Appendix D: Yuba County Water Agency-Ground Water Management Plan

YUBA COUNTY WATER AGENCY
GROUNDWATER
MANAGEMENT PLAN

March 2005

ORDINANCE NO. 9

OF THE BOARD OF DIRECTORS OF THE YUBA COUNTY WATER AGENCY TO ADOPT A GROUNDWATER MANAGEMENT PLAN UNDER WATER CODE §10750 *et seq.* (AB 3030, STATS 1992)

The Board of Directors of the Yuba County Water Agency ordains as follows:

Section 1. This ordinance is adopted with reference to the following background recitals:

WHEREAS, the California Legislature has declared that groundwater is a valuable natural resource in California and should be managed to ensure both its safe production and its quality; and

WHEREAS, it is the intent of the Legislature through the passage of AB3030 (Stats 1992) codified as Water Code §10750 *et seq.* to encourage local agencies to work cooperatively to manage groundwater resources within their jurisdictions; and

WHEREAS, the Legislature also has declared that the additional study of groundwater resources is necessary to better understand how to manage groundwater effectively to ensure the safe production, quality, and proper storage on groundwater in this state; and

WHEREAS, the adoption of a Groundwater Management Plan is encouraged, but not required by law; and

WHEREAS, any local agency, whose service area includes a groundwater basin, or a portion of a groundwater basin, that is not subject to groundwater management pursuant to other provisions of law or a court order, judgment, or decree, may, by ordinanceadopt and implement a groundwater management plan within its service area; and

WHEREAS, the Yuba County Water Agency (Agency) is an independent, government organization created in 1959 by the Yuba County Water Agency Act, hereafter referred to as the Act; and

WHEREAS, the Agency was created to develop and promote the beneficial use and regulation of the water resources of Yuba County; and

WHEREAS, the Act and Water Code section 10750 et seq. authorize the Agency to adopt and implement a Groundwater Management Plan; and

WHEREAS, the Agency is interested in the development of a Groundwater Management Plan as defined under Water Code Section 10750, *et seq.*; and

WHEREAS, the Agency began proceedings on a groundwater management plan in 1996 (See Resolution No. 1996-8) and in 1998 (See Resolution No. 1998-11) and 2002 (See Resolution No. 2002-14); however, each time the plan was not completed within the statutory two year period; and

WHEREAS, in 2003 the Agency facilitated a Water Advisory Committee (WAC) comprising of local water purveyors, reclamation districts, Yuba County agencies, Yuba County Resource Conservation District, and Beale Air Force Base, to assist in the development of the Groundwater Management Plan and this committee met on approximately a monthly basis during development of the Plan; and

WHEREAS, the purpose of the Agency Groundwater Management Plan is to build and formalize the historically successful management of Yuba County's groundwater resource and develop a framework for implementation of future activities; and

WHEREAS, prior to adopting a resolution of intention to draft a groundwater management plan, Water Code §10753.2 requires a local agency to hold a second hearing, after publication of notice pursuant to Government Code §6066, on whether or not to adopt a resolution of intention to draft a Groundwater Management Plan, and take protests, pursuant to this part for the purposes of implementing the plan and establishing a groundwater management program; and

WHEREAS, a resolution of intent (Resolution No. 2004-14) to draft a groundwater management plan was passed on October 12, 2004, and such hearing was noticed pursuant to Government Code Section 6066; and

WHEREAS, upon adoption of the Groundwater Management Plan the Agency will discuss the continuation and composition of the WAC to guide implementation of the Plan and the Agency will ensure effective outreach to other self-supplied pumpers in the area; and

WHEREAS, the Agency prepared a draft Groundwater Management Plan that was released for public review on February 3, 2005 and made available for inspection in local libraries and at the Agency's office located in Marysville, California, and on the Agency's website; and

WHEREAS, the Agency published a Public Notice of the availability of the Public Review Draft – Yuba County Water Agency Groundwater Management Plan in the Appeal Democrat newspaper on February 7, 2005 and February 14, 2005, as required under Government Code Section 6066 pursuant to Water Code Section 10753.5; and

WHEREAS, the Board of Directors received an update on the formation of the Groundwater Management Plan at its regular workshop meeting held February 1, 2005

and recommended to schedule a public hearing to adopt the groundwater management plan pursuant to Water Code Section 10750 *et.seq*. for the purposes of hearing protests and adopting the plan and establishing a groundwater management program, at 8:30 A.M. on February 22, 2005; and

WHEREAS, the Agency has documented suggested changes to the groundwater management plan, based on comments received on the public review draft, under Water Code Section 10750 *et seq*.; and

WHEREAS, the Agency has not received a majority written protest against the plan under Water Code section 10753.6.

Section 2. The Agency hereby adopts the Yuba County Water Agency Groundwater Management Plan under Water Code Section 10750 et seq. (AB 3030, Stats 1992) in the form as presented at this Board meeting.

Section 3. This ordinance shall take effect 30 days after its final passage.

Section 4. Within 15 days from the date of passage of this ordinance, the Agency Secretary shall (a) publish it at least once in a newspaper of general circulation published and circulated in the Agency, and (b) submit a copy of the plan in electronic format to the State Department of Water Resources.

The foregoing ordinance was introduced by the Board of Directors at its meeting on February 22, 2005, and duly passed and adopted by the Board of Directors of the Agency at its meeting on March 1, 2005 by the following roll call vote:

AYES: BELZA, CARPENTER, GRIEGO, NICOLETTI, SCHRADER, STOCKER

NOES: NONE

ABSENT: LOGUE

NOT VOTING: NONE

Don Schrader, Chairman, Board of Directors

ATTEST:

JEANENE UPTON
ASSISTANT SECRETARY

Jeanene Upton/MGT

CERTIFICATION

I hereby certify that I am the duly appointed Assistant Secretary of the Yuba County Water Agency and that the foregoing is the true and correct Agency Ordinance No. 9, which was duly introduced, regularly adopted and published pursuant to law.

By: _____
Assistant Secretary

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ABBREVIATIONS AND ACRONYMS

AB	Assembly Bill
AF	Acre-feet
AF/year	Acre-feet per year
Beale AFB	Beale Air Force Base
BMO	Basin Management Objective
BVID	Browns Valley Irrigation District
BWD	Brophy Water District
Cal Water	California Water Service
CALFED	CALFED Bay-Delta Program
CAS	California Aquifer Susceptibility
CID	Cordua Irrigation District
W.S.A	Water Service Area
cfs	Cubic feet per second
COC	Contaminants of concern
RWQCB	Regional Water Quality Control Board
CWC	California Water Code
CWD	Carmichael Water District
Camp Far West I.D.	Camp Far West Irrigation District
DCA	1,2-dichloroethane
DCE	cis-1,2-dichloroethene
Delta	Sacramento/San Joaquin River Delta
DHS	California Department of Health Services
DMS	Data Management System
Dry Creek M.W.C.	Dry Creek Mutual Water Company
DWR	California Department of Water Resources
DWSAP Program	Drinking Water Source Assessment and Protection Program
EWA	Environmental Water Account
GMP	Groundwater Management Plan
gpm	Gallons per minute
Hallwood I.C.	Hallwood Irrigation Company
InSAR	Interferometric Synthetic Aperture Radar
Linda County W.D.	Linda County Water District
LUST	Leaking Underground Storage Tank
M&I	Municipal and industrial
McClellan AFB	McClellan Air Force Base
MCL	Maximum Contaminant Level

MWH	Montgomery Watson Harza
μg/L	micrograms per liter
μmhos/cm	micromhos per centimeter
mg/L	Millgrams per liter
mgd	Million gallons per day
msl	Mean sea level
NAWQA	National Water Quality Assessment
NGS	National Geodetic Survey
OPUD	Olivehurst Public Utility District
PBE	Physical Barrier Effectiveness
PCAs	Potential Contaminating Activities
PCE	Tetrachloroethene
PL	Public Law
Plumas M.W.C.	Plumas Mutual Water Company
POU	Place of Use
Rameriz W.D.	Rameriz Water District
Reclamation	U.S. Bureau of Reclamation
RD 10	Reclamation District No. 10
RD 784	Reclamation District No. 10
SMWA	Sacramento Metropolitan Water Authority
SOP	Standard Operating Procedure
South Yuba W.D.	South Yuba Water District
SWRCB	State Water Resources Control Board
TCE	Trichloroethene
TDS	Total dissolved solids
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WWD	Wheatland Water District
YCWA	Yuba County Water Agency

1.0 INTRODUCTION

The Yuba County Water Agency (YCWA) is an independent, stand-alone government organization created in 1959 by the Yuba County Water Agency Act, hereafter referred to as the Act (see **Appendix A** for the complete Act). The YCWA was created to develop and promote the beneficial use and regulation of the water resources of Yuba County (See **Figure 1** for the location of the Yuba County and the YCWA boundary). Two sections of the Act are of particular importance to the implementation of groundwater management in Yuba County (County). The first section relates to water supply:

§84-4. AVAILABILITY OF WATER SUPPLY; NECESSARY ACTS

> *Sec. 4. The agency shall have the power as limited in this act to do any and every lawful act necessary in order that sufficient water may be available for any present or future beneficial use or uses of the lands or inhabitants within the agency, including, but not limited to irrigation, domestic, fire protection, municipal, commercial, industrial, recreational, and all other beneficial uses and purposes. (Stats.1959, c. 788, p. 2783, § 4.)*

The second section relates to the storage of water:

> ***§84-4.3 Storage of water; conservation and reclamation; actions involving use of waters or water rights***
>
> *Sec. 4.3. The agency shall have the power to store water in surface or underground reservoirs within or outside the agency for the common benefit of the agency; to conserve and reclaim water for present and future use within the agency; to appropriate and acquire water and water rights, and to import water into the agency and to conserve and utilize, within or outside the agency, water for any purpose useful to the agency; …(Stats.1959, c. 788, p. 2783, § 4.3)*

The YCWA has a long history of actively managing the County's water resources for beneficial use in cooperation with its member units; stakeholders; and local, state, and federal agencies[1]. An example is the YCWA's contribution to reversing a potentially serious overdraft situation that existed in the south Yuba basin (See **Figure 1** for the basin location). Between 1948 and 1981, groundwater elevations in the south Yuba basin had declined an estimated 130 feet[2]. In 1984 the YCWA began delivering surface water, from its new Bullards Bar Reservoir to this basin which offset the use of groundwater extraction, resulting in increasing groundwater elevations to near historical levels.

[1] As defined in the Act, Member Units refer to any district, which enters into a contract with the YCWA for the delivery of water or repayment of infrastructure to deliver water. Currently, there are eight districts that are Member Units. They are: Browns Valley Irrigation District, Brophy Water District, Cordua Irrigation District, Dry Creek Mutual Water Company, Hallwood Irrigation Company, Rameriz Water District, South Yuba Water District and Wheatland Water District.

[2] Based on the hydrograph for state well ID: 14N05E06B01M, located within Brophy Water District.

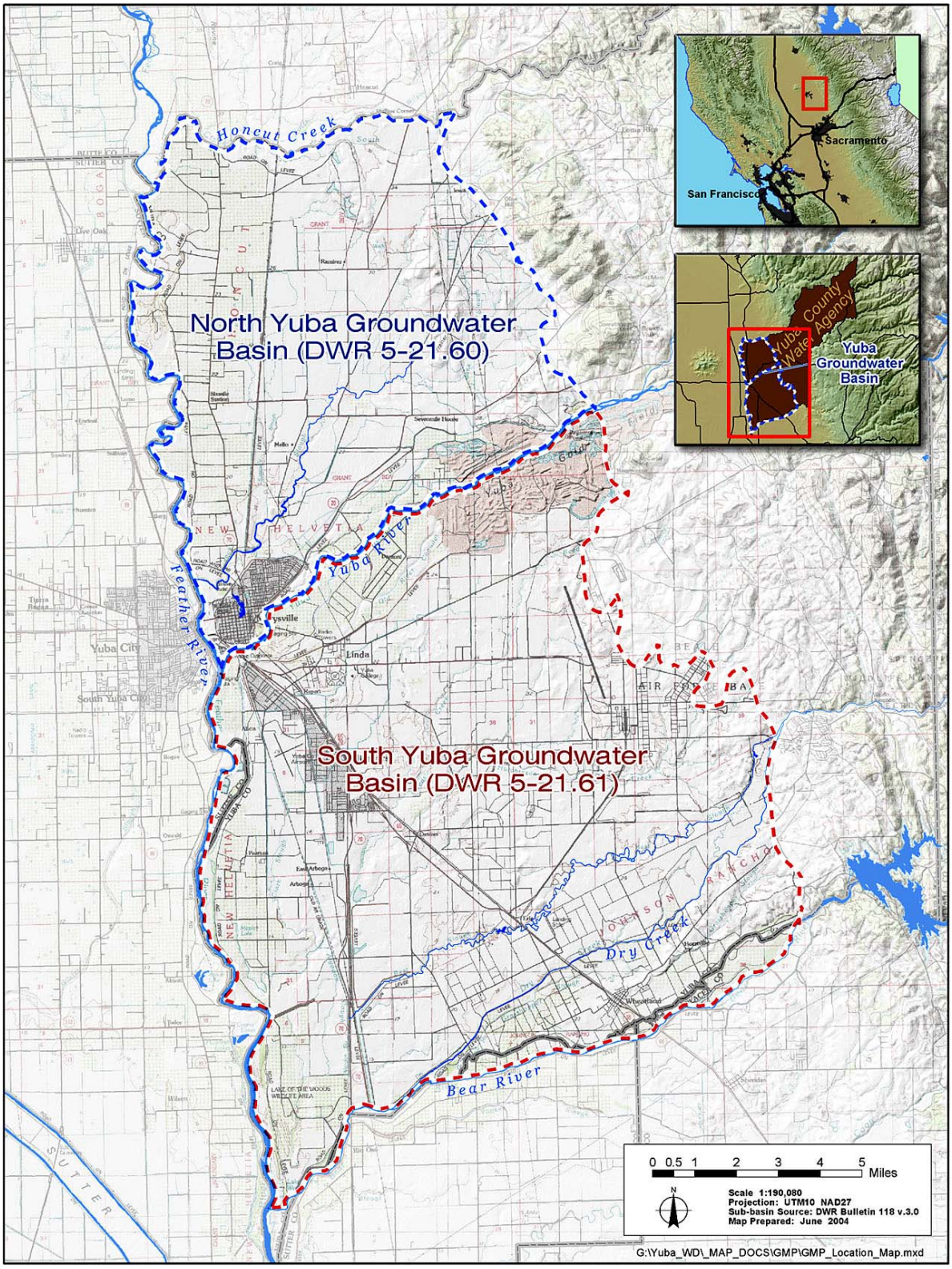

Figure 1. Location of Yuba County, Yuba County Water Agency and the Yuba Groundwater Basin

Such active surface water and groundwater conjunctive management is at the core of the YCWA's commitment to resource management. A commitment that has led to the following activities:

- Monitoring of North and South Yuba groundwater basin levels in cooperation with the Department of Water Resources (DWR).
- Measurement of water quality.
- Conducting groundwater studies.
- Exercise of this resource for the benefit of the County and State.

In recognition of the importance of groundwater management the YCWA has undertaken efforts to formalize its historical groundwater management program by developing a Groundwater Management Plan (GMP) consistent with the provisions of California Water Code (CWC) § 10750 *et seq*. The area covered by this GMP is shown in **Figure 1**.

1.1 Other Activities Affecting Resource Management

Over the past several decades, the YCWA has met water resource management challenges brought on by:

- Floods of 1955, 1986, and 1997.
- Droughts of 1976, 1977 and 1987 through 1992.
- The Bay-Delta Accord of 1994 (and State Water Resources Control Board (SWRCB) Decision 1641) and the subsequent Sacramento Valley Water Management Program Short-Term Agreement of 2001 (Phase 8).
- The 1999 listing of steelhead and spring run chinook salmon under protection of the Endangered Species Act.
- The SWRCB hearing and Decision 1644 regarding minimum in-stream flows in the Lower Yuba River.
- Yuba County's participation in meeting increasing statewide water demands through the YCWA's transfer program.

The YCWA and its member units have invested substantial time and resources in planning efforts to address many of the aforementioned items. Some of these activities, listed above, are discussed in more detail below.

