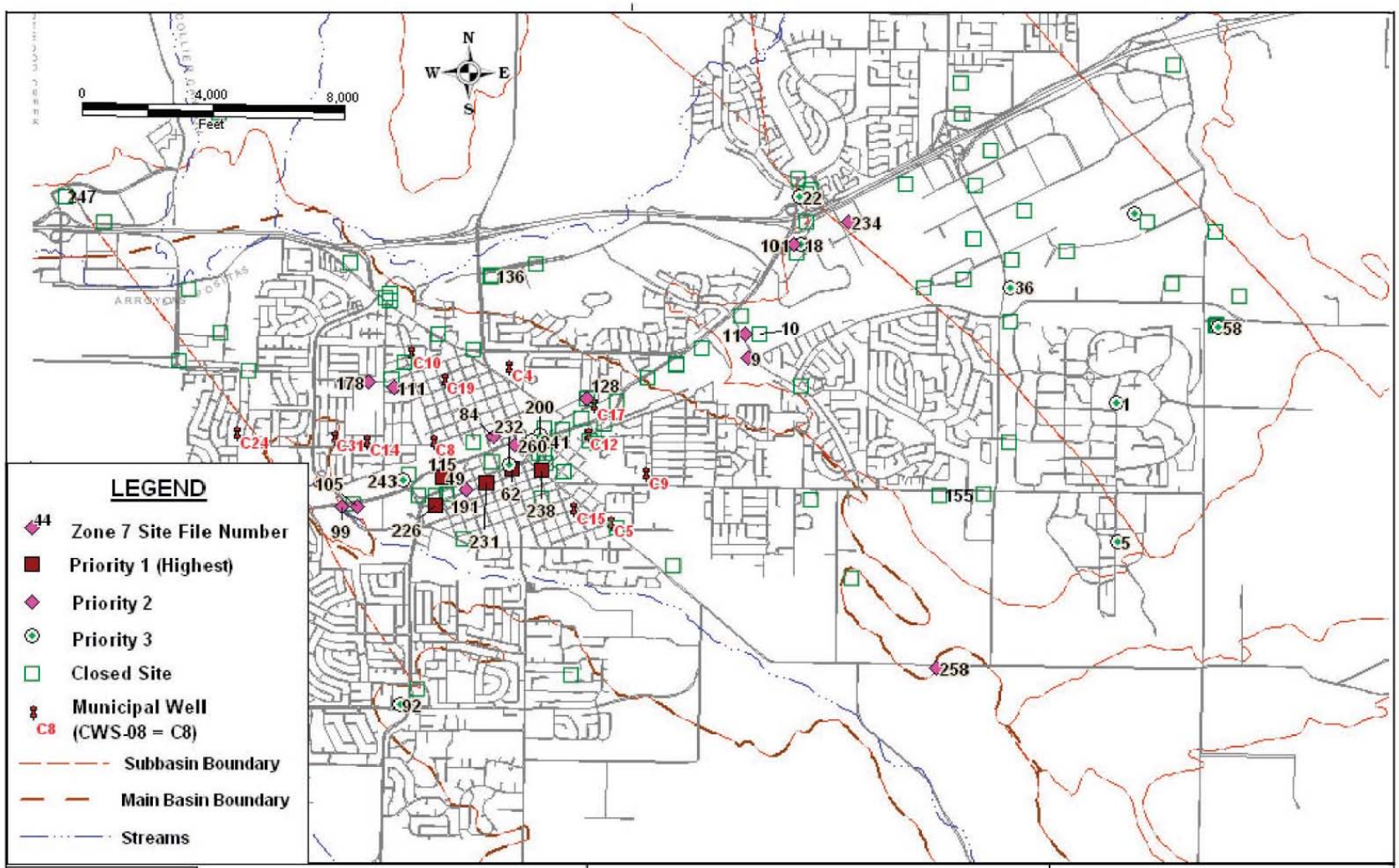
Appendix B

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

Jones & Stokes

Figure A
Toxic Site Surveillance, Livermore Area Sites

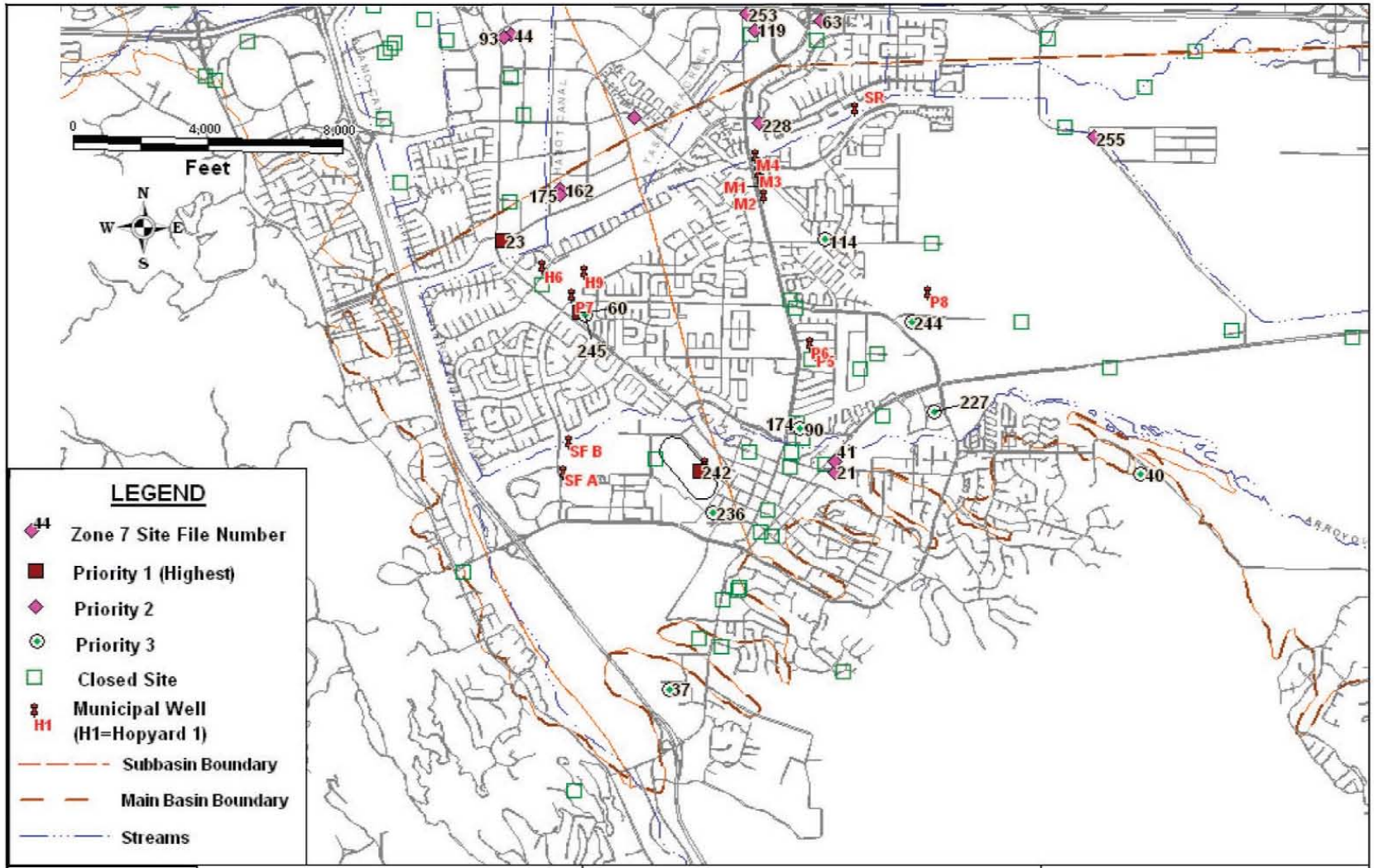


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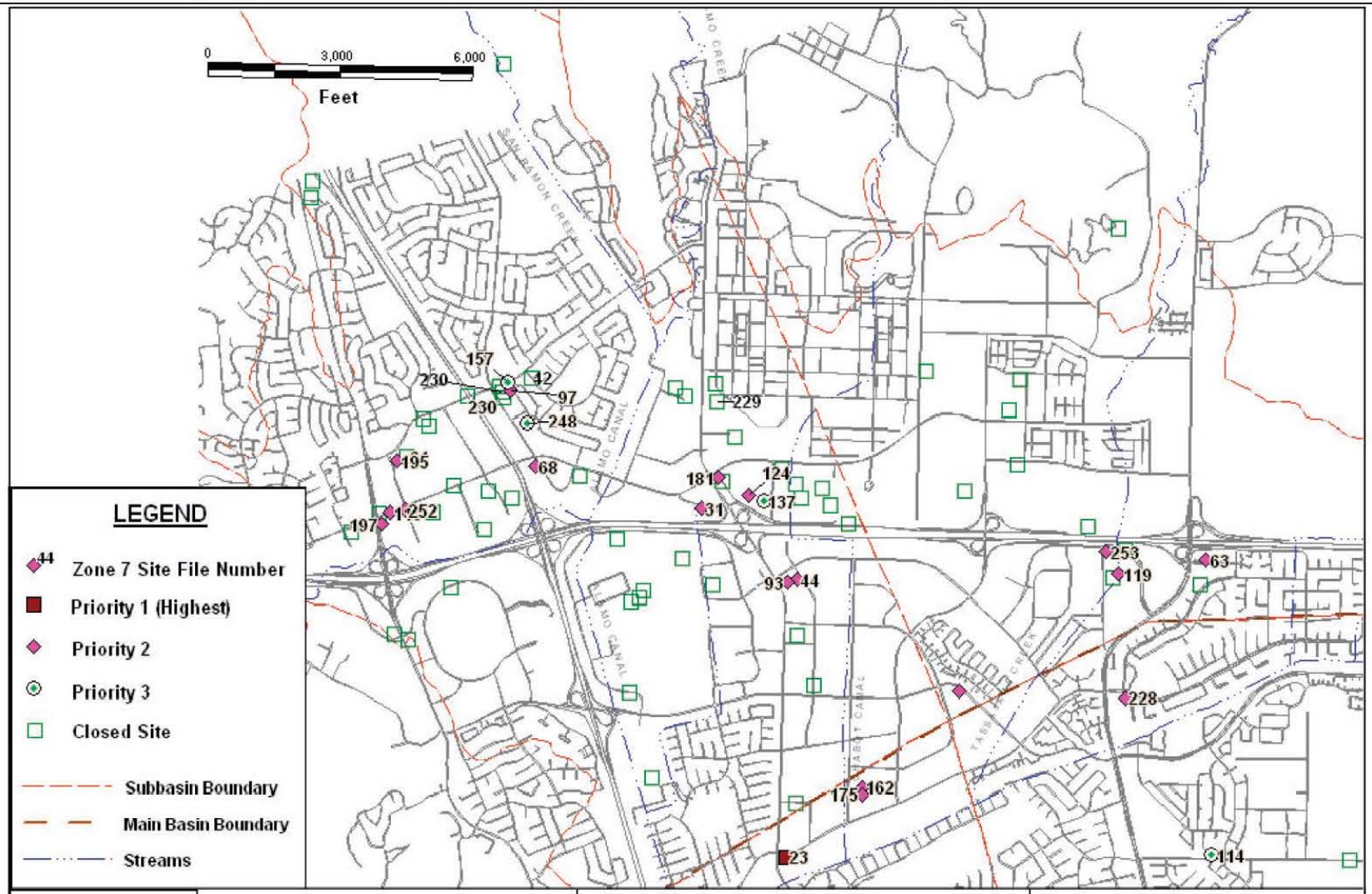
Figure B
Toxic Site Surveillance, Pleasanton Area Sites



ZONE 7 WATER AGENCY
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For Toxic Report:	January 2004
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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

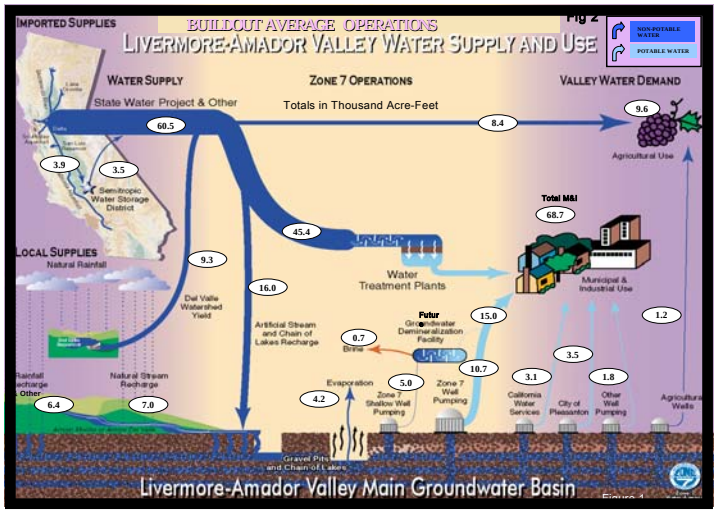
Executive Summary of Salt Management Plan

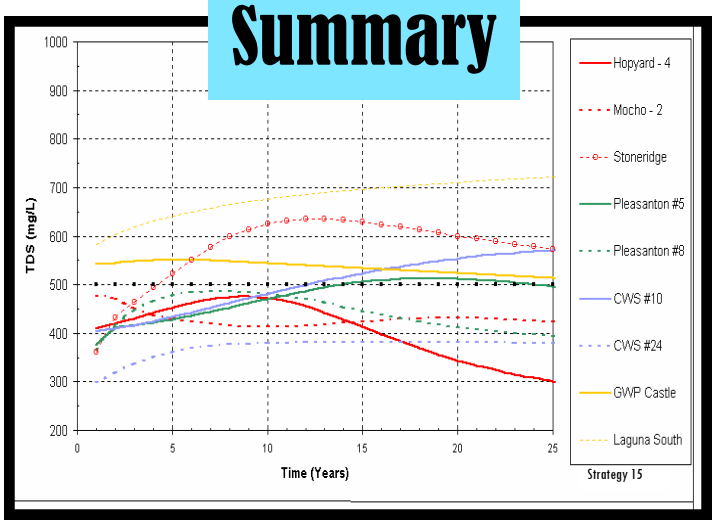
ALAMEDA COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT

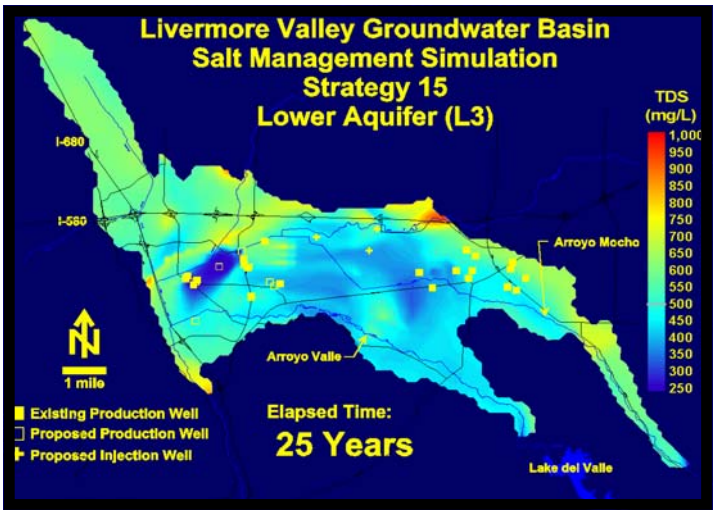
Livermore-Amador Valley Main Groundwater Basin

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

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Gary Tamminen
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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.

Sincerely,

Bruce H. Wolfe
Executive Officer

cc: Mr. David Requa
Assistant General Manager
Dublin San Ramon Services District
7051 Dublin Blvd
Dublin, CA 94568

Mr. Darren Greenwood
Water Resources Division Manager
City of Livermore
