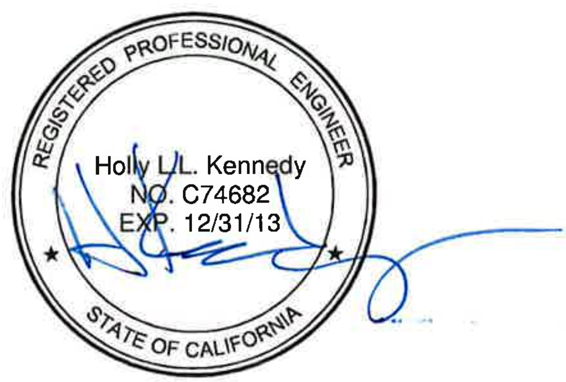
2010 Urban Water Management Plan

City of Reedley

September 9, 2013



Prepared under the responsible charge of

Holly L.L. Kennedy
C74682

HDR

2121 N. California Blvd., Suite 475
Walnut Creek, CA 94596

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Abbreviations

ac-ft	Acre-feet
ac-ft/yr	Acre-feet per year
AID	Alta Irrigation District
BMP	Best management practices
˚C	Degrees Celsius
ccf	Hundred cubic feet
CII	Commercial Industrial Institutional
COM	Commercial customer
CUWCC	California Urban Water Conservation Council
City	City of Reedley
DBCP	dibromochloropropane
DMM	Demand management measure
DRU-CDF	Demographic Research Unit, California Department of Finance
DWR	California Department of Water Resources
EDB	ethylene dibromide
ET	Evapotranspiration
Ft	feet
GAC	granular activated carbon
gpm	Gallons per minute
gpcd	Gallons per capita per day
IND	Industrial
INS	Institutional
KCRD	Kings River Conservation District
MG	Million gallons
mgd	Million gallons per day
mg/L	Milligrams per liter
MOU	Memorandum of understanding
PCE	tetrachloroethene
PG&E	Pacific Gas and Electric
TCE	trichloroethylene
TCP	trichloropropane
TDS	Total dissolved solids
UWMP	Urban Water Management Plan
UWMP Act	Urban Water Management Planning Act
VOC	volatile organic compound
WWTP	Wastewater treatment plant
yr	Year

1. Plan Preparation

The Urban Water Management Planning Act (UWMP Act) was created by Assembly Bill 797, which was signed into law in September 1983. Since then the UWMP Act has been amended by Assembly Bill 2661 (July 1990), Assembly Bill 1869 (October 1991), and Assembly Bill 11X (October 1991).

The UWMP Act requires that urban water suppliers (i.e. municipal water suppliers providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually) prepare and adopt Urban Water Management Plans (UWMPs) which report, describe, and evaluate water deliveries and uses, water supply sources, efficient water uses, and demand management measures.

The UWMP Act directs water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies are available to meet existing and future demands. Urban water suppliers are required to assess current demands and supplies over a 20-year planning horizon and consider various drought scenarios. The UWMP Act also requires water shortage contingency planning and drought response actions to be included in a UWMP.

In November 2009, the Water Conservation Bill of 2009 (SBX7-7) was passed. This bill includes elements of the 20x2020 Water Conservation Plan which was designed to reduce the statewide per capita urban water use by 20 percent by the year 2020. The Water Conservation Bill of 2009 requires urban water suppliers to report in their UWMPs base daily per capita water use (baseline), an urban water use target, an interim urban water use target, and compliance daily per capita water use. This will enable water agencies, and in turn, the State of California, to track progress towards decreasing daily per capita urban water use throughout the state.

The City of Reedley (City) has previously prepared and adopted plans in 2000 and 2005. The City has prepared this update to the 2005 UWMP to ensure the efficient use of available water supplies, determine existing baseline water consumption, establish water use targets, describe and evaluate the existing water system and historical and projected water use, evaluate current and projected water supply reliability, describe and evaluate demand management measures, and provide water shortage contingency plans as required by the UWMP Act.

This UWMP was prepared in accordance with California Water Code, Division 6, Article 1, Sections 10620-10621. In addition, the contents of this UWMP are consistent with Article 2, Contents of Plans, Sections 10630-10634.

1.1 Resource Optimization

The City understands that water is a limited resource and that a long-term reliable supply of water is essential to protect and sustain the local, regional, and state economies. It also recognizes, while conservation and efficient use of water is a statewide concern, planning for this use is best done at a local and regional level.

As described in this UWMP, the City has developed local groundwater supplies and implemented water conservation and recharge strategies to maximize the use of local resources and increase water supply reliability.

As a signatory to the California Urban Water Conservation Council's (CUWCC) MOU for Urban Water Conservation, the City is committed to reducing the per capita demand of its water customers. A more detailed discussion on the City's water conservation efforts is presented in Section 6.

1.2 Coordination

The City coordinated with other local and regional agencies in the area during the preparation of this UWMP. The agencies and organizations contacted or involved in the preparation, discussion, and/or coordination of this UWMP are listed in Table 1-1.

Table 1-1
Coordination with Appropriate Agencies

Coordinating Agencies	Participated in Development	Commented on the Draft	Attended Public Meetings	Contacted for Assistance	Received a Copy of the Draft	Sent a Notice of Intent to Adopt
County of Fresno				X		X
Kings River Conservation District						X
Upper Kings Water Integrated Regional Management Authority						X
Alta Irrigation District						X
Consolidated Irrigation District						X
General Public			X		X	X

Reedley is a member of the Kings River Conservation District (KRCD), a regional water management entity. KRCD is a political subdivision of the state that was created in 1951 by special legislation to protect local water rights and cooperate with other agencies to manage the water supply, among other responsibilities. The regional group is responsible for identifying concerns and issues related to developing groundwater, submitting an Integrated Water Resources Management Plan, and formulating a consensus on regional problems or conflicts, among other responsibilities.

The City is also a member of the Upper Kings Basin Integrated Regional Water Management Authority that coordinates water resources planning and projects that address groundwater,

water conservation and efficiency, water quality, riparian habitat, flood corridors, and disadvantaged communities in the Upper Kings Basin Region.

1.2.1 City and County Notification

The City sent a notice to Fresno County on January 3, 2013 that the UWMP was being reviewed, modified, and prepared. A copy of the notice of intent to adopt is provided in Appendix A.

1.2.2 Public Comment and Hearing

The City has provided opportunities for public review and comment of the 2010 UWMP. Notices of public hearings were placed in the local newspaper and posted at the City office. A copy of the notice is provided in Appendix B. The public notice stated that the UWMP was being updated and that the public was encouraged to provide oral and written comments on the Draft UWMP. This UWMP was finalized after the public review period and was placed on the City's website.

On August 13, 2013 the City conducted a public hearing at Reedley City Hall to hear and discuss any comments from the public prior to adopting the UWMP. This hearing provided an opportunity for the City's customers/residents and employees in the area to learn about the water supply situation and plans for providing a reliable, safe, high-quality water supply for the future.

1.3 Plan Adoption, Submittal, and Implementation

The 2010 UWMP was prepared during the spring of 2013. The updated plan was adopted by the City Council at the August 13, 2013 Council meeting, and will be submitted to the California Department of Water Resources (DWR) within 30 days of City Council approval. A copy of the resolution is provided in Appendix C.

Within 30 days of submitting the UWMP to the DWR, the adopted UWMP will be submitted to the California State Library and the County of Fresno. The adopted UWMP will also be available for public review at the City Hall, located at 1733 Ninth Street, Reedley CA 93254.

This UWMP will be implemented to meet the 2015 and 2020 urban water use targets. Daily per capita urban water use will be decreased throughout the service area by implementing the water conservation measures described in Section 6.

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2. System Description

This section provides a description of the City's water system including a description of the climate, population, and demographics. This section also provides descriptions of the distribution system.

2.1 Description of City and Service Area

The City is located along the Kings River in the central San Joaquin Valley of Fresno County and approximately 25 miles southeast of the City of Fresno and 20 miles northwest of Visalia. The City covers approximately 5.08 square miles and serves a population of approximately 24,000 through about 6,000 active service connections[1]. The City's service area boundaries are illustrated in Figure 2-1.

The City owns and operates a potable water system supplied by six active wells. Two wells are currently offline because of poor water quality issues, and a new tank is currently being constructed. Water is treated with 12 percent sodium hypochlorite and pumped directly from the wells to the distribution system. The City currently uses groundwater to meet 100 percent of its water demand. As described in Table 2-1, the City's potable water distribution system includes approximately 83 miles of water mains and two[2] elevated treated water storage tanks with a total nominal storage capacity of 100,000 gallons. The City treats water directly at the groundwater wells for a combined total capacity of 12.5 million gallons per day (MGD).

**Table 2-1
Summary of Potable Water Facilities**

Facility	Value
Miles of pipeline	83
Number of storage tanks	2
Total storage tank capacity	100,000 gallons
Number of wells in service	6
Total well capacity	12.5 MGD
Average daily well production	5.3 MGD

Figure 2-2 illustrates the location of the City's wells and the distribution system. Pipelines range from 3/4-inch diameter pipes that connect customers' water meters to the City's mains to larger 12-inch transmission pipelines. The pipelines are made of various materials, depending on when and where they were installed. Pipeline materials in the distribution system include asbestos cement, cast iron, concrete, PVC, and steel.

[1] Based on Department of Water Resources Public Water System Statistics report submitted in 2011.
[2] The new 1.5 MG Sports Complex Water Tower is currently under construction with an estimated completion/ online date in late 2013.

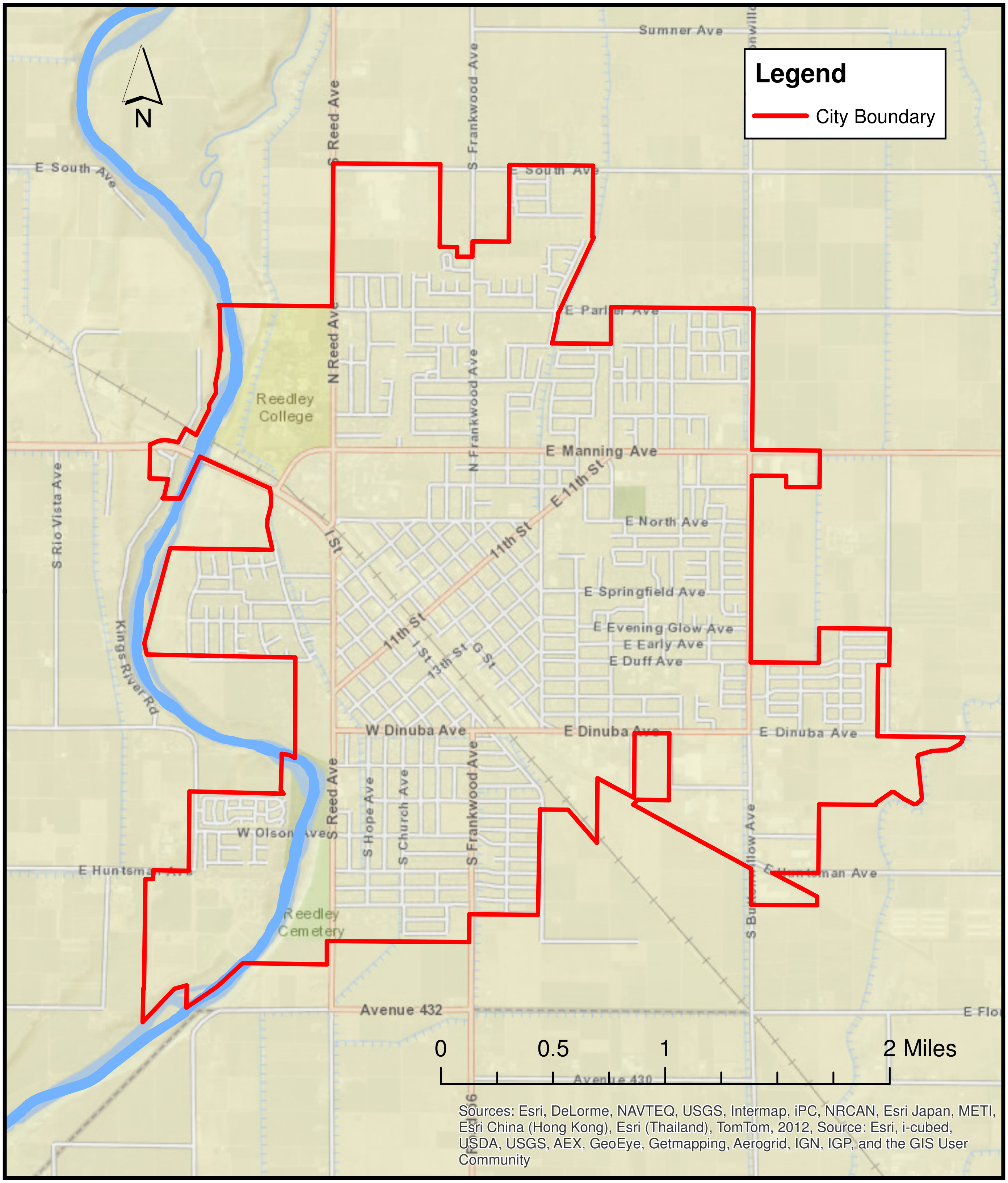

Figure 2-1. Existing Service Area

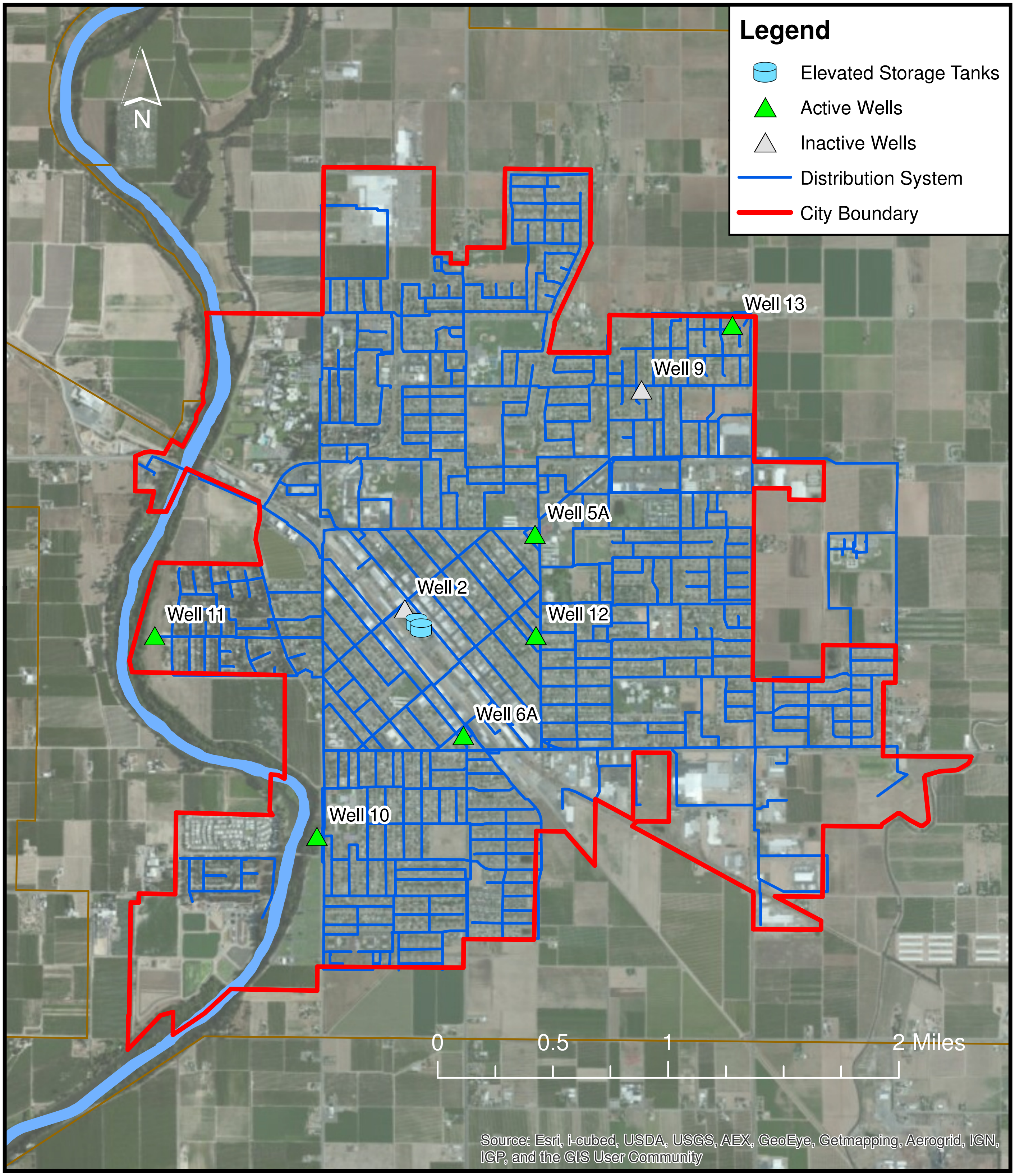

Figure 2-2. Distribution System

2.2 Climate

The City has a semi-arid climate. Summers are hot and dry with average monthly highs near 100° F, and winters are mild and slightly wetter with average monthly lows near 35° F. The annual average precipitation is 12-14 inches, mostly occurring between the months of November and April. The evapotranspiration rate (ETo), which is an indicator of how much water is required to maintain healthy agriculture and landscaping, ranges from 0.89 to 8.06 in/month and averages 6 ft per year, with highest ETo occurring in the months of May through October. The difference between precipitation and ETo can be thought of as the crop water demand that must be met with applied water. Table 2-2 summarizes the temperature, rainfall, and ETo averages for the service area.

Table 2-2
Service Area Climate

	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo[a]	inches	0.85	1.76	3.30	4.84	6.83	7.80	8.67	7.69	5.67	3.54	1.65	0.73	53.33
Rainfall[b]	inches	2.46	2.69	2.69	1.16	0.52	0.26	0.08	0.02	0.35	0.69	1.71	1.82	14.44
Average Max Temperature[2]	°F	55.8	63.2	69.1	77.3	84.2	91.7	97.8	97.1	90.3	80.3	64.4	55.5	77.4
Average Min Temperature[2]	°F	35.2	39.1	43.2	47.3	52.4	58.5	63.1	60.9	56.2	48.4	39.5	35.1	48.4

[1] From California Irrigation Management System, Site 142 Orange Cove.
[2] From Western Regional Climate Center. Orange Cove, CA (046476).