1.1.1 Sacramento Valley Water Management Program Short-Term Agreement (Phase 8)

The Sacramento Valley Water Management Program (SVWMP) is an integrated effort by the Sacramento Valley water users to provide water as a mechanism to avoid a SWRCB hearing to determine which water users would be responsible to meet water quality standards set forth by the 1994 Bay-Delta Accord.[3] Rather than face a hearing, the Sacramento Valley Water Management Agreement (Agreement) establishes a framework to meet supply, water quality, and environmental needs in the Sacramento Valley. The YCWA is a signatory to the Agreement and is thereby committed to providing water for Bay-Delta quality needs while it continues to manage the resource for local supply reliability and beneficial use within the County.

[3] For a list of the signatories of the SVWMA see *The Sacramento Valley Water Management Agreement*, September 2001.

1.1.2 State Water Resources Control Board RD1644

In 1988, a complaint was filed with the SWRCB against the YCWA by a coalition of fisheries groups. The coalition's main contention was that the instream flow requirements did not provide an adequate level of protection for fishery resource in the lower Yuba River. On March 1, 2001 the SWRCB issued Decision 1644 and on July 16, 2003 the SWRCB issued Revised Decision 1644 (RD 1644)[4]. RD 1644 curtails the ability of the YCWA to provide a reliable surface water supply for local needs and eliminates the YCWA's ability to transfer water to fund County flood protection, water supply efforts and fund other YCWA needs. Since the original complaint was filed, several hearings and lawsuits have ensued. Currently, the YCWA is pursuing litigation as well as participating with the DFG and other parties in an ongoing settlement process.

1.1.3 Yuba County Water Agency Transfer Program

In addition to supplying water to its local member units, the YCWA has transferred water to other parts of the State when there was both a need for additional supply in other areas and when available water from the Yuba River was greater than the local need. As detailed in **Table 1**, the YCWA has significant experience in water transfers, both surface water and groundwater substitution transfers.

These transfers were often developed through cooperation between the YCWA's and its member units in the form of groundwater substitution transfers. In the case of a groundwater substitution transfer the YCWA participates in close monitoring of the groundwater basin.

The historical success of the YCWA's transfer program; the requisite monitoring program; and the cooperation with member units, local stakeholders and local, state and federal agencies exemplify the YCWA's commitment to resource management and form the foundation for the GMP.

1.2 Purpose of the Yuba County Groundwater Management Plan

The purpose of the YCWA's GMP is to build on and formalize the historically successful management of the County's groundwater resource and develop a framework for implementation of future activities.

1.3 Authority to Prepare and Implement a Groundwater Management Plan

The authority to manage the County's groundwater resource is provided through the Act and Water Code Division 6, part 2.75 (§ 10750 et seq.). The YCWA prepared this GMP consistent with the provisions of CWC § 10750 *et seq.* as amended January 1, 2003.

The state groundwater management law (Water Code Division 6, part 2.75, commencing with section 10750) prohibits the Agency from managing groundwater within the service area of another local water district, public utility or mutual water company, without the agreement of that other entity. (Section 10750.9(b).) This plan and the Agency's implementation of the plan shall comply with these and other applicable limitations of state law.

[4] A copy of RD 1644 is available from the State Water Resources Control board web site; http://www.waterrights.ca.gov/hearings/decisions/RevisedWRD1644.pdf

State law encourages local water agencies to coordinate on groundwater management plans. (See Water Code §§ 10755.2-10755.4.) The draft plan should indicate whether or not any of the local districts has adopted its own groundwater management plan. If one or more local districts have adopted a plan, then the Agency plan should address coordination among the plans and involved districts. Both South Yuba Water District and Cordua Irrigation District have adopted GMPs.

TABLE 1.
Recent YCWA Water Transfers

Year	Transferred to	Amount (acre-feet)		
		Surface Water	Groundwater Substitution	Total
1987	Department of Water Resources	83,100	0	83,100
1988	Department of Water Resources	135,000	0	135,000
1989	Department of Water Resources for DFG	200,000	0	200,000
1989	East Bay Municipal Utility District*	60,000	0	60,000
1989	City of Napa	7,000	0	7,000
1990	Department of Water Resources	109,000	0	109,000
1990	City of Napa	6,700	0	6,700
1990	Tudor/Feather	2,951	0	2,951
1991	State Water Bank	99,200	84,840	184,040
1991	State water Bank for DFG	28,000	0	28,000
1991	City of Napa	7,500	0	7,500
1992	State Water Bank	30,000	0	30,000
1994	Department of Water Resources	0	26,033	26,033
1997	Bureau of Reclamation (refuge water)	20,000	0	20,000
1997	Sacramento Area Flood Control Agency	48,857	0	48,857
2001	Environmental Water Account/ Department of Water Resources	102,119	61,140	163,259
2002	Environmental Water Account/ Department of Water Resources	101,792	55,258	157,050
2002	Contra Costa Water District	5,000	0	5,000
2003	Environmental Water Account/ Department of Water Resources	65,000	0	65,000
2003	Contra Costa Water District	5,000	0	5,000

Source: Yuba County Water Agency

*East Bay Municipal Utility District did not take delivery of the water.

1.4 Groundwater Management Plan Components

The YCWA's GMP includes the following required and recommended components:

CWC § 10750 *et seq.* (seven mandatory components). Recent amendments to the CWC § 10750 *et seq.* require GMPs to include several components to be eligible for the award of funds administered by DWR for the construction of groundwater projects or groundwater quality projects[5].

DWR Bulletin 118 (2003) components (seven recommended components).

CWC § 10750 *et seq.* (12 voluntary components). CWC § 10750 *et seq.* includes 12 specific technical issues that could be addressed in GMPs to manage the basin optimally and protect against adverse conditions.

Table 2 lists the section(s) in which each component is addressed.

[5] These amendments to the CWC were included in Senate Bill 1938, effective January 1, 2003.

TABLE 2.
Location of Yuba County Water Agency's GMP Components

Description	Section(s)
A. CWC § 10750 *et seq.*, Mandatory Components	
1. Documentation of public involvement statement.	3.4.1, 3.4.2
2. Basin Management Objectives (BMOs).	3.2
3. Monitoring and management of groundwater elevations, groundwater quality, inelastic land surface subsidence, and changes in surface water flows and quality that directly affect groundwater levels or quality or are caused by pumping.	3.5
4. Plan to involve other agencies located within groundwater basin.	3.4.2
5. Adoption of monitoring protocols by basin stakeholders.	3.5
6. Map of groundwater basin showing area of agency subject to GMP, other local agency boundaries, and groundwater basin boundary as defined in DWR Bulletin 118.	Figure 2
7. For agencies not overlying groundwater basins, prepare GMP using appropriate geologic and hydrogeologic principles.	N/A
B. DWR's Suggested Components	
1. Manage with guidance of advisory committee.	3.4.2
2. Describe area to be managed under GMP.	2.1 – 2.3
3. Create link between BMOs and goals and actions of GMP.	3.5
4. Describe GMP monitoring program.	3.5
5. Describe integrated water management planning efforts.	3.7
6. Report on implementation of GMP.	4.1
7. Evaluate GMP periodically.	4.2
C. CWC § 10750 *et seq.*, Voluntary Components	
1. Control of saline water intrusion.	3.6.7
2. Identification and management of wellhead protection areas and recharge areas.	3.6.4
3. Regulation of the migration of contaminated groundwater.	3.6.5
4. Administration of well abandonment and well destruction program.	3.6.2
5. Mitigation of conditions of overdraft.	3.5.1
6. Replenishment of groundwater extracted by water producers.	3.7
7. Monitoring of groundwater levels and storage.	3.5.1
8. Facilitating conjunctive use operations.	3.7
9. Identification of well construction policies.	3.6.3
10. Construction and operation by local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.	NA
11. Development of relationships with state and federal regulatory agencies.	3.4.3
12. Review of land use plans and coordination with land use planning agencies to assess activities that create reasonable risk of groundwater contamination.	3.6.4

2.0 YUBA COUNTY WATER RESOURCES

Within the County boundary water purveyors currently utilize both surface water and groundwater to meet demand. The YCWA, by its Act, wholesales water to entities authorized to purvey water. The YCWA has water service agreements to deliver surface water to its member units and several former river diverters. The member units are: Browns Valley Irrigation District, Brophy Water District, Cordua Water District, Dry Creek Mutual Water Company, Hallwood Irrigation District, Rameriz Water District, South Yuba Water District and Wheatland Water District. In addition to the surface water delivered by the YCWA the member units have existing capacity to pump groundwater to meet part of their demand.

The five municipal purveyors located in the County groundwater basin rely exclusively on groundwater to meet their needs. The municipal purveyors are California Water Service, Linda County Water District, the City of Wheatland, Olivehurst Public Utility District (OPUD)[6], and Beale Air Force Base (Beale AFB). Other water purveyors in the County use a combination of groundwater and surface water supplies to meet demand. Locations of all water purveyors within the County boundaries are shown in **Figure 2**. The groundwater and surface water supplies available to the County are summarized below.

2.1 Groundwater Supplies

This section provides a regional description of the geologic and hydrogeologic conditions of the underlying groundwater basin. The area of the groundwater aquifer, as defined by DWR Bulletin 118 (2003), is shown on **Figure 1**.

The groundwater aquifer underlying Yuba County is divided by the Yuba River creating the two subbasins -- Yuba North and Yuba South. DWR defines the subbasins as follows:

- *North Yuba subbasin* (groundwater basin number 5-21.60) is bounded on the north by Honcut Creek, the Feather River on the west, on the south by the Yuba River and on the east by the Sierra Nevada.
- *South Yuba subbasin* (groundwater basin number 5-21.61) is bounded on the north by the Yuba River, the Feather River on the west, on the south by the Bear River and on the east by the Sierra Nevada.

These two subbasins are considered subbasins to the larger Sacramento Valley groundwater basin, and are hydraulically isolated from the rest of the Sacramento basin by the surface streams that surround it. The Yuba County groundwater subbasins encompass an area of approximately 270 square miles.

The combined volume of water stored in the North and South Yuba subbasins is estimated at 1.7 million acre-feet. The potential usable portion of this volume has been estimated at more than 340,000 acre-feet (Bookman-Edmonston Engineering, Inc.). The estimated usable portion of the groundwater basin is not a definitive amount as this quantity is restricted by extraction capacity,

[6] The OPUD is currently scheduled to provide water to the Plumas Lake Specific Plan Area. At which time the area will be annexed into OPUD's Service Area. The Specific Plan Area is shown on **Figure 2** as the cross-hatched area just south of the current OPUD boundary.

the potential for impacts, both to the environment and to other basin groundwater users and the need to maintain groundwater quality.

Information provided herein has been excerpted from the extensive investigation and report titled *Groundwater Resources and Management in Yuba County* (Bookman-Edmonston 1992) and other studies conducted over the past decade. Although the North Yuba subbasin and the South Yuba subbasin are hydraulically isolated from each other the underlying geology of the two subbasins is similar. Therefore, the following description of the geologic setting discusses the two subbasins as if they are one.

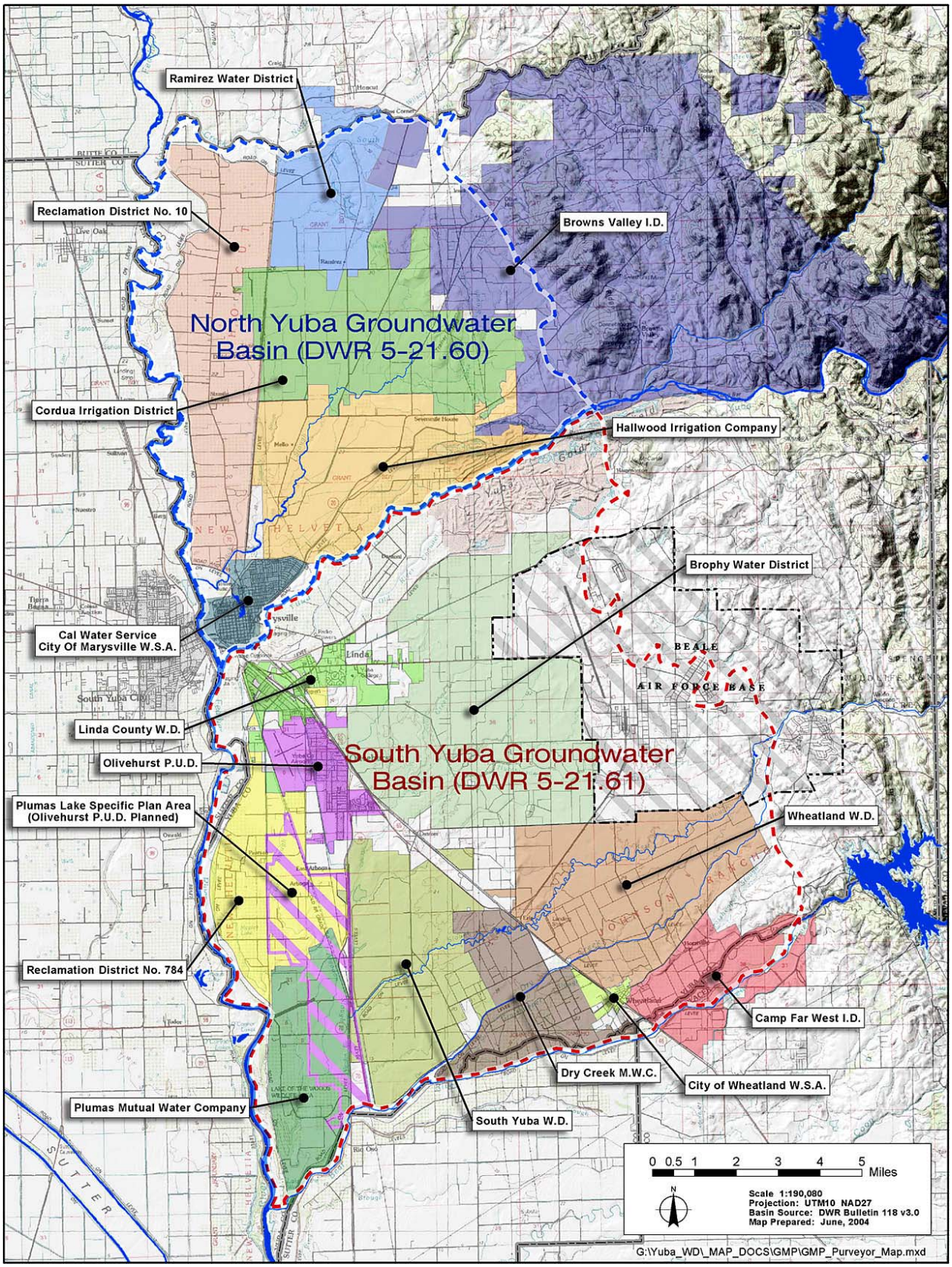

Figure 2. Location of Water Purveyors within Yuba County

2.1.1 Overview of the Hydrogeologic Setting

2.1.1.1 Geologic Setting

The subbasin area is bounded on the east by the impermeable rocks of the Sierra Nevada. These same rocks and younger consolidated rocks extend beneath the subbasin at a gradually increasing depth toward the Feather River and beyond to the trough of the Sacramento Valley. Fresh groundwater is stored in this wedge-shaped body of alluvial material to depths of 1,000 feet. Beneath these alluvial deposits are consolidated rocks, which may contain saline water and are effectively, non-water-bearing.

2.1.1.2 Physical Structure of Freshwater-Bearing Formation

The freshwater-bearing formation structure is thickest along the Feather River and thinnest along the Sierra Nevada boundary. The thickness varies from 1,000 feet in the southwest corner near the Bear River to less than 300 feet at the base of the Sierra foothills. All of the stratified alluvial deposits slope gently to the west. No faults or folding of strata are known to occur within the freshwater-bearing area.

2.1.1.3 Description of Geologic Formations

All alluvial deposits and adjacent nonwater-bearing rocks are subdivided into geologic units called formations, which are described below in sequence of age from oldest to youngest. They range in age from the very old Paleozoic Sierran bedrock to the overlying alluvial materials that are still being deposited. Between these are the nonwater-bearing Eocene and Cretaceous Age rocks and the two principal water-bearing formations, the Laguna Formation and the Older Alluvium Formation, that together comprise over 95 percent of the subbasin water storage volume. The remaining volume includes the superficial stream channel and floodplain deposits. The geologic formations described below are summarized and shown in **Figure 3**.