101 W. Jack London Blvd.
Livermore, CA 94550

bcc: Lila Teng

Acknowledgements

Salt Management Plan Report

ZONE 7 OF ALAMEDA COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT – ZONE 7 WATER AGENCY

Dale Myers, General Manager
Edward Cumming, Assistant General Manager
Vince Wong, Assistant General Manager

Prepared by Zone 7 Water Resources Staff in Conjunction with EOA, Inc.

David Lunn, Water Resources - Project Manager
Jarnail Chahal, Water Resources – Project Engineer
Gerald Gates, Water Resources – Staff Technician

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Dan Wendell, CH2MHILL – Groundwater Modeling
Harold Meyer, Water Resources Management, Inc. – System Operations Modeling

Guidance and Direction were Provided by the Technical Advisory Group

Bill Adams, Steve Gittings, Randy Werner – City of Livermore
Steve Cuzenza, Garry Lee – City of Pleasanton
Dave Requa, Bob Gresens – DSRSD
Bert Michalczyk, Bruce Webb - DERWA
Sam Palermo – California Water Service
Helen Ling – Morrison and Associates
Vince Wong, David W. Lunn – Zone 7

Public Input was Provided by the Groundwater Management Advisory Committee

Mary Jean Aufderheide, Dorothy Bishop, Michael Gatzman, Bryant Hudson,
Zev Kahn, Eric Nichols, Peggy Purnell, Jay Zucca

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.