2.3 Service Area Population

The City of Reedley is dubbed the World's Fruit Basket because the City's primary industry is agriculture and manufacturing (shipping & packing) of fruit, primarily grapes, nectarines, plums, peaches, and citrus. Growth in the City, mainly residential in nature, has averaged about 3 percent per year since World War II. The 1990s and early 2000s had a declining trend from 3.6 percent to 2.4 percent per year.

Population estimates for the City's service area were calculated in accordance with DWR guidelines, *Methodologies for Calculation of Baseline and Compliance Urban per Capita Water Use* (DWR, February 2011).

Census data for the City was used to determine the population for the service area. The City water supply distribution area overlaps over 95 percent with the City's boundary. Because of the significant boundary overlap, the City is considered a Category 1 Water Supplier per the Methodology 2: Service Area Population criteria described in *Methodologies for Calculation of Baseline and Compliance Urban per Capita Water Use*. DWR recommends Category 1 suppliers use population data from the California Department of Finance, Demographic Research Unit (DRU-CDF) as the preferred method of obtaining population statistics for the service area.

Table 2-3 shows the historic population within the incorporated City and service area based on DRU-CDF data.

Table 2-3
Population and Consumption Trends within the City's Service Area

Year	Population	Water Production[a] (ac-ft/yr, potable)
1920	2,447	na
1930	2,589	na
1940	3,170	na
1950	4,135	na
1960	5,850	na
1970	8,131	na
1980	11,071	3,635
1990	15,791	4,229
1995	18,757[b]	4,616
2000	20,756	5,002
2005	21,447[b]	5,385
2010	24,194	4,722
2011	24,407	4,450

a) No information available on water production before 1980 (na = not available).
b) Population estimate for January 1. All other population estimates use an April 1 census date.

Table 2-4 shows the estimated population for the City's service area for 2010 through 2035. The projected population is based on an estimated growth rate of 3 percent per year for the 25 year projection period, and is consistent with future population growth rates presented in the City of Reedley Draft General Plan for 2030.

Table 2-4
Population — Current and Projected

	2010	2015	2020	2025	2030	2035	Data Source[b]
Service Area Population[a]	24,194	30,404	35,247	40,861	47,369	54,914	2010: DRU-CDF 2015-2035: GP 2030

a) Service area population is defined as the population served by the distribution system.
b) The population is based on Census data from the DRU-CDF for 2010 and projections from the City of Reedley General Plan 2030 (GP 2030) for 2015-2035.

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3. System Demands

The City's past, current and projected water demands are presented in this section. This section also includes a baseline water use calculation and defines specific water use targets to meet the 2020 goal of 20 percent water use reduction. Current water demand is provided by water use sector and projected to 2035 in five-year increments. Current system losses are also provided and projected to 2035.

3.1 Baselines and Targets

The following sections describe the methods used to calculate the baseline water use and targets:

- **Baseline daily per capita water use:** The amount of water used within the City's distribution system area on a per capita basis.
- **Urban water use target:** The amount of water planned to be delivered in 2020 to each resident within the City's distribution system area, taking into account water conservation practices that are currently in place or which will be implemented.
- **Interim urban water use target:** The planned daily per capita water use in 2015, a value halfway between the baseline daily per capita water use and the 2020 urban water use target.

3.1.1 Base Period Ranges

Two baseline periods must be evaluated to calculate the base daily per capita water use:

- **10- to 15-Year Base Period:** This is a 10-year or 15-year continuous period used to calculate baseline per capita water use.
    - If recycled water makes up less than 10 percent of 2008 water deliveries, a continuous 10-year period is used.
    - If recycled water makes up 10 percent or more of 2008 water deliveries, a continuous 10- to 15-year period can be used.
- **5-Year Base Period:** This is a continuous 5-year period used to determine whether the 2020 per capita water use target meets the legislation's minimum water use reduction requirements of at least a 5 percent reduction per capita water use.

The base period is used to calculate a base daily per capita water use, which is the baseline for computation of required future reductions. The City's 2008 water deliveries are shown in Table 3-1. As shown, the City did not use recycled water in 2008. Therefore, a 10-year base period is required to calculate the baseline per capita water use. The baseline period of 1999 through 2008 was used. Table 3-1 also shows the 5-year base period (2003-2007) used to calculate the minimum water use reduction requirement.

Table 3-1
Base Period Ranges

Base	Parameter	Value	Units
10- Year Base Period	2008 total water deliveries	6,014	ac-ft
	2008 total volume of delivered recycled water	0	ac-ft
	2008 recycled water as a percent of total deliveries	0%	percent
	Number of years in base period[1]	10	years
	Year beginning base period range	1999	
	Year ending base period range	2008	
5-Year Base Period	Number of years in base period	5	years
	Year beginning base period range	2003	
	Year ending base period range	2007	

1) The 2008 recycled water as a percent of total deliveries is less than 10 percent. Therefore, the first base period is a continuous 10-year period.

3.1.2 Base Daily Per Capita Water Use

The daily per capita water use was calculated for each year in the base period by dividing the gross water use by the distribution system population. The daily per capita water use for the 10-year base period is shown in Table 3-2. The base daily per capita water use is calculated as the average daily per capita water use over the 10-year period. Multiplying the 10-year based daily per capita water use 0.80 results in a value of 215 gpcd, the water use target under the Method 1 calculation (elaborated in Section 3.1.3).

Table 3-2
Base Daily Per Capita Water Use — 10-Year Range

Base Period Year		Distribution System Population	Daily System Gross Water Use (mgd)	Annual Daily Per Capita Water Use (gpcd)
Sequence Year	Calendar Year			
Year 1	1999	20,291	4.80	236
Year 2	2000	20,756	4.47	215
Year 3	2001	20,785	4.80	231
Year 4	2002	20,786	5.24	252
Year 5	2003	20,818	11.47	551
Year 6	2004	20,951	5.79	276
Year 7	2005	21,447	4.81	224
Year 8	2006	21,961	5.48	249
Year 9	2007	23,227	5.28	227
Year 10	2008	23,811	5.37	225
			Base Daily Per Capita Water Use	**269**
			Base Daily Per Capita Water Use x 0.80	**215**

The daily per capita water use for the 5-year base period is shown in Table 3-3. The base daily per capita water use is calculated as the average daily per capita water use over the 5-year period. Multiplying the 5-year base daily per capita water use by 0.95 results in a value of 290 gpcd. The 2020 per capita water use target cannot exceed this value.

Table 3-3
Base Daily Per Capita Water Use — 5-Year Range

Base Period Year		Distribution System Population	Daily System Gross Water Use (mgd)	Annual Daily per Capita Water Use (gpcd)
Sequence Year	Calendar Year			
Year 1	2003	20,818	11.47	551
Year 2	2004	20,951	5.79	276
Year 3	2005	21,447	4.81	224
Year 4	2006	21,961	5.48	249
Year 5	2007	23,227	5.28	227
			Base Daily Per Capita Water Use	**306**
			Base Daily Per Capita Water Use x 0.95	**290**

3.1.3 Water Use Targets

As described in the *Methodologies for Calculation of Baseline and Compliance Urban per Capita Water Use,* an urban water use target for the year 2020 and an interim water use target for the year 2015 must be set using one of four methods:

- **Method 1:** Eighty percent of the water supplier's baseline per capita water use.
- **Method 2:** Per capita daily water use estimated using the sum of performance standards applied to indoor residential use; landscaped area water use; and CII uses.
- **Method 3:** Ninety-five percent of the applicable state hydrologic region target as stated in the State's April 30, 2009, draft 20x2020 Water Conservation Plan.
- **Method 4:** An alternative approach developed by the DWR that takes into consideration water loss, conservation program saturation, and a number of other factors.

Method 1 was used to determine the City's water use target. The 2020 urban water use target for Method 1 (based on 80% of the 10-year base daily per-capita water use) is 215 gpcd. The maximum allowable target in 2020, based on 95 percent of the 5-year base daily per capita water use, was determined to be 290 gpcd. The 2020 target of 215 gpcd is less than the maximum allowable 290 gpcd. Therefore, no further adjustment to the 2020 target is required.

The interim water use target for year 2015 of 242 gpcd was estimated as the mid-point between the 10-year baseline per capita water use of 269 gpcd and the 2020 target of 215 gpcd. A summary of the water use targets is provided in Table 3-4.

Table 3-4 Baseline and Water Use Targets	
Water Use Target	**Daily Per Capita Water Use (gpcd)**
Baseline	269
Interim Water Use Target (2015)[1]	242
Urban Water Use Target (2020)[1]	215

1) Targets are based on Method 1.

3.2 Water Demands

This section quantifies past, current, and future water demands by water use sectors (i.e. single family residential, multi-family residential, commercial/ institutional, industrial, landscape, agriculture, etc.). Water use projections are also provided for recycled water, water losses, and low income single family and multi-family housing units.

3.2.1 Actual Water Deliveries

Current water use was quantified and distributed between water use sectors. The actual number of accounts and water deliveries are summarized in Table 3-5 for the year 2006 and in Table 3-6 for the year 2011. 2011 was the first full year that water use was metered and recorded. Although the number of City accounts has increased between 2006 and 2011, the overall water delivery has dropped substantially.

Table 3-5
Water Deliveries — Actual, 2006

Water Use Sectors	2006				
	Metered		Not Metered		Total
	Number of Accounts	Volume (ac-ft/yr)	Number of Accounts[1]	Volume[2] (ac-ft/yr)	Volume (ac-ft/yr)
Single Family	0	0	5,046	3,955	3,955
Multi-Family	0	0	0	763	763
Commercial/ Institutional	0	0	310	1,088	1,088
Industrial	0	0	0	39	39
Landscape	0	0	0	290	290
Agriculture	0	0	0	0	0
Other	0	0	0	0	0
Total	**0**	**0**	**5,356**	**6,135**	**6,135**

1) Number of accounts reported to DWR in 2006.
2) Estimated values based on proportional distribution for 2011 as presented in Figure 3-1 and total produced water reported to DWR in 2006. The total reported water delivery values include system losses.

Table 3-6 Water Deliveries — Actual, 2011					
Water Use Sectors	2011				
	Metered[1]		Not Metered		Total
	# of Accounts	Volume (ac-ft/yr)	# of Accounts	Volume (ac-ft/yr)	Volume (ac-ft/yr)
Single Family	5,125	2,530	0	0	2,530
Multi-Family	230	488	0	0	488
Commercial/ Institutional	544	696	0	0	696
Industrial	7	25	0	0	25
Landscape	41	186	0	0	186
Agricultural Irrigation	0	0	0	0	0
Other	0	0	0	0	0
Total	**5,947**	**3,925**	**0**	**0**	**3,925**

1) Total metered delivery (3925 ac-ft/yr) does not include system losses and is lower than total produced water (4450 ac-ft/yr) reported to DWR.

The distribution of water use among the water use sectors for 2011 is illustrated in Figure 3-1. The number of water service connections and volume of water served provide insight into different customers' water use, which can be useful in defining effective water conservation measures. Most service connections are single family residential which on average represents about 64 percent of the total demand.

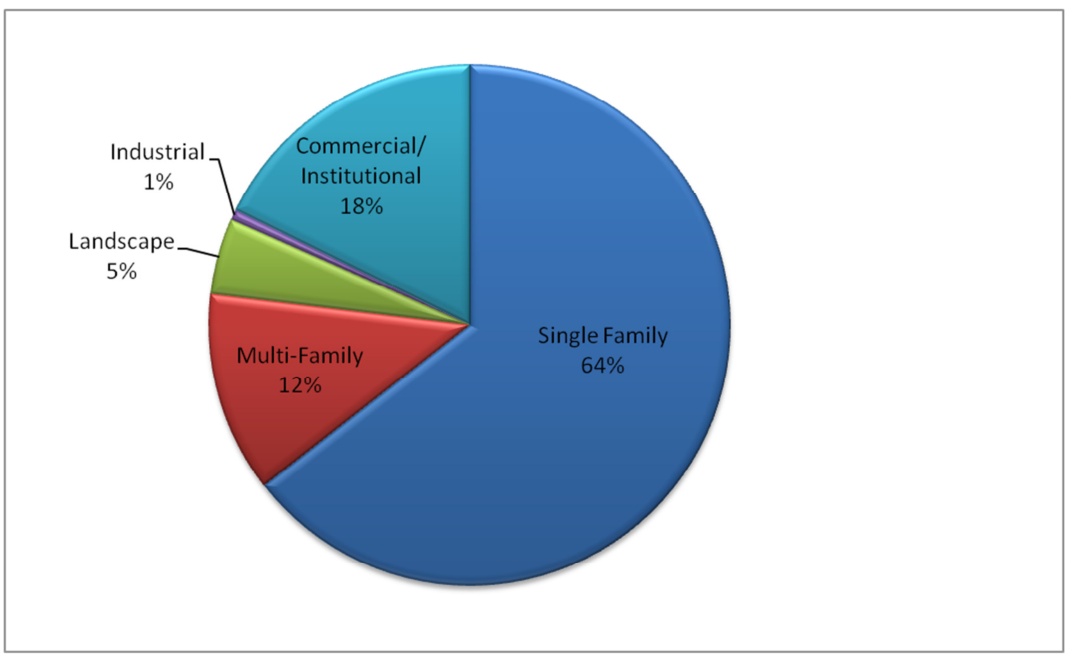

Figure 3-1. Distribution of Water Use among Water Use Sectors

3.2.2 Projected Water Deliveries

Water demand projections were developed through 2035 using the following information:

- 2008-2011 data including population, level of water use, and baseline accounts in each customer category.
- Assumptions on how residential or commercial future use is projected and the percent of water losses including unmetered and unbilled uses.
- City estimated population growth projections.

Table 3-7 provides a summary of water demand projections for the year 2015. The projected per capita water use is about 180 gpcd (including water losses presented in Table 3-11). This is lower than the 2015 target of 242 gpcd. The City's per capita water demands have been significantly reduced in recent years through water conservation efforts, including the implementation of metering with commodity rates. The City's conservation program is described further in Chapter 6.

Table 3-8 provides a summary of water demand projections for the year 2020. The projected per capita water use is also about 180 gpcd (including water losses presented in Table 3-11), which meets the 2020 target of 215 gpcd.

Table 3-7
Water Deliveries — Projected, 2015

Water Use Sectors	2015				
	Metered		Not Metered		Total
	# of Accounts	Volume (ac-ft/yr)	# of Accounts	Volume (ac-ft/yr)	Volume (ac-ft/yr)
Single Family	5,768	3,494	0	0	3,494
Multi-Family	259	674	0	0	674
Commercial	612	257	0	0	257
Industrial	8	35	0	0	35
Landscape	46	961	0	0	961
Agriculture	0	0	0	0	0
Other	0	0	0	0	0
Total	**6,693**	**5,421**	**0**	**0**	**5,421**

Table 3-8 Water Deliveries — Projected, 2020					
Water Use Sectors	2020				
	Metered		Not Metered		Total
	# of Accounts	Volume (ac-ft/yr)	# of Accounts	Volume (ac-ft/yr)	Volume (ac-ft/yr)
Single Family	6,687	4,051	0	0	4,051
Multi-Family	300	781	0	0	781
Commercial	709	298	0	0	298
Industrial	9	40	0	0	40
Landscape	53	1,114	0	0	1,114
Agriculture	0	0	0	0	0
Other	0	0	0	0	0
Total	**7,758**	**6,284**	**0**	**0**	**6,284**

Table 3-9 provides a summary of water demand projections for 2025 through 2035. The City's continued conservation efforts are projected to maintain the per capita water use below the 2020 target of 215 gpcd to about 180 gpcd by 2035.

Table 3-9 Water Deliveries — Projected 2025, 2030, and 2035						
Water Use Sectors	2025		2030		2035	
	Metered		Metered		Metered	
	# of Accounts	Volume (ac-ft/yr)	# of Accounts	Volume (ac-ft/yr)	# of Accounts	Volume (ac-ft/yr)
Single Family	7,752	4,696	8,987	5,444	10,418	6,311
Multi-Family	348	905	403	1,049	467	1,216
Commercial	822	345	953	400	1,105	464
Industrial	10	46	12	53	14	61
Landscape	61	1,291	71	1,497	82	1,735
Agriculture	0	0	0	0	0	0
Other	0	0	0	0	0	0
Total	**8,993**	**7,283**	**10,426**	**8,443**	**12,086**	**9,787**

3.2.3 Sales to Other Water Agencies

The City does not routinely sell water to any other agency and does not plan to do so in the future, as shown in Table 3-10. In 2013, the City of Orange Cove purchased a small amount (approximately 10,000 gallons) of water, hauled by water truck. In the future, any water sold to outside agencies would occur infrequently or on an emergency basis.

Table 3-10 Sales to Other Water Agencies (ac-ft/yr)								
Retail Agency	2006	2011	2013	2015	2020	2025	2030	2035
City of Orange Cove	0	0	0.03	0	0	0	0	0
Total	0	0	0.03	0	0	0	0	0

3.2.4 Additional Water Uses and Losses

Additional water uses not accounted for in Table 3-5 through Table 3-9 are provided in Table 3-11.

Table 3-11 Additional Water Uses and Losses (ac-ft/yr)							
Water Use[a]	2006[a]	2011	2015	2020	2025	2030	2035
Saline Barriers	0	0	0	0	0	0	0
Groundwater Recharge	0	0	0	0	0	0	0
Conjunctive Use	0	0	0	0	0	0	0
Raw Water	0	0	0	0	0	0	0
Recycled Water	0	0	0	0	0	0	0
System Losses	N/A	526	726	842	976	1,131	1,311
Other	0	0	0	0	0	0	0
Total	N/A	526	726	842	976	1,131	1,311

a) No metered delivery or loss data available. Total water use estimated to be total well production.

Unaccounted for water, or water loss, is defined to be the difference between water produced and water sold to customers. Unaccounted for water use normally includes unmetered water use such as for fire protection, system leaks, and unauthorized connections. Unaccounted for water can also result from meter inaccuracies. Unaccounted water uses and real losses are listed as "system losses" in Table 3-11. In California, unaccounted for urban water generally ranges from 6 to 15 percent. In 2011, the City's average unaccounted water was approximately 11.8% percent.

3.2.5 Total Water Use

The City's total water demands are summarized in Table 3-12.