2.1.1.3.1 Sierra Nevada Bedrock Formation

The Sierra Nevada Bedrock Formation does not store or yield significant amounts of groundwater. Shallow domestic wells can obtain small quantities of water from the weathered zone in these rocks, but the supply is not usually dependable. These rocks form the eastern boundary of the Yuba County groundwater subbasin and extend beneath the subbasin and Sacramento Valley to a considerable depth. At the west end of the dredger tailings, these rocks were found at a depth of 1,222 feet. Along the eastern boundary, north of the Yuba River, they occur within the subbasin as “islands” of bedrock surrounded by alluvial materials. These rocks are found beneath dredger tailings at a shallow depth upstream from Daguerre Point Dam.

Volcanic rocks are included with the Sierran bedrock formations within the property of Beale AFB. They may be an important source of groundwater, but very little is known about their occurrence.

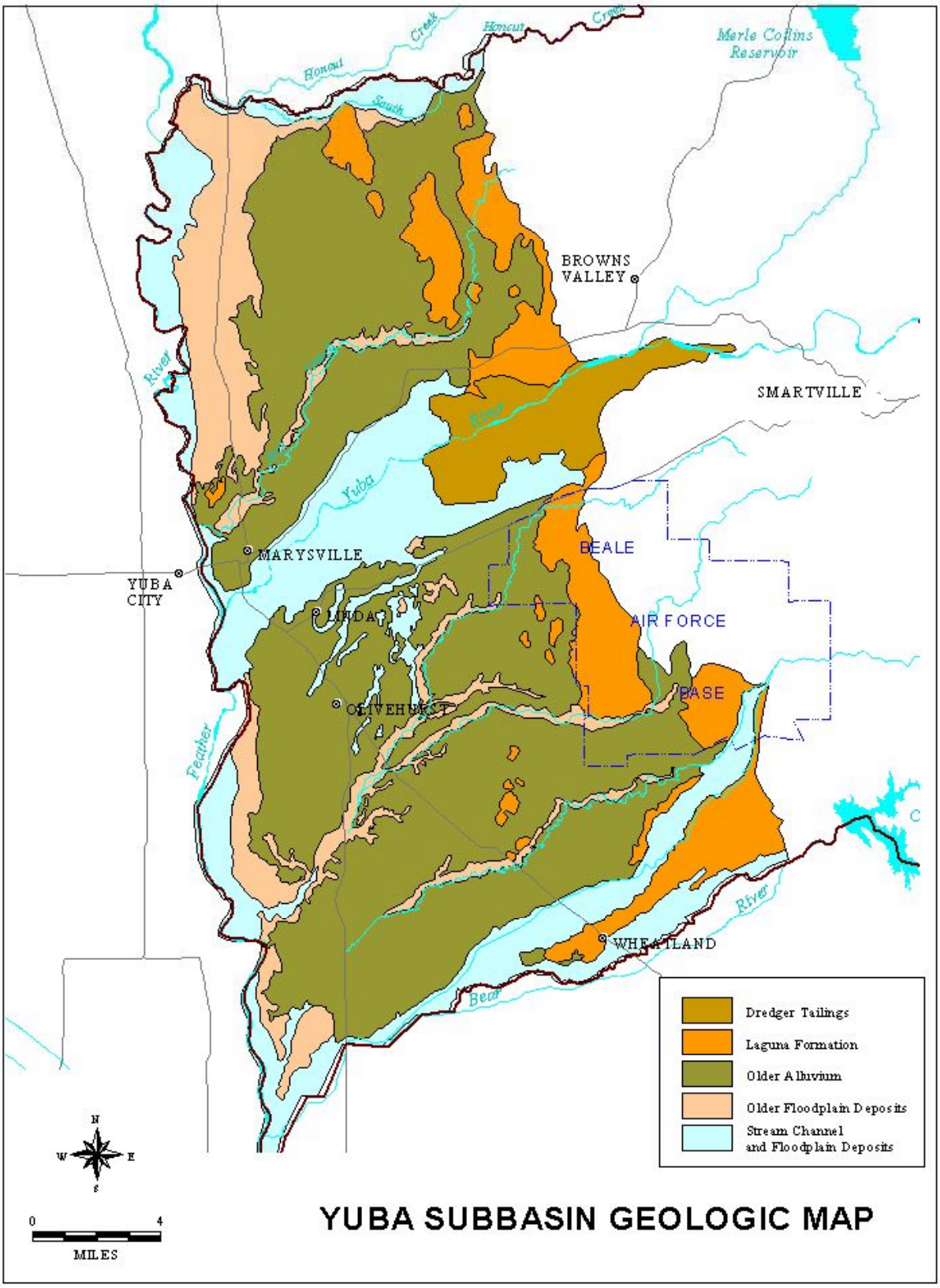

Figure 3. Geologic Map

2.1.1.3.2 Cretaceous Age Formations

Rocks from Cretaceous Age formations are common to the entire Sacramento Valley and occur at a depth of about 600 feet in the Goldfields area, although they are typically found at much greater depth. Marine in origin, they originally contained saline water; however, it is believed that through most of the subbasin, the salt water in these formations has been mostly flushed out toward the valley trough.

2.1.1.3.3 Eocene Age Formations

Underlying nearly all the Yuba County groundwater basin and overlying Cretaceous Age formations are rocks of Eocene Age. These rocks are probably nonmarine in origin. Although well drillers have given the Eocene rock various names depending upon their location in the valley, the Ione Formation is considered the most commonly occurring formation name. Typically clay, samples of this formation have been found at depths of 255 to 483 feet in the easterly thinner area of the groundwater subbasin.

2.1.1.3.4 Laguna Formation

The Laguna Formation is the thickest and most extensive water-bearing unit in the Sacramento Valley groundwater basin. The formation is exposed intermittently along the east side of the valley from Oroville south to Stockton. In Yuba County, the Laguna Formation is well exposed all along the foothills adjacent to the eastern boundary of the groundwater basin. It is also exposed in isolated hills between Beale Air Force Base and Wheatland, where the thin surrounding younger sediments allow the Laguna Formation to be exposed in “windows.” Farther west, the formation is only found in deep wells.

The overall composition of the formation is silts to sandy silts with abundant clay. Gravel or sand deposits are uncommon in surface exposures. In the subsurface, well logs indicate that the formation is predominantly blue clay. Sand and gravel layers are thin and discontinuous and are commonly cemented. Although the amount of coarse-grained material appears to decrease toward the north and south away from the Yuba River vicinity, considerable coarse materials occur in the Yuba River vicinity between depths of 150 to 600 feet.

The overall low permeability of the Laguna Formation provides low well yields in comparison to the overlying younger deposits. In addition to the formation’s fine-grained character, permeability is also reduced because much of the thin sand and gravelly zones are cemented.

The Laguna Formation varies in thickness from 400 feet toward the center of the Yuba County groundwater subbasin to 1,000 feet in the southwestern portion of the basin.

2.1.1.3.5 Older Alluvium Formation

The Older Alluvium is the predominant surficial geologic formation. It extends from Dry Creek north to Honcut Creek, interrupted only by the wide floodplain of the Yuba River. On the west, it is bounded by the Older Floodplain Deposit Formation and on the east by the Laguna Formation.

This formation was created by alluvial materials laid down into alluvial fans by streams flowing from the Sierra Nevada. The alluvial materials were created through erosion of the Sierra

Mountains by streams. When compared to the Laguna Formation, this formation has a greater proportion of sands and gravels.

The Older Alluvium Formation is comprised of loosely compacted silt, sand, and gravel with some clay. The deposits occur in lenticular beds and are more stratified than the Laguna Formation. Gravel deposits are more concentrated in the upper 150 feet of the formation. The amount of gravel and the thickness of the layer decrease in a westward downstream direction as the distance from the Yuba River increases.

The thickness of the formation varies widely. It is difficult to distinguish the contact of this formation with the Laguna Formation. Based on the concentration of gravel and sand deposits, it appears that the formation is about 150 feet thick in the Yuba River vicinity and thins to less than 100 feet to the south.

Wells drilled into this formation may yield up to 2,000 gpm. In water-bearing character, the Older Alluvium Formation is moderately permeable throughout, except at its surface, where hardpan and claypan soils have developed. Hardpan soils, a characteristic of the formation, provide an impediment to the infiltration of precipitation and unconsumed applied water. Nearly all domestic wells and shallow irrigation wells in the Yuba County groundwater subbasin have been drilled and completed in this formation because the gravels found in this formation usually provide adequate yields. Several wells with depths of less than 150 feet are known to yield 1,000 to 1,200 gpm. Higher-yielding wells in these areas are usually much deeper and obtain their additional yield from the underlying Laguna Formation.

2.1.1.3.6 Older Floodplain Deposit Formation

Bordering the Feather River adjacent to more recent alluvium is a 1- to 2-mile-wide bank of gravelly sand, silt, and clay deposited during flooding events. These deposits predate the younger stream and overbank deposits of the Feather River and overlie the Older Alluvium Formation on the east. Well logs show 5 to 15 feet of “topsoil” often overlying hardpan that is probably the buried surface of the Older Alluvium Formation. The formation is too thin to store appreciable amounts of groundwater and has no value as a source of extractions. Its moderate permeability, however, provides for the infiltration of precipitation and return of unconsumed irrigation water to the water table unless they are prevented by buried hardpan soils.

2.1.1.3.7 Stream Channel and Floodplain Deposit Formation

The alluvial materials in the Stream Channel and Floodplain Deposit Formation are of recent age and are made up of coarse sand and gravels along the present stream channels of Honcut Creek and the Yuba, Bear, and Feather Rivers. They also occur as abandoned overflow channels two to five miles south of the Yuba River. The greatest volume of coarse gravel occurs along the Yuba River in a band up to three and one-half miles in width. Huge quantities of rounded, very coarse, boulder- and cobble-sized gravel were laid down in the upper reach of the Yuba River after it flowed out of its canyon in the Sierras. Farther downstream in the agricultural areas, thick deposits of highly permeable sands and gravels provide large quantities of water to wells. These deposits are up to 110 feet thick. All of the stream channels and floodplain deposits along the Yuba River act as a large water intake area for recharge of the subbasin.

2.1.1.3.8 Dredger Tailings

In the upper reach of the Yuba River, extending from the Sierras for 15 miles downstream, are large piles of very coarse gravels and cobbles that have been extensively dredged for gold. The thickness of the dredged gravels in the eastern area above Daguerre Point Dam is 60 to 80 feet. West and southwest of Hammonton, for a distance of one or two miles, the dredger tailings are 100 to 125 feet thick. In this central area of tailings, the gravels are underlain by white sands and clays, as revealed by mineral exploration bore holes. Here the underlying fine-grained sedimentary materials are probably part of the Laguna Formation.

2.1.2 Groundwater Occurrence and Development

Groundwater occurs generally under water table or unconfined conditions throughout most of the groundwater subbasin. Well drillers generally report no changes in water levels during the drilling in many wells, both moderately deep and shallow, indicating a lack of confinement. In some areas, the water levels in cable-tool-drilled holes are reported to rise after water was first encountered. This condition is more common in the deeper wells, particularly in the Laguna Formation, where groundwater is considered to be confined by overlying clay layers. Confinement probably occurs mostly at depths in excess of 300 to 400 feet.

2.1.3 Well Yields

Well yields and water level drawdowns are known through the testing of industrial, irrigation, and community supply wells soon after they were drilled by either well drillers or pump installers. These yields may be recorded along with the well logs on the “Well Drillers Report” filed with the DWR. Ninety-two driller reports filed with the DWR and reviewed for the report Groundwater Resources and Management in Yuba County (Bookman-Edmonston 1992) have production data. The average well yield per township area (36 square miles) range from 1,000 to 2,300 gpm and the average specific capacity can range from 16 to 74 gallons per minute per foot. The specific capacity of a well is the well yield (the flow from the well in gpm that the well produces) divided by the drawdown in feet, measured as the distance from the water surface in the well from static to the pumping condition. The specific capacity is a relative measure of the rate at which a well produces water for each foot of drawdown.

The area of highest well yields is in the Stream Channel and Floodplain Deposit Formation of the Yuba River. Wells with depths of 200 to 400 feet can yield 2,000 to 4,000 gpm, with most of the yield derived from the upper 100 feet or more of sand and gravel. The area with the lowest yield can found on the Beale Air Force Base property. Wells near the property range in depth from 264 to 354 feet and supply an average of 1,000 gpm per well.

Irrigation wells commonly produce between 1,000 to 2,000 gpm and range in depth from a few hundred feet to 700 feet. Typically, the well yield is primarily derived from the Older Alluvium Formation because the underlying Laguna Formation is much less permeable.

2.1.4 Groundwater Storage

Specific yield[7] can be used to estimate the amount of groundwater storage. Average specific yield amounts by depth zone were taken from the studies by the U.S. Geological Survey that were presented in Bulletin No. 6 of the SWRCB. Estimates of storage capacity for equivalent depth zones are presented separately in **Table 3** for the North Yuba and South Yuba subbasins. These storage capacity estimates were computed directly from the area of each subarea, average specific yield in each depth zone, and the thickness of each depth zone.

TABLE 3.
Estimated Storage Capacities and Specific Yields

	Depth Zones (feet)			
	20 to 50	**50 to 100**	**100 to 200**	**20 to 200**
North Yuba subbasin				
Specific Yield (percent)	8.9	8.3	5.5	6.9
Storage Capacity (acre-feet)	130,000	210,000	280,000	620,000
South Yuba subbasin				
Specific Yield (percent)	8.0	7.4	6.2	6.8
Storage Capacity (acre-feet)	210,000	330,000	550,000	1,090,000
Total Storage by Depth Zone (acre-feet)	340,000	540,000	830,000	1,710,000

For the North Yuba the groundwater storage capacity estimated to a depth of 200 feet is 620,000 acre-feet. Storage capacity in the South Yuba subbasin is estimated to be 1,090,000 acre-feet. The total storage capacity in the study area was estimated as 1,710,000 acre-feet. This amount represents the entire quantity of ground water contained to a depth of 200 feet. As can be seen from **Table 3**, the portion of the subbasin between 20 and 50 feet in depth provides storage of about 340,000 acre-feet. For the range between 50 and 100 foot, the storage amount is about 540,000 acre-feet. A portion of this storage is currently exercised for local groundwater use and some portion is vacant. Caution should be taken when using these numbers because they do not represent the operational characteristics such as recharge rate, recharge origin, and pumping issues that significantly reduce the usable amount of groundwater. However, they do indicate that a significant body of water is available from which to draw under various management scenarios.

2.1.5 Groundwater Storage Conditions

The North Yuba subbasin and the South Yuba subbasin, provide 40 percent and 60 percent, respectively, of the total groundwater storage capacity of the Yuba groundwater aquifer. Historically, irrigation demands in the North Yuba subbasin area have been sufficiently supplied

[7] Specific yield is the amount of water available for extraction from water storage in the ground. This available amount of water is the total amount of water in storage that will drain under the influence of gravity.
source: Heath, Ralph C., 1993. "Basic Ground-Water Hydrology," USGS Water-Supply Paper 2220. p.8.

with diversions from the Yuba River. Conversely, in the South Yuba subbasin, surface water supplies were limited until the Yuba South Canal was developed in 1983.

Figure 4 shows the historical groundwater surface elevations in both Subbasins. Historically, agricultural and urban water uses in the South Yuba subbasin area relied heavily on groundwater supplies, resulting in a large pumping depression across the entire subbasin and especially near the Wheatland area. Since the construction of the Yuba South Canal, and delivery of surface water by the YCWA to the member districts of Brophy Water District, South Yuba Water District, and, more recently, Dry Creek Mutual Water Company, groundwater storage has recovered to the extent that current groundwater storage in the South Yuba subbasin area probably exceeds that of 1960 and is near the levels of the pre-development era. The exception to this is in the area of Wheatland Water District, which is currently still utilizing groundwater for irrigation. In Wheatland, a depression still exists.