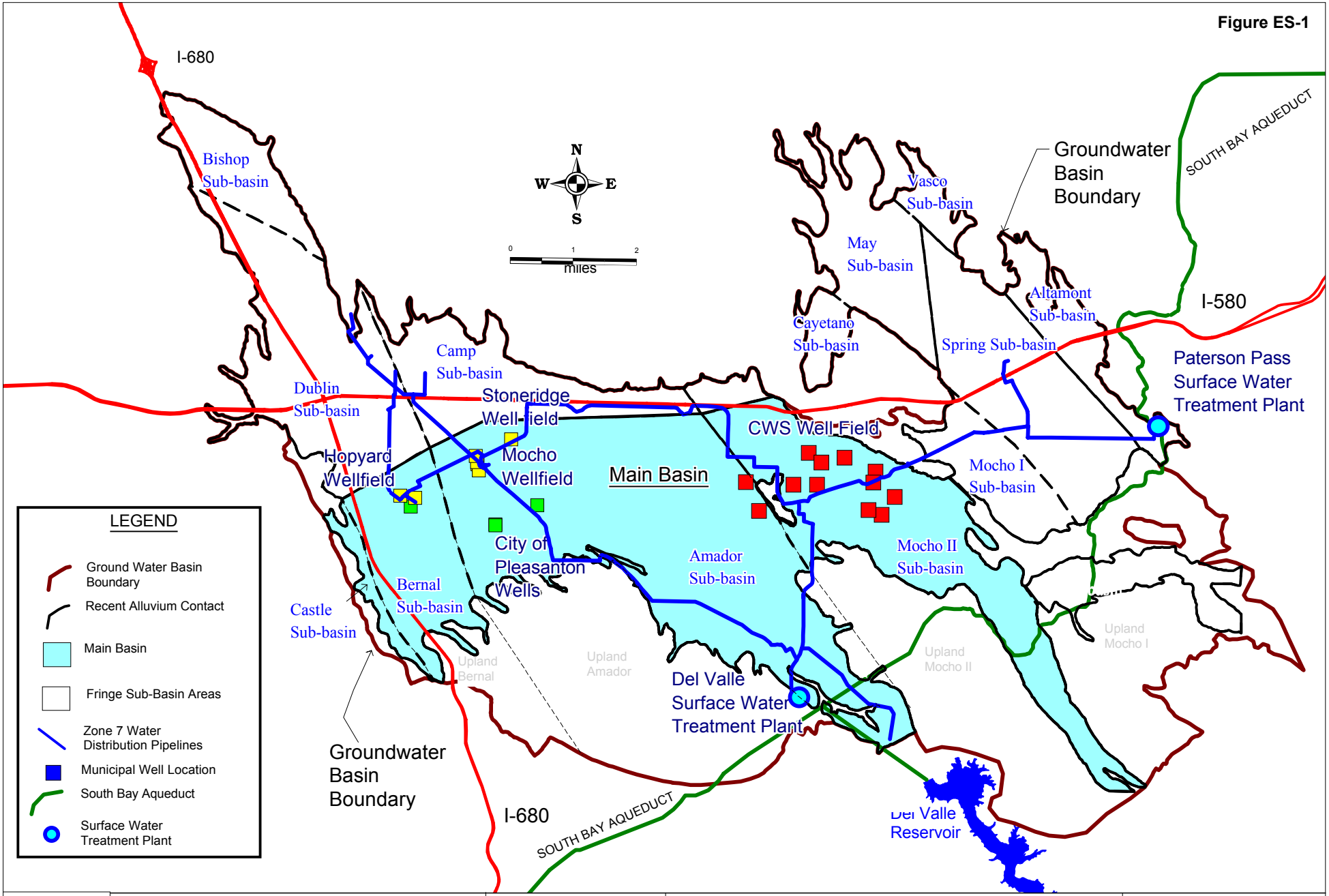
Background

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



ZONE 7 WATER AGENCY
5997 PARKSIDE DRIVE PLEASANTON CA 94588

DRAWN	GERALD GATES STEWART SMITH
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SALT MANAGEMENT PLAN

GROUNDWATER BASIN AND WATER FACILITIES MAP

SCALE	1" = 2 Miles
DATE	31 July 2002
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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**

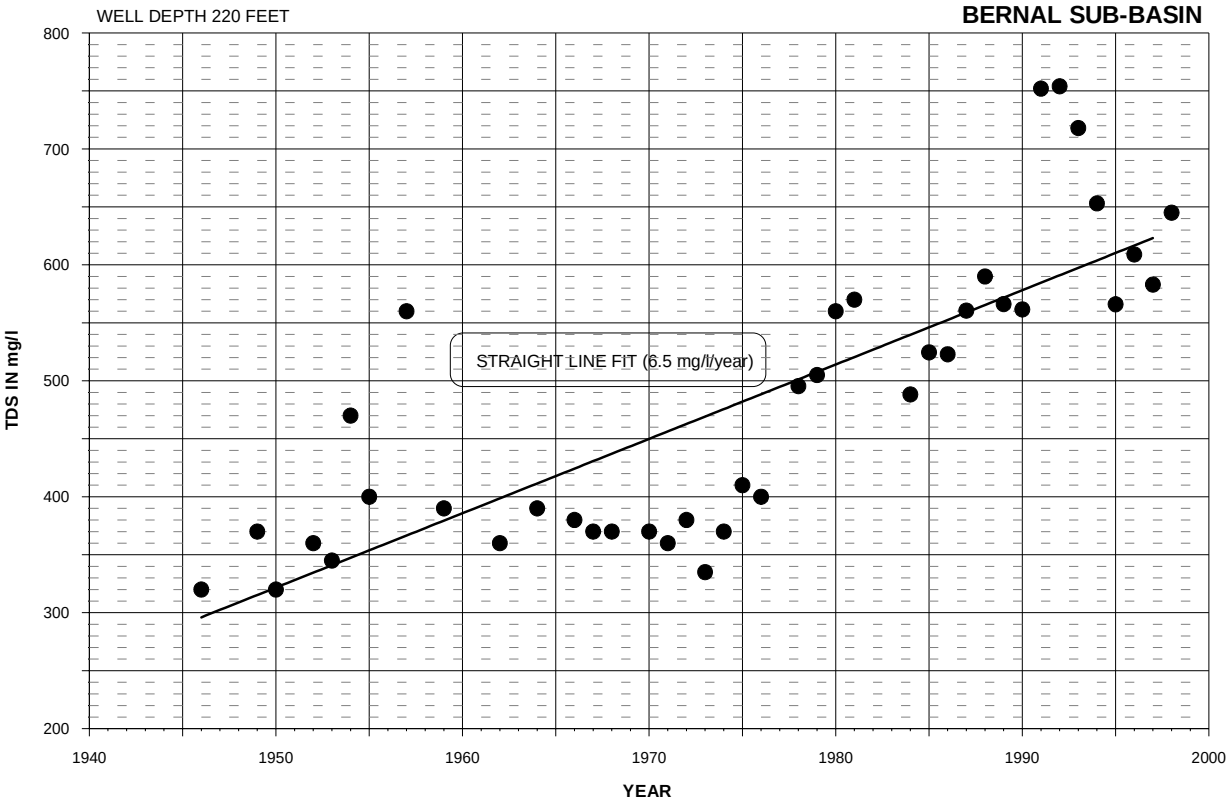
Delivered water TDS also varies from east to west in the valley. The blend of surface to groundwater varies between turnouts because of the locations of the wells relative to the turnouts and because of their intermittent use. The Livermore and CWS service areas, which are closer to surface water treatment 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



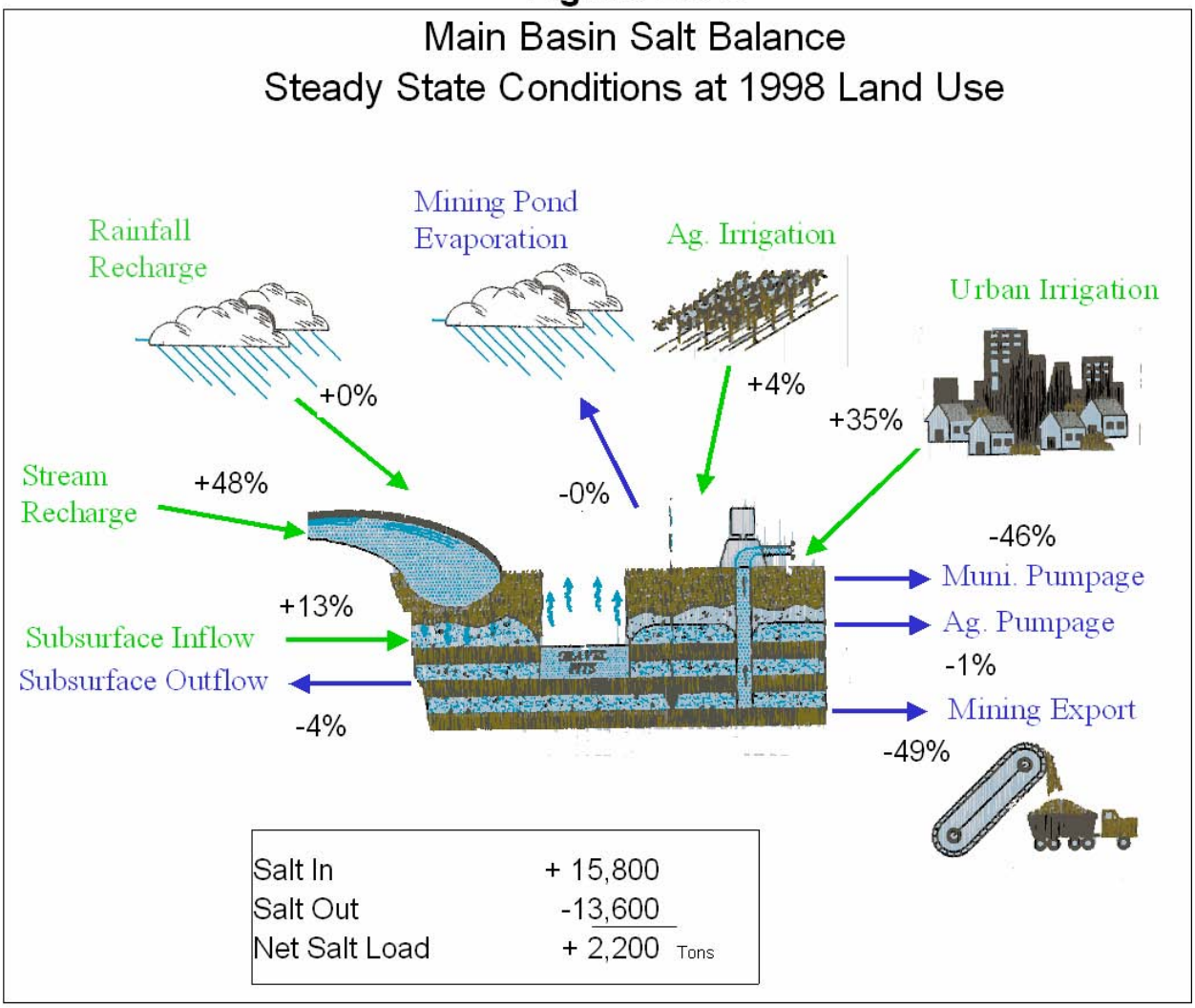
NOTE: ALL DATA IS FROM O-LINE (DEEP AND SHALLOW WELLS)