Table 3-12 Total Water Use (ac-ft/yr)							
Water Use	2006[a]	2011	2015	2020	2025	2030	2035
Total Water Deliveries	N/A	3,925	5,421	6,284	7,283	8,443	9,787
Sales to Other Water Agencies	0	0	0	0	0	0	0
Additional Water Uses and Losses	N/A	526	726	842	976	1,131	1,311
Total	**6,135**	**4,451**	**6,147**	**7,126**	**8,259**	**9,574**	**11,098**

a) No metered delivery or loss data available. Total water use estimated to be total well production..

3.2.6 Lower-Income Projected Water Demands

State legislation (SB 1087 and Government Code §65589.7), effective January 1, 2006, specifies that local water agencies and sewer districts must grant priority for service hook-ups to projects that help meet the community's fair housing need.

A lower-income household is defined as a household that earns less than 80 percent of the median income, adjusted for family size. Based on the *Fresno County Regional Housing Needs Allocation Plan*, (FCOG, 2007), the number of new lower income households to be constructed between 2006 and 2013 is about 485 housing units, or approximately 40 percent of the total new construction over the same period. This percentage was applied to the total number of new construction units occurring between 2015 and 2035 to estimate the number of lower-income households.

Table 3-13 provides a summary of lower-income water demands. These water use projections are included in the overall water use projections provided in Table 3-7 through Table 3-9.

Table 3-13 Lower-Income Projected Water Demands (ac-ft/yr)					
	2015	2020	2025	2030	2035
Lower-Income Water Demands (ac-ft/yr)[a]	1,684	1,953	2,263	2,624	3,042

a) Lower-Income water demands are included in the total water use projections provided in Table 3-7 through Table 3-9.

3.3 Imported Water Demand Projections

The City does not import water from any wholesale supplier as shown in Table 3-14. There is currently no other wholesale or retail supplier operating within the City limits.

Table 3-14 Retail Agency Demand Projections Provided to Wholesale Suppliers (ac-ft/yr)							
Wholesaler	Contracted Volume	2010	2015	2020	2025	2030	2035
None	0	0	0	0	0	0	0

3.4 Water Use Reduction Plan

The City plans to achieve compliance with the water use targets through water conservation, including metering with commodity rates. The recent implementation of metering and use of commodity rates resulted in a significant reduction in per capita use, from approximately 249 gpcd in 2006 to 180 gpcd in 2011.

The City adopted a tiered rate structure which became effective May 1, 2010. The inclining block structure encourages conservation and discourages waste of potable water supplies by charging higher prices for excessive water uses.

As discussed in Section 3.2.1, although the number of connections has increased in recent years, water deliveries have decreased. The decline in total water demand is reflective of the enhanced levels of conservation taking place. Conservation is expected to continue over the planning horizon, as described further in Section 6.

With water conservation, the estimated daily per capita water use for 2015 and 2020 is shown in Table 3-15. Based on these estimates, the interim and 2020 water use reduction targets will be achieved.

Table 3-15
Projected Per Capita Use

Year	Water Use Target (gpcd)	Daily Per Capita Water Use (gpcd)
2015	242	180
2020	215	180

4. System Supplies

This section describes existing and future sources of water available to the City. It includes a description of each water source, source limitations, water quality, and future opportunities.

4.1 Water Sources

The City's water supplies are 100 percent groundwater pumped from the Kings Subbasin. Table 4-1 provides a summary of current and projected water supplies. Each water supply is described further in the following sections.

Table 4-1
Water Supplies — Current and Projected (ac-ft/yr)

Water Supply Sources	2010[a]	2015	2020	2025	2030	2035
Wholesale Supply	0	0	0	0	0	0
Supplier-Produced Groundwater	4,722	6,147	7,126	8,259	9,574	11,098
Supplier-Produced Surface Water	0	0	0	0	0	0
Transfers In	0	0	0	0	0	0
Exchanges In	0	0	0	0	0	0
Recycled Water	0	0	0	0	0	0
Desalinated Water	0	0	0	0	0	0
Total	**4,722**	**6,147**	**7,126**	**8,259**	**9,574**	**11,098**

a. Source: Public Water System Statistics, 2010.

4.2 Imported Water Supplies

The City does not import water or purchase from a wholesale supplier and does not intend to do so in the future, as shown in Table 4-2.

Table 4-2
Wholesale Supplies — Existing and Planned Sources of Water (ac-ft/yr)

Wholesale Sources	Contracted Volume	2015	2020	2025	2030	2035
None[a]	0	0	0	0	0	0

a. The City does not import water or purchase water from a wholesale supplier.

4.3 Existing Groundwater Supplies

The City relies on groundwater pumped from the Kings Subbasin as its sole source of supply. The City currently operates 6 groundwater wells within the subbasin to meet water demands in the service area.

4.3.1 Description of Groundwater Subbasin[3]

The Kings Subbasin is part of the San Joaquin Hydrogeologic Basin, which straddles portions of both the Sacramento and San Joaquin Valleys in Fresno, Kings, and Tulare County. The Basin occupies 976,000 acres and is bordered to the north by the San Joaquin River. The subbasin is bordered to south by the southern fork of the Kings River and the northern boundaries of the Empire West Side Irrigation District and Kings County Water District, southern boundaries of Laguna, Consolidated, and Alta Irrigation Districts, and western boundary of Stone Corral Irrigation District. The eastern boundary of the subbasin is the alluvium-granite rock of the Sierra Nevada. The western boundary is the eastern boundaries of the Delta-Mendota and Westside Subbasins.

The subbasin is primarily comprised of marine deposits from periodic inundation of the Pacific Ocean and continental deposits from erosion of surrounding mountains. The principal aquifers consist of unconsolidated continental deposits, i.e. older deposits from the Tertiary and Quaternary age overlain with younger deposits from the Quaternary age, and coarse oxidized deposits of the alluvium. Quaternary deposits consist of older alluvium, lacustrine and marsh deposits, younger alluvium, flood-basin deposits, and sand dunes. The older alluvium is the most important aquifer in the subbasin and yields from these wells can reach above 3000 gpm. The flood-basin, lacustrine, and marsh deposits located in the western part of the sub-basin consist of silt and clay that restrict vertical movement of water and do not produce appreciable wells. In the Reedley area, the soils are typically coarse sands with high percolation rates and specific yields, but areas of clay soils exist in some areas.

Groundwater recharge comes from river, stream, and canal seepage, percolation of irrigation water, and intentional recharge. For the most part, the groundwater table in the Reedley area is dependent on snow melt and runoff in canals and ditches of the Alta Irrigation District as well as recharge from the Kings River. Snow pack in the Sierra Nevada to the east is variable and therefore total water supply to the area is subject to wide fluctuations in volume. Groundwater pumping is inversely proportional to the surface water supply available in the region, and in years when there is limited surface water available for irrigation, the groundwater levels experience a decline.

In general, groundwater flow is to the southwest based on contours mapped by DWR in recent years, including the area of the City and vicinity.[4] The estimated storage in the subbasin was 93 million ac-ft with a depth of 1,000 ft or less. Well depths range from 100 to 500 ft, with an average depth of 210 ft. Well yields range from 20,000-30,000 gpm and average 500-1,500 gpm for municipal and irrigation wells. Specific yield in the subbasin ranges from 0.2 percent to 36 percent, with an average specific yield estimated to be 11.3 percent.

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[3] Information on groundwater characteristics of the Kings Subbasin for Sections 4.3.1-4.3.3. was provided by Department of Water Resources, *California's Groundwater*, Bulletin 118 (Update 2003).
[4] Schmidt, Kenneth D and Associates, *Groundwater Pumping, Recharge, and Consumptive Use in the Proposed City of Reedley Sphere of Influence*, May 2013 (Draft).

Historical multi-year droughts in the Subbasin include: 1912-13, 1918-20, 1923-24, 1929-34, 1947-50, 1959-61, 1976-77, 1987-92, and most recently 2007-09 drought. Per Bulletin 118, most wells showed a response to the drought of 1976-1977. After the 1987-1992 drought, well levels in the northeast subbasin showed declines of 10 to 40 ft, and water levels in the western subbasin showed declines of 10 to 50 ft, although some have recovered to mid-1980's levels. Wells in the southeast basin have generally recovered to mid-1980's levels.

4.3.2 Groundwater Quality

Bicarbonate, calcium, magnesium, and sodium are the dominant ions in the subbasin groundwater and in the Reedley area. Groundwater is of the bicarbonate and calcium bicarbonate type, although chloride water does exist (though primarily in the western area). Moving west, the groundwater become more saline, higher in total dissolved solids (TDS), and contains higher sodium. Groundwater TDS seldom exceeds 600 mg/L but has been found at concentrations of up to 2,000 mg/L at depths from 700 to 3,000 ft. However, groundwater quality generally improves with depth in the typical range for water wells. TDS in the subbasin ranges between 200 to 700 mg/L. The City's latest Consumer Confidence Report (2011) showed an average TDS of 252 mg/L and a range of 100 to 400 mg/L.

Some chemical contaminants have been found in parts of the Kings Subbbasin. Along the eastern part of the basin, dibromochloropropane (DBCP), a soil fumigant nematicide and nitrates can be found in the groundwater. Along the western portion of the subbasin, shallow brackish groundwater is a water quality issue. In other localized areas of the subbasin, elevated concentrations of fluoride, boron, sodium, ethylene dibromide (EDB), and chlorinated VOCs such as trichloroethene (TCE), tetrachloroethene (PCE), and trichloropropane (TCP) can also be found.

In the Reedley area, DBCP, TCP, and nitrates are the contaminants of concern. In general, these contaminants result from applications over a large land area and are not present in concentrated plumes. Nitrates in the groundwater originate from fertilizer, sewage, livestock waste, and natural sources. DBCP has been banned, so the contaminant concentration should decrease over time. TCP, currently undergoing regulatory review by the State of California, is a byproduct or impurity of older pesticide and fumigant formulas and concentrations should also decrease over time.

The City's existing water supply meets all current water quality regulations and is expected to in the future. However, two wells (Well 2 and Well 9) are currently offline related to elevated levels of TCP above the State's drinking water notification level of 0.005 µg/L. In addition, test wells at the site of a new well (Well 14) currently undergoing construction have suggested potential groundwater contamination from DBCP and TCP. Water from the new Well 14 will be treated with granular activated carbon (GAC) to remove contaminants of concern to levels below State and Federal requirements.

4.3.3 Historic Groundwater Levels

The water table in the Reedley area is historically shallow, and in the early 20th century the depth to groundwater averaged 10 ft or less. Subsequent droughts and groundwater pumping in excess of long-term sustainable yield has resulted in a gradual decline in the groundwater levels over time, a trend that is expected to continue in the future. Modeling performed by the Kings River Conservation District estimated that the average overdraft in the Kings Subbasin between 1964 and 2004 was 161,000 ac-ft/yr.[5] Updated models in the 2012 *Upper Kings Basin Integrated Regional Water Management Plan* projected an average groundwater storage decline of 122,000 ac-ft/yr from 2011 to 2035.[6]

Groundwater levels in the Reedley area in the last five years showed a marked decrease during the last drought (2007-2009) but have somewhat recovered since that time. Groundwater contour maps, prepared by Alta Irrigation District, show that depth to groundwater levels increased from 55-65 ft in 2007 (first year of the drought) to 70-85 ft in 2009 (last year of the drought) and decreased back down to 50-60 ft in 2011.

Long-term water level measurements for eight wells near the City obtained from the Department of Water Resources indicate an average annual water level decline of 0.4 ft/year for the Reedley area.[7] Based on groundwater level declines for these wells, an overdraft of approximately 350 ac-ft/yr is estimated for the Reedley sphere of influence (SOI), much lower than the deficit estimated and reported in Section 4.3.4 below. The difference is attributable to groundwater inflow into the SOI from the north, east, and south parts of the subbasin.

4.3.4 Groundwater Management

The groundwater basin is not currently adjudicated. However, Bulletin 118-80, *Ground Water Basins in California*, published in 1980, identified the Kings Basin as being in critical condition of overdraft. The conditions were not reevaluated for the 2003 update to Bulletin 118. The overdraft in the Kings Basin was previously estimated by the KRCD to be an average of 161,000 ac-ft/yr from 1964-2004, with approximately 10 million ac-ft of groundwater mined in the last 50 years or so. KCRD models project that overdraft will average around 122,000 ac-ft/yr through 2035.

The groundwater deficit was estimated for the City's sphere of influence (SOI) in the 2013 report on *Groundwater Pumping, Recharge, and Consumptive Use in the Proposed City of Reedley Sphere of Influence*.[8] The SOI currently consists of approximately 4,900 acres and includes around 4,500 acres in AID and 400 acres in CID. In 2012, the total consumptive use in the existing SOI was estimated to be 5,650 ac-ft, including 2,150 ac-ft for urban consumptive use and 3,500 ac-ft for irrigation consumptive use. The estimated amount of recharge into the

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[5] KRCD, *Upper Kings Basin Integrated Regional Water Management Plan*, 2007.
[6] KRCD, *Upper Kings Basin Integrated Regional Water Management Plan*, 2012.
[7] Schmidt, 2013.
[8] Ibid.

SOI was estimated to be 2,650 ac-ft, from canal/ditch surface water irrigation application (1,500 ac-ft/yr for) and canal/ditch recharge (1,150 ac-ft/yr). Therefore, the average water deficit for the City's existing SOI for 2012 was estimated to be approximately 3,000 ac-ft/yr.

The City is engaged in groundwater recharge projects and activities to reduce the consumptive use of groundwater. For example, the City currently recharges treated wastewater effluent from the WWTP using percolation ponds at the plant. The City also maintains nine stormwater percolation basins that also provide groundwater recharge, although the volume has not been quantified. The percolated wastewater and stormwater is subsequently pumped as groundwater for local crop irrigation.

In comparison to estimates for the City's SOI, AID has reported an average overdraft of 22,000 ac-ft/yr within AID boundaries (including parts of the City). AID has also monitored groundwater levels over the past 75 years, and has reported an overall declining groundwater trend for the area. The City's contribution to AID's reported overdraft was not analyzed for this plan.

AID is currently addressing overdraft and declining groundwater supplies in the area by engaging in groundwater recharge and banking projects. AID uses surface water to recharge groundwater both directly (when excess surface water is available) and indirectly (via unlined canals). AID also has two groundwater banking projects located in the eastern part of the District, Harder Pond and Travers Pond, that provide surface water to mitigate groundwater quality issues (used for drinking water) in the area. AID has also entered into a groundwater banking project with the City of Dinuba (a few miles southeast of the City) to help with a localized overdraft problem.

4.3.5 Groundwater Usage

The City is not restricted to a specific volume of groundwater from the Kings Subbasin. The amount of groundwater pumped in the last several years has been sufficient to meet the City's demands. A summary of the total volume of groundwater that has been pumped between 2005 and 2011 is shown in Table 4-3.

Table 4-3
Groundwater — Volume Pumped (ac-ft/yr)

Basin Name(s)	Metered or Unmetered	2005	2006	2007	2008	2009	2010	2011
Kings Subbasin	Metered[a]	5,385	6,135[b]	5,919	6,014	6,025	4,722	4,450[b]
Percent of Total Water Supply		100%	100%	100%	100%	100%	100%	100%

a. Reported values for total pumped groundwater are based data reported in the City's Public Water System Statistics, as reported to DWR.

b. Reported values for 2006 and 2011 include system losses and match values reported in Table 3-12 (do not match values reported for delivered water in Table 3-6).

In the future, the groundwater that will be used to supply the water demands for the City will also be drawn from the Kings Subbasin, which will continue to meet 100 percent of the City's needs. The projected volume of water to be pumped from the Kings Subbasin is shown in Table 4-4.

Table 4-4
Groundwater — Volume Projected to be Pumped (ac-ft/yr)

Basin Name(s)	2015	2020	2025	2030	2035 (opt)
Kings Subbasin	6,147	7,126	8,259	9,574	11,098
Percent of Total Water Supply	100%	100%	100%	100%	100%

4.4 Transfer Opportunities

Currently, the City has no transfer or exchange agreements with other water suppliers in the region. There are no short-term or long-term planned or potential future water exchanges in the region. It is infeasible for the City to purchase surface water rights, and therefore there is no current imperative to develop municipal surface water treatment plants. However, if urban lands continue to develop and rely exclusively on groundwater, and if recharge facilities are not developed to help meet future urban demands, treatment of surface water for municipal use in lieu of groundwater may be needed, according to the Consolidated Irrigation District (CID) *Groundwater Management Plan*.[9] Due to the City's proximity to AID and CID, it is conceivable that surface water could be supplied by these Districts or direct recharge or groundwater banking projects could facilitate exchanges in the future; however, nothing is planned at this time as shown in Table 4-5.

Table 4-5
Groundwater — Volume Projected to be Transferred (ac-ft/yr)

Transfer agency	Transfer or exchange	Short term or long term	Proposed Volume
Alta Irrigation District	0	0	0
Consolidated Irrigation District	0	0	0
Total	0	0	0

[9] CID, *Groundwater Management Plan*, March 2009.

4.5 Desalinated Water Opportunities

There are currently no plans to develop seawater desalination, as the City is not located in a coastal area. In addition, because the groundwater below the City it not brackish, there are no plans to develop brackish groundwater desalination projects. As a result, the City does not intend to pursue desalination to augment water supplies at this time.

4.6 Recycled Water Opportunities

Previous studies, including most recently the 2011 *City of Reedley WWTP Effluent Recycling Study* [10] found effluent recycling to be infeasible and/or too costly to be recommended as viable. The reuse alternatives considered direct farm irrigation of both private and City-owned (public) land, landscape and golf course irrigation, reuse by nearby irrigation districts, and reuse by an agricultural research field station. These alternatives would require (costly) tertiary treatment and disinfection to meet effluent requirements for irrigation of non-fodder farmland. In addition, irrigation by recycled water is more expensive than irrigation by groundwater or water provided by the irrigation districts. Therefore, there is currently no recycled water program in the City and no projections for the use of recycled water in the future, although the City will continue to monitor effluent reuse options. Currently, the City's wastewater effluent is discharged to percolation ponds for groundwater recharge.