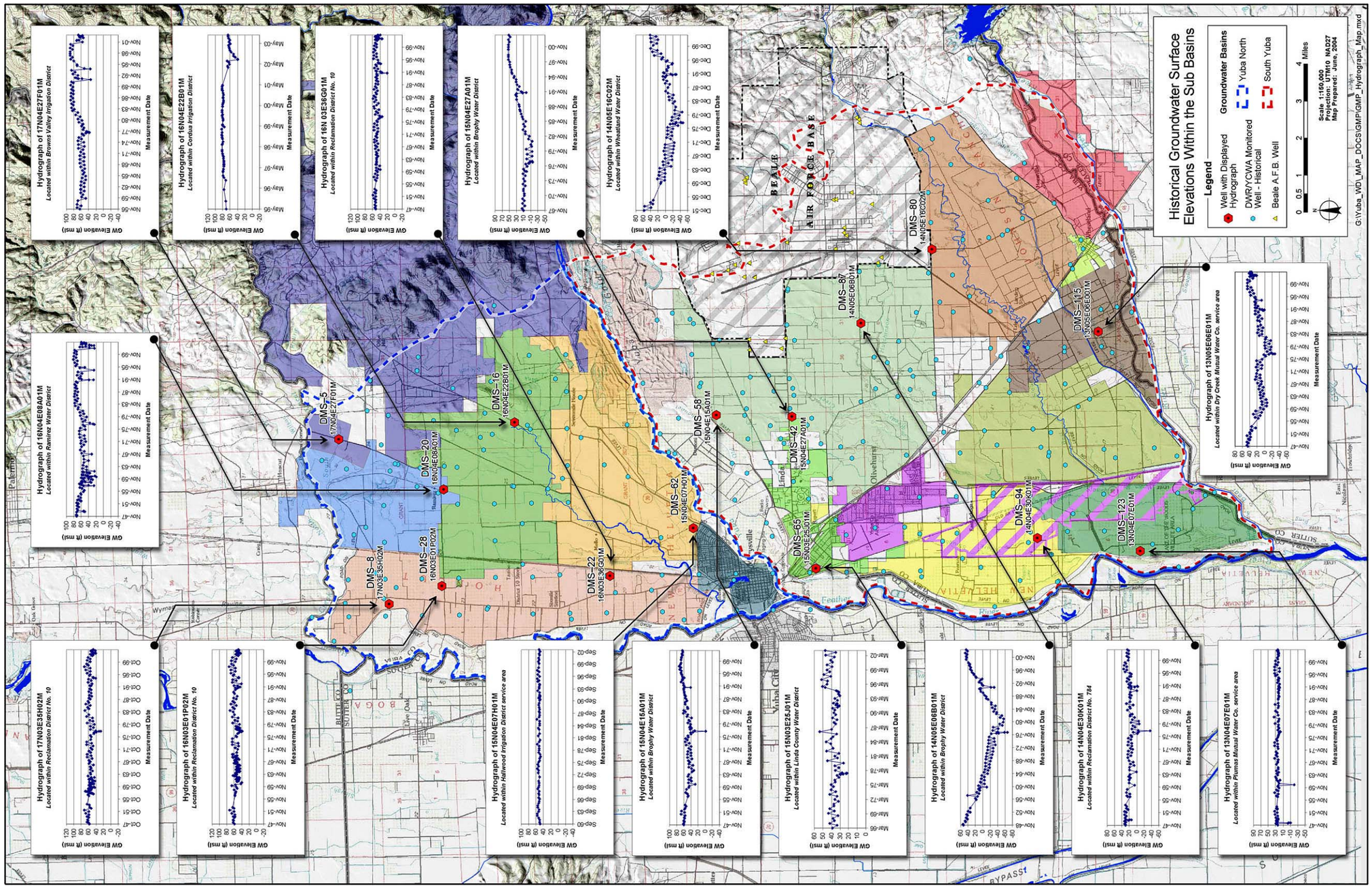

Figure 4. Historical Groundwater Surface Elevations within Subbasins

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The recovery of the South Yuba subbasin is clear to see by examining the hydrographs in **Figure 4**. The replenishment of the groundwater basin is a direct result of the Yuba River Development Project, water supply operations of the YCWA, and the facilities installed by the member units and the YCWA.

Figure 5 shows that the estimated increases in the annual groundwater storage rate for the South Yuba subbasin area range from 15,100 acre-feet to 21,200 acre-feet, depending on year type, since the construction of the South Yuba Canal. Based on the estimated average specific yield of the South Yuba subbasin of 6.8 percent, the importation of surface water through operation of the Yuba River Development Project has resulted in an increase in storage of about 250,000 acre-feet from 1983 to 1998.

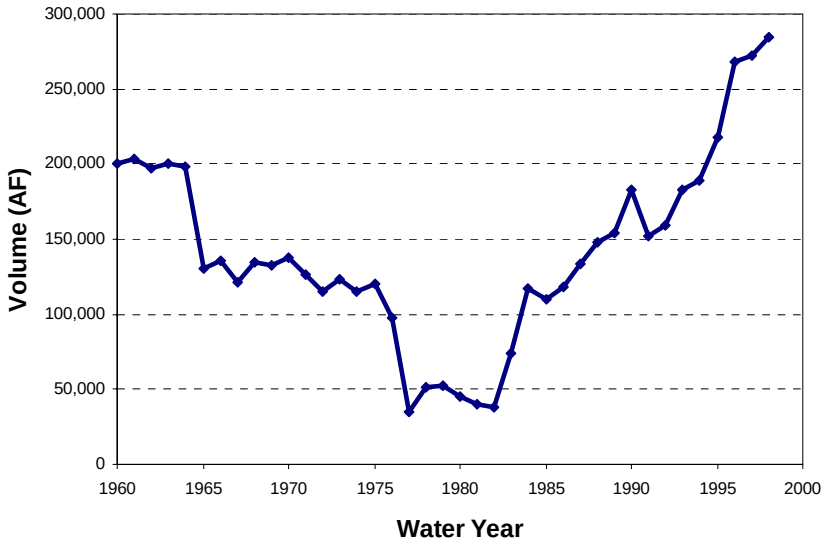

Figure 5. Estimated Groundwater Storage in the South Yuba Subbasin Area from 1960 to 1998 (based on 200,000 acre-feet of storage in 1960)

2.1.6 Water Quality

Groundwater in the subbasins has similar water quality characteristics and for the most part is of good quality for both domestic and agricultural uses. Groundwater quality is generally characterized by major cations (calcium, magnesium, sodium, and potassium) and anions (carbonate, bicarbonate, sulfate, and chloride). Groundwater is generally characterized and given a name, based on the percentage of each of these major cations and anions (Piper 1953). The nomenclature methods are:

Calcium bicarbonate designates water in which calcium amounts to 50 percent or more of the cations and bicarbonate amounts to 50 percent or more of the anions (in milliequivalents per liter).

Sodium-calcium bicarbonate designates water in which sodium and calcium are first and second in order of abundance of the cations, respectively, but neither one amounts to 50 percent or more of the total cations.

Sodium sulfate-bicarbonate designates water in which sulfate and bicarbonate are first and second in order of abundance of the anions, respectively, but neither one amounts to 50 percent or more of the total anions.

Sodium-calcium sulfate-bicarbonate designates water where neither a single cation or anion amounts to 50 percent. The water is typically designated as a "transitional" water type.

2.1.6.1 Baseline Water Quality Conditions

The groundwater in the Yuba subbasins is mostly calcium-magnesium or magnesium-calcium bicarbonate water (USGS 1979). Exceptions to this consistent water quality type occur near the town of Wheatland, where sodium-calcium chloride water has been encountered. Scattered occurrences of calcium-sodium bicarbonate water have been reported in various wells.

Sodium is of particular concern for irrigation of salt-sensitive crops. Based on methods developed by the U.S. Salinity Laboratory, water in the subbasins was classified by its suitability for irrigation water. Most of the Yuba subbasins contain water that has low TDS and low sodium concentrations (irrigation water classification code C1-S1), making the water ideal for irrigation.

2.1.6.2 Current Conditions

In the Wheatland area poorer water quality is forcing farmers to abandon some wells and pump longer on wells that still provide good quality water. Within the WWD, at least two wells have been capped because of poor water quality and more are being considered (Winchester 2001). For at least one ranch, crop damage has occurred.

2.2 Surface Water Supplies

The Yuba River basin drains approximately 1,339 square miles of the western Sierra Nevada slope, including portions of Sierra, Placer, Yuba, and Nevada Counties. The Yuba River is a tributary of the Feather River, which, in turn, is a tributary of the Sacramento River (**Figure 1**). The average annual unimpaired flow of the Yuba River at Smartville is 2.45 million acre-feet; however, a significant portion of this water is diverted out of the watershed and is not available to the lower Yuba River. The annual unimpaired flow has ranged from a high of 4,925,000 acre-feet in 1986 to a low of 370,000 acre-feet in 1977.

2.3 Surface Water Facilities

Since the mid 1800's, the Yuba River basin has been significantly developed for gold mining, debris control, water supply, power generation, flood control, fish enhancement and recreation. This development includes the upstream hydroelectric diversions by Pacific Gas and Electric Company (PG&E); hydroelectric and water supply diversions by Nevada Irrigation District and South Feather Water and Power Agency; the construction of Daguerre Point Dam and Englebright Dam by the California Debris Commission, now operated and maintained by the

U.S. Army Corps of Engineers (Corps) for debris control; and the construction of New Bullards Bar Dam by the YCWA for water supply, flood control, hydroelectric generation, recreation, and fish and wildlife enhancement (see **Figure 6**).

Daguerre Point Dam, the first dam constructed on the lower Yuba River that still exists, is located about 12.5 miles downstream of the current Englebright Dam. Construction was completed in 1906, with diversion of the river over the dam being completed in 1910.

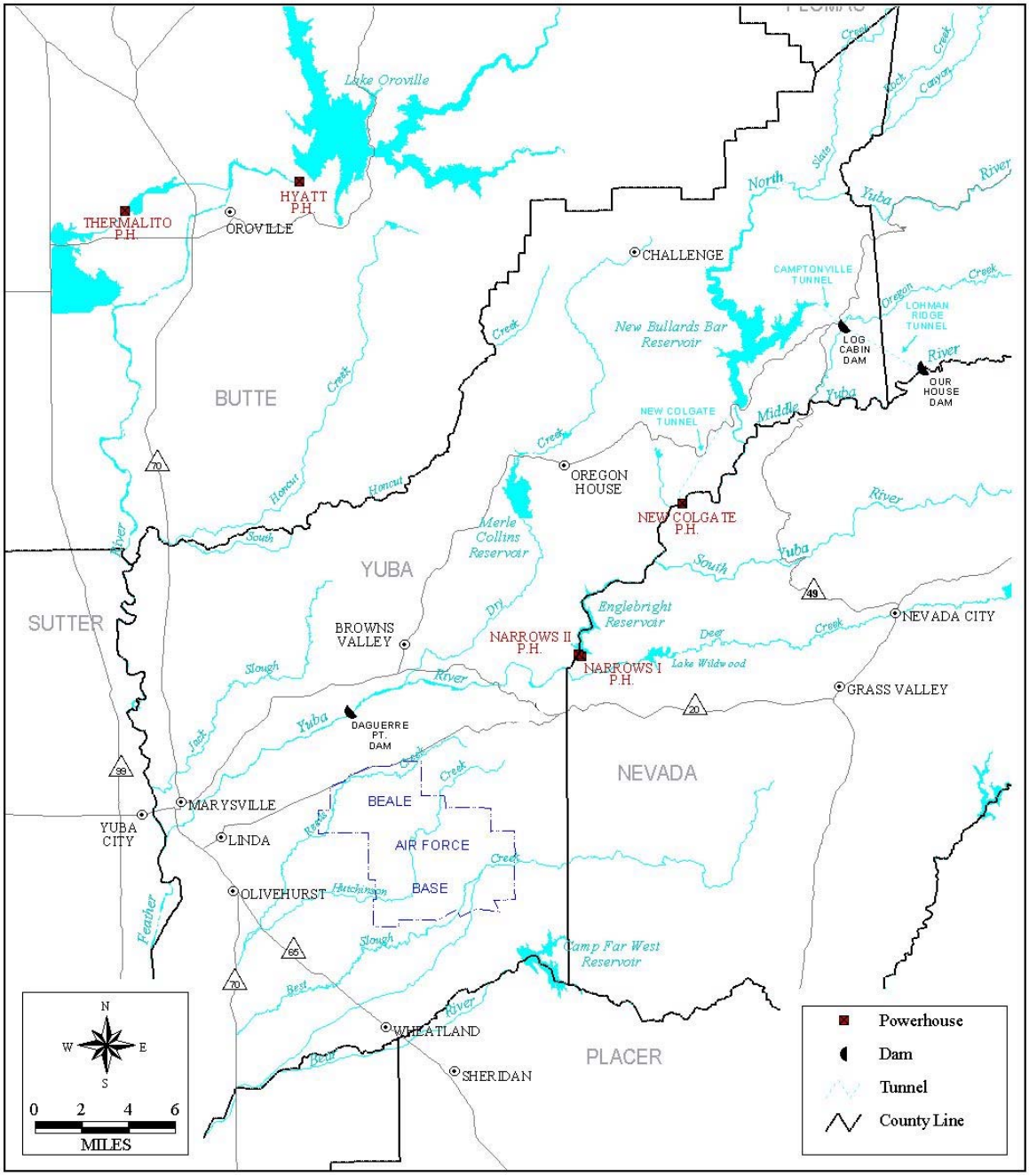

Figure 6. Major Water Development Facilities in the Yuba River Basin

Today, Daguerre Point Dam is the location of the majority of water diversions from the lower Yuba River. Daguerre Point Dam, due to its impoundment of water, provides enhanced recharge from the Yuba River to both the North and South Yuba groundwater subbasins.

Englebright Dam, the second dam constructed on the lower river, was built in 1941 by the California Debris Commission, now operated and maintained by the Corps, to collect placer-mining debris that was moving down the Yuba River into the Sacramento Valley, provide for beneficial use of water, recreation, flood control and downstream navigation. The North, Middle and South branches of the Yuba River flow into Englebright Reservoir. Consequently, construction of Englebright Dam completely blocked anadromous fish migration into the North, Middle, and South branches of the Yuba River. The dam constitutes the upstream extent of anadromous fish migration today. The approximately 24-mile-long reach of the Yuba River between Englebright Dam and its confluence with the Feather River has been defined as the lower Yuba River (**Figure 6**).

The YCWA began operation of its Yuba River Development Project (YRDP) in 1970. As part of the YRDP, New Bullards Bar Dam was built on the North Yuba River. The YCWA owns and operates the Colgate and Narrows II Powerhouses below New Bullards Bar and Englebright Dams, respectively. The release capacity of the Narrows II Powerhouse is approximately 3,400 cubic feet per second (cfs), which defines the YCWA's greatest controlled release capability from Englebright Reservoir into the lower Yuba River.

New Bullards Bar Reservoir, located upstream of Englebright Dam, is the primary storage reservoir within the Yuba River basin, with a storage capacity of about 966,000 acre-feet. Fifteen other reservoirs have been constructed in the upper portion of the basin on the Middle and South Yuba Rivers, with a combined storage capacity of approximately 400,000 acre-feet. Except for New Bullards Bar Reservoir, there is only minimal storage for regulation of snowmelt within the basin. The smaller storage facilities on the headwaters of the South Yuba and Middle Yuba River usually fill with early runoff. Hence, in wetter years much of the spring and early summer flow to the lower Yuba River is a result of uncontrolled snowmelt within the basin. In the summer and early fall, prior to the precipitation season, most of the flow in the lower Yuba River is provided by releases from New Bullards Bar Reservoir.

The coupled operation of New Bullards Bar Reservoir and Englebright Reservoir includes releases through the New Colgate, Narrows I (owned by PG&E), and Narrows II hydroelectric generating facilities, providing the principal regulation of the lower Yuba River. Under existing water rights and agreements, PG&E may operate up to 45,000 of the 75,000 acre-feet of Englebright Reservoir storage, but only about 10,000 acre-feet of this capacity is typically exercised. This fluctuation of the Englebright Reservoir storage is principally for daily or weekly regulation of winter freshets and because Englebright Reservoir is an afterbay for Colgate Power House operations. The average impaired inflow into Englebright Reservoir is about 1.6 million acre-feet per year. On average, 1.1 million acre-feet per year passes through New Bullards Bar Reservoir; the remaining 500,000 acre-feet is local inflow and flow from the South Yuba and Middle Yuba Rivers directly into Englebright Reservoir. Below Englebright Reservoir, local inflow and runoff from Deer Creek contributes, on average, additional 170,000 acre-feet per year below the Smartville gage, just below Englebright Dam.