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

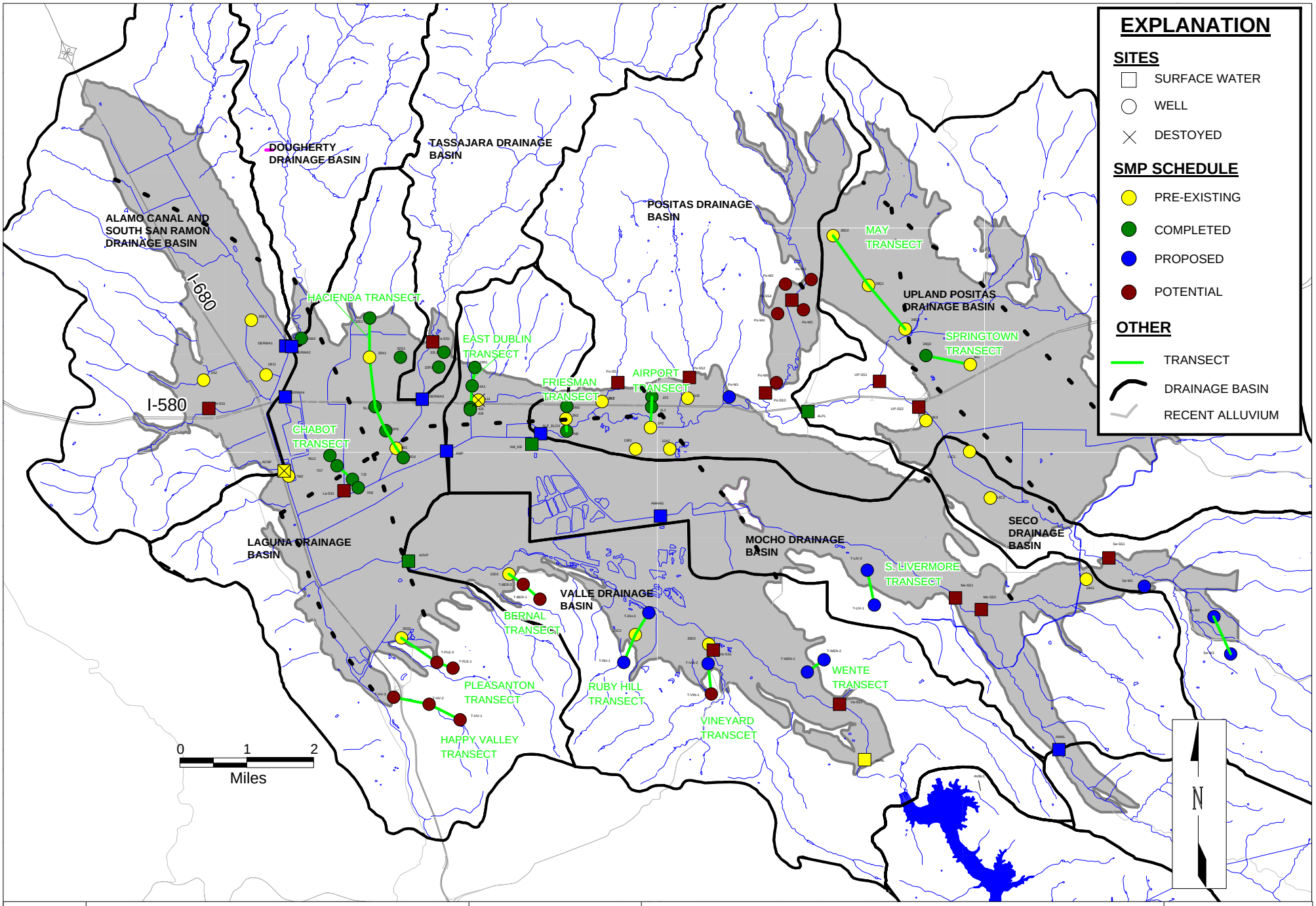
The SMP includes a Salt Management Monitoring Plan (SMMP) designed to help refine the baseline salt loading estimates, particularly from new urban and agricultural irrigation in the fringe basins. Seventeen additional monitoring wells and upgraded continuous recording surface water monitoring facilities 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) .*

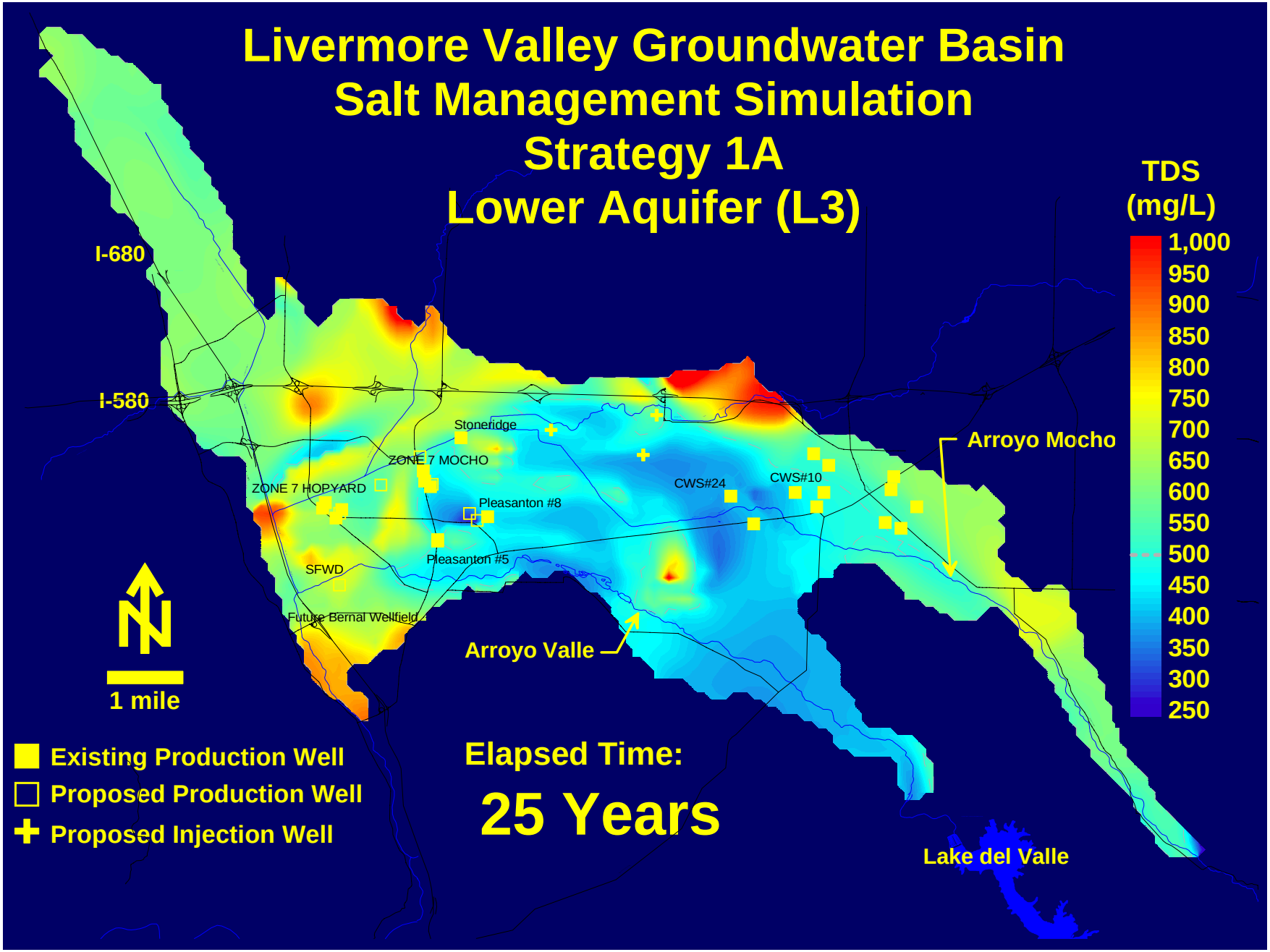

Livermore Valley Groundwater Basin
Salt Management Simulation
Strategy 1A
Lower Aquifer (L3)
TDS
(mg/L)
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
I-680
I-580
Stoneridge
ZONE 7 MOCHO
ZONE 7 HOPYARD
Pleasanton #8
Pleasanton #5
SFWD
Future Bernal Wellfield
CWS#24
CWS#10
Arroyo Mocho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