4.6.1 Description of Wastewater Agencies and Quantities

Within the City's service area, there is a single wastewater treatment facility. The City's recently expanded 5 MGD wastewater treatment plant (WWTP) provides primary and secondary treatment along with centrifuge dewatering of solids and effluent reclamation via percolation ponds. The City's secondary effluent is not disinfected and is therefore classified as an "oxidized" (undisinfected secondary) wastewater according to Title 22, severely limiting the allowable uses of the effluent. Currently, the treated wastewater does not meet the recycled water standard. This volume and the volume of wastewater collected and treated at the City's WWTP is shown in Table 4-6.

Table 4-6
Recycled Water — Wastewater Collection and Treatment (ac-ft/yr)

Type of Wastewater	2005	2010	2015	2020	2025	2030	2035
Wastewater Collected & Treated in Service Area[a]	2,466	2,089	2,720	3,153	3,654	4,236	4,911
Volume that Meets Recycled Water Standard	0	0	0	0	0	0	0

a. Average dry weather flow (ADWF) for 2005. All other years are projected values based on estimates from historical ratio of groundwater production to sanitary sewer ADWF (at 2.26:1).

In the past, the City discharged small portions of wastewater effluent to the Kings River, but the NPDES permit was rescinded in 2006. Currently, 100 percent of the wastewater effluent is

[10] Carollo Engineers, *WWTP Effluent Recycling Study*, Letter Report for the City of Reedley, April 2011.

discharged to percolation ponds on the WWTP premises. Table 4-7 shows that the water currently being discharged does not meet the recycled water standard.

Table 4-7 Recycled Water — Non-Recycled Wastewater Disposal (ac-ft/yr)							
Method of Disposal	**Treatment Level**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Discharge to percolation ponds	Undisinfected Secondary	2,089	2,720	3,153	3,654	4,236	4,911
Discharge to Kings River[a]	Undisinfected Secondary	0	0	0	0	0	0
	Total	**2,089**	**2,720**	**3,153**	**3,654**	**4,236**	**4,911**

a. NPDES permit to discharge up to 1.75 MGD to the Kings River was rescinded in 2006.

4.6.2 Recycled Water Projections

As described in the previous sections, the City does not plan to implement a recycled water system now or in the future. Therefore, there are no plans to use recycled water at any location in the future, as shown in Table 4-8.

Table 4-8 Recycled Water — Potential Future Use (ac-ft/yr)							
User type	**Description**	**Feasibility[a]**	**2015**	**2020**	**2025**	**2030**	**2035**
Agricultural Irrigation	N/A	Infeasible	0	0	0	0	0
Landscape Irrigation	N/A	Infeasible	0	0	0	0	0
Commercial Irrigation	N/A	Infeasible	0	0	0	0	0
Golf Course Irrigation	N/A	Infeasible	0	0	0	0	0
Wildlife Habitat	N/A	Infeasible	0	0	0	0	0
Wetlands	N/A	Infeasible	0	0	0	0	0
Industrial Reuse	N/A	Infeasible	0	0	0	0	0
Groundwater Recharge	N/A	Infeasible	0	0	0	0	0
Seawater Barrier	N/A	Infeasible	0	0	0	0	0
Geothermal / Energy	N/A	Infeasible	0	0	0	0	0
Indirect Potable Reuse	N/A	Infeasible	0	0	0	0	0
		Total	**0**	**0**	**0**	**0**	**0**

a. Technical and economic feasibility.

The 2005 UWMP did not contain recycled water projections over the planning horizon, and Table 4-9 reflects both the current non-use and projected non-use of recycled water by use type.

Table 4-9 Recycled Water — 2005 UWMP Use Projection Compared to 2010 Actual (ac-ft/yr)		
Use Type	**2010 Actual Use**	**2005 UWMP Projection for 2010[a]**
Agricultural Irrigation	0	--
Landscape Irrigation	0	--
Commercial Irrigation	0	--
Golf course Irrigation	0	--
Wildlife Habitat	0	--
Wetlands	0	--
Industrial Reuse	0	--
Groundwater Recharge	0	--
Seawater Barrier	0	--
Geothermal / Energy	0	--
Indirect Potable Reuse	0	--
Other	0	--
Total	0	0

a. From the 2005 UWMP. No projections were provided for total recycled water use or distribution by use type.

Because the City has no plans to implement the use of recycled water, Table 4-10 shows no methods to encourage recycled water use in the future.

Table 4-10 Methods to Encourage Recycled Water Use (ac-ft/yr)						
Actions	**Projected Results**					
	2010	**2015**	**2020**	**2025**	**2030**	**2035**
Financial Incentives	0	0	0	0	0	0
Other	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**

4.6.3 Recycled Water Planning

The City has thoroughly explored ways to expand water recycling. However, the City's water recycling options have been found to be both too expensive and infeasible. The City may investigate opportunities and the potential for implementing a recycled water system again in the future.

4.7 Future Water Supply Projects

The City will require new water supply projects to enhance water supply and reliability in order to meet projected water demands in the future. A summary of the new water supply project is presented in Table 4-11. The City is also considering other future water supply projects, but the timing of these projects has not been determined at this time.

Table 4-11
Future Water Supply Projects (ac-ft/yr)

Project Name[a]	Projected Completion Date	Potential Project Constraints	Normal-Year Supply	Single-Dry Year Supply	Multiple-Dry Year First Year Supply	Multiple-Dry Year Second Year Supply	Multiple-Dry Year Third Year Supply
Sports Complex Water Tower and Well #14	2013	Groundwater Overdraft	2,500	2,500	2,500	2,500	2,500
		Total	**2,500**	**2,500**	**2,500**	**2,500**	**2,500**

a. Water volumes presented here have been accounted for in Table 4-1.

5. Water Supply Reliability and Water Shortage Contingency Planning

The UWMP Act requires that each water supplier provide an assessment of the reliability of its water supply during normal, dry, and multiple dry years. This section considers the impact on water supplies during a single extreme dry year and a multiple dry year period. In addition, a catastrophic water shortage could also occur, for example, as a result of earthquake damage, power outage, or water quality emergency. Thus, this section also presents the response to potential water shortages including catastrophic water supply interruption and drought.

5.1 Water Supply Reliability

Many factors could result in an inconsistency of the City's water supply, including limits on the amount available, water quality, climatic conditions, or a combination of these. Table 5-1 lists the City's sources of water supply and the potential factors that could impact the City's supply.

Table 5-1
Factors Resulting in the Inconsistency of Supply

Factors	Groundwater
Limitation Quantification	Reductions in groundwater table could impact pump well capacity.
Legal	Currently supply is available at a consistent level of use. Future supply increases may not be consistent due to delays in construction or environmental documentation.
Environmental	
Water Quality	Groundwater contamination by pesticides, herbicides, and/or nitrates could impact water quality. Treatment would be required for impacted water sources.
Climatic	Drought conditions could result in a reduction of the groundwater table, reducing water supply.

The City's best strategy to ensure future reliability of supply is to continue to use the groundwater aquifers as its primary source of water using sustainable management practices and conservation measures described in Section 6.

5.2 Water Shortage Contingency Plan

In accordance with Assembly Bill 11X, the City developed and adopted a Conservation Ordinance, Reedley City Ordinance, Title 8, Chapter 1, Article 12 (8-1-12), establishing a Water Shortage Contingency Plan. In addition, a catastrophic supply interruption plan based on the City's Emergency Operations Plan was developed in 2012. These plans are described in the following subsections.

5.2.1 Catastrophic Supply Interruption Plan

Catastrophic water shortages could occur as a result of earthquake damage, power outage, or water quality emergency. The City adopted an updated version of its Emergency Operations Plan (EOP) in June 2012 that provides guidance for emergency planning, organization, and response policies and measures for catastrophic event preparation through recovery. Although the plan is broad and covers emergencies beyond those affecting water supply, the plan does establish emergency organization, task assignment, and both general and specific procedures to help coordinate planning and response efforts for public works and utilities emergencies.

Emergency management may be divided into four phases:

- **Pre-Emergency Response:** When a disaster is inevitable, actions are precautionary and emphasize protection of life. Typical responses include:
  - Evacuation of threatened populations to safe areas
  - Advising threatened populations of the emergency and apprising them of safety measures to be implemented.
  - Advising the City Council and Fresno County Operational Area of the emergency.
  - Identifying the need for mutual aid and requesting such through the Fresno County Operational Area.
  - Requesting an emergency proclamation by local authorities.
- **Emergency Response:** During this phase, emphasis is placed on saving lives and property, controlling the situation and minimizing the effects of the disaster. Immediate response is accomplished by the City by timely and effective deployment of local government agencies.
- **Recovery Phase:** Recovery operations address the procedures for accessing Federal and state programs available for individuals, business, and public assistance following a disaster. Examples of recovery activities include:
  - Restoring utilities
  - Applying for state and federal assistance programs
  - Conducting hazard mitigation analysis
  - Identifying residual hazards
  - Determining and recovering costs associated with response and recovery
  - Demobilizing operations
  - After action reporting
- **Mitigation Phase:** Mitigation efforts occur both before and after disaster events. Eliminating or reducing the impact of hazards, which existing in the City and are a threat to life and property are part of the mitigation efforts. Mitigation tools include:
  - Local ordinances and statutes
  - Structural measures
  - Tax levies or abatements
  - Public information and community relations
  - Land use planning
  - Professional training

In the event of possible catastrophes, including earthquakes, regional power outage or other disaster, an Emergency Operations Center (EOC) will be opened, and the City's Emergency Operation Plan EOP will be followed. The Public Works Director will be in charge of coordinating the response to the public works.. In general, the responsibilities include the following:

- Coordinating all Public Works operations,
- Maintaining public facilities,
- Operating utilities and services and restoring those that have been damaged or destroyed, and
- Assisting other functions with traffic issues, search and rescue, transportation, etc. as needed.

Table 5-2 provides a summary of actions to be carried out during the emergency response.

Table 5-2
Preparation Actions for a Catastrophe

Actions and Duties	Summary of Actions
General Duties	Receive and process all field resource requests for Public Works resources
	Coordinate with EOC Logistics Section on acquisition of all resources and support supplies, transportation, materials, and equipment
	Determine the need for and location of general staging areas of unassigned resources
	Coordinate with the Facilities Unit of the EOC Logistics Section and participate in any action planning meetings pertaining to the establishment of additional locations
	Prioritize the allocation of resources to individual incidents, monitor resource assignments, and make adjustments based on assignments based on requirements.
	Provide for the procurement and distribution of potable water supplies and coordinate with the Health Branch on water purification notices.
EOC Start-up Actions	Ascertain if key Public Works personnel are in the EOC or have been notified
	Ensure all on-duty Public Works personnel have been alerted and notified of the current situation
	Ensure that all off-duty Public Works personnel have been notified of call-back status (when they should report), in accordance with current department emergency procedures
	Ensure that all Public Works personnel have completed status check on equipment, facilities, and operational capabilities
	Ensure that all field units begin the safety assessment survey of critical facilities and report status information to the EOC Planning/ Intelligence Section through the EOC Operations Section
Operational Duties	Receive and process all requests for Public Works resources
	Maintain backup power in the EOC
	Assure that all emergency equipment has been moved from unsafe areas
	Mobilize personnel, heavy equipment, and vehicles to designated general staging areas
	Obtain Public Works resources through the EOC Logistics Section, utilizing mutual aid process when appropriate
	Allocate available resources based on requests and EOC priorities
	Determine priorities for identifying, inspecting, and designated hazardous structures to be demolished

Table 5-2 Preparation Actions for a Catastrophe	
Actions and Duties	**Summary of Actions**
Operational Duties (Continued)	Ensure that sources of potable water and sanitary sewage systems are available and protected from potential hazards
	Develop priorities and coordinate with utility companies for restoration of utilities to critical and essential facilities
	In coordination with the Fresno County Department of Public Works, determine the status of the Disaster Routes and other transportation routes into and within the affected areas
	Determine present priorities and estimated times for restoration. Clear and reopen Disaster Routes on a priority basis
	Coordinate with the Law Branch to ensure the safety of evacuation routes following a devastating event
	Coordinate with the Supply Unit of the EOC Logistics Branch for sanitation service during an emergency
	Support cleanup and recovery operations during disaster events
	Clear debris from waterways to prevent flooding. Drain flooded areas, as needed
	Develop a debris removal plan to facilitate city cleanup operations
Water Management Duties	Determine the need to staff a water task group and secure resources through the Logistics Section
	Contact the Fresno County Department of Public Health, local water utilities, Public Works, Fire Department, Police Department, and other sources to compile situation information including: Cause and extent of water system damage for both domestic and fire hydrant systems • Estimate duration of system outage • Geographical area affected • Population affected • Actions taken to restore system • Resources needed to reactivate system • Emergency potable water needs (quantity and prioritized areas)
	Notify the Fresno County Operational Area EOC of the situation and need for mutual and participate in conference call as requested
	Contact Department of Health Services and request situation report for affected areas (including information non boil water order areas)
	Evaluate and prioritize potable water needs (quantity/ location/ duration - minimum two gallons per person per day)
	In coordination with the EOC Logistics Section, identify and obtain potable water resources (if necessary, recommend EOC Director request mutual aid to identify and/or obtain water resources).
	Identify and secure locations for water distribution points (e.g., parks, city halls, shelters, etc.)
	In coordination with the EOC Logistics Section, identify and secure staff resources needed to operate water distribution points (if necessary, recommend that the EOC Director request mutual aid to obtain required staff resources)
	Consult with the Department of Health Services District Office, water utilities and PIO for appropriate public information announcements and media interface
	Transmit the Finance/ Administration Section data on costs incurred in EOC effort to purchase and distribution potable water

The City also evaluates, on an on-going basis, its ability to respond to customer needs in an emergency situation. These efforts include the following:

- Identification of water-dependent customers (medical care facilities and critical-care individuals)
- Establishment of a temporary emergency office site
- Purchase and storage of emergency supplies (food, water, tools, shelter)
- Evaluation and integration of mutual aid programs with neighboring agencies and independent contractors
- Purchase of mobile generators to run multiple pump sites in all pressure zones

The City operates a radio controlled telemetry system which is used to monitor tank and pump levels from remote locations. This system provides a fast response time to dramatic drops in water levels and pressure.

Emergency response is an ongoing process and staff will continue to look for areas of improvement and enhancements to respond to water quality and quantity problems in emergency circumstances.

5.2.2 Water Conservation and Water Shortage Contingency Plan

In the event of a severe water shortage, the City's water supplies will be restricted. A description the water emergency stage and criteria is provided in Table 5-3.

Table 5-3
Water Shortage Contingency — Water Supply Conditions and Rationing Levels

Stage No.	Water Supply Conditions	% Reduction
All Stages, Emergency	In the event that an immediate water supply shortage occurs due to the breakage or failure of a tank, pump, pipeline or conduit causing an immediate emergency, the Public Works Director shall declare the extent of the water supply shortage emergency and, after allocating and setting aside the amount of water necessary for domestic use, sanitation and fire protection, shall determine and implement the appropriate water supply shortage restrictions.	To be determined in Special Meeting by the City

5.2.3 Water Waste Prohibitions

The City has implemented on-going prohibitions to reduce water waste through the City's Water Conservation Ordinance (Appendix D), Reedley City Ordinance, Title 8, Chapter 1, Article 12 (8-1-12), adopted in March 2008. All requirements of this Ordinance are in effect under normal conditions. The Water Conservation Ordinance minimizes outdoor water use and reduces unnecessary use of the potable water and applies to all persons, customers, and property within in the City limits. Table 5-4 provides a summary of on-going and dry period prohibitions. Additional mandatory prohibitions during an acute water shortage will be determined in a Special Meeting by the City, per Section 5.2.2.

Table 5-4
Water Conservation Ordinance — Mandatory Prohibitions

Prohibitions	When Prohibition Becomes Mandatory
Restrictions on Water Waste: • The use of water which allows substantial amounts of water to run off to a gutter, ditch, or drain. Every water user is deemed to have his water distribution lines and facilities under his control at all times and to know the manner and extent of his water use and excess runoff. • The excessive use, loss, or escape of water through breaks, leaks or malfunctions in the water user's plumbing or distribution facilities for any period of time after such escape of water should reasonably have been discovered and corrected. It shall be presumed that a period of forty eight (48) hours after discovery is a reasonable time within which to correct such a leak or break. • The washing of vehicles, building exteriors, sidewalks, driveways, parking areas, tennis courts, patios, or other paved areas without the use of a positive shutoff nozzle on the hose, which results in excessive runoff	On-Going
Restrictions on Irrigation: • Installation of Lawn Sprinkling Systems: Lawn sprinkling system/devices shall be properly designed, installed, maintained and operated to prevent overuse of water. • Modifying Duration of Watering: The "water customer" shall modify watering duration and frequency schedules so that the sprinkler's application does not exceed the irrigated area's absorption rate and generate surface runoff. • Hours of Irrigation: All outdoor irrigation of lawns, gardens, landscaped areas, plants, trees, shrubs or other greenscape areas shall occur between the hours of twelve o'clock (12:00) midnight and twelve o'clock (12:00) noon and eight o'clock (8:00) P.M. and twelve o'clock (12:00) midnight on designated days as listed in subsections C4 and C5. When on the winter schedule, (see subsection C5) water customers may water anytime during the designated day. • Summer Watering Schedule (April 2 Through October 30): All dwellings or establishments with even numbered street addresses (addresses ending with 0, 2, 4, 6, 8) shall water only on Wednesday, Friday and Sunday. Dwellings or establishments with odd numbered addresses (addresses ending with 1, 3, 5, 7, 9) shall water only on Tuesday, Thursday and Saturday. There shall be no watering on Mondays. • Winter Watering Schedule (November 1 Through April 1): All dwellings or establishments shall water only on Wednesday or Sunday. Specific irrigation times shall not be enforced. During rain events, water customers should turn automatic sprinkler timers off or place them on pause.	On-Going

5.2.3.1 Consumption Reduction Methods

Under a water shortage, customers will be required to reduce their water consumption as specified in Table 5-5.

Table 5-5 Water Shortage Contingency — Consumption Reduction Methods		
Consumption Reduction Methods	Stage When Method Takes Effect	Projected Reduction (%)
As determined in Special Meeting	All Stages, Emergency	Will be determined in the event of an immediate water supply shortage.