The New Bullards Bar Dam and Reservoir, Our House and Log Cabin diversion dams, Colgate Power House, Narrows II Powerhouse, and Lower Yuba River diversions and other conveyance

facilities make up the principal components of the YRDP, which the YCWA constructed in the late 1960s.

2.4 Yuba County Water Agency

2.4.1 Institutional

The YCWA plays a major role in management and allocation of surface water supplies in Yuba County. The YCWA constructed and operates the Yuba River Development Project, a water storage and hydroelectric project, a primary feature of which is the New Bullards Bar Dam and Reservoir on the North Yuba River. This multi-purpose development began operation in 1970 and provides electric power generation, water supply, flood control and instream flows for fisheries and recreation. Utilizing the YRDP, the YCWA provides base and supplemental water supply to its member units through its water rights and facilities on the Yuba River. In the area of groundwater management, the YCWA assists local districts, has commissioned and conducted monitoring and studies of groundwater use, groundwater levels, and groundwater quality. In addition, the YCWA has managed groundwater substitution transfers since 1991, in cooperation with member districts, to provide water to other parts of the state and which generate revenue to fund YCWA programs.

2.4.2 Water Rights

As part of conjunctive use operations within Yuba County, the YCWA has and will continue to utilize its water rights to regulate waters of the Yuba River in coordination with groundwater pumping activities. This coordinated operation is intended to increase the overall yield of Yuba County's water resources for beneficial use. For the diversion and use of waters within the Yuba River watershed, the YCWA holds various water right permits and licenses for power, irrigation, domestic, and industrial uses in conjunction with its YRDP. The YCWA's consumptive use water right permits total more than 1 million acre-feet per year. The place of use of these rights is the YCWA's service area, which covers the areas of its member districts and includes most of the agricultural land in Yuba County.

2.5 Use of Water in Yuba County

Groundwater is an important source of supply in Yuba County. All urban areas in the subbasin, including Marysville, Olivehurst, Linda, and Wheatland, as well as Beale Air Force Base, are all dependent on pumped groundwater for their municipal and industrial water supply. In addition, approximately 30 percent of the county's irrigation supply comes from groundwater. Most of this groundwater pumping for irrigation occurs south of the Yuba River.

Irrigation north of the Yuba River is primarily supplied by surface water except in Reclamation District 10. Groundwater is a primary source of water for irrigation north of the Yuba River on the western portion of the basin, in Reclamation District 10. In the South subbasin, portions of Reclamation District 784 and all of the Wheatland Water District (WWD) rely upon groundwater, while Brophy Water District, South Yuba Water District and Dry Creek Mutual Water Company currently receive surface water from the Yuba River. A surface water delivery system is currently being designed for WWD.

Use of groundwater for irrigation and municipal supply developed gradually as the need for water increased. This provided benefits to water users in the basin, but as early as the 1950s, groundwater levels were falling in the southern portion of Yuba County due to overdraft. During this period pumping of groundwater was exceeding the rate of recharge to the groundwater basin.

Partly in response to this water table decline, the YCWA began to provide Yuba River water to Brophy Water District and South Yuba Water District in 1983. Monitoring indicates groundwater levels have recovered since the early 1980's. Currently both the Yuba North Subbasin and the Yuba South Subbasin are in good health. Water levels have rebounded to near historical high levels and a substantial amount of water has been replenished into the basins, with the greatest portion of the replenishment in the Yuba South subbasin.

In 1991 the State was in the throws of a major drought. Five years of very dry condition had taken its toll on the water supplies of the State. In response to a call for aggressive water management by the Governor, the YCWA, together with its Member Units, developed a groundwater substitution program to pump over 80,000 acre-feet of water for use on local lands for irrigation. This allowed for the release of an equal amount of water from New Bullards Bar Reservoir for use throughout the State. This type of groundwater substitution transfer has been completed in three dry years since that time, 1994, 2001, and 2002.

2.6 Future Facilities and Operations

When the YRDP was constructed, financing limitations resulted in postponing the construction of the conveyance facilities, which would have delivered water to WWD. WWD continues to use groundwater for irrigation. As a result the Wheatland area contains a noticeable depression caused by the continued pumping. A major concern is that, with continued pumping, the Wheatland area has gradually seen an increase in salinity concentrations and water quality has been significantly degraded.

In order to complete surface water delivery to the South Basin of the YRDP and bring surface water to WWD, the YCWA and WWD applied for and received a grant from DWR. This grant and local funds will fund construction of the project, which is expected to begin in the near future.

The proposed project is the construction of a new canal system for delivery of surface water to the District. Delivery of surface water would allow for in-lieu recharge of the South Yuba subbasin. In-lieu recharge consists of a change in the water balance of the basin, to allow for an increase in the basin storage volume. Based on year 2000 water level data for the entire South Yuba subbasin, about 70,000 acre-feet of voided aquifer storage is available for in-lieu recharge. This project will increase the safe yield of the Yuba South subbasin, creating an additional water supply that can be used to meet local and out-of-county water needs.

At the time of this writing the project final design is just beginning.

3.0 MANAGEMENT PLAN ELEMENTS

The elements of this GMP include an overall goal, a set of management objectives, and a series of plan components that discuss and identify the actions necessary for meeting the goal and objectives.

3.1 Groundwater Management Goal

The goal of this GMP is to build upon and formalize Yuba County's historically successful conjunctive management of groundwater resources and to provide future management of this resource in order to ensure continued local supply reliability, contribute to the Sacramento Valley Water Management Program, and maintain the ability to enter into transfers that assist in alleviating water shortages throughout the state.

3.2 Basin Management Objectives

To meet the goal stated above, the YCWA has adopted four specific basin management objectives (BMOs). These BMOs include the following:

Achieve groundwater storage levels that result in a net benefit to basin groundwater users. The YCWA intends to manage groundwater through conjunctive use activities to avoid unreasonable impacts that may occur from changes in groundwater elevations due to external transfers. Groundwater elevation reduction which may occur as a result of groundwater extraction to meet local and out of county demands in drier years, will be monitored by the YCWA.

Maintain or improve groundwater quality in the Basin for the benefit of groundwater users. Generally, the groundwater in the Basin is of excellent quality. However, occurrences of both groundwater contamination and increases in total dissolved solids are documented in the Basin. In these instances the YCWA will coordinate with appropriate local, state and federal agencies to pursue actions that result in the remediation of the problem.

Protect against potential inelastic land surface subsidence. Land subsidence can cause significant damage to essential infrastructure. Historically land surface subsidence within the County area has been minimal, with no known significant impacts to existing infrastructure. Given the historical trends, the potential for land surface subsidence from groundwater extraction in the north and south subbasin areas is remote. However, the YCWA intends to coordinate with DWR to monitor for potential land surface subsidence. If inelastic subsidence is documented in conjunction with declining groundwater elevations, the YCWA will investigate appropriate actions to avoid adverse impacts

Protect against adverse impacts to surface water flows. Among other important uses the Yuba River provides habitat for a variety of fish and wildlife species. The YCWA is committed to meeting the flow requirements in the Yuba River for protection of habitat. In addition, the YCWA plans to coordinate with DWR in monitoring efforts that evaluate the relationship (if any) between groundwater pumping and adjacent river or stream flows.

3.3 GMP Components

The GMP includes a variety of components that are required by CWC § 10753.7, recommended by DWR Bulletin 118 (2003), and optional under CWC § 10753.8. These components can be grouped into five general categories: (1) stakeholder involvement, (2) monitoring program, (3) groundwater resource protection, (4) groundwater replenishment, and (5) planning integration. Each category and its components are presented in this section. Under each component is a discussion, proposed actions, and identification of the objectives toward which the component is directed.

3.4 Component Category 1: Stakeholder Involvement Plan

The YCWA actively promotes the involvement of stakeholders when fulfilling its responsibilities as described in the Water Agency Act to:

…develop and promote the beneficial use and regulation of the water resources of Yuba County.…

Many and various water purveyors, agencies and organizations actively participate in basin monitoring and measurement throughout Yuba County. The YCWA utilized the GMP development process to consolidate information and, to the extent appropriate, improve management efficiency by formalizing the existing process of basin management. The GMP was developed with the involvement of the YCWA's eight member units, municipal purveyors within the County, other agricultural purveyors, members of the public and the state Department of Water Resources (DWR). To include all of these stakeholders, the YCWA pursued several avenues. These avenues include, (1) public notices, (2) using advisory committees for development of the GMP and (3) coordination with the DWR. Each of these is discussed further below.

3.4.1 Involving the Public

Groundwater in California is used by the public, and the YCWA is committed to involving the public in the development and implementation of its GMP. In the preparation of this GMP, the YCWA filed notices in the Appeal Democrat (**Appendix B**). First, in accordance with CWC § 10753.2, a notice of intent to adopt a resolution to prepare a GMP was published in the Appeal Democrat on August 12, 2002 and again on August 19, 2002. The Yuba County Water Agency Board of Directors adopted the resolution of intent on August 27, 2002, at a publicly held Board meeting. However, the Agency was unable to complete the GMP within two years as required by CWC § 10753.4. Therefore, the Agency prepared and published another notice of intent to prepare a GMP on September 24, 2004 and October 1, 2004, adopted the resolution of intention 2004-15 on October 12, 2004 (included in Appendix B). Finally, the YCWA provided a public comment period from February 1, 2005 to February 22, 2005 on the draft GMP and noticed and held a meeting for the public to comment on the GMP prior to its adoption on March 1, 2005.

3.4.1.1 Actions

The YCWA will take the following actions:

- Continue efforts to encourage public participation as opportunities arise.

- Provide public briefings at meetings of the YCWA's Board of Directors regarding GMP implementation progress.
- Work with member units to maximize outreach on GMP activities including the use of the YCWA Web site.

3.4.2 Formation of an Advisory Committee for GMP Development

The YCWA used an advisory committee in its GMP development. On November 7, 2003 the YCWA held a meeting to discuss the formation of a Water Advisory Committee (WAC) that would assist in development of the GMP (see **Appendix C**). An invitation to the meeting was mailed to all of the water purveyors shown on **Figure 2** plus the Departments of Agriculture and Planning at Yuba County, the Community Services Districts of Camptonville and River Highland, the Yuba County Resource Conservation District and Beale Air Force Base (Beale AFB).[8] The committee met on approximately a monthly basis during GMP development

The primary groups represented on the WAC include:

- Browns Valley Irrigation District
- California Water Service
- Camp Far West Irrigation District
- City of Wheatland
- Cordua Irrigation District
- Dry Creek Mutual Water Company
- Hallwood Irrigation District
- Linda County Water District
- Olivehurst Public Utility District
- Rameriz Water District
- Reclamation District 784
- River Highlands Community Services District
- Yuba County Resources Conservation District
- Yuba County Water Agency
- Wheatland Water District
- Yuba County Department of Agriculture
- Butte Pump & Well Service

3.4.2.1 Actions

The YCWA will take the following actions:

- Upon adoption of the GMP, the YCWA will discuss the continuation and composition of the WAC to guide implementation of the plan.
- The YCWA will ensure effective outreach to other self-supplied pumpers in the area.
- The YCWA's monitoring plan includes coordination with personnel involved in the remediation plan at Beale AFB.

[8] Beale Air Force Base is currently implementing a remediation plan for known contaminant plumes of the Base Property. Extensive monitoring is part of the remediation plan.

3.4.3 Developing Relationships with State and Federal Agencies

Working relationships between the YCWA and the local, state, and federal regulatory agencies are critical to developing and implementing the various groundwater management strategies and actions detailed in this GMP. The water transfers described in Section 1.0 of the GMP provide examples of the YCWA ability to work cooperatively with the regulatory agencies.

Building upon the existing relationships with the DWR, the YCWA will refine and formalize the existing monitoring and measurement program in cooperation with the DWR Central District.

3.4.3.1 Actions

The YCWA will take the following action:

- Continue to develop working relationships with local, state, and federal regulatory agencies.

3.5 Component Category 2: Monitoring Program

The YCWA participates in monitoring and measurement of the water resources as part of the power granted in the Water Agency Act to:

…carry on technical and other necessary investigations, make measurements, collect data, make analyses, studies, and inspections pertaining to water supply …

This section of the report describes the monitoring programs for all four categories of monitoring required by the CWC:

- Groundwater Storage and Elevation
- Groundwater Quality
- Inelastic Subsidence
- Groundwater and Surface Water Interaction

Each of these categories is discussed below in turn. The intent of this section of the GMP is to review the monitoring efforts to date and determine if any enhancements are needed.

3.5.1 Groundwater Storage and Elevation

The basin is monitored both for the health of the *long-term basin storage* and for *localized-short-term* impacts of pumping on groundwater elevations. Long-term basin health is monitored as changes in groundwater storage over time. Managing the long-term health of the basin meets the BMO of achieving groundwater storage levels that result in a net benefit to basin groundwater users. Estimates of changes in groundwater storage are developed using monitoring data that report the changes in groundwater surface elevation throughout the basin[9].

Such monitoring data also serve another purpose, to indicate potential localized, short-term impacts of pumping. As stated in BMO #1 the YCWA strives to:

- Avoid potential unreasonable impacts that may occur from changes in groundwater surface elevations due to external transfers.

[9] By using water level measurements and estimates of specific yield, the change in groundwater storage may be estimated.

- Monitor any lowering of groundwater surface elevations that may occur, as a result of groundwater extraction to meet local demands in drier years.

The YCWA is compiling historic water level data measurements extending back from 1947 to the present. Sources of historic water level data for the North and South Yuba subbasins include:

- DWR
- YCWA
- Member Units
- Beale AFB
- Municipalities

3.5.1.1 Groundwater Storage and Elevation Monitoring Efforts in Yuba County

Groundwater elevation monitoring in Yuba County wells has evolved over time. DWR maintains a database that contains records dating back to 1947. Originally, water level measurements were collected by DWR. When DWR budget cuts threatened to eliminate its monitoring program, the Yuba County Agriculture Department agreed to continue measuring water levels because of the value of the data. When the Yuba County Agriculture Department budget cuts threatened to eliminate its monitoring activities, the YCWA agreed to continue collecting water level data.

Currently, groundwater monitoring is done cooperatively between DWR and the YCWA. In 1995, the DWR-YCWA monitoring network was modified to increase efficiency. To reduce ongoing monitoring costs, DWR developed a plan that discontinued monitoring a number of wells in exchange for installing fewer, more strategically located wells. The YCWA paid approximately $100,000 to DWR to install the new wells. Currently, both YCWA personnel and DWR personnel measure water levels for these wells.

There are 74 wells in the current DWR/YCWA monitoring program. The location of those wells is shown on **Figure 7**.