Figure ES-7

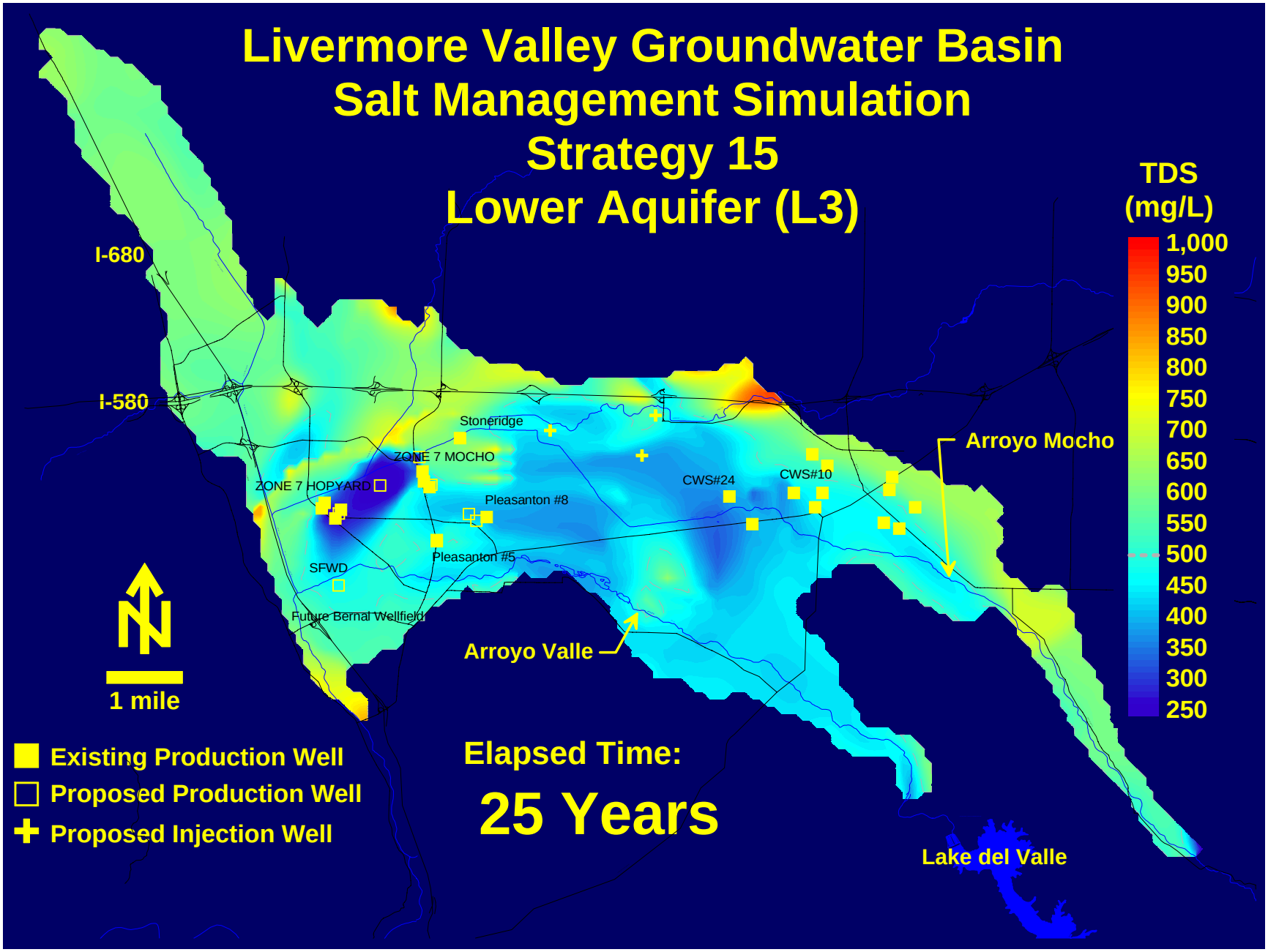

Livermore Valley Groundwater Basin
Salt Management Simulation
Strategy 15
Lower Aquifer (L3)
TDS
(mg/L)
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
I-680
I-580
Stoneridge
ZONE 7 MOCHO
ZONE 7 HOPYARD
Pleasanton #8
Pleasanton #5
SFWD
Future Bernal Wellfield
CWS#24
CWS#10
Arroyo Mocho
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%

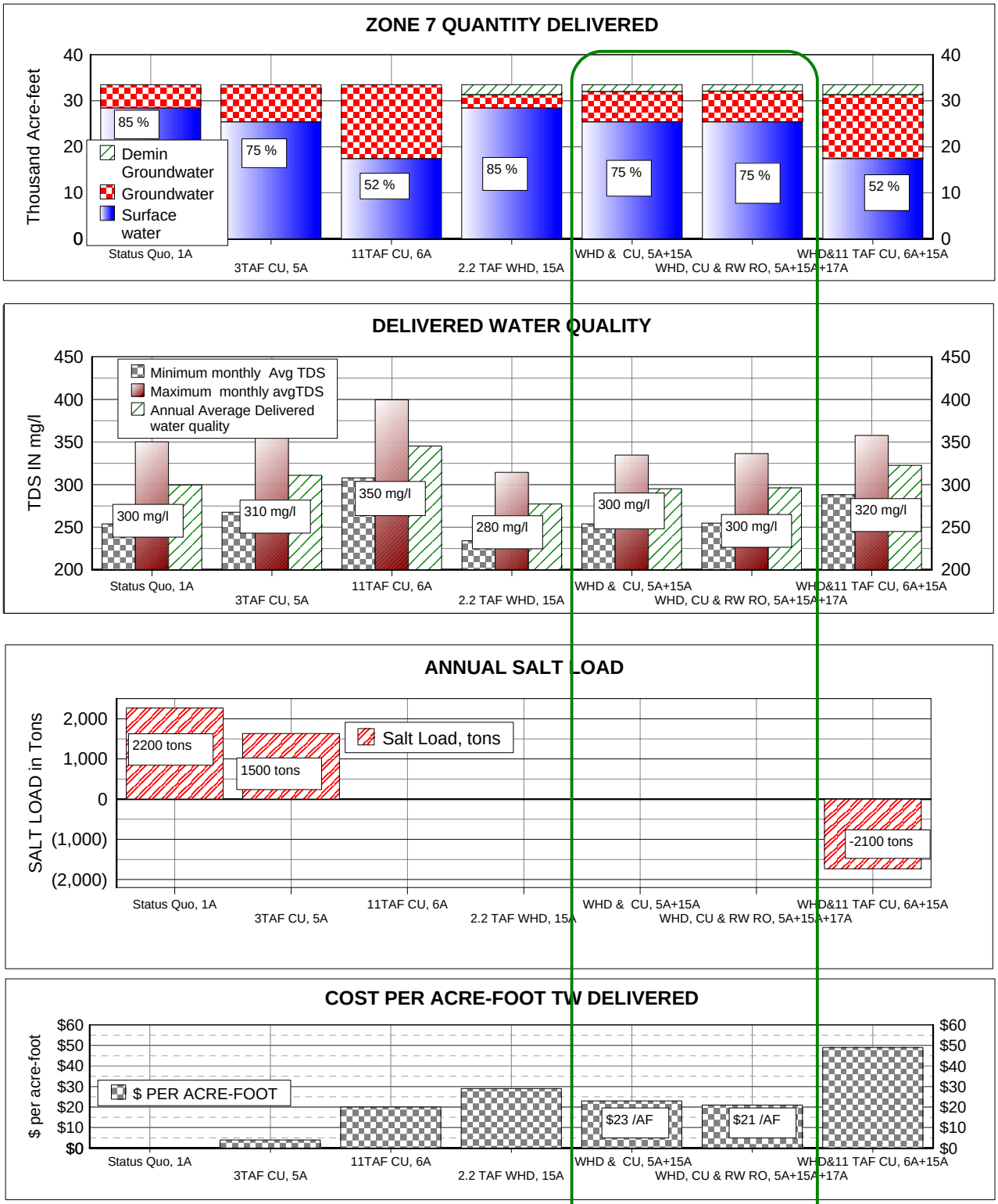
Assumptions:

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



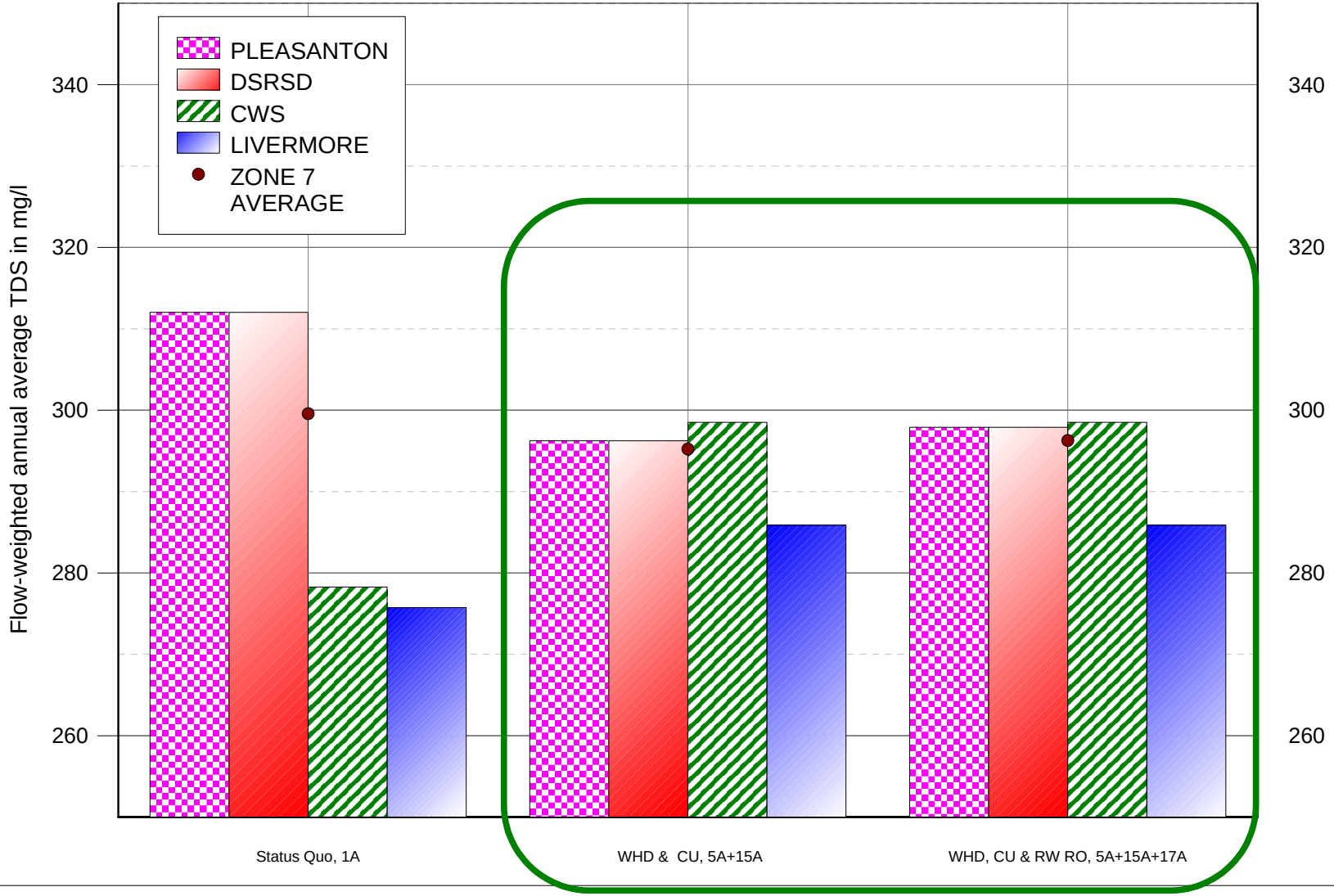
CU = CONJUNCTIVE USE, WHD= WELL HEAD DEMINERALIZATION
RW RO= RECYCLED WASTE WATER RO, PENDING PUBLIC ACCEPTANCE
AF= ACRE-FEET, TAF=THOUSAND ACRE-FEET