5.2.4 Penalties

Any customer violating the regulations and restrictions on water use as shown in Table 5-4 receive a verbal warning issued by public works personnel or City-designated official for the first such violation. Upon a second violation, the customer receives a written notice of violation by public works department personnel or police department personnel. For a third violation, a written notice of such violation is issued and water service to the customer is terminated at the discretion of the Public Works Director. Restoration of water service following termination is contingent on agreement by the customer to adhere to Conservation Ordinance provisions, and any and all costs of enforcement are billed to the customer. Additional violations after water service restoration results in fines per violation (not to exceed five hundred dollars), levied at the discretion of the Public Works Director. In determination of the number of offenses, only notices issued within two years of the first notice are considered.

A summary of penalties and charges is shown in Table 5-6.

Table 5-6 Water Shortage Contingency — Penalties and Charges		
Penalty	Level When Penalty Takes Effect	Charge[a] (per violation)
Penalty for violations after third violation (after restoration of water service)	4th Violation	$500
Penalty for water in excess of mandatory restriction	Emergency	Will be determined in the event of an immediate water supply shortage.

a. Not to exceed value.

5.2.5 Exemptions to Regulations

Exemption requests must be submitted in writing to the Public Works Director. Exemptions to regulations and/ or penalties may be granted under the following conditions:

- Compliance with the Conservation Ordinance would cause unnecessary and undue hardship to the applicant, including, but not limited to, adverse economic impacts such as loss of production or jobs.
- Compliance with the Conservation Ordinance would cause a condition adversely affecting the health, sanitation, fire protection, or safety of the applicant or the public.

- There is a 30-day exemption from irrigation duration and watering schedule restrictions to allow for the establishment of new lawns.
- Commercial nurseries, public parks, cemeteries, and schools are also exempt from duration and schedule restrictions but are requested to curtail all non-essential water use.

5.2.6 Water Shortage Effects on Revenues and Expenditures

Water service is billed by the City using tiered rate structure for water consumption and a fixed rate meter service charge. The meter service charge is based upon the size of the meter serving the customer's account.

Water use reductions will have an adverse effect on costs and available reserves. The City recognizes that operational costs often rise in time of drought because of the level of customer service activities required and increased water management costs. Fixed costs (based on water meter size) are collected regardless of volume consumed.

With drastic reductions in water supply of 50% or more, lowered revenues would not cover costs for the City to operate the system. The City could consider temporarily increasing or restructuring rates to encourage conservation during periods of water shortage and/or to collect sufficient reserve to cover operating costs.

5.3 Water Quality

The largest potential impacts to water quality for the City's supply are nitrates and agricultural pesticides/ herbicides, primarily found in the shallow aquifer, that could contaminate the City's groundwater supplies. There are health concerns with both types of contaminants. Elevated nitrate in drinking water can cause methemoglobinemia (blue baby syndrome) and diuresis. Elevated pesticides and herbicides, such as DBCP and TCP, can elevate the risk of cancer and reproductive system problems.

The City manages these water quality risks by monitoring these and other contaminants to maintain concentrations remain below the required MCL. Historically, the City has drilled wells in excess of 650 ft to avoid shallow-aquifer contaminants. Older, shallower wells have been abandoned where risk of contamination is high. The City has also opted to provide higher quality water by using an appropriate treatment process. For example, the City plans to treat groundwater using activated carbon to remove traces of TCP at the new Well 14 currently under construction.

There have been no instances when water quality issues have limited water supply because well production at high quality wells has been able to meet demand and new wells have been constructed as demands have increased. A summary of the current and projected water supply impacts due to water quality is provided in Table 5-7

Table 5-7 Water Quality — Current and Projected Water Supply Impacts (ac-ft/yr)							
Water Source	Description of Condition	2010	2015	2020	2025	2030	2035
City Produced Groundwater[a]	Contamination by nitrates, DBCP, and/or TCP	--	2,500	2,500	2,500	2,500	2,500

a. Groundwater will be treated to remove contaminants

5.4 Drought Planning

Drought planning considers water supplies during single-dry and multiple-dry years as defined below:

- **Average Year:** Defined as the median runoff over the previous 30 years or more.
- **Single-Dry Year:** Generally considered to be the lowest annual runoff for a watershed since the water-year beginning in 1903.
- **Multiple-Dry Year:** Generally considered to be the lowest average runoff for a consecutive multiple year period (three years or more) for a watershed since 1903.

5.4.1 Past Drought Information

The local region has experienced droughts in the years 1912-13, 1918-20, 1923-24, 1929-34, 1947-50, 1959-61, 1976-77, 1987-92, and most recently the 2007-09 drought. During these periods of drought, the system did not suffer shortages of water in meeting maximum day or long term (maximum month) demands.

The City's projected dry year water demands are based on the hydrologic conditions presented in Table 5-8. The single driest water year occurred in 1924. The lowest average annual multiple dry year period occurred between 1929 and 1931.

Table 5-8 Basis of Water Year Data	
Hydrologic Condition	Base Year(s)
Average Water Year	2006
Single-Dry Water Year	1924
Multiple-Dry Water Years	1929-1930

5.4.2 Historic Conditions - Water Supply in Normal and Dry Years

The estimated potable water supply in each of the years identified in Table 5-8 is provided in Table 5-9. The dry years were compared to normal water years, shown as a percentage of normal water year supply.

Table 5-9 Supply Reliability — Historic Conditions (ac-ft/yr)[a]				
Average / Normal Water Year (2006)	Single Dry Water Year (2009)	Multiple Dry Water Years		
		Year 1 (2007)	Year 2 (2008)	Year 3 (2009)
6,135	5,919	5,919	6,014	6,025
Percent of Average/ Normal Year	**96.5%**	**96.5%**	**98.0%**	**98.2%**

a. Table values are the total reported well production for 2006-2009. Total well capacity is much higher (approximately 12.5 MGD or 14,000 ac-ft/yr).

5.4.3 Minimum Water Supply over the Next Three Years

The minimum water supply available during each of the next three years (2013-2015) is provided in Table 5-11. Potable water supplies (groundwater) are based on the driest three-year historic sequence. Recycled water is not part of the City's supply plan and was not included in this table.

Table 5-10 Supply Reliability — Current Water Sources (ac-ft/yr)[a]					
Water Supply Sources	Average / Normal Water Year Supply	Single Dry Year	Multiple Dry Water Year Supply		
		Year 2013	Year 2013	Year 2014	Year 2015
City Produced Groundwater	6,135	5,794	5,968	5,968	6,147
	Percent of Normal Year	**94.5%**	**97.3%**	**97.3%**	**100.2%**

a. Table values are the total estimated well production for the year based on projected demands and 11.8% system losses. Total well capacity is much higher (approximately 12.5 MGD or 14,000 ac-ft/yr).

5.4.4 Determination of Actual Water Reductions

At a given water supply shortage level, customers will be required to reduce their water consumption by a specified percentage per Table 5-5. Actual water restrictions are determined by comparing metered water consumption to the consumption during the same billing period in the last calendar year.

5.4.5 Comparison of Supply and Demand

Table 5-11, Table 5-12, and Table 5-13 compare projected water supplies and demands under normal, single dry, and multiple dry water years. Supply in every year will meet 100% of the demand. Groundwater well capacity is higher than supply totals reported in Tables 5-11 through 5-13, but only the required amount of supply will be pumped to meet demand.

Table 5-11 Supply and Demand Comparison — Normal Year (ac-ft/yr)					
	2015	2020	2025	2030	2035
Supply Totals (from Table 4-1)	6,147	7,126	8,259	9,574	11,098
Demand Totals (From Table 3-12)	6,147	7,126	8,259	9,574	11,098
Difference	0	0	0	0	0
Difference as % of Supply	0%	0%	0%	0%	0%
Difference as % of Demand	0%	0%	0%	0%	0%

Table 5-12 Supply and Demand Comparison — Single Dry Year (ac-ft/yr)					
	2015	2020	2025	2030	2035
Supply Totals	6,147	7,126	8,259	9,574	11,098
Demand Totals	6,147	7,126	8,259	9,574	11,098
Difference	0	0	0	0	0
Difference as % of Supply	0%	0%	0%	0%	0%
Difference as % of Demand	0%	0%	0%	0%	0%

Table 5-13 Supply and Demand Comparison — Multiple Dry-Year Events (ac-ft/yr)						
		2015	2020	2025	2030	2035
Multiple-Dry Year First Year Supply	Supply Totals	6,147	7,126	8,259	9,574	11,098
	Demand Totals	6,147	7,126	8,259	9,574	11,098
	Difference	0	0	0	0	0
	Difference as % of Supply	0%	0%	0%	0%	0%
	Difference as % of Demand	0%	0%	0%	0%	0%
Multiple-Dry Year Second Year Supply	Supply Totals	6,147	7,126	8,259	9,574	11,098
	Demand Totals	6,147	7,126	8,259	9,574	11,098
	Difference	0	0	0	0	0
	Difference as % of Supply	0%	0%	0%	0%	0%
	Difference as % of Demand	0%	0%	0%	0%	0%
Multiple-Dry Year Third Year Supply	Supply Totals	6,147	7,126	8,259	9,574	11,098
	Demand Totals	6,147	7,126	8,259	9,574	11,098
	Difference	0	0	0	0	0
	Difference as % of Supply	0%	0%	0%	0%	0%
	Difference as % of Demand	0%	0%	0%	0%	0%

Based on this comparison, the City has sufficient supplies to meet the demands during normal and dry water years.

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6. Demand Management Measures

Demand management measures (DMMs) are specific actions a water supplier takes to support its water conservation efforts. The UWMP Act identifies 14 DMMs that are to be evaluated in the City's UWMP. These 14 DMMs correspond to the 14 best management practices (BMPs) listed and described in the California Urban Water Conservation Council Memorandum of Understanding (CUWCC MOU) that signatory water suppliers commit to implement as part of their urban water conservation programs. Table 6-1 correlates the DMM names and the CUWCC BMP names and reorganization, and identifies the BMPs which have been implemented by the City.

Table 6-1
Demand Measurement Measures (DMMs) and Best Management Practices (BMPs)

CUWCC BMP Organization and Names (2009 MOU)				UWMP DMMs		Implementation Status
Type	Category	BMP #	BMP Name	DMM #	DMM Name	
Foundational	Operations Practices	1.1.1	Conservation Coordinator	L	Water Conservation Coordinator	On-going
		1.1.2	Water Waste Prevention	M	Water Waste Prohibition	On-going
		1.1.3	Wholesale Agency Assistance Programs	J	Wholesale Agency Programs	N/A
		1.2	Water Loss Control	C	System Water Audits, Leak Detection, and Repair	On-going
		1.3	Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections	D	Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections	On-going
		1.4	Retail Conservation Pricing	K	Conservation Pricing	On-going
	Education Programs	2.1	Public Information Programs	G	Public Information Programs	On-going
		2.2	School Education Programs	H	School Education Programs	Planned 2013
Programmatic	Residential	3.1	Residential Assistance Program	A	Water Survey Programs for Single-Family Residential and Multifamily Residential Customers	On-going
				B	Residential Plumbing retrofit	Planned 2014
		3.2	Landscape Water Survey	A	Water Survey Programs for Single-Family Residential and Multifamily Residential Customers	On-going
		3.3	High-Efficiency Clothes Washing Machine Financial Incentive Programs	F	High-Efficiency Washing Machine Rebate Programs	On-going (PG&E)
		3.4	Water Sense Specification (WSS) Toilets	N	Residential Ultra-Low-Flush Toilet Replacement Programs	On-going
	Commercial, Industrial, & Institutional	4	Commercial, Industrial, and Institutional	I	Conservation Programs for Commercial, Industrial, and Institutional Accounts	On-going
	Landscape	5	Landscape	E	Large Landscape Conservation Programs and Incentives	Not Planned

The majority of the above measures have already been enacted by the City or are scheduled for implementation in the near future. The measures that are not scheduled for implementation are the following:

- Wholesale Agency Assistance BMP 1.1.3/ DMM J which is not applicable to retail urban water suppliers.
- Retail Conservation Pricing BMP 1.4/ DMM K which cannot be fully implemented due to City water bond covenants.
- Landscape BMP 5/ DMM 3 which has costs that outweigh the benefits of implementation.

Although a signatory to the CUWCC, the City has elected to describe the DMMs in lieu of submitting CUWCC annual reports. The DMMs are described in greater detail below.

6.1 Water Conservation Coordination (BMP 1.1.1/ DMM L)

The City's Water Systems Supervisor also serves as the Water Conservation Coordinator. The Coordinator's responsibilities include the following:

- Coordinating with the City and public works departments to promote existing water conservation measures.
- Evaluating existing and planning future water conservation measures.
- Tracking, planning, and reporting on BMP implementation.

In addition, City and public works department personnel contribute a significant amount of time to water conservation efforts, including operations staff who actively monitor for water waste, customer service staff who respond to conservation inquiries, and the finance department who regularly monitor bills to detect potential customer leaks.

For FY 2013/ 2014, the City's budget includes $1000 for Water Conservation Certification to be used for improving water conservation coordination.

6.1.1 Effectiveness Evaluation

The City evaluates the overall effectiveness of its conservation programs by monitoring total annual water use. The benefits provided by the coordinator are qualitative and are not associated with specific water conservation savings.

6.2 Water Waste Prohibition (BMP 1.1.2/ DMM M)

Conservation Ordinance 2008-02 was adopted in March 2008 and prohibits the waste of water and stipulates an irrigation watering schedule. A copy of this ordinance is provided in Appendix D. Since adoption in 2008, the Ordinance has been effective in reducing water waste. The City encourages its customers to use water efficiently, even during times of adequate supplies, per the water conservation practices described in the Ordinance and summarized previously in Sections 5.2.3-5.2.5 and Table 5-3. The City also relies on its residents to report water waste by calling the City's customer service line. The customer service department will then issue a work order for a service representative to investigate the complaint.

In addition to the Conservation Ordinance, all new construction in the City follows the California Green Building Standards Code (Part 11 of the California Building Standards Code) which includes mandatory measures for efficient showerheads, toilets, faucets, etc. to reduce the amount of water wasted.

6.2.1 Effectiveness Evaluation

The City will continue to measure the effectiveness of this program by the reduction in water use compared to pre-Ordinance conditions, although recent reductions are attributed to newly installed meters. In the 12 months ending December 31, 2009 (after the Ordinance), average per capita water use was 9% percent lower as compared to the 12-month period ending December 31, 2006, (before the Ordinance).

6.3 Wholesale Agency Assistance (BMP 1.1.3/ DMM J)

The wholesale agency assistance BMP is not applicable to retail urban water retailers.

6.4 Water Loss Control (BMP 1.2/ DMM C)

The City currently does not have a formal Water Loss Control program, but plans to implement this program and will submit AWWA Standard Water Audit and Water Balance worksheets in future reporting period as required as a member of the CUWCC.

The City has enacted several measures that address water loss including the recent purchase of several thousand dollars worth of leak detection equipment. The equipment, which attaches to distribution system valves, has been used to detect system losses. The City's leak detection program also includes notifying customers when a leak may be occurring on their property. The potential leak is normally discovered by unusually high meter reads identified by the meters which have high water use warnings or by the City's customer service and billing staff as they prepare monthly bills. If a high meter read is identified, a City service representative flags the meter and alerts the customer.

In addition, water efficiency standards are set for landscaping in the aforementioned Conservation Ordinance. Landscape construction requirements, such as a requirement to install sprinkler heads greater than 12 inches from hard surfaces, has also minimized water loss.

6.4.1 Effectiveness Evaluation

The City will track the effectiveness of its water loss control program based on reductions in water losses throughout the system over time, as monitored by the Conservation Coordinator and reported in future CUWCC BMP reports. Since customer meters have only recently been installed, limited data is currently available to evaluate the effectiveness of the leak detection program. Future updates of the City's UWMP will reevaluate this BMP by quantifying system losses since 2011.

6.5 Metering with Commodity Rates (BMP 1.3/ DMM D)

The City recently finished installing meters on most existing service connections and will require meters for all new connections in the future A small number of uninhabited properties have not yet been metered. The City bills for water using conservation pricing and a tiered volumetric rate structure. Refer to BMP 1.4 in the next subsection for a description of the City's rate structure.

Effectiveness Evaluation

All of the City's customers are now metered. The City will continue to measure the effectiveness of this program by the reduction in water use compared to pre-metered years. In the 12 months ending December 31, 2011, average per capita water use was 27 percent lower as compared to the 12-month period ending December 31, 2008.

6.6 Retail Conservation Pricing (BMP 1.4/ DMM K)

As described above, the City meters all services and charges for use based on the quantity of water used. The tiered rate structure includes a monthly fixed service charge based upon the size of the customer's meter in addition to a volumetric or commodity charge based upon the total volume of water consumed by a customer during the billing period. The rate structure was designed to encourage conservation and discourage water waste and to move closer to a conservation-oriented structure by implementing volumetric pricing for all customers. However, less than 70% of revenue is collected from volumetric pricing, and is therefore not considered sufficient to meet the CUWCC BMP requirement. Meeting this 70% criterion will not be possible until existing water bonds (i.e., the City's 2007 Water Bond) are fully paid off. The economic infeasibility results from a revenue bond rate covenant that requires rates to be set at a fixed level to assure that the minimum debt service coverage ratio (a financial measure of the utility's ability to repay debt) will be met. Although the City is not fully complaint with the CUWCC BMP at this time, the new tiered rate structure has resulted in significant per capita reduction.

6.6.1 Effectiveness Evaluation

The City will measure the effectiveness of this program by the reduction in water use compared to pre-conservation pricing conditions. The new meters and modified rate structure were implemented very recently, so limited effectiveness data is available. As mentioned previously, in the 12 months ending December 31, 2011 (after tiered rates were implemented), average per capita water use was 27 percent lower as compared to the 12-month period ending December 31, 2008 (before meters and tiered rates), dropping from approximately 225 gpcd in 2008 to 163 gpcd in 2011. The decline can be attributed to both new metering and the new conservation rate structure.

6.7 Public Information Programs (BMP 2.1/ DMM G)

The City conducts several informal programs that address water conservation issues on an on-going basis. The City develops materials including brochures, bill stuffers, messages printed on bill and information packets, and general water conservation information.

The Public Works Department provides several brochures to educate citizens about their water system and conservation. For example, the City advertises in the local newspaper and occasionally holds landscape irrigation fairs that address the following:

- Meter and sprinklers on display with information on how they work.
- Magnets disseminated with watering schedules.
- Drought-tolerant plants on display by local nurseries.

Brochures are also available at the Department's front office, including *Save Our Water*, a 5-page checklist available in both English and Spanish. In addition, residential rebate brochures from PG&E for low-water appliances are also made available. Finally, bill stuffers containing conservation information are typically mailed out before the summer season.