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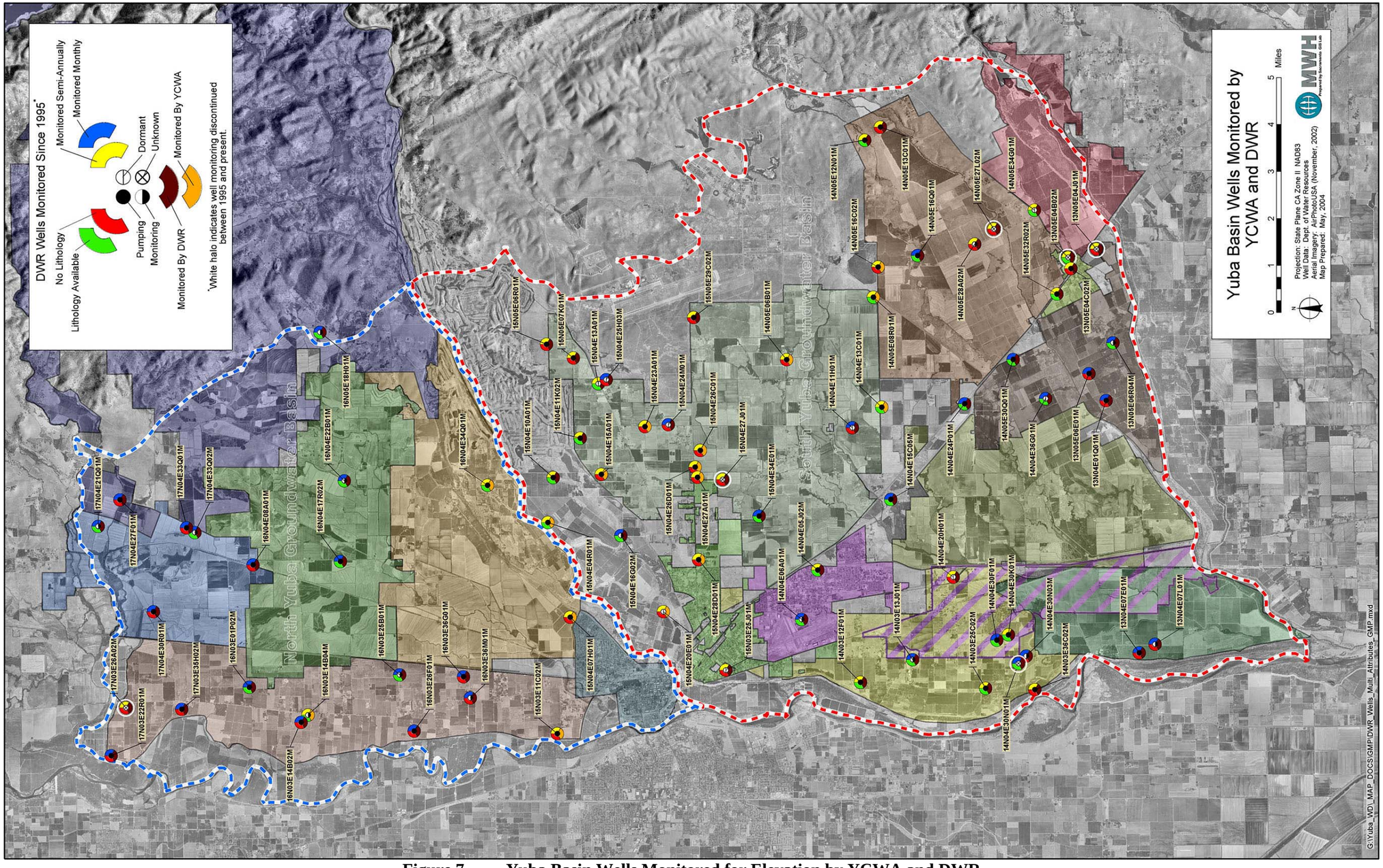

Figure 7. Yuba Basin Wells Monitored for Elevation by YCWA and DWR

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In addition to showing the location of the wells monitored for groundwater surface elevations, **Figure 7** also details the following:

- Whether the well is a dedicated monitoring well or a production well[10]
- Who monitors the well
- How often the well is monitored
- Whether the data on the well contains lithologic data

The responsibilities of both DWR and YCWA in the monitoring program follows.

DWR. As of 2004, 58 of the wells in the monitoring network are monitored by DWR. Of those wells, 22 are monitored semi-yearly and 36 are monitored monthly. The water level in each well is measured manually by DWR staff, using a water level indicator. As the term implies, "monthly" measurements are taken 12 times a year. Semi-annual measurements are generally taken within three-week windows in the spring (e.g., March) and fall (e.g., October).

YCWA. The YCWA monitors 16 of the wells in the monitoring network. Measurements are generally taken in either (1) March and October or (2) April and November. The water level in each well is measured manually by YCWA staff, using a water level indicator.

In addition to the groundwater surface elevation monitoring done by YCWA and DWR the YCWA **Member Units** also monitor groundwater surface elevation**.** During 1991, the State experienced a major drought emergency, and the governor was proposing to suspend agricultural water right diversions in order to meet urban demands. The YCWA was instrumental in working with the State to develop a groundwater substitution drought water bank program in which groundwater was pumped for crop irrigation, and the surface water normally used for irrigation was transferred to urban users for a fee. Additional groundwater substitution transfers occurred in 1994, 2001, and 2002 (See **Table 1** in Section 1 of this document for details of these transfers).

During the transfer years of 2001 and 2002 there was increased monitoring of groundwater surface elevations. This increased monitoring effort focused on monitoring wells involved in the transfer and was done to, (1) assess the effects of the transfer on the groundwater resource, and (2) provide reasonable assurance that the water pumped and accounted for, as part of the transfer, was in lieu of surface water deliveries.

The YCWA and its Member Units have implemented an informal Third Party Impact Action Plan and will discuss a formal Third Party Impact Action Plan which would include a series of steps to be taken to ensure that a groundwater substitution transfer does not impose significant unmitigated impacts on third parties (i.e., other legal users of water).

Municipalities. The following municipalities measure water levels in their wells on at least a monthly basis:

- California Water Services Company
- Olivehurst Public Utilities District
- Linda County Water District

[10] **Figure 7** includes the category 'unknown' for wells that were in the set of monitoring wells in the 1995 revision of the monitoring program, but are not currently being monitored.

- City of Wheatland

The Cities of Marysville and Wheatland have developed a supervisory control and data acquisition {SCADA} system. Use of SCADA in monitoring implies that monitoring occurs in real time.

Table 4 presents a tabular summary of the number, frequency and type of well currently being monitored for groundwater surface elevation in the Yuba Subbasins.

Table 4.
Summary of DWR/YCWA Well Monitoring

	Type of Well	Number of Wells Monitored			Notes
		Semi-annually	Monthly	Total	
DWR	Production	15	20	35	
	Monitoring	3	12	15	
	Dormant	4	4	8	
	Total	22	36	58	
YCWA	Production	16	0	16	
	Monitoring	0	0	0	
	Dormant	0	0	0	
	Total	16	0	16	
Transfer	Production	Between 0 and 146			(1)
Municipal	Production	~35	~35	~35	(2)

(1) Data for 2002 monitoring only

(2) Cities of Marysville and Wheatland have SCADA systems, so monitoring data is real-time

3.5.1.2 Refinement of Existing Groundwater Storage and Elevation Monitoring

The compositions of the monitoring networks have been in continual flux (i.e., wells added and dropped over time). Additionally, protocols for measuring water levels have likely been (and continue to be) inconsistent over the aggregate set of wells monitored. For these reasons, the YCWA is coordinating with its Member Units, DWR, and other basin groundwater extractors to determine if any refinements are needed to provide adequate basin coverage.

3.5.1.3 Actions

Enhancements to existing groundwater storage and elevation monitoring efforts will be considered on a cost-effective basis by the YCWA when and if:

- Existing monitoring efforts continually report confusing or spurious findings, or the findings are considered to have a deleterious impact on the groundwater resource.
- Potential impacts to the groundwater basin are reported in areas where little or no existing monitoring occurs.
- State regulations require more stringent monitoring, particularly to maintain local control of the groundwater resource.
- Coordination with monitoring activities that occur at Beale AFB for both the remediation program and water service.

The types of actions to be pursued if enhancements are required include:

- Coordinate with Member Units, DWR, and other basin groundwater extractors (e.g., Beale AFB, municipalities, etc.) to identify an appropriate group of wells for monitoring both during transfer and non-transfer years. Preference will be given to wells currently in an agency's monitoring network that (a) have long records of historic water level data and are useful in assessing trends within the subbasins, (b) have uniform protocols used for measuring and recording the water level data, (c) are non-producing wells or have relatively low extraction volumes so water level readings represent relatively static levels, and (d) have well construction information. Geographic distribution, basin hydrogeology, and areas of extraction will also be considered.
- Coordinate with Member Units, DWR, and other basin groundwater extractors to ensure that the selected wells are maintained as part of a long-term monitoring network.
- Coordinate with DWR to ensure that the timing of water level data collection by Member Units and other basin groundwater extractors in transfer years coincides within one month of DWR data collection on wells measured twice a year.
- Coordinate with Member Units, DWR, and other basin groundwater extractors on the development of uniform data collection protocols and data sharing and archiving procedures.
- Coordinate with Member Units, DWR, and other basin groundwater extractors to ensure that needed water level data are collected, verify that uniform data collection protocols are used among the agencies, and confirm that data sharing and archiving procedures are implemented.
- Provide training for the Member Units and other basin groundwater extractors on implementation of data collection protocols, if requested.
- Consider ways to fill gaps in the monitoring well network by identifying additional suitable existing wells or identifying opportunities for constructing new monitoring wells.
- Assess groundwater storage and elevation trends and conditions based on the network annually. Compare current trends to historical trends. Present findings to DWR and coordinate on future program modifications.
- Assess the adequacy of the groundwater storage and elevation monitoring well network annually.

3.5.2 Groundwater Quality

The purpose of the groundwater quality component of the overall monitoring program is to develop and implement actions that will help the YCWA meet BMO #2 – maintain or improve groundwater quality in the Basin for the benefit of groundwater users. This process requires (1) collection and analysis of adequate data; and (2) in the event of a detected problem, coordination with appropriate local, State, and federal agencies to pursue actions resulting in remediation.

Because the majority of the wells in the basin are used for agricultural supplies, limited water quality data exists. The YCWA is compiling available historical water quality data extending from the 1940s to the present. Sources of water quality data include:

- DWR
- Municipalities
- SWRCB
- Beale AFB

3.5.2.1 Groundwater Quality Monitoring Efforts in Yuba County

DWR. DWR Central District maintains data for 62 water quality wells in the two subbasins (35 in the north, 27 in the south). These data were collected starting in the 1940s. Currently, DWR collects data for 13 water quality wells in the two subbasins on a regular basis (i.e., data for seven wells are collected in one year and data for the other six wells are collected the next year). Samples are collected after the onset of pumping in the months of May, June, and July. Constituents analyzed include minerals, nutrients, and nitrates.

During 2002, the most recent transfer year involving groundwater substitution, water quality samples were collected by DWR Central District for 84 of the approximately 200 wells subscribed in the YCWA transfer program. Constituents included minerals, nutrients, nitrates, pH, total dissolved solids, turbidity, and temperature. This occurred during the months of July, August, and September.

Municipalities. As required under Title 22, the municipalities collect water quality data for required constituents and report that data to the Department of Health Services (DHS). This level of monitoring is sufficient under existing regulatory guidelines to ensure that the public is provided with a safe, reliable drinking water supply. The municipalities include:

- California Water Services Company
- Olivehurst Public Utilities District
- Linda County Water District
- City of Wheatland

SWRCB. The California Legislature and Governor, as well as private citizens, have become increasingly concerned about the recent public supply well closures due to the detection of chemicals, such as MTBE from gasoline and various solvents from industrial sources. As a result of the increased awareness toward groundwater quality, the Supplemental Report of the 1999 Budget Act required the SWRCB to develop a comprehensive ambient groundwater monitoring plan.

To meet this mandate, the SWRCB created the Groundwater Ambient Monitoring and Assessment (GAMA) Program. The primary objective of the GAMA Program is to assess the water quality and relative susceptibility of groundwater resources.

The GAMA Program has two sampling components: the California Aquifer Susceptibility (CAS) Assessment which primarily addresses public supply drinking water wells and the Voluntary Domestic Well Assessment Project which addresses private drinking water wells. The GAMA Program is being directed out of the SWRCB Division of Water Quality, Land Disposal Section, Groundwater Special Studies Unit.

The Voluntary Domestic Well Assessment Project samples domestic wells for various constituents commonly found in domestic well water and provides that information to the domestic well owners. In addition, the Voluntary Domestic Well Assessment Project includes a public education component to aid the public in understanding water quality data and water quality issues affecting domestic water wells. The Voluntary Domestic Well Assessment Project focuses on specific areas, as resources permit. The focus areas are chosen based upon existing knowledge of water quality and land use, in coordination with local environmental agencies. The SWRCB incurs the costs of sampling and analysis, and the results are provided to domestic well owners as quickly as possible. During April through June, 2002, Voluntary Project staff sampled 119 domestic supply wells in Yuba County.

Beale AFB. Water quality data is collected at Beale for both the groundwater remediation program and the service of municipal water. The YCWA will be coordinating with Beale to review the monitoring activities.

Figure 8 shows the locations of the wells monitored by DWR and the SWRCB.

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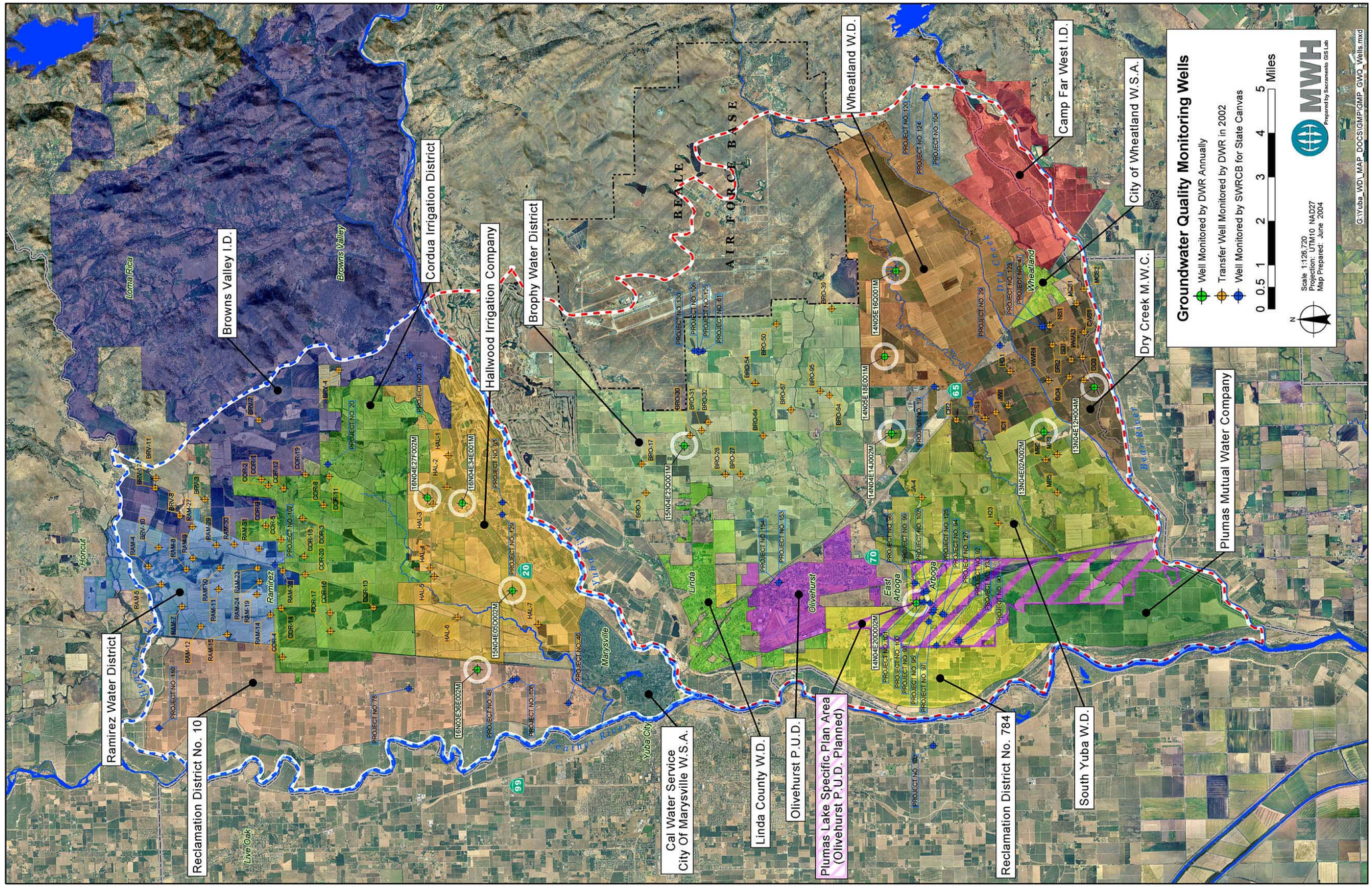

Figure 8. Yuba Basin Wells Monitored for Water Quality in the Subbasins

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3.5.2.2 Refinement of Existing Groundwater Quality Monitoring

The compositions of the monitoring networks have been in continual flux (i.e., wells added and dropped over time). Additionally, protocols for measuring water quality have likely been (and continue to be) inconsistent over the aggregate set of wells monitored. For these reasons, the YCWA is coordinating with its Member Units, DWR, and other basin groundwater extractors to determine if any refinements are needed to provide adequate basin coverage.