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

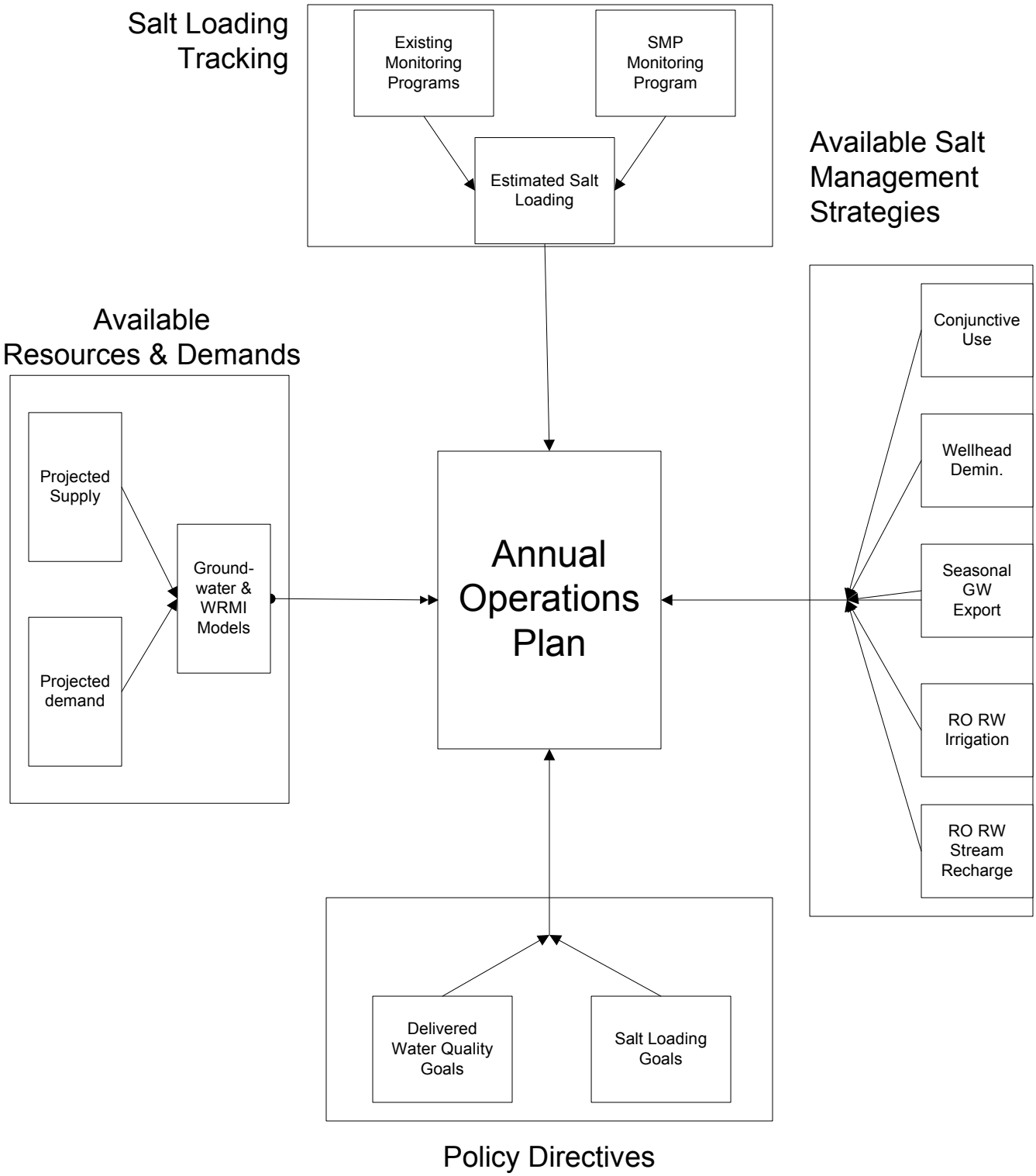
Zone 7's annual operations plan has been expanded to incorporate the SMP goals and an adaptive management process. This means that when all the facilities are in place to fully implement the SMP, each year staff will review the projected water supply forecast, retailer water demands and adopted salt 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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6/26/2002

- 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

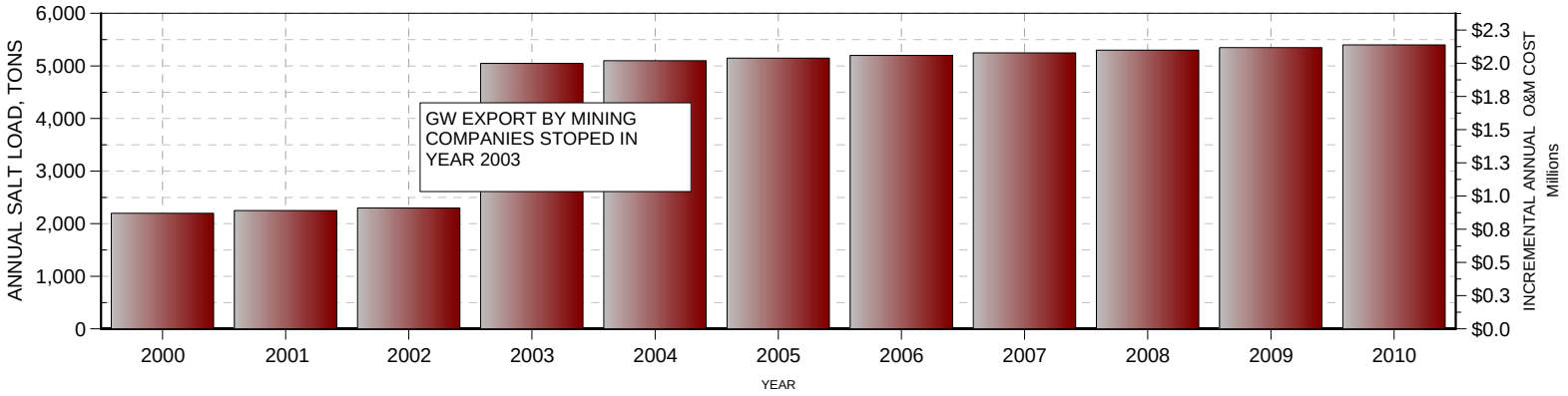
The above phased near-term implementation plan was presented to and approved by the Zone 7 Board of Directors on August 18, 1999 by Resolution No. 99-2068. The tables and figures illustrating the plan contained in Chapter 12 (ES 9-12) are essentially the same as those presented to the Board. The Resolution 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

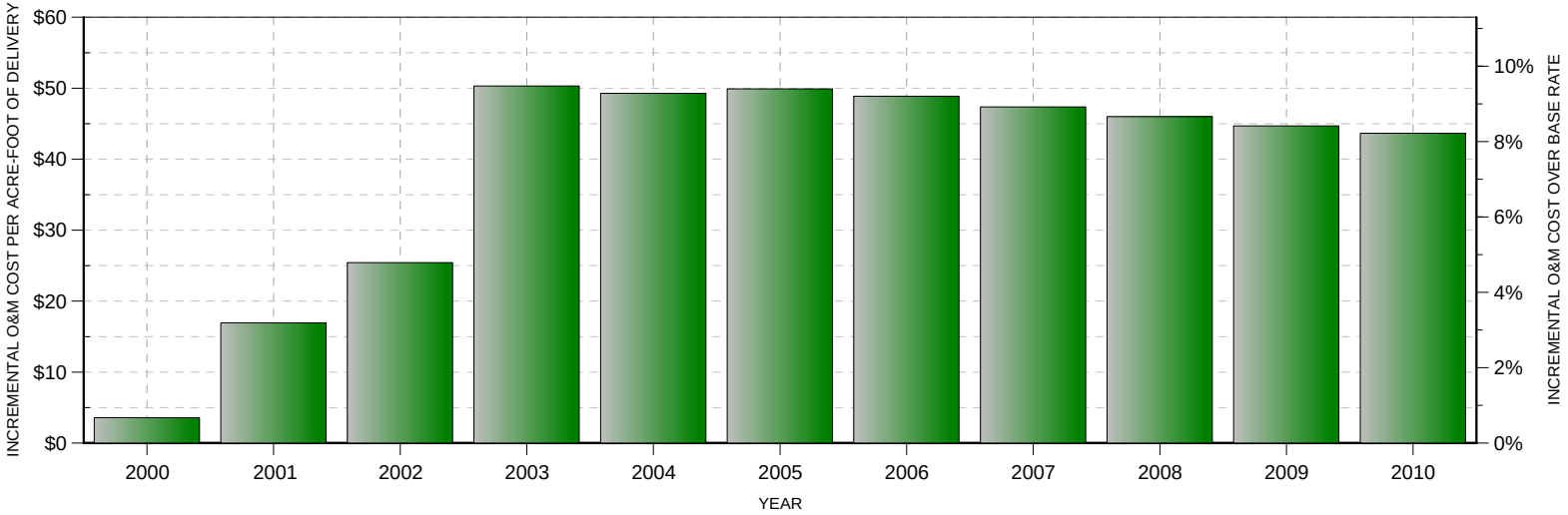
Main Basin salt loading has been projected to increase from the current (1999) 2,200 tons/year to 5,400 tons/year by year 2010 (Section 8.9). The upper graph in Figure ES-12 presents projected future annual salt loading from year 2000 through 2010. This graph shows the salt load in tons on the left y-axis 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.