In the past, the City did not have a formal budget set aside for information programs, as costs for these items are usually taken out of water enterprise account addressing "Special Items." However, for FY 2013/214, the City has added a line item for "Water Conservation Public Education" and allocated $1000 to the budget. From FY 2013 forward, the City will budget for and track the public information program separately.

6.7.1 Effectiveness Evaluation

The public information program is an essential component of developing water conservation awareness; however, the effectiveness and benefits of the program are qualitative in nature and cannot be defined in quantitative terms.

6.8 School Education Programs (BMP 2.2/ DMM H)

The City does not have a formal school education program explicitly addressing water conservation. However, the City currently has wastewater and stormwater education programs that are presented to specific ages of school children. The City plans to implement a program initially working with and tying into the existing wastewater and stormwater education programs.

6.8.1 Effectiveness Evaluation

Public information programs are an essential component of developing water conservation awareness; however, the effectiveness and benefits of the programs are qualitative in nature and cannot be defined in quantitative terms. Beginning in FY 2013/2014, the City will track the implementation of its school education program.

6.9 Residential Assistance Program (BMP 3.1/ DMM A&B)

The City does not maintain a formal water survey program for residential customers but has been helping customers informally using a reaction-based approach. For example, leak detection assistance and inspections are performed on an on-call basis. City personnel are deployed to help homeowners understand how to find the meters and discuss with customers how the meters, sprinklers, irrigation valves, toilets, etc., work and how to locate leaks on the property. The City will continue to utilize water meter leak detection software for notifying residents of a potential water leak.

Water meters are data-logged and daily usage can be tracked. If there appears to be a leak or abnormally high usage in a customer's service connection, the meters are flagged. Flagged meter logs are sent to the customer to track and find leaks.

At this time, the City does not hand out low-flow showerheads, faucets, etc. However, the City does provide information on rebate programs, such as those for high efficiency clothes washing machines, as described in Section 6.11.

In the coming years, the City will need to comply with the recently passed Senate Bill (SB) 407 legislation requiring replacement of non-water conserving plumbing fixtures. Key compliance dates for SB 407 are as follows:

- On or after January 1, 2014, for all building alterations or improvements to residential (single-and multi-family) and commercial real property, water-conserving plumbing fixtures must replace other noncompliant plumbing fixtures as a condition for issuing a certificate of final completion and occupancy or final permit approval by the local building department.
- On or before January 1, 2017, all noncompliant plumbing fixtures in any single-family residential real property must be replaced by the property owner with water-conserving plumbing fixtures.
- On or after January 1, 2017, a seller or transferor of residential (single-and multi-family) or commercial real property must disclose to a purchaser or transferee specified requirements for replacing plumbing fixtures, and indicate whether the property includes noncompliant plumbing.
- On or before January 1, 2019, all noncompliant plumbing fixtures in multi-family residential and commercial real property must be replaced with water-conserving plumbing fixtures.

6.9.1 Effectiveness Evaluation

In 2013, the City will begin to track the number of residential water audits conducted each year. The City does not track effectiveness or estimate conservation savings because these vary based on type of recommendations provided to the customer.

The City also does not track the effectiveness or estimate conservation savings of residential plumbing retrofits.

6.10 Landscape Water Survey (BMP 3.2/ DMM A)

In the past, site-specific residential landscape surveys were often covered as part of the informal residential assistance/ leak detection surveys described in Section 6.9. In addition, the City conducted site-specific visits for new developments after new grass has been established. The site visits were intended to help customers reset their irrigation timers in order to minimize water waste and meet the requirements of the Conservation Ordinance. For FY 2013/ 2104, the City has added a line item for "Water Conservation Landscape Audit Program" in the budget and has allocated a budget of $1000 to continue conducting landscape surveys.

6.10.1 Effectiveness Evaluation

Beginning in 2013, the City will track the number of landscape water surveys conducted, including those conducted as part of the residential water audits described previously.

6.11 High Efficiency Clothes Washing Machine Rebates (BMP 3.3/ DMM F)

There is currently no City administered replacement or rebate program for high efficiency clothes washers. However, the City refers its customers to an existing rebate program offered by the local utility provider, Pacific Gas and Electric (PG&E). PG&E provides rebates for high efficiency clothes washing machines up to $50. The City promotes and disseminates rebate brochures at the Public Works Department office.

6.11.1 Effectiveness Evaluation

The City does not evaluate the effectiveness or estimate conservation savings of the PG&E program, and no data is available from PG&E. Therefore, the effectiveness of this program is currently unavailable.

6.12 Water Sense Specification Toilets (BMP 3.4, DMM N)

The City does not currently have a toilet replacement program, but a rebate program is scheduled for implementation beginning in 2014. The rebate program will provide up to $100 for low flush toilets. In the FY 2013/214 budget, $1000 has been allocated for the "Water Conservation Low Flow Toilet Program."

As mentioned previously, all new construction in the City follows the California Green Building Standards Code (Part 11 of the California Building Standards Code) which includes mandatory measures for efficient toilets to reduce the amount of water wasted.

6.12.1 Effectiveness Evaluation

Because the program has not yet been implemented, the City has not evaluated the effectiveness of this program.

6.13 Commercial, Industrial, and Institutional (BMP 4, DMM I)

The City recently completed installing meters on all commercial, industrial, and institutional (CII) customers, but does not currently have a formal program that tracks CII water surveys, rebates, or savings from implemented measures on the CUWCC's Demonstrated Savings Measures list. Some unique conservation measures have already been adopted by CII customers, such as carwash and laundromat water recycling, although the realized savings have not been documented (as data on metered water delivery to these accounts is only available after 2011).

The City does require CII customers to conserve water by requiring compliance with the Conservation Ordinance, and only approving new projects that meet required state building and/or landscape irrigation codes. The City also does not discriminate between customer type and provides the same public information and auditing/ surveying opportunities that are available for residential customers.

Although the City does not have a rebate program, the CUWCC provides many rebates for commercial customers (subject to availability and/or before June 2013), including high efficiency clothes washers (up to $400), high efficiency toilets (up to $200), high-efficiency urinals (up to $300), pressurized waterbrooms (up to $50), X-ray film processor recirculation systems (up to $2000), and cooling tower conductivity controllers (up to $1200).

6.13.1 Effectiveness Evaluation

Since historical data is not available, the City has not evaluated the effectiveness or estimated conservation savings of this program. The City also does not track rebates provided by the CUWCC and other parties. In the future, the effectiveness of any CII measure cannot be easily evaluated on its own terms because of the broad nature of the BMP and difficulty of attributing savings to any one measure.

6.14 Landscape (BMP 5/ DMM E)

The City does not have a formal landscape water survey program at this time. Currently, landscape irrigation accounts for about 5% percent of the City's total water demand. There are irrigation meters on institutional users (churches, schools, etc). There are no audits or water budgets for existing users. However, landscape areas for new developments over 2500 sf trigger an automatic water budget review requirement per the California Model Water Efficient Landscape Ordinance.

At this time it is not considered cost effective to implement a landscape water survey program. If the City were to conduct a water survey on 90% of the existing potable water landscape customers (37 surveys), it is estimated there would be 5 ac-ft/yr of water savings (based on an assumed reduction of 20% per surveyed customer). The cost to implement a landscape audit program is estimated to be approximately $62,240 per year. The average cost for potable water in the City's system is $440 per ac-ft (including commodity, capacity, and fire protection costs). By reducing use by 5 ac-ft/yr, the cost savings would only be about $2,200 per year, or $22,000 over 10 years. This information is summarized in Table 6-2. The cost to implement the landscape survey program far outweighs the benefit. Furthermore, given the current economic climate, the City does not have available funding to implement such a program. Therefore, the City has no plans to implement a landscape water survey program at this time.

Table 6-2
Landscape Survey — Cost Benefit Analysis

	Cost[3]	Basis
Landscape Survey Costs [1]		
Administrative	$6,000	80 hrs x $75/ hour
Field Labor	$26,640	12 hrs/survey x $60/hr x 37 surveys
Customer Participation	$29,600	$800/survey x 37 surveys
Total Cost	**$62,240**	
Potential Savings[2]	5 ac-ft/yr	
Cost of Potable Water	$22,000	$440/ac-ft x 5 ac-ft/yr x 10 years
Does Landscape Survey Provide Benefit?	**NO**	

1) The survey costs are based on surveying 90% of the City's existing potable water customers (about 37 surveys). The CUWCC BMP requires 90% of metered landscape accounts receive assistance over a 10-year period (or 9% of accounts per year).
2) Potential savings are based on 20% of the 37 existing potable water customers' demands for which a survey may be conducted.
3) Costs do not include interest rate adjustments over the 10-year period and are comparative in 2013 dollars.

6.14.1 Effectiveness Evaluation

The City does not evaluate the effectiveness or estimate conservation savings of informal water surveying programs.

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7. Completed UWMP Checklist

No.	UWMP Requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
PLAN PREPARATION				
4	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	10620(d)(2)		Section 1.2 Table 1-1
6	Notify, at least 60 days prior to the public hearing on the plan required by Section 10642, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. Any city or county receiving the notice may be consulted and provide comments.	10621(b)		Section 1.2.1
7	Provide supporting documentation that the UWMP or any amendments to, or changes in, have been adopted as described in Section 10640 et seq.	10621(c)		Documentation provided when changes occur
54	Provide supporting documentation that the urban water management plan has been or will be provided to any city or county within which it provides water, no later than 60 days after the submission of this urban water management plan.	10635(b)		Section 1.3
55	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	10642		Section 1.2 Table 1-1
56	Provide supporting documentation that the urban water supplier made the plan available for public inspection and held a public hearing about the plan. For public agencies, the hearing notice is to be provided pursuant to Section 6066 of the Government Code. The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water. Privately-owned water suppliers shall provide an equivalent notice within its service area.	10642		Section 1.2.2
57	Provide supporting documentation that the plan has been adopted as prepared or modified.	10642		Section 1.3
58	Provide supporting documentation as to how the water supplier plans to implement its plan.	10643		Section 1.3

No.	UWMP Requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
59	Provide supporting documentation that, in addition to submittal to DWR, the urban water supplier has submitted this UWMP to the California State Library and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. This also includes amendments or changes.	10644(a)		Section 1.3
60	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the urban water supplier has or will make the plan available for public review during normal business hours	10645		Section 1.3
SYSTEM DESCRIPTION				
8	Describe the water supplier service area.	10631(a)		Section 2.1
9	Describe the climate and other demographic factors of the service area of the supplier	10631(a)		Section 2.2 Section 2.3 Table 2-1 Table 2-2
10	Indicate the current population of the service area	10631(a)	Provide the most recent population data possible. Use the method described in "Baseline Daily Per Capita Water Use." See Section M.	Section 2.3 Table 2-3
11	Provide population projections for 2015, 2020, 2025, and 2030, based on data from State, regional or local service area population projections.	10631(a)	2035 and 2040 can also be provided to support consistency with Water Supply Assessments and Written Verification of Water Supply documents.	Section 2.3 Table 2-4
12	Describe other demographic factors affecting the supplier's water management planning.	10631(a)		Section 2.3
SYSTEM DEMANDS				
1	Provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	10608.20(e)		Section 3.1 Table 3-1 Table 3-2 Table 3-3 Table 3-4

No.	UWMP Requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
2	*Wholesalers:* Include an assessment of present and proposed future measures, programs, and policies to help achieve the water use reductions. *Retailers:* Conduct at least one public hearing that includes general discussion of the urban retail water supplier's implementation plan for complying with the Water Conservation Bill of 2009.	10608.36 10608.26(a)	Retailers and wholesalers have slightly different requirements	Section 1.2.2
3	Report progress in meeting urban water use targets using the standardized form.	10608.40		To be provided at a later date
25	Quantify past, current, and projected water use, identifying the uses among water use sectors, for the following: (A) single-family residential, (B) multifamily, (C) commercial, (D) industrial, (E) institutional and governmental, (F) landscape, (G) sales to other agencies, (H) saline water intrusion barriers, groundwater recharge, conjunctive use, and (I) agriculture.	10631(e)(1)	Consider 'past' to be 2005, present to be 2010, and projected to be 2015, 2020, 2025, and 2030. Provide numbers for each category for each of these years.	Section 3.2 Table 3-5 Table 3-6 Table 3-7 Table 3-8 Table 3-9
33	Provide documentation that either the retail agency provided the wholesale agency with water use projections for at least 20 years, if the UWMP agency is a retail agency, OR, if a wholesale agency, it provided its urban retail customers with future planned and existing water source available to it from the wholesale agency during the required water-year types	10631(k)	Average year, single dry year, multiple dry years for 2015, 2020, 2025, and 2030.	Section 3.3 Table 3-14
34	Include projected water use for single-family and multifamily residential housing needed for lower income households, as identified in the housing element of any city, county, or city and county in the service area of the supplier.	10631.1(a)		Section 3.2.6 Table 3-13
SYSTEM SUPPLIES				
13	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, and 2030.	10631(b)	The 'existing' water sources should be for the same year as the "current population" in line 10. 2035 and 2040 can also be provided.	Section 4.1 Table 4-1
14	Indicate whether groundwater is an existing or planned source of water available to the supplier. If yes, then complete 15 through 21 of the UWMP Checklist. If no, then indicate "not applicable" in lines 15 through 21 under the UWMP location column.	10631(b)	Source classifications are: surface water, groundwater, recycled water, storm water, desalinated sea water, desalinated brackish groundwater, and other.	Section 4.1

No.	UWMP Requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
15	Indicate whether a groundwater management plan been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	10631(b)(1)		Section 4.3.4
16	Describe the groundwater basin.	10631(b)(2)		Section 4.3.1
17	Indicate whether the groundwater basin is adjudicated? Include a copy of the court order or decree.	10631(b)(2)		Section 4.3.4
18	Describe the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. If the basin is not adjudicated, indicate "not applicable" in the UWMP location column.	10631(b)(2)		Not applicable
19	For groundwater basins that are not adjudicated, provide information as to whether DWR has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition. If the basin is adjudicated, indicate "not applicable" in the UWMP location column.	10631(b)(2)		Section 4.3.4
20	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	10631(b)(3)		Section 4.3.5 Table 4-3
21	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	10631(b)(4)	Provide projections for 2015, 2020, 2025, and 2030.	Section 4.3.5 Table 4-4
24	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	10631(d)		Section 4.4 Table 4-5
30	Include a detailed description of all water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years, excluding demand management programs addressed in (f)(1). Include specific projects, describe water supply impacts, and provide a timeline for each project.	10631(h)		Section 4.7
31	Describe desalinated water project opportunities for long-term supply, including, but not limited to, ocean water, brackish water, and groundwater.	10631(i)		Section 4.5
44	Provide information on recycled water and its potential for use as a water source in the service area of the urban water supplier. Coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	10633		Section 4.6

No.	UWMP Requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
45	Describe the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	10633(a)		Section 4.6.1 Table 4-6
46	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	10633(b)		Section 4.6.1 Table 4-6 Table 4-7
47	Describe the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.	10633(c)		Section 4.6.2 Table 4-8 Table 4-9
48	Describe and quantify the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.	10633(d)		Section 4.6.2 Table 4-8
49	The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	10633(e)		Section 4.6.2 Table 4-9
50	Describe the actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.	10633(f)		Section 4.6.2 Table 4-10
51	Provide a plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.	10633(g)		Section 4.6.3
WATER SHORTAGE RELIABILITY AND WATER SHORTAGE CONTINGENCY PLANNING [b]				
5	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	10620(f)		Section 1.1
22	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage and provide data for (A) an average water year, (B) a single dry water year, and (C) multiple dry water years.	10631(c)(1)		Section 5.4 Table 5-8 Table 5-9

No.	UWMP Requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
23	For any water source that may not be available at a consistent level of use - given specific legal, environmental, water quality, or climatic factors - describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.	10631(c)(2)		Section 5.1 Table 5-1
35	Provide an urban water shortage contingency analysis that specifies stages of action, including up to a 50-percent water supply reduction, and an outline of specific water supply conditions at each stage	10632(a)		Section 5.2.2 Table 5-3
36	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.	10632(b)		Section 5.4.3 Table 5-10
37	Identify actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.	10632(c)		Section 5.2.1 Table 5-2
38	Identify additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.	10632(d)		Section 5.2.3 Table 5-4
39	Specify consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.	10632(e)		Section 5.2.2 Table 5-3
40	Indicated penalties or charges for excessive use, where applicable.	10632(f)		Section 5.2.4 Table 5-6
41	Provide an analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.	10632(g)		Section 5.2.6
42	Provide a draft water shortage contingency resolution or ordinance.	10632(h)		Appendix D
43	Indicate a mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.	10632(i)		Section 5.4.4

No.	UWMP Requirement [a]	Calif. Water Code reference	Additional clarification	UWMP location
52	Provide information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments, and the manner in which water quality affects water management strategies and supply reliability	10634	For years 2010, 2015, 2020, 2025, and 2030	Section 5.3 Table 5-2
53	Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. Base the assessment on the information compiled under Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.	10635(a)		Section 5.4.5 Table 5-11 Table 5-12 Table 5-13
DEMAND MANAGEMENT MEASURES				
26	Describe how each water demand management measures is being implemented or scheduled for implementation. Use the list provided.	10631(f)(1)	Discuss each DMM, even if it is not currently or planned for implementation. Provide any appropriate schedules.	Section 6
27	Describe the methods the supplier uses to evaluate the effectiveness of DMMs implemented or described in the UWMP.	10631(f)(3)		Section 6
28	Provide an estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the ability to further reduce demand.	10631(f)(4)		Not available
29	Evaluate each water demand management measure that is not currently being implemented or scheduled for implementation. The evaluation should include economic and non-economic factors, cost-benefit analysis, available funding, and the water suppliers' legal authority to implement the work.	10631(g)	See 10631(g) for additional wording.	Section 6
32	Include the annual reports submitted to meet the Section 6.2 requirements, if a member of the CUWCC and signer of the December 10, 2008 MOU.	10631(j)	Signers of the MOU that submit the annual reports are deemed compliant with Items 28 and 29.	Not available

a The UWMP Requirement descriptions are general summaries of what is provided in the legislation. Urban water suppliers should review the exact legislative wording prior to submitting its UWMP.

b The Subject classification is provided for clarification only. It is aligned with the organization presented in Part I of this guidebook. A water supplier is free to address the UWMP Requirement anywhere with its UWMP, but is urged to provide clarification to DWR to facilitate review.