3.5.2.3 Actions

Enhancements to existing groundwater quality monitoring efforts will be considered on a cost-effective basis by the YCWA when and if:

- Existing monitoring efforts continually report confusing or spurious findings, or the findings are considered to have a deleterious impact on the groundwater resource.
- Potential impacts to the groundwater basin are reported in areas where little or no existing monitoring occurs.
- State regulations require more stringent monitoring, particularly to maintain local control of the groundwater resource.

The types of actions to be pursued if enhancements are required include:

- Coordinate with Member Units, DWR, and other basin groundwater extractors (e.g., Beale AFB, municipalities, etc.) to identify an appropriate group of wells for monitoring both during transfer and non-transfer years. Preference will be given to wells currently in an agency's monitoring network that (a) have long records of historic water quality data and are useful in assessing trends within the subbasins, (b) have uniform protocols used for measuring and recording the water quality data, (c) are either producing or non-producing wells, appropriately selected for the constituent being monitored , and (d) have well construction information. Geographic distribution, basin hydrogeology, and areas of extraction will also be considered.
- Coordinate with DWR to ensure that the selected wells are maintained as part of a long-term monitoring network.
- Coordinate with appropriate state and local agencies to ensure that the timing of water quality data collected by Member Units and other basin groundwater extractors in transfer years coincides within one month of DWR data collection.
- Coordinate with Member Units, DWR, and other basin groundwater extractors on the development of uniform data collection protocols and data sharing and archiving procedures.
- Coordinate with Member Units, DWR, and other basin groundwater extractors to ensure that needed water quality data are collected, verify that uniform data collection protocols are used among the agencies, and confirm that data sharing and archiving procedures are implemented.
- Provide training for the Member Units and other basin groundwater extractors on implementation of Action Item #5, if requested.
- Consider ways to fill gaps in the monitoring well network by identifying additional suitable existing wells or identifying opportunities for constructing new monitoring wells.

- Coordinate with Member Units, DWR, other basin groundwater extractors, and other local, State, and federal agencies to identify where wells may exist in areas with sparse groundwater quality data. Identify opportunities for collecting and analyzing water quality samples from those wells. If wells are sampled through other programs, coordinate with the appropriate agency on sharing of data.
- Coordinate with Member Units, DWR, other basin groundwater extractors, and other local, State, and federal agencies to pursue actions that result in containment and remediation of water quality problems within the subbasins.
- Assess current groundwater quality trends in comparison to historical trends. Present findings to DWR and coordinate on future program modifications.
- Obtain DWR's 2002 water quality data for the 84 wells that were sampled and prepare Stiff Plots[11] and tri-linear diagrams to evaluate geographical trends in groundwater quality.
- Assess the adequacy of the groundwater quality monitoring well network annually.

3.5.3 Inelastic Subsidence

Subsidence of the land surface resulting from compaction of underlying formations affected by head (water level) decline is a well-documented concern throughout much of the Central Valley. During a typical pumping season, changes in land surface elevation can be observed as a result of both elastic and inelastic subsidence in the underlying basin. Elastic subsidence results from the reduction of pore fluid pressures in the aquifer and typically rebounds when pumping ceases or when groundwater is otherwise recharged resulting in increased pore fluid pressure. Inelastic subsidence occurs when pore fluid pressures decline to the point that aquitard (a clay bed of an aquifer system) sediments collapse resulting in permanent compaction and reduced ability to store water in that portion of the aquifer.

The purpose of the inelastic subsidence component of the overall monitoring program is to develop and implement actions that will help the YCWA meet BMO #3 – protect against potential inelastic land surface subsidence. This process requires (1) coordination with DWR to monitor for potential land surface subsidence, (2) collection and analysis of adequate data, and (3) investigation of appropriate actions to avoid adverse impacts (in the event inelastic subsidence is documented in conjunction with declining groundwater elevations).

3.5.3.1 Inelastic Subsidence Monitoring Efforts in Yuba County

To date, minimal subsidence monitoring activity has occurred in Yuba County. In recent years, DWR and the YCWA developed a preliminary monument network by correlating National Oceanic and Atmospheric Administration's National Geodetic Survey (NGS) monuments with topographic data to determine proposed locations for new monuments. That network has not been finalized nor an implementation plan developed. The YCWA is not aware of any existing efforts to monitor inelastic groundwater subsidence within the county, but DWR has expressed

[11] The Stiff Plot represents four major anions and four major cations present in a water-composition. The ionic concentrations should be plotted in the same sequence on four different parallel axis. The resulting points are connected to give an irregular polygonal shape or pattern. The width of the pattern is an approximate indication of total ionic content.
source Peck, Dallas L., 1989. "Study and Interpretation of the Chemical Characteristics of Natural Water," USGS Water-Supply Paper 2254. p.175.

interest in coordinating with the YCWA on the development and implementation of a monitoring program.

3.5.3.2 Actions

- Coordinate with DWR on the necessity of developing and implementing a monitoring program. This program will include uniform data collection protocols and data sharing and archiving procedures.
- Explore funding opportunities for the installation of subsidence extensometers and other benchmarks to perform periodic repeat-level surveys at the benchmarks.
- Coordinate with other agencies (particularly the County of Yuba, the municipalities, and the NGS) to determine if there are other suitable benchmark locations in Yuba County to aid in the analysis of potential land surface subsidence.
- Educate Member Units and other basin groundwater extractors on the potential for land surface subsidence and signs that could be indicators of subsidence.

3.5.4 Groundwater and Surface Water Interaction

The purpose of the groundwater and surface water interaction component of the overall monitoring program is to develop and implement actions that will help the YCWA meet BMO #4 – protect against adverse impacts to surface water flows. The YCWA is committed to meeting the flow requirements in the Yuba River for protection of fish and wildlife habitat. In addition, the YCWA plans to coordinate with DWR in monitoring efforts that evaluate the relationship (if any) between groundwater pumping and adjacent river or stream flows.

3.5.4.1 Groundwater and Surface Water Interaction Monitoring Efforts in Yuba County

The interaction between groundwater and surface water has not been extensively evaluated within the two subbasins. Both DWR and the YCWA have initiated evaluation efforts.

DWR. In recent years, DWR has studied groundwater and surface water interaction in the basin. It conducted aquifer pump tests at eight locations and is utilizing multi-level piezometers. In March 2003, DWR installed a multi-level piezometer in close proximity to both its Bear River stream gage (near Pleasant Grove Road) and a production well subscribed in the YCWA transfer program. Data were recorded at both the piezometer and stream gage on synced, 15-minute intervals and stable isotope samples were taken and analyzed. DWR has collected data for over 14 months and is preparing a report based on that data. In summer 2004, DWR installed another multi-level piezometer in close proximity to the YCWA's Yuba River stream gage (near Marysville). The data collected and analyzed at these two stations in non-transfer years will establish a baseline that will allow DWR to observe changes in water levels and composition resulting from transfer program extractions. DWR is exploring the installation of additional groundwater/surface water interaction stations.

YCWA and Member Units. The YCWA and its Member Units collect less data related to groundwater and surface water interaction in non-transfer years. During transfer years, the YCWA and its Member Units increased their monitoring efforts by implementing (1) the *Groundwater Monitoring and Reporting Program* that specified EC measurements and monitoring of the potential for impact to the Bear River, and (2) the *Groundwater Substitution*

Program Third Party Action Plan to ensure that a groundwater substitution transfer does not impose significant unmitigated impacts on third parties (i.e., other legal users of water).

3.5.4.2 Actions

- Meet with DWR to understand the results of its Bear River study and the need for other future groundwater surface water interaction studies.
- Meet with DWR to determine the need and cost effectiveness of installing additional monitoring stations.

Coordinate with DWR on the development of uniform data collection protocols and data sharing and archiving procedures.

-

3.5.5 Data Management

The YCWA, DWR, the YCWA's eight member units, the four municipal water purveyors and Beale Air Force Base maintain a varying range of groundwater-related data in a wide variety of formats. The YCWA is examining the extent to which there is value to be added by organizing all or part of this data into one central repository.

The DWR currently maintains much of the groundwater elevation data described in section 3.5.1, above. The groundwater substitution transfers done in 2001 and 2002 required that the YCWA's member units collect monthly groundwater elevation data at the beginning of the transfer, during the transfer and for a period of time after the transfer. The YCWA is committed to coordinating with the member units to assure that such measurements, as required, are obtained and the data maintained.

To the extent that groundwater quality data becomes necessary for the YCWA to meet its objective to develop and promote the beneficial use and regulation of the water resources of Yuba County, the YCWA will also develop a system for collecting and maintaining groundwater quality data. The same is true of data for inelastic ground subsidence and groundwater and surface water interaction.

Other data that will be gathered and maintained on as needed basis includes well construction details, lithologic data available from borings and construction of wells.

3.5.5.1 Actions

To maintain and improve the usability of the data regarding groundwater and aquifer properties in Yuba County, the YCWA will take the following actions:

- Continue to coordinate with member units and other water purveyors to determine what types of data are currently available and in what formats.
- Develop data management methods on an as needed basis for data determined critical to the management of water resources in Yuba County.

3.6 Component Category 3: Groundwater Resource Protection

The YCWA considers groundwater protection to be one of the most critical components of ensuring a sustainable groundwater resource and is empowered through the Agency Act to;

…prevent contamination, pollution or otherwise rendering unfit for beneficial use the subsurface or subsurface water used in said agency, and to commence, maintain and defend actions and proceedings to prevent any such interference with such waters as may endanger or damage the inhabitants, lands, or use of water in, or flowing into the agency;….

In this GMP, resource protection includes both prevention of contamination from entering the groundwater basin and remediation of existing contamination. Prevention measures include proper well construction and destruction practices, development of wellhead protection measures, and protection of recharge areas. Containment and remediation include measures to prevent contamination from human activities as well as contamination from natural substances such as saline water bodies.

YCWA is committed to coordinating with the various state, local and federal agencies that monitor groundwater quality and are responsible for projects that clean-up groundwater contamination where it may exist. Specifically, YCWA does not operate a project related to groundwater contamination cleanup, recharge, storage or extraction. YCWA's involvement in various aspects of groundwater resource protection are detailed below by category.

3.6.1 Well Construction, Abandonment and Destruction Policies

3.6.1.1 Well Construction Policies

Proper construction of water wells is necessary to not only provide a reliable water supply, but also to protect the groundwater resource. Section 231 of the California Water Code requires the DWR to develop well standards to protect groundwater quality. DWR has documented the well standards in Bulletin 74-81 (DWR, 1981) and Bulletin 74-90 (DWR, 1991), the supplement to Bulletin 74-81.

Most counties and some cities have adopted ordinances to protect groundwater quality. In Yuba County the agency responsible for well construction permitting and inspection is the Environmental Health Department (EHD) per Chapter 7.03 of the County Ordinances. Yuba County EHD enforces the DWR well standards and as such, requires a permit (**Appendix D**) to be issued before a well can be drilled or modified. Yuba County reviews the permit application to verify that proposed well location and construction details meet the DWR requirements. When a well is constructed, modified, or destroyed, the law requires that the drilling contractor submit a Well Completion Report to the Department. The well owner should obtain a copy of this report from the drilling contractor. The well completion report for an existing well should be available in the files of DWR's Central District Office.

Only qualified personnel can deepen an existing well, drill a new well, or destroy a well. The California Business and Professions Code requires that, "No person shall undertake to dig, bore,

or drill a water well, cathodic protection well, groundwater monitoring well, or geothermal heat exchange well, to deepen or reperforate such a well, or to abandon or destroy such a well, unless the person responsible for that construction, alteration, destruction, or abandonment possesses a C-57 Water Well Contractor's License." The California Contractor's State License Board web page can be checked to find out whether a contractor is licensed and the status of a license, as well as providing information on hiring a contractor.

The contact information for the County regarding wells is:

Yuba County Environmental Health Department
915 8th Street, Suite 123
Marysville, CA 95901-5273
(530) 749-5450

3.6.1.2 Well Abandonment Policies

The water well standards used by the DWR defines a well as being either abandoned or permanently inactive if it has not been used for one year, unless the owner demonstrates intention to use the well again. In accordance with Section 24400 of the California Health and Safety Code, the well owner shall properly maintain an inactive well as evidence of intention for future use in such a way that follows strict requirements enforced by the DWR. According to the Yuba County Ordinance 7.03.090, a well is deemed abandoned by the definition in DWR Bulletin 74-81 and such abandoned well shall be destroyed or placed inactive by its owner.

3.6.1.3 Well Destruction Policies

Proper destruction of water wells is necessary to protect the groundwater resource. In Yuba County the agency responsible for well destruction oversight is the Environmental Health Department per Chapter 7.03 of the County ordinances. The Yuba County ordinance requires a permit to be issued before a well can be drilled or modified. Yuba County reviews the permit application to verify that proposed abandonment and destruction details meet the DWR requirements (DWR 1981, 1991) Therefore, when a well is destroyed, the law requires that the drilling contractor submit a Well Completion Report to the Department. The well owner should obtain a copy of this report from the drilling contractor. The well completion report for an existing well should be available in the files of DWR's Central District Office.

The actions listed below will provide improved dissemination of information regarding well construction, well abandonment and well destruction policies within Yuba County to appropriate agencies.

3.6.1.4 Actions

The YCWA will take the following actions:

- Schedule a meeting with the County Department of Environmental Services, Member Units and interested M&I water purveyors to facilitate the an exchange of information of existing

County well ordinances and discuss possible new ordinances, such as a minimum depth for new wells.

- Request that Beale AFB provide a copy of the most recently delineated investigation borders for remediation sites originating from Beale AFB, and other known groundwater contaminant sources, to YCWA; Members Units and M&I water purveyors within the County for their review and possible use (i.e. locating and designing new wells and for possible transfer pumping).
- Provide information to Member Units and M7I water purveyors on well construction, destruction and abandonment as requested. For example, providing access to existing analysis on subsurface hydrogeology for the construction of new wells.

- Obtain "wildcat" well map from California Division of Oil and Gas to ascertain the extent of historic gas well drilling operations in the area as these wells could function as conduits of contamination if not properly destroyed.

3.6.2 Wellhead Protection Measures

Identification of wellhead protection areas is a component of the Drinking Water Source Assessment and Protection (DWSAP) Program administered by the Department of Health Services (DHS). DHS set a goal for all water systems statewide to complete Drinking Water Source Assessments by mid-2003. All municipalities within Yuba County have completed their required assessments by performing the three major components required by DHS:

- Delineation of capture zones around sources (wells).
- Inventory of Potential Contaminating Activities (PCAs) within protection areas.
- Vulnerability analysis to identify the PCAs to which the source is most vulnerable.

Delineation of capture zones includes using groundwater gradient and hydraulic conductivity data to calculate the surface area overlying the portion of the aquifer that contributes water to a well within specified time-of-travel periods. Typically, areas are delineated representing 2-, 5-, and 10-year time-of-travel periods. These protection areas need to be managed to protect the drinking water supply from viral, microbial, and direct chemical contamination.

Inventories of PCAs include identifying potential origins of contamination to the drinking water source and protection areas. PCAs may consist of commercial, industrial, agricultural, and residential sites, or infrastructure sources such as utilities and roads. Depending on the type of source, each PCA is assigned a risk ranking, ranging from "very high" for such sources as gas stations, dry cleaners, and landfills, to "low" for such sources as schools, lakes, and non-irrigated cropland.

Vulnerability analysis includes determining the most significant threats to the quality of the water supply by evaluating PCAs in terms of risk rankings, proximity to wells, and Physical Barrier Effectiveness (PBE). PBE takes into account factors that could limit infiltration of contaminants including type of aquifer, aquifer material (for unconfined aquifers), pathways of contamination, static water conditions, hydraulic head (for confined aquifers), well operation, and well construction. The vulnerability analysis scoring system assigns point values for PCA risk rankings, PCA locations within wellhead protection areas, and well area PBE; the PCAs to

which drinking water wells are most vulnerable are apparent once vulnerability scoring is complete.

3.6.2.1 Actions

The YCWA will take the following actions:

- Request that municipalities provide vulnerability summaries from the DWSAP to the YCWA to be used for guiding management decisions in the basin.