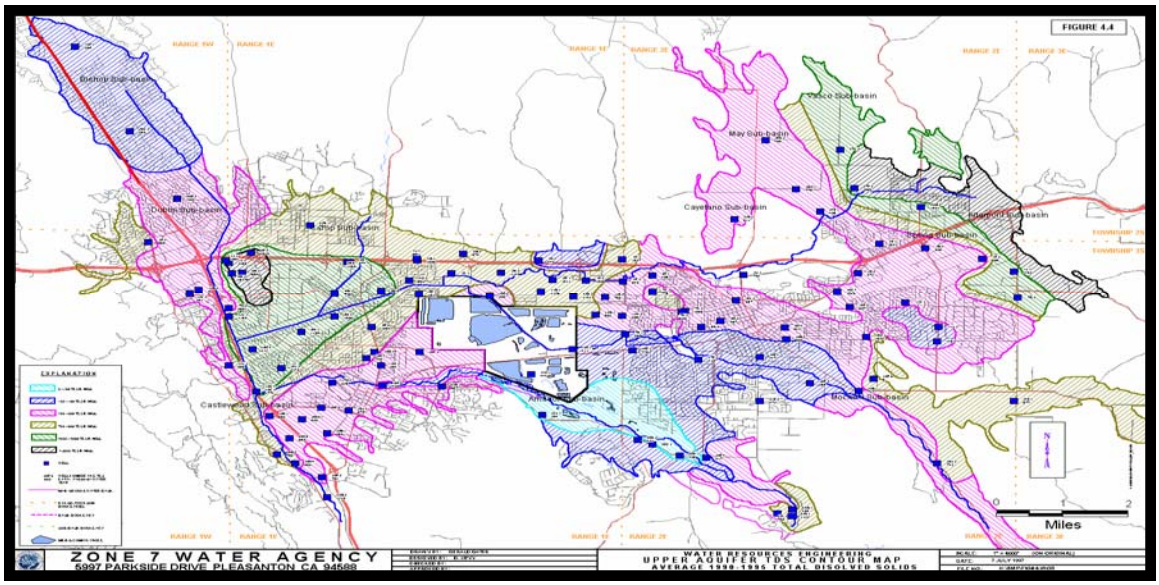
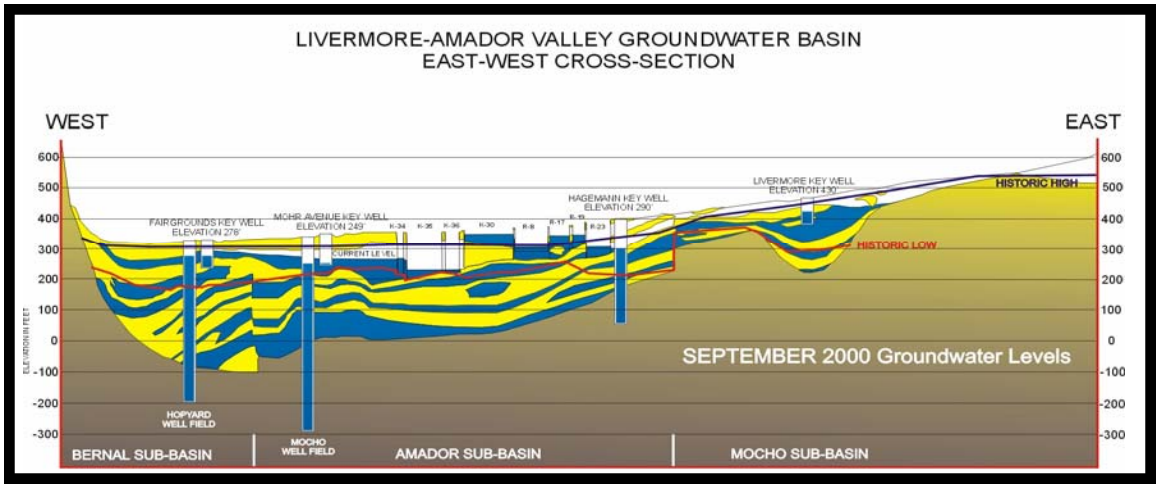


FIGURE 4.4
Bishop Sub-basin
Chain Sub-basin
Castenada Sub-basin
May Sub-basin
Cayetano Sub-basin
Amador Sub-basin
Mocho Sub-basin
Miles
ZONE 7 WATER AGENCY
5997 PARKSIDE DRIVE PLEASANTON CA 94588
WATER RESOURCES ENGINEERING
UPPER AQUIFER TDS CONTOUR MAP
AVERAGE 1988-1995 TOTAL DISOLVED SOLIDS


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

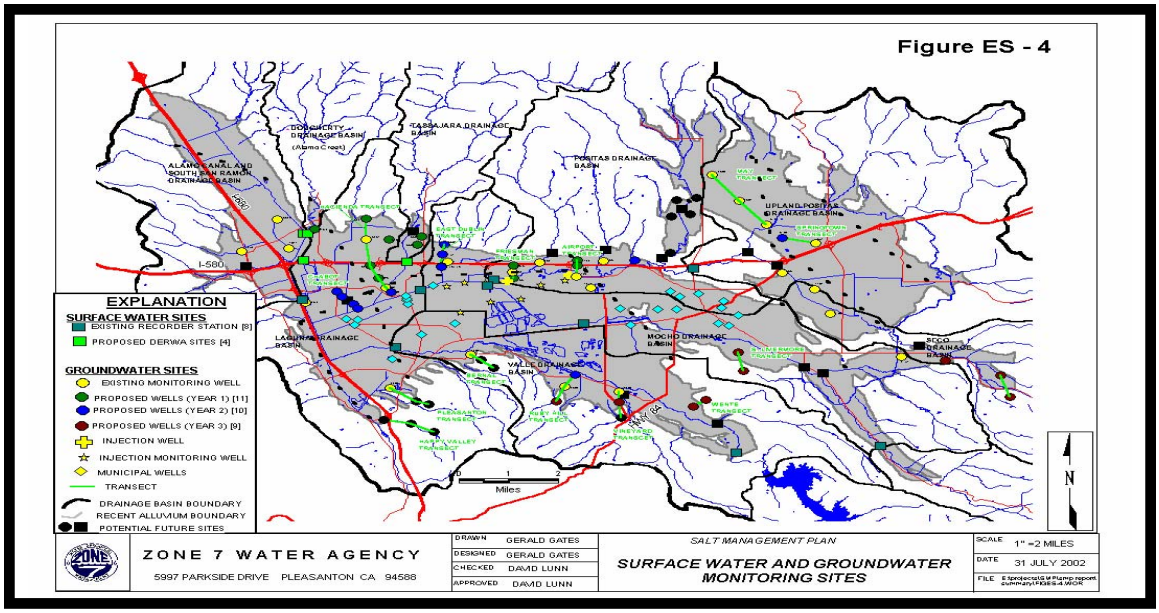


Figure ES - 4
DOWNTOWN DRAINAGE BASIN
CASSAJARA DRAINAGE BASIN
POSITAS DRAINAGE BASIN
ALAMEDA CANAL AND SOUTHERN RAMON DRAINAGE BASIN
UPLAND POSITAS DRAINAGE BASIN
I-580
LAGUNA DRAINAGE BASIN
VALLEY DRAINAGE BASIN
MOCHO DRAINAGE BASIN
SCOO DRAINAGE BASIN
EXPLANATION
SURFACE WATER SITES
EXISTING RECORDER 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

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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

D9

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

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

100 NORTH CANYONS PARKWAY, LIVERMORE, CA 94551 PHONE (925) 454-5000

September 23, 2005

Mary Scruggs
Division of Planning and Local Assistance
Conjunctive Water Management Branch
PO Box 942836
Sacramento, CA 94236-0001

Subject: **Transmittal of Zone 7's Groundwater Management Plan**

Dear Ms. Scruggs:

Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7 Water Agency) is pleased to present our newly-adopted Groundwater Management Plan. Zone 7 Water Agency is a water wholesaler that delivers water to four retail water supply agencies, Dublin-San Ramon Services District, California Water Service Company and the Cities of Livermore and Pleasanton. The four retailers have formed the Tri-Valley Water Retail Group which has endorsed the plan (see attached letter). A copy of the Board Resolution adopting the plan is also attached.

Please feel free to contact me at (925) 454-5016, if you have any questions concerning the Groundwater Management Plan.