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APPENDIX A

City and County Notification Letters

City of Reedley
Public Works Department
1733 Ninth Street
Reedley,CA 93654
(559) 637-4200
FAX 637-2139

January 3, 2013

County of Fresno
Department of Public Works and Planning
2220 Tulare Street, 6th Floor
Fresno, Ca. 93721

Dear Public Works and Planning officials,

Re: Urban Water Management Plan

The City of Reedley is in the process of updating its Urban Water Management Plan (UWMP). The Urban Water Management Planning Act requires every urban water supplier that serves more than 3,000 customers, or serves more than 3,000 acre-feet of water annually, to prepare and adopt an UWMP and periodically update that plan at least once every five years. The UWMP is a planning document that assists urban water suppliers in assessing existing and future water demands and evaluating long-term water supply reliability. The plan also evaluates potential future sources and water conservation efforts to improve overall reliability for a water supplier's service area.

The City of Reedley is currently updating its UWMP for 2010 and welcomes and appreciates any input that you may wish to provide on this matter.

Please feel free to call or e-mail your comments or questions to us.

Sincerely,

Russ Robertson
Public Works Director
(559)637-4200 ext. 213
russ.robertson@reedley.ca.gov

APPENDIX B

Public Hearing Notice

City of Reedley
Public Works Department
1733 Ninth Street
Reedley,CA 93654
(559) 637-4200
FAX 637-2139

January 3, 2013

County of Fresno
Department of Public Works and Planning
2220 Tulare Street, 6th Floor
Fresno, Ca. 93721

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The City of Reedley is currently updating its UWMP for 2010 and welcomes and appreciates any input that you may wish to provide on this matter.

Please feel free to call or e-mail your comments or questions to us.

Sincerely,

Russ Robertson
Public Works Director
(559)637-4200 ext. 213
russ.robertson@reedley.ca.gov

APPENDIX C

Resolution Adopting UWMP

RESOLUTION NO. 2013-074

A RESOLUTION OF THE CITYCOUNCIL OF THE CITY OF REEDLEY ADOPTING THE 2010 URBAN WATER MANAGEMENT PLAN.

WHEREAS, the California Legislature enacted the Urban Water Management Planning Act (California Water Code, Section 10608 through 10656), which requires that every urban water supplier that provides water to more than 3,000 customers or supplying more than 3,000 acre feet of water annually shall prepare and adopt a urban water management plan; and,

WHEREAS, the City of Reedley is an urban water supplier providing water to a population of 24,194 in 2010; and,

WHEREAS, the UWMP was prepared in accordance with the California Water Code, Division 6, Article 1, Sections 10608-10656; and,

WHEREAS, The City of Reedley Urban Water Management Plan (UWMP) must be adopted after public review and hearing, and filed with the California Department of Water Resources within 30 days of adoption; and,

WHEREAS, the City of Reedley has prepared and circulated for public review a Draft UWMP, and a properly noticed public hearing regarding the UWMP was held by the City Council on August 13, 2013; and,

WHEREAS, the City did prepare the UWMP and shall file the UWMP with the California Department of Water Resources by September 12, 2013; and,

RESOLUTION NO. 2013-074

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Reedley hereby adopts the 2010 Urban Water Management Plan

This foregoing resolution is hereby approved and adopted this 13th day of August, 2013, by the following vote:

AYES: Betancourt, Soleno, Fast, Rodriguez, Beck.

NOES: None.

ABSTAIN: None.

ABSENT: None.

Robert O. Beck

Robert O. Beck, Mayor

ATTEST:

Sylvia B. Plata

Sylvia Plata, City Clerk

CITY OF REEDLEY
INCORPORATED FEB. 18, 1913

APPENDIX D

Water Conversation Ordinance 2008-02

ORDINANCE NO. 2008-02

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF REEDLEY ADDING SECTION 8-1-12 TO CHAPTER 1 OF TITLE 8 OF THE REEDLEY CITY CODE RELATING TO WATER CONSERVATION

THE CITY COUNCIL OF THE CITY OF REEDLEY DOES ORDAIN AS FOLLOWS:

SECTION 1. Section 8-1-12 is hereby added to Chapter 1 of Title 8 of the Reedley City Code to read as follows:

"8-1-12 WATER CONSERVATION

A. PURPOSE:

The purpose of this ordinance is to minimize outdoor water use and reduce unnecessary use of the potable water supplies of the City of Reedley.

The provisions of this ordinance shall apply to all persons, customers and property within the limits of the City of Reedley.

B. WASTE OF WATER PROHIBITION:

The following uses of water are defined as "waste of water" and are hereby prohibited except as otherwise authorized:

(1) The use of water which allows substantial amounts of water to run off to a gutter, ditch, or drain. Every water user is deemed to have his water distribution lines and facilities under his control at all times and to know the manner and extent of his water use and excess runoff.

(2) The excessive use, loss, or escape of water through breaks, leaks or malfunctions in the water user's plumbing or distribution facilities for any period of time after such escape of water should reasonably have been discovered and corrected. It shall be presumed that a period of forty eight (48) hours after discovery is a reasonable time within which to correct such a leak or break.

(3) The washing of vehicles, building exteriors, sidewalks, driveways, parking areas, tennis courts, patios, or other paved areas without the use of a positive shut-off nozzle on the hose, which results in excessive runoff.

C. LANDSCAPE IRRIGATION

(1) Lawn sprinkling system/devices shall be properly designed, installed, maintained and operated to prevent overuse of water.

(2) The "water customer" shall modify watering duration and frequency schedules so that the sprinkler's application does not exceed the irrigated area's absorption rate and generate surface runoff.

(3) Hours of irrigation: All outdoor irrigation of lawns, gardens, landscaped areas, plants, trees, shrubs or other greenscape areas shall occur between the hours of twelve o'clock (12:00) midnight and twelve o' clock (12:00) noon and eight o'clock (8:00) p.m. and twelve o'clock (12:00) midnight on designated days as listed in (4) and (5) below. When on the winter schedule, (see (5) below) water customers may water anytime during the designated day.

(4) Summer watering schedule: April 2 – October 30: All dwellings or establishments with even numbered street addresses (addresses ending with a 0, 2, 4, 6, 8) shall water only on Wednesday, Friday and Sunday. Dwellings or establishments with odd numbered addresses (addresses ending with a 1, 3, 5, 7, 9) shall water only on Tuesday, Thursday and Saturday. There shall be no watering on Mondays.

(5) Winter watering schedule: November 1 – April 1: All dwellings or establishments shall water only on Wednesday or Sunday. Specific irrigation times shall not be enforced. During rain events, water customers should turn automatic sprinkler timers off or place them on pause.

D. ENFORCEMENT/ PENALTIES

It is one of the objectives of the City Council of the City of Reedley that the citizens of Reedley are encouraged to voluntarily comply with this chapter. Therefore, in furtherance of said objective, the enforcement of sub sections B and C of this chapter will be as follows:

(1) First violation: A verbal warning of such violation shall be issued by public works department personnel or a designated official of the City of Reedley. Documentation shall be noted on the work order or complaint form.

(2) Second violation: A written notice of such violation shall be issued by public works department personnel or the police department personnel.

(3) Third violation: A written notice of such violation shall be issued and water service to the customer shall be terminated. Water service termination shall be at the discretion of the Public Works Director. Restoration of water service after termination shall be contingent on an agreement by the customer to adhere to the provisions of this chapter. Any and all cost of enforcement incurred by the City of Reedley, including overhead, will be billed to the customer.

(4) Additional violations after restoration of water service may result in a fine per violation not to exceed five hundred dollars ($500.00). Fines will be levied at the discretion of the Public Works Director.

Determination of number of offenses: To determine whether a violation is other than a first offense, only notices issued within two years after the date of the first notice will be considered.

E. EXCEPTIONS

(1) A written application for exception to sections of this chapter shall be submitted to the Public Works Director. Exemptions may be granted if:

(a) Compliance with this chapter would cause unnecessary and undue hardship to the applicant, including but not limited to adverse economic impacts such as loss of production or jobs; or,

(b) Compliance of this chapter would cause a condition adversely affecting the health, sanitation, fire protection, or safety of the applicant or the public.

(2) A 30 day exception from irrigation restrictions listed in numbers 3, 4, and 5 of section C in this chapter may be granted for new lawns not yet established.

(3) Commercial nurseries, public parks, cemeteries, and schools are exempt from numbers 3, 4, and 5 of section C of this chapter but will be requested to curtail all non essential water use."

SECTION 2. The City Clerk is hereby directed to cause a summary of this Ordinance to be published by one insertion in a newspaper of general circulation in the community at least five

(5) days prior to adoption and again fifteen (15) days after its adoption. If a summary of the ordinance is published, then the City Clerk shall cause a certified copy of the full text of the proposed ordinance to be posted in the office of the City Clerk at least five days prior to the Council meeting at which the ordinance is adopted and again after the meeting at which the ordinance is adopted. The summary shall be approved by the City Attorney.

This Ordinance shall take effect and be in full force thirty (30) days from and after its adoption.

ATTEST:

I hereby certify that the foregoing Ordinance No. 2008-02 was introduced and given first reading by title only at a regular meeting of the City Council of the City of Reedley held on the 26th day of February, 2008, and was thereafter duly passed, approved, and adopted at a regular meeting of said City Council held on the 25th day of March, 2008, by the following vote:

AYES: Brockett, Betancourt, Fast, Rapada, Soleno.

NOES: None.

ABSENT: None.

ABSTAIN: None.

Ray Soleno, Mayor of the City of Reedley

ATTEST:

Kay L. Pierce, Deputy City Clerk

CITY OF REEDLEY
INCORPORATED FEB. 18, 1913

APPENDIX E

Groundwater Management Plan

Groundwater Management Plan

Alta Irrigation District

AMENDED
GROUNDWATER MANAGEMENT PLAN

ADOPTED JUNE 10, 2010

ALTA IRRIGATION DISTRICT

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GROUNDWATER MANAGEMENT PLAN

I. INTRODUCTION

A. General

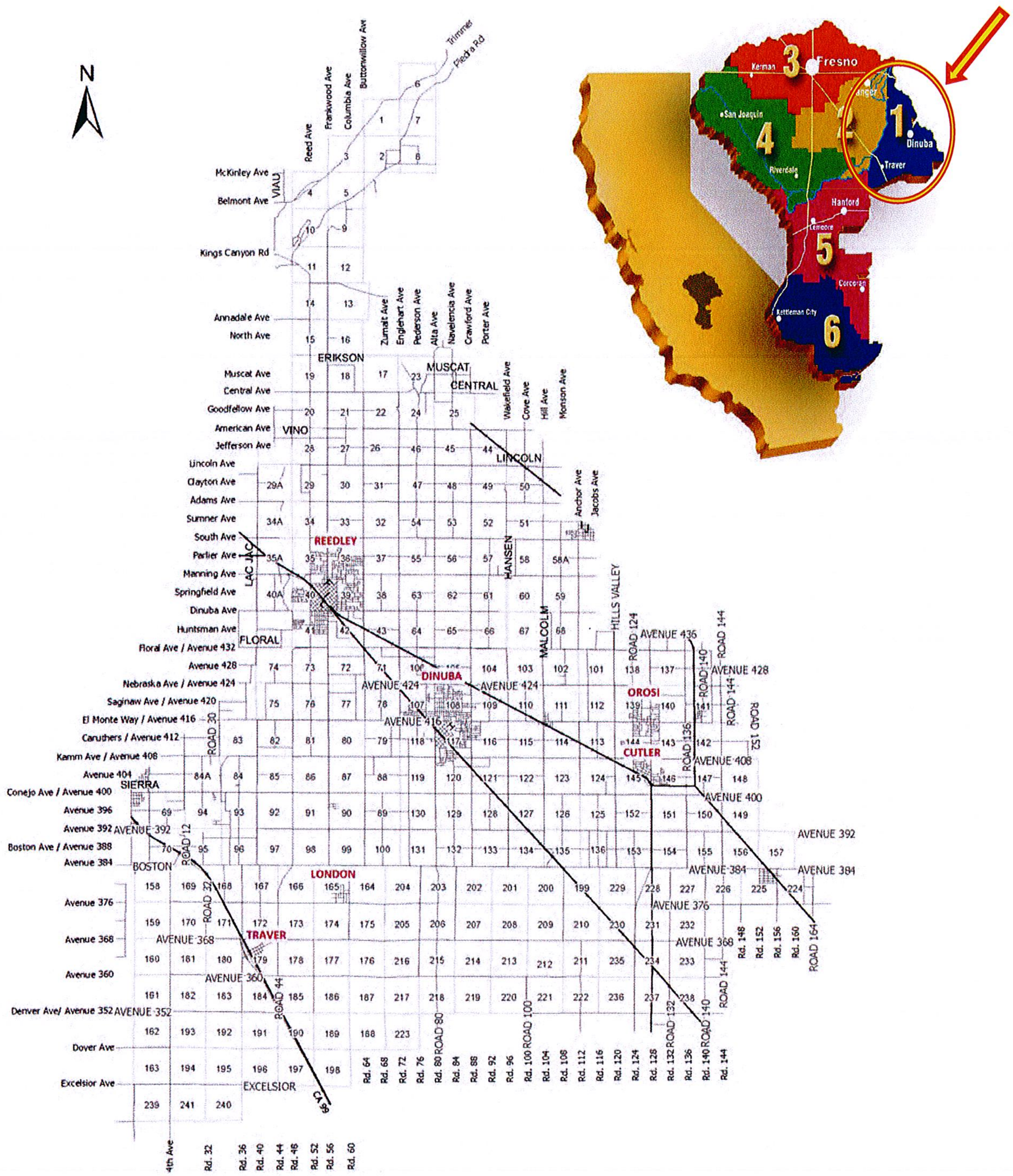
The Kings River ("River"), which provides the surface water supply for the Alta Irrigation District, a California Irrigation District ("District"), is one of the largest streams entering the San Joaquin Valley. The River's watershed covers 1,742 square miles, ranging in elevation from 500 to 14,000 feet above sea level. The majority of the watershed area is located in the high Sierra Mountains and receives heavy snowfall in the winter months. Usually, this snow melts slowly. Thus in average years, the River does not reach its highest stage until the middle of May or early June. The current yearly average runoff for the Kings River is 1,689,700 acre-feet. However, the average runoff does not guarantee this volume will be developed in any given year. The variation with the amount of runoff is great, not only from year to year, but also from month to month. As a result of this great variation, there were alternating periods of flood and drought in the drainage area of the River until Pine Flat Dam was completed in 1954.

Rainfall occurs primarily in the winter months with virtually no rainfall in the summer months. The average annual rainfall within the District for the fifty-year period preceding 1956 was 11.39 inches with the annual crop use per acre ranging from 24 to 36 inches. As a result, the agricultural crops within the District cannot and do not depend upon rainfall for all their irrigation needs; instead, they depend upon surface water deliveries and deep well pumps.

Historical water deliveries to the service area of the District were initiated in 1882 by a private water company called the "76" Land and Water Company. In 1887, the California legislature passed the Wright Act, which conferred on farming communities the powers of municipalities to purchase, construct and operate irrigation works. On July 7, 1888, sixty-six landowners interested in developing a new public irrigation district filed petitions with the Tulare County Clerk. The District would now comprise 130,000 acres in Tulare, Fresno and Kings Counties and would become the Alta Irrigation District. The present communities of Dinuba, Reedley, Traver, Cutler, and Orosi lie within these boundaries.

Historically, the District enjoyed a shallow water table. In the early 1900's the distance from the ground surface to the groundwater table averaged less than ten feet. However, each successive drought period during the last fifty years has caused an increase in the agricultural groundwater pumping. Consequently the water table has dropped significantly. As agricultural land is paved over for urbanization, the competition for control of water resources among agricultural, urban and environmental interests will significantly increase.

B. Map of District



C. Purpose and Goals

The Alta Irrigation District has long recognized the importance of groundwater to its service area. On August 14, 1994 its Board of Directors initially adopted a Groundwater Management Plan (***see APPENDIX, AB 3030 Groundwater Management Plan, Attachment A***). Later they amended that Plan in order to be in compliance with SB 1938 (***see APPENDIX, Notice of Intent, Attachment B***). The District intends to continue using the existing AB 3030 Groundwater Management Plan and to include in it the information required by SB 1938 under WC 10753.7 as allowed for in Section 10750.9(b), (hereinafter referred to as the "Plan").

The Plan being adopted under SB 1938 incorporates and advocates a regional perspective on groundwater management planning by establishing basin-wide management objectives for the Plan to achieve. In addition, the proposed Plan would require additional monitoring of groundwater levels, subsidence and water quality to evaluate and determine proposed management actions.

The principal action item in the Plan will be gathering and evaluating additional data concerning quantity and quality of groundwater so the District can develop and implement management actions and best management practices on a local and regional basis. Those actions will enhance the valuable groundwater resource by at least reducing the long-term groundwater level decline in the area and by addressing groundwater quality issues that impact potable water supplies. The District is now pursuing many of the action items already identified in the plan and will, when the Plan is adopted, begin pursuing additional actions. Other action items will require further study prior to implementation.

Water users in the District use conjunctively both surface water and groundwater so the District well understands that both surface water and groundwater are necessary to meet the water demands of the area and are critical to achieving a successful water management program. The goals developed and implemented through the Plan will be designed to achieve and maintain this primary single purpose in all groundwater and surface water management actions. Activities to accomplish this goal may range from addressing water quality issues to importing additional water supplies. Specific actions recommended for implementation are discussed in Section VI.

The proposed Plan will reduce duplication of activities by local agencies, which will utilize it in their long-term planning activities within the District. The Plan will be flexible by allowing updates to be made as needed, based on the additional information that is gathered through the monitoring programs.

The District is funding preparation of the Plan. Future activities required to fully implement the Plan may require additional funding sources. SB 1938 allows for the levying of groundwater assessments or fees under certain circumstances and according to specific procedures. Prior to instituting a fee structure, the District must hold an election on whether or not to impose these levies. A majority of the votes cast at the election will be required to implement any levy to provide additional funding.