3.6.3 Protection of Recharge Areas

The California Legislature and Governor, as well as private citizens have become increasingly concerned about groundwater quality and public supply well closures due to the detection of chemicals, such as the gasoline additive MTBE, solvents from industrial sources, and more recently perchlorate. To address these concerns the Supplemental Report of the 1999 Budget Act and later the Groundwater Quality Monitoring Act of 2001 (AB 599 – Statutes of 2001) required the SWRCB to develop a comprehensive ambient groundwater monitoring plan. The SWRCB is collaborating with the U.S. Geological Survey (USGS) and Lawrence Livermore National Laboratory (LLNL) to implement the GAMA Program. The GAMA Program prioritizes groundwater basins for assessment based on groundwater use. Currently, the Yuba County North and South subbasins are not scheduled for assessment.

Local participation in the GAMA Program is voluntary. YCWA will assist in the assessment by facilitating information exchange with the County, the Member Units and interested M&I water purveyors when the Yuba County North and South subbasin assessment is underway.

3.6.3.1 Actions

The YCWA will take the following actions:

- Track the inclusion of Yuba County in the SWRCB GAMA Program. Program when appropriate.

3.6.4 Control of the Migration and Remediation of Contaminated Groundwater

The North and South Yuba Basins are primarily farmland and as such have potential for contaminating activities from nitrates and pesticides. Additionally, potential sources of groundwater contamination may occur around urban growth areas, such as Wheatland, Olivehurst, and Marysville, and from Beale AFB.

Evaluation of the extent and types of contaminants present at Beale AFB began in 1985 and has resulted in the removal of source areas and the implementation of remedial activities such as installation of groundwater treatment plants. Beale AFB's goal is to prevent contaminants that exceed drinking water maximum contaminant levels from leaving the property. The lead agency for the groundwater cleanup at the base is the Central Valley Regional Water Quality Control Board (RWQCB). The YCWA will coordinate with the RWQCB on aspects of this project that could affect groundwater levels near Beale AFB.

Twenty-two locations on the base have been investigated for soil and groundwater contamination. The most common contaminant is trichloroethylene (TCE), a volatile organic compound that was commonly used as a degreaser. There are several distinct TCE groundwater contamination plumes scattered throughout the base. Most plumes are contained within the base with the exception of Site 13, which is located near the western boundary of the base. Concentrations of TCE below drinking water maximum contaminant levels have been detected in some off-site domestic and monitoring wells along North Beale Road. The RWCQB has suggested consideration of establishing "Consultation Zones"in the areas where groundwater actions such as pumping could affect migration or containment of groundwater plumes. However, at this time no action has been considered by the RWQCB or Beale AFB.

There are other remedial actions occurring at Beale AFB to prevent the migration of contaminated groundwater. This information is published in annual reports by the Office of Environmental Restoration at Beale. The contact information at Beale AFB is:

Environmental Restoration
9 CES/CEVR
6601 B Street
Beale AFB, CA 95903-1708
DSN: 368-3856
(530) 634-3856

3.6.5 Fuel Storage Tanks

Leaky underground storage tanks (LUST) are another source of groundwater contamination in the area. There are 43 LUST sites in the area with potential or actual groundwater contamination in the project area. The sites are in various stages from initial characterization to remediation. Groundwater contamination is typically limited to shallow groundwater bearing zones with down-gradient areas being the most affected. MTBE has been detected in groundwater near some of the LUST. MTBE is a gasoline oxygenate that is very mobile in groundwater.

3.6.5.1 Actions

The YCWA will take the following actions:

- Request information from the RWQCB and other responsible agencies with regard to water quality concerns within the Basin and locations of known and potential groundwater contamination.
- Request copies of annual monitoring reports from Beale AFB that describe the extent of groundwater contamination plumes on Base.
- Provide YCWA Members Units with all information obtained from OES and the RWQCB on the extent of the investigation areas of contaminant plumes and LUST sites for their information in developing groundwater extraction patterns and in the siting of future production or monitoring wells.

3.6.6 Control of Saline Water Intrusion

Saline water can slowly degrade a groundwater basin and ultimately render all or part of a basin unusable. Several sources can contribute to increased salinity in groundwater. In addition to sea

water intrusion, saline degradation of groundwater can be caused by use and re-use of the water supply; lateral or upward migration of saline water; downward seepage of sewage and industrial wastes; downward seepage of mineralized surface water from streams, lakes, and lagoons; and interzonal or interaquifer migration of saline water.

At present, saline water intrusion has not been identified as a problem in the Yuba Subbasin, but saline water impacts can be a threat to water quality. The YCWA will test for saline water when appropriate.

The YCWA, in cooperation with DWR has undertaken the task of better understanding the quality of groundwater throughout the basin. This information will be used in the management of groundwater resources throughout the basin. Activities under this component may include water quality monitoring, investigation into causes, analysis of impacts, and development and implementation of solutions.

3.6.6.1 Action.

The YCWA will take the following actions:

- Observe TDS concentrations in transfer wells sampled by DWR in 2002. Correlate TDS with depth and distance from recharge areas and describe observed trends.
- Acquire geophysical logs for oil and gas exploration borings. These logs are available through the State of Department of Conservation Division of Oil and Gas. These electrical geophysical logs will delineate the base of freshwater at each boring location.
- Publish information obtained from DWR and other sources on salinity trends in annual basin report.

3.7 Component Category 4: Groundwater Sustainability

To ensure a long-term viable supply of groundwater, the YCWA and its member units are seeking ways to increase the conjunctive management abilities in the subbasins over the long-term. The YCWA is currently in the process of constructing the infrastructure needed to deliver surface water to approximately 7,750 acres of land within Wheatland Water District. This land is currently being served by groundwater. This project allows groundwater elevations underlying the WWD to increase naturally (in-lieu recharge) by providing surface water to an area that has historically relied on groundwater.

Recharge can also occur via direct recharge. At the present the YCWA is not investigating direct recharge because natural recharge and in-lieu recharge have proved sufficient methods to maintain the health of the basin.

3.7.1 Actions

To maintain storage volume of groundwater in the Yuba north and south subbasins the YCWA will take the following actions:

- Continue pursuing the project to deliver surface water to WWD.
- Coordinate with member units to use monitoring data to maintain the health of the subbasins.

4.0 PLAN IMPLEMENTATION

Table 5 summarizes the action items presented in Section 3 and an implementation schedule. Many of these actions involve coordination by the DWR with other local and federal agencies and most of these will begin within 6 months, following adoption of this GMP. A few activities involve assessing trends in basin monitoring data for the purpose of determining the adequacy of the monitoring network. These assessments will be made as new monitoring data become available for review by the YCWA, and results will be documented in an annual Monitoring and Measurement report (see below).

4.1 Annual Monitoring and Measurement Report

The YCWA will report on progress made implementing the GMP in an annual Monitoring and Measurement report, which will summarize groundwater conditions in the subbasins and document groundwater management activities from the previous year. This report will include:

- Summary of monitoring results, including a discussion of historical trends.
- Summary of management actions during the period covered by the report.
- A discussion, supported by monitoring results, of whether management actions are achieving progress in meeting BMOs.
- Summary of any plan component changes, including addition or modification of BMOs, during the period covered by the report.

The Monitoring and Measurement report will be completed by June 1st each year and will report on conditions and activities completed through April 31st of the prior year. Annual meetings will be held with the local agencies that are managing groundwater within the basin and are complying with the YCWA GMP. (pursuant to CWC §10755.3).

4.2 Future Review of GMP

This GMP is intended to be a framework for the first regionally-coordinated management efforts in the Yuba subbasins. As such, many of the identified actions will likely evolve as the YCWA actively manages and learns more about the basin. Many additional actions will also be identified in the annual Monitoring and Measurement report described above. The GMP is therefore intended to be a living document, and it will be important to evaluate all of the actions and objectives over time to determine how well they are meeting the overall goal of the plan. The YCWA plans to evaluate this entire plan within five years of adoption.

4.3 Financing

It is envisioned that implementation of the GMP, as well as many other groundwater management-related activities will be funded from a variety of sources including revenues from the Sacramento Valley Water Management Plan; the YCWA; in-kind services by member units; state or federal grant programs; and local, state, and federal partnerships. Some of the items that would likely require additional resources include:

- Monitoring for groundwater quality and elevation.
- Preparation of GMP annual reports.

- Updates of the overall GMP.
- Collection of additional subsidence data.
- Construction of monitoring wells where critical data gaps exist.
- Stream-aquifer interaction studies.
- Implementation of the GMP including:
- Committee coordination.
- Project management.
- Implementation of regional conjunctive use program.

During year one of plan implementation, YCWA will prepare an estimate of some of the likely costs associated with the above activities.

TABLE 5
Summary of Action Items

COMPONENT CATEGORY 1: STAKEHOLDER INVOLVEMENT PLAN

Involving the Public

1. Provide public briefings at meetings of the Agency's Board of Directors regarding GMP implementation progress.
2. Work with member units to maximize outreach on GMP activities.

Formation of an Advisory Committee for GMP Development

1. Invite M.U. to form a committee that meets to review progress on topics including, but not limited to; GMP implementation; monitoring reports, potential amendments to the GMP, etc.

COMPONENT CATEGORY 2: MONITORING PROGRAM

Groundwater Storage and Elevation

1. Coordinate with Member Units, DWR, and other basin groundwater extractors (e.g., Beale AFB, municipalities, etc.) to identify an appropriate group of wells for monitoring both during transfer and non-transfer years. Preference will be given to wells currently in an agency's monitoring network that (a) have long records of historic water level data and are useful in assessing trends within the subbasins, (b) have uniform protocols used for measuring and recording the water level data, (c) are non-producing wells or have relatively static levels, and (d) have well construction information. Geographic distribution, basin hydrogeology, and areas of extraction will also be considered.
2. Coordinate with Member Units, DWR, and other basin groundwater extractors to ensure that the selected wells are maintained as part of a long-term monitoring network.
3. Coordinate with DWR to ensure that the timing of water level data collection by Member Units and other basin groundwater extractors in transfer years coincides within one month of DWR data collection on wells measured twice a year.
4. Coordinate with Member Units, DWR, and other basin groundwater extractors to ensure that needed water level data are collected, verify that uniform data collection protocols are used among agencies, and confirm that data sharing and archiving procedures are implemented.
5. Provide training for the Member Units and other basin groundwater extractors on implementation of data collection protocol, if requested.
6. Consider ways to fill gaps in the monitoring well network by identifying additional suitable existing wells or identifying opportunities for constructing new monitoring wells.
7. Annually assess groundwater storage and elevation trends and conditions based on the network. Compare current trends to historical trends. Present findings to DWR and coordinate on future program modifications.
8. Assess the adequacy of the groundwater storage and elevation monitoring well networks annually.

Groundwater Quality

1. Coordinate with Member Units, DWR, and other basin groundwater extractors (e.g., Beale AFB, municipalities, etc.) to identify an appropriate group of wells for monitoring both during transfer and non-transfer years. Preference will be given to wells currently in an agency's monitoring network that (a) have long records of historic water quality data and are useful in assessing trends within the subbasins, (b) have uniform protocols used for measuring and recording the water quality data, (c) either producing or non-producing wells, appropriately selected for the constituent being monitored, and (d) have well construction information. Geographic distribution, basin hydrogeology, and areas of extraction will also be considered.
2. Coordinate with DWR to ensure that the selected wells are maintained as part of a long-term monitoring network.
3. Coordinate with DWR to ensure that the timing of water quality data collection by Member Units and other basin groundwater extractors in transfer years coincide within one month of DWR data collection.
4. Coordinate with Member Units, DWR, and other basin groundwater extractors on the development of uniform data collection protocols and data sharing and archiving procedures.
5. Coordinate with Member Units, DWR, and other basin groundwater extractors to ensure that needed water quality data are collected, verify that uniform data collection protocols are used among the agencies, and confirm that data sharing and archiving procedures are implemented.
6. Provide training for the Member Units and other basin groundwater extractors on implementation of Action Item #5, if requested.
7. Consider ways to fill gaps in the monitoring well network by identifying additional suitable existing wells or identifying opportunities for constructing new monitoring wells.
8. Coordinate with Member Units, DWR, other basin groundwater extractors, and other local, State, and federal agencies to identify where wells may exist in areas with sparse groundwater quality data. Identify opportunities for collecting and analyzing water quality samples from those wells. If wells are sampled through other programs, coordinate with the appropriate agency on sharing of data.
9. Assess current groundwater quality trends in comparison to historical trends. Present findings to DWR and coordinate on future program modifications.
10. Obtain DWR's 2002 water quality data for the 84 wells that were sampled and prepare Stiff plots and tri-linear diagrams to evaluate geographical trends in groundwater quality.
11. Assess the adequacy of the groundwater quality monitoring well network annually.

Inelastic Subsidence

1. Coordinate with DWR on the necessity of developing and implementing a monitoring program.
2. Explore funding opportunities for the installation of subsidence extensometers and other benchmarks to perform periodic repeat-level surveys at the benchmarks if a monitoring program is determined to be warranted.
3. Educate Member Units on the potential for land surface subsidence and signs that could be indicators of subsidence.

Groundwater and Surface Water Interaction

1. Meet with DWR to understand the results of its Bear River study and the need for future studies.
2. Meet with DWR to determine the need to and cost-effectiveness of installing additional monitoring stations.
3. Coordinate with DWR on the development of uniform data collection protocols and data sharing and archiving procedures.

Data Management System

1. Continue to coordinate with member units and other water purveyors to determine what types of data are currently available and in what formats.
2. Develop data management methods on an as needed basis for data determined critical to the management of water resources in Yuba County.

COMPONENT CATEGORY 3: GROUNDWATER RESOURCE PROTECTION

Well Construction, Abandonment and Destruction Policies

1. Schedule a meeting with the County Department of Environmental Services, Member Units and interested M&I water purveyors to facilitate the exchange of information of existing County well ordinances and discuss possible new ordinances, such as a minimum depth for new wells.
2. Request that Beale AFB provide a copy of the most recently delineated investigation borders for remediation sites originating from Beale AFB, and other known groundwater contaminant sources to; YCWA Members Units and M&I water purveyors within the County for their review and possible use (i.e. locating and designing new wells and for possible transfer pumping).
3. Provide support to Member Units on well construction, destruction and abandonment as requested. For example, providing access to existing analysis on subsurface hydrogeology for the construction of new wells.
4. Obtain "wildcat" well map from California Division of Oil and Gas to ascertain the extent of historical gas well drilling operations in the area as these wells could function as conduits of contamination if not properly destroyed.

Wellhead Protection Measures

1. Request that municipalities provide vulnerability summaries from the DWSAP to the YCWA to be used for guiding management decisions in the basin.

Protection of Recharge Areas

1.Coordinate with the SWRCB regarding participation in the GAMA Program when appropriate.

Fuel Storage Tanks

1. Request information from the RWQCB and other responsible agencies with regard to water quality concerns within the Basin.
2. Coordinate with Beale AFB to obtain annual monitoring reports describing extent of groundwater contamination plumes on Base.
3. Provide YCWA Members Units with all information obtained from OES and the RWQCB on the extent of the investigation areas of contaminant plumes and LUST sites for their information in developing groundwater extraction patterns and in the siting of future production or monitoring wells.

Control of Saline Water Intrusion

1. Request information from the RWQCB and other responsible agencies with regard to water quality concerns within Basin.
2. Acquire geophysical logs for oil and gas exploration borings. These logs are available through the State of Department of Conservation Division of Oil and Gas. These electrical geophysical logs will delineate the base of freshwater at each boring location.
3. Publish information obtained from DWR and other sources on salinity trends in annual basin report.

COMPONENT CATEGORY 4: GROUNDWATER SUSTAINABILITY

1. Continue pursuing the project to deliver surface water to WWD.
2. Coordinate with member units to use monitoring data to maintain the health of the subbasins.

5.0 REFERENCES

Bookman-Edmonston Engineering: Ground Water Resources and Management in Yuba County. September 1992.

California Department of Water Resources (DWR). California's Groundwater. Bulletin 118. Update 2003.

California Department of Water Resources (DWR). California Well Standards. Bulletin 74-81 & 74-90 combined. 1974, 1990.

Sacramento Groundwater Authority. Groundwater Management Plan. December 2003.

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6.0 APPENDICES

Appendix A The Yuba County Water Agency Act

Appendix B Copies Of Public Notices

Appendix C Copy of Invitation Letter for Formation of the WAC Dated Nov 1, 2003

Appendix D Copy of Yuba County Environmental Health Department Well Drilling Permit

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