Sincerely,

G.F. Duerig
Acting Assistant General Manager

Attachments

cc (without attachments):
Kim Rosmaier, CA DWR – Central District
Dave Lunn
Tom Rooze
Sal Segura

TriValley
Water
RETAILERS

A cooperativ
the City of Liv
Dublin San R
and the Calif

CC: JD
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RECEIVED
SEP 15 2005

September 14, 2005

Mr. Dale Myers, General Manager
Zone 7 Water Agency
100 N. Canyons Parkway
Livermore, CA 94550

Subject: Zone 7's Draft Groundwater Management Plan for Livermore-Amador Groundwater Basin-August 2005

Dear Mr. Myers:

The Tri-Valley Water Retailers Group thanks you and your staff for the opportunity to review Zone 7's draft *Groundwater Management Plan for Livermore-Amador Groundwater Basin* (GMP) dated August 2005. Specific comments on this important management document have been provided earlier by individual retail agencies to Jill Duerig of your staff. As stated in the Executive Summary, Zone 7 prepared the GMP to compile and document all of its current groundwater management policies and programs in a single document, and to satisfy the intent of the State's Groundwater Management Planning Act. The water retailers understand that the Planning Act is broad, and recognize that the Zone's GMP may not need to address specific issues regarding Zone 7's groundwater use and management that are still being worked out locally. The compilation of current management practices in a single GMP document will be helpful to provide retailers and Zone 7 a useful starting point for discussing future amendments to groundwater management policies and procedures that address these specific local issues.

The Tri-Valley Water Retailers Group acknowledges Zone 7's adoption of this GMP as a starting point for future local discussions and decisions on groundwater management. As such, we endorse transmittal of the Plan to the State Department of Water Resources, with the understanding that Zone 7 and the retailers will continue to work together toward mutually agreed upon groundwater management goals.

We look forward to working with Zone 7 in the future, using the GMP as a starting point, to frame, develop or modify groundwater management policies and procedures for the safe production, improved water quality and long-term sustainability of the Tri-Valley's valuable local groundwater resource.

Please provide a copy of this letter to your Board of Directors for their information in their consideration of the *Groundwater Management Plan for Livermore-Amador Groundwater Basin*.

Sincerely,

Bert Michalczyk

Bert Michalczyk
Chair, Tri-Valley Water Retailers Group

BM:ngh

Cc: Dan McIntyre, City of Livermore
John Freeman, California Water Service Company
Rob Wilson, City of Pleasanton

ZONE 7
ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

BOARD OF DIRECTORS

RESOLUTION NO 06-2796

INTRODUCED BY DIRECTOR MARCHAND
SECONDED BY DIRECTOR STEVENS

RESOLUTION APPROVING AND ADOPTING THE FINAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, following publication of notice and conducting a public hearing, a Notice of Intent to Draft and Adopt a Groundwater Management Plan ("Notice of Intent") was adopted by the Zone 7 Board on August 21, 2005; and

WHEREAS, Zone 7 published said Notice of Intent in accordance with the requirements set forth in the California Groundwater Management Planning Act (Water Code Sections 10750, et seq.); and

WHEREAS, such notice also included a written statement describing the manner in which interested parties could participate in providing input on the groundwater management plan;

WHEREAS, copies of the Draft Groundwater Management Plan were made available for public review in local libraries, at the Zone 7 office and on the Zone 7 website; and

WHEREAS, Zone 7 distributed additional copies of the Draft Groundwater Management Plan to its water retail agencies, Dublin San Ramon Services District, California Water Service Company and the Cities of Livermore and Pleasanton; and

WHEREAS, Zone 7 received public comments on the document; and

WHEREAS, comments received were addressed in drafting a final version of the Groundwater Management Plan; and

WHEREAS, on September 21, 2005 the Zone 7 Board of Directors conducted a second public hearing on the September 2005 Groundwater Management Plan; and

WHEREAS, the Zone 7 Board of Directors considered both written and oral comments received on the Groundwater Management Plan;

NOW, THEREFORE, THE ZONE 7 BOARD OF DIRECTORS DOES HEREBY RESOLVE that the September 2005 Groundwater Management Plan referenced and incorporated herein, is hereby approved and adopted by this Board of Directors and shall be the basis for Zone 7's groundwater management policy for future activities.

BE IT FURTHER RESOLVED, as the GMP is a compilation of existing Zone 7 policies and practices and does not involve any changes or additions thereto, the Board of Directors hereby finds that the GMP is not project for purposes of CEQA and is thus exempt therefrom and directs the Clerk of the Board to file a Notice of Exemption with the County Clerk in compliance with CEQA Guideline 15062.

ADOPTED BY THE FOLLOWING VOTE:

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

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 7 of Alameda County Flood Control and Water Conservation District on

September 21, 2005

By _____
President, Board of Directors

NOTICE OF EXEMPTION

To: ☐ Office of Planning and Research
For U.S. Mail:
P.O. Box 3044
Sacramento, CA 95812-3044

Street Address:
1400 Tenth Street, Room 121
Sacramento, CA 94514

To: ☒ County Clerk
County of Alameda
1106 Madison Street
Oakland, CA 94612

From: ZONE 7 WATER AGENCY
100 North Canyons Parkway
Livermore, CA 94551

Lead Agency (if different from above):

Project Title: Groundwater Management Plan for Livermore-Amador Groundwater Basin

Project Location – Specific: Livermore-Amador Valley

Project Location – City: Cities of Livermore, Pleasanton, Dublin and Unincorporated Eastern Alameda County

Project Location – County: Alameda

Description of Nature, Purpose, and Beneficiaries of Project:

The Zone 7 Groundwater Management Plan (GMP) is a summary written to combine all of Zone 7's existing groundwater management efforts into a single document. The GMP provides a detailed description of Zone 7's existing groundwater management practices throughout the Livermore-Amador Valley Groundwater Basin and a description of the regulatory setting that involves a GMP.

Name of Public Agency Approving Project: Zone 7 Water Agency

Name of Person or Agency Carrying Out Project: Zone 7 Water Agency

Exempt Status: *(check one)*

☐ Ministerial (Sec. 21080(b)(1); 15268);

☐ Declared Emergency (Sec. 21080(b)(3); 15269(a));

☐ Emergency Project (Sec. 21080(b)(4); 15269(b)(c));

☐ Categorical Exemption. State type and section number:

☒ Statutory Exemptions. State code number: 14 CCR 15061.b.3

Reasons why project is exempt:

This Groundwater Management Plan is a requirement in the preparation and for the adoption of an Urban Water Management Plan pursuant to Section 10652 of the Water Code. The Plan is merely a compilation and summary of existing policies and practices without any changes or additions thereto thus there is no possibility that this plan will have a significant effect on the environment , therefore per the general rule of CEQA Guideline 15061.b.3, this activity is not subject to CEQA.

Lead Agency Contact Person: Mary Lim
Area Code/Telephone/Ext: 925-454-5036

If filed by Applicant:

1. Attach certified document of exemption finding.
2. Has a Notice of Exemption been filed by the public agency approving the project? ☐ Yes ☐ No

Signature: Mary Lim Date: 9/22/05 Title: Environmental Services Program Manager

☑ Signed by Lead Agency

Date received for filing at OPR: _____

☐ Signed by Applicant

Form 4. Environmental Declaration

*ENVIRONMENTAL DECLARATION

(Calif. Fish and Game Code Sec. 711.4)

NAME AND ADDRESS OF APPLICANT OR LEAD AGENCY:

Zone 7 Alameda County Flood Control and Water Conservation District

100 North Canyons Parkway

Livermore, CA 94551

FOR COURT USE ONLY

FILING NO.

CLASSIFICATION OF ENVIRONMENTAL DOCUMENT:

1. NOTICE OF EXEMPTION/STATEMENT OF EXEMPTION — PLU117

☒ A—STATUTORILY OR CATEGORICALLY EXEMPT
$25.OO (Twenty-Five Dollars) – CLERK's FEE

☐ B—DE MINIMUS IMPACT – CERTIFICATE OF FEE EXEMPTION REQUIRED — PLU 117
$25.OO (Twenty-Five Dollars) – CLERK's FEE

2. NOTICE OF DETERMINATION – FEE REQUIRED

☐ A—NEGATIVE DECLARATION — PLU 116
$1,250.OO (Twelve Hundred Fifty Dollars) – STATE FILING FEE
$25.OO (Twenty-Five Dollars) – CLERK's FEE

☐ B—ENVIRONMENTAL IMPACT REPORT — PLU 115
$850.OO (Eight Hundred Fifty Dollars) – STATE FILING FEE
$25.OO (Twenty-Five Dollars) – CLERK's FEE

3. ☐ OTHER (Specify)_____ — PLU117
$25.OO (Twenty-Five Dollars) – CLERK's FEE

* THIS FORM MUST BE COMPLETED AND SUBMITTED WITH ALL ENVIRONMENTAL DOCUMENTS FILED WITH THE ALAMEDA COUNTY CLERK'S OFFICE.

FIVE COPIES OF ALL NECESSARY DOCUMENTATION ARE REQUIRED FOR FILING PURPOSES.

APPLICABLE FEES MUST BE PAID AT THE TIME OF FILING AN ENVIRONMENTAL DOCUMENT WITH THE ALAMEDA COUNTY CLERK'S OFFICE.

MAKE CHECK PAYABLE TO: ALAMEDA COUNTY CLERK

Rev. 1/15/91–1056

Check Date: 09/21/2005 DP Check No. 1014249

Invoice Number		Invoice Date	Voucher ID	Gross Amount	Discount Available	Paid Amount
9-19-05Exemptior	ZONE7	9/19/2005	00012582	25.00	0.00	25.00

Invoice Type : Government Fees Use Tax : 0.00

Payment Comments: NOTICE OF EXEMPTION RETURN CHECK TO QIC 90201 ATTN: M CHUN

Approved 09/20/2005 15.24.06 by ABAUTIST

Vendor Number	Vendor Name			Total Discounts$0.00	
0000032647	COUNTY OF ALAMEDA				
Check Number	Date		Total Amount	Discounts Taken	Total Paid Amount
1014249	9/21/2005		$25.00	$0.00	$25.00