D. Reasons for Updating Plan

Historically, the use of groundwater within the State of California has not been regulated except in basins where the groundwater extraction rights have been adjudicated by the courts or special management districts have been authorized by the state legislature. Groundwater accounts for approximately one-third of the water used within the state and will become even more important in the future with the growth of competing demands on groundwater resources. The District's primary role as a regional water resource agency is to sustain and improve its conjunctive use programs to enhance surface and groundwater supply and quality. The principal reason for updating the Plan will be to institute regionally-based management actions that will address the issues of long-term water supply and water quality using, for example, groundwater banking. This approach will require more intensive monitoring efforts along with implementation of action items as part of a regional management plan. This Plan will enable the District to make a comprehensive effort either through participating in the Upper Kings Basin Integrated Regional Water Management Plan Joint Powers Authority ("JPA") or adopting principles linking the various SB 1938 plans in the Kings Sub-basin. The JPA is more fully discussed in Section V of this Plan. The Kings Sub-basin is defined under Bulletin 118 ***(see APPENDIX, Kings Sub-basin, Bulletin 118, Attachment C)***. The JPA's primary focus will be to monitor water quality, depth to groundwater and subsidence on a regional basis. Localized trends will be addressed through the SB 1938 Plans of various agencies.

E. Advisory Committee

To initiate the groundwater management plan, the District formed a regionally diverse advisory committee comprised of representatives of the following agencies: City of Dinuba, City of Reedley, County of Tulare, Alta Irrigation District, Kings River Conservation District, Cutler Public Utility District, Orosi Public Utility District and Community Water Center. Upon adoption of the Plan by the Alta Irrigation District Board of Directors, the SB 1938 Advisory Committee will be terminated. The purpose of the SB 1938 Advisory Committee is to incorporate localized community interest and input from public agencies that overlie Alta Irrigation District's sphere of interest.

F. Public Participation

All meetings of the SB 1938 Advisory Committee would be noticed on the District's website and any member of the public can attend the meeting or email comments on the website pertinent to the Plan ***(see APPENDIX, Attached Meeting Notices and Minutes, Attachment D)***. In addition, all information received from the public will be noted and reviewed at those public meetings and in the minutes of such meetings.

II. EXISTING CONDITIONS

A. Groundwater Basin

The Alta Irrigation District overlies a portion of a groundwater sub-basin designated as the Kings Sub-basin. The California Department of Water Resources has designated this basin to be a critically overdrafted groundwater basin. The District has been monitoring groundwater levels for at least the last seventy-five years. The results of this monitoring effort are consistent with the findings of the Department of Water Resources. The water level measurements taken within the District show a continued downward trend in the groundwater elevations within the District's boundaries. This average overdraft is approximately 22,000 acre feet per year.

The total water supply available to the District is extremely variable and dependent on the snowpack that occurs in the Sierra Nevada Mountain Range to the east. The pumping within the groundwater basin is inversely proportional to the surface water supply made available from runoff within the Kings River Watershed.

The boundaries of the District include land within three counties, two incorporated cities and numerous unincorporated urban water districts. All of the urban communities, along with many individual residences scattered throughout the District, are dependent on the groundwater supply to meet their domestic demands. Surface water is currently not available to meet those needs. The conjunctive use of both the groundwater and surface supplies is necessary to meet the irrigation requirements within the District. This irrigation demand represents by far the largest water use within the basin.

The District recognizes that the continuation of the agricultural, municipal and industrial developments within the basin is dependent on maintaining an adequate water supply. With the conjunctive use that already occurs within the District, adequate surface water supplies are necessary to achieve a water balance. However, additional facilities to develop new water supplies can be constructed to increase water resources within the District.

B. Geology

The District is located in the eastern portion of the San Joaquin Valley and southern half of the Great Valley geomorphic province of California. The District is part of the valley, which is a nearly flat northwest to southeast trending alluvial plain. Alluvial sediments are found within the District and are bounded on the east by granitic rocks of the Sierra Nevada. The alluvium within the District is a heterogeneous mix of clay, silt, sand and gravel (USGS, 1968). The soils within the District are complex with the unconsolidated alluvial fans being made up of varied textured material. The upper soils vary from very heavy clays near the base of the Sierra Nevada (on the east side of the District) to relatively coarse sand near the western boundary along the Kings River. Much of the area is underlain by hardpan that restricts the vertical percolation of the water. These areas are typically ripped and/or soil amendments are applied to improve the vertical percolation. Throughout the District there are isolated locations of coarse grained material with high percolation rates. These are typically found at locations where old streambeds historically meandered throughout the District.

Along the east side of the District, the basement complex is shallow and the aquifer depth is very limited. The granite bedrock slopes quickly westward within the District resulting in a deeper aquifer along the western boundary of the District. The bedrock depth is approximately 500 feet below the ground surface along the eastern perimeter of the District and increases to 5,500 feet near its southwest limits. The coarse, sandy materials that are found along the west side of the District are reflected in the higher specific yields for those soils, which are typically 50 percent to 100 percent greater than for the finer textured clay materials found on the east side of the District. This same correlation is also found in the deeper soils, which are much less permeable and have significantly lower specific yields than the upper soils. Therefore, the specific yields from wells drilled into the deeper portions of the aquifer are considerably less than the yields from shallower wells.

C. Hydrology

The hydrology of this area is principally impacted by the snowpack that occurs within the Kings River Watershed and to a limited extent by both the local runoff from the foothills lying just easterly of the District and the precipitation that occurs within the District. The water table within the District is unconfined and typically flows in a southwesterly direction. Groundwater extractions are made for agricultural, municipal and industrial purposes. These extractions are very significant during periods when there is little surface water available to augment the water needs within the District. The groundwater levels, during those periods, experience a significant decline. Surface water made available to the irrigation canals and pipelines through diversion from the Kings River provides a stabilizing factor on the groundwater levels. This surface water supply reduces the amount of pumping, provides recharge and is the principal contributing factor that influences the groundwater conditions. This effect is evident in years of below normal runoff when a rapid decline in the groundwater level is experienced. Based on the District's fall 2009 groundwater measurements, the average depth to groundwater level was 53.16 feet.

D. Climate

The area is semi-arid with mild winters and hot, dry summers. The average rainfall, based on District records, is approximately 11 inches per year. The majority of this rainfall occurs from November through April. With the long, hot summers that normally occur in the valley, there is about 6 feet of evaporation per year with the majority of that evaporation occurring during the period May through October. The winds in the area are principally from the northwest with a southeast wind usually indicating that a rainstorm is imminent.

E. Surface Water Supplies

The District is located east of the Kings River in the Central San Joaquin Valley. To the east of the District are the Sierra Nevada Foothills. The District is composed primarily of alluvial fans sloping to the southwest with elevations ranging from about 425 feet at the northern point to 270 feet in the southwest corner. The incorporated communities within the district are Reedley (population 23,000) and Dinuba (population 21,700). There are also several unincorporated communities, housing clusters and individual rural residences.

The primary economy within the District is agriculture or businesses related to agriculture. The primary crops grown within the region are grapes, nectarines, plums, peaches and citrus. Due to the relatively high land prices and high production costs in for hand labor, spraying and fertilizer, the average parcel size is approximately 36 acres. There are approximately 4,000 agricultural parcels within the district.

Initially, agricultural production in the region was primarily dry land farming; but with the development of a dependable surface water supply and groundwater wells and a willingness of farmers to take the risk of raising high value crops, the cropping pattern changed to perennial crops and the need for a stable water supply became paramount.

The estimated average irrigation crop demand within the District is 325,000 acre feet and the average surface water supply is 148,416 acre feet; therefore, there is a strong reliance on an alternate water supply: groundwater.

The District diverts water from the Kings River at the "Cobbles Weir" and measures water into the District at a computer-controlled headgate ("Headgate") located near the community of Piedra. Downstream of the Headgate are 78 ditch laterals serving approximately 4,000 agricultural parcels. The total length of canals and pipelines is between 350 and 400 miles. The canal widths vary from 4 to 100 feet; lengths range from 3,000 feet to nearly 18 miles ***(see APPENDIX, KRCD Surface Water Study Table 111-1, Attachment E)***.

The range of annual diversions from the Headgate during a recent twenty-year period were as follows: 248,042 acre feet in 1993 (highest annual diversion); 58,284 acre feet in 1990 (lowest annual diversion) and 150,261 acre feet was the average annual diversion. The average time period for each water run within said twenty-year period is 115 days; the shortest water run being 48 days; and the longest water run being 183 days ***(see AID Twenty-Year Diversion Table as Table 1)***. The District's diversion and storage rights are based upon riparian and appropriative claims as well as contractual agreements and licenses granted by the State Water Resources Control Board. Such agreements control the use of District's rights in conjunction with the rights of the other twenty-seven (27) entities storing and diverting water from the Kings River. All the twenty-eight (28) entities comprise the Kings River Water Association. It is typical for weather patterns and the resulting volume of water in storage to vary significantly from year to year, thus illustrating the necessity of water storage in the production of perennial crops.

Table 1: AID Twenty –Year Diversion Table

Year	HG Diversion	Days Ran
2009	150,834	107
2008	131,685	89
2007	76,225	54
2006	211,646	161
2005	212,052	165
2004	128,426	91
2003	137,603	100
2002	133,219	99
2001	124,465	92
2000	166,411	139
1999	147,120	117
1998	172,176	182
1997	214,341	156
1996	221,084	152
1995	235,729	178
1994	122,697	92
1993	248,042	183
1992	66,624	58
1991	107,017	81
1990	58,284	48
1989	89,807	69

F. Water Management Strategies

Alta Irrigation District operates an "arranged delivery system" allowing farmers to order water on or off within the system with at least 24 hour's notice. Primarily, water orders are called in between 7:00 a.m. and 3:00 p.m. each day; with a subsequent coordinating meeting each morning and afternoon to determine changes within the system. All water use is measured on a daily basis. The District uses a calibrated submerged orifice to determine the instantaneous flow rate. The District is in the process of updating its distribution system by requiring cumulative flow meters on all turnouts when open canals are replaced by pipelines.

Daily water measurements are the basis of the District's levying a volumetric surcharge, which pays for all water-run related costs ***(see APPENDIX, Table 9 FUTURE DISTRICT OPERATIONAL BUDGET, Engineer's Report Proposition***

***218 Procedures, December 2005, Attachment F*)**. The conjunctive use pattern of utilizing surface water in wet years and relying more on groundwater in dry years helps to maintain sufficient water supplies to irrigate the predominantly permanent crops. The most beneficial use of surface water is to motivate farmers to avoid using their groundwater pumps, thus leaving in place and conserving the groundwater to be utilized only when needed.

In 1990, Alta Irrigation District commissioned the Kings River Conservation District to complete a "Surface Water Study" to study and review the District's surface water delivery system. A system water balance was evaluated in wet and dry years to determine seepage evaporation, evapotranspiration (ET) of bank vegetation, and operational spillage. The study showed that seepage (estimated to be approximately 23 percent of the District's total diversion) was the most significant loss in the system.

The water flow in the District's canals and pipelines is measured by means of overflow weirs, undershot gates, parshall flumes or a current meter. The District has developed rating tables that are used to set the proper flow rate in each of the canals and pipelines. However, the District may reallocate water from the different laterals if the demand warrants such reallocation.

The District has instituted a water allocation formula to equitably distribute water to farmers based on the estimated snowpack runoff. The formula is based on four days per twenty acres utilizing one cubic foot per second per entitlement percentage. Approximately eighty percent of the District's irrigable acres receive one hundred percent entitlement; the remaining acreage is entitled to receive seventy-five percent, fifty percent, twenty-five percent, or no surface water entitlement. Historically, the lower water entitlement areas either were not farmed or were being farmed to low value crops. The allocation formula is set by the Board of Directors and can be adjusted by lengthening or shortening the number of irrigation days per twenty acres. Typically, in less than average water years, water is held in storage until peak demand occurs in May, June and July.

Water regulating reservoirs used by the District have been designed to better maintain constant flows in the lower areas of the district. In 1991, the district developed the fifty-seven acre Button Ponding Basin, which is fed by five tributary canals. The flow rates of those canals have been prone to fluctuate between midweek and weekend days. All the inflow entering the regulating basin is now being stored for downstream agricultural deliveries when needed. Additional regulating reservoirs are being evaluated for future construction.

In any conjunctive use area, groundwater recharge is a critical part of the overall Plan. For many years, the District has maintained recharge basins along the southwesterly perimeter of its boundaries. They are located in areas of highly permeable soils. In addition, some effective recharge results simply from conveying water through the District's canals, even though the majority of the soil types are such that the recharge capability of the soil is very limited.

The District has been conducting extensive research to locate additional recharge sites in the eastern portion of the District, since that area is severely impacted in dry years due to the low specific yields and the limited water storage depth of the aquifers. In 1987, the District was selected for funding through the Proposition 44 program to develop a groundwater recharge basin in an area that had limited groundwater resources. The site appeared to have soil types that would be conducive to recharge efforts. An in-depth geological study was undertaken and it was determined that the site would not be effective for groundwater recharge. The District has continued its efforts to locate sites for developing percolation basins in the eastern part of the District, but it is not likely that a suitable location will be found.

To proceed with a groundwater recharge program, additional surface water supplies are necessary to fully implement the Plan. The District's average annual water supply is already committed. The surface water necessary to conduct an extensive program is available only in wet years when additional water supplies or floodwaters are available on the Kings River. The District's goal has been and will be to make beneficial use of those waters by recharging the underground. For the most part, District conveyance facilities are currently available to transport these waters to the basin locations. Unfortunately, the prospects for locating effective recharge basin sites within the areas of greatest need are not promising.

The District will also be negotiating with cities interested in jointly funding new recharge sites. If suitable sites are located within or adjacent to the boundaries of a municipal jurisdiction, the possibility of a joint use facility would be evaluated. The potential exists for water to be delivered to all or part of the site for recharge purposes during a portion of the year, with consideration given to other uses during the remainder of the year.

As a complement to the District's local recharge program, one of the action items is to evaluate "groundwater banking". This could be accomplished by assisting the recharge efforts of other districts that have access to better groundwater recharge sites. Floodwaters would be recharged (banked) in a district thereby improving groundwater levels in its service area. The amount of water banked would be quantified on an annual basis and an agreement developed so that the District would have rights to extract or receive a stipulated portion of the water banked through the joint agreement. In both the short and long terms, this approach appears to be the most effective way for the District to benefit the Basin Plan Area. In addition, investigations will continue on potential local recharge sites.

In 2009, the District did aggressively implement groundwater management projects to address issues of localized overdraft. The District and the City of Dinuba developed a recharge project to collect storm water and other surplus water supplies in a series of basins comprising 28 acres. The project will be effective in utilizing local supplies to mitigate groundwater pumping within the City of Dinuba. The District implemented the Harder Pond Banking Project to recharge stormwater and other surplus water supplies in the westerly portion of the District. The project will enable the District to direct water supplies to designed recharge areas and by means of extraction wells, to make more efficient downstream agricultural deliveries. The District is also moving forward with the Traver Pond Banking Project, which will also allow water to be recharged and extracted for downstream agricultural deliveries. The Harder and Traver Banking Projects are designed to conserve and thus generate the two million gallons per day of potable surface water for the proposed surface water treatment plant to serve Cutler and Orosi ***(see APPENDIX, Water Banking Annual Report, Attachment G)***.

Water banking is an important tool available to the District enabling it to better utilize available water supplies. The water banked will always exceed the extraction amount. The water remaining in the ground will bolster the groundwater in the immediate area of the banking project. The water extracted will be utilized to supplement the surface water deliveries, thereby reducing downstream groundwater extractions.

Additional locations for future banking projects will continue to be evaluated by the District. Where suitable locations are found and it is determined additional water is available to effectively utilize the site, the District will seek additional funding. Expansion of the Harder and Traver Pond sites will also be considered.

III. WATER QUALITY

A. Surface Water Quality

The surface water supply for the District consists principally of diversions from the Kings River. The snowpack and rainfall within the Kings River watershed produce extremely high quality water with very low amounts of dissolved salts. This has allowed consistently high agricultural yields to occur on the heavier soils, which are not freely drained, without causing a serious drainage problem. The surface water also provides an excellent source of water for recharging the District's groundwater supply. It is important that the District maintain the high quality of this water. To this end, the District has been active in identifying any surface water discharges within the Basin that may negatively impact water quality. These will be continually monitored and may require a discharger to obtain a permit through the NPDES process. Anyone causing overland surface flows that are found to be detrimental to the District's water supply, groundwater or surface water, will be put on notice that they must either eliminate the discharge or clean those flows to avoid compromising the quality of the District's water supply.

The District regulates municipal storm water discharges into District facilities by enforcing the terms of permits granted by the District to those dischargers. The permits specify the exact area being drained and/or flow allowed to be discharged. Permit conditions require that the quality of this discharged water meet the existing and future standards set by the Regional Water Quality Control Board. The right to discharge can be terminated at any time the conditions of the permit are not met by the discharger.

B. Groundwater Quality/Source Water Quality Protection

Except for dibromochloropropane (DBCP) and nitrates, the quality of groundwater in the District is high because its source is excellent Kings River surface water flowing from the western slope of the Sierras. This results in having excellent quality water for recharge within the Kings River Watershed. When the groundwater is used for domestic purposes, construction of ground level treatment facilities to remove specific contaminants or the drilling of deeper uncontaminated wells have been required. The nitrate contamination is usually the result of agricultural fertilizer, domestic sewage, livestock wastes, or from natural sources. In some isolated locations, nitrate levels in groundwater have also caused problems for the agricultural pumpers. Since DBCP is no longer used for nematode control, concentration levels are expected to drop over time. In addition, some wells require chlorination because of bacteriological concerns. The groundwater management plan will include locally cost effective recommended procedures to maintain the existing excellent water quality (***see Best Management Practices, Section VI.B.15, page 23***). In the Kings Sub-basin, typical contaminates of concern in the water used for domestic purposes are DBCP and nitrates.

Groundwater wells are prevalent throughout the District. The wells are used by cities, agricultural producers, industrial developments and individual homeowners. With the many water production wells, there is a risk that cross-aquifer contamination can occur. The greatest potential for groundwater contamination within the basin is cross-aquifer flow through improperly abandoned wells and the improper sealing of new wells. Therefore, it is necessary that proper sealing of new wells and abandonment of old wells always be accomplished. At a minimum, the water well standards of Tulare, Kings & Fresno Counties along with Bulletin 74 requirements must be met. In addition, it may be advantageous to require construction standards that exceed those presently mandated by either the county or state. With the continual raising of standards for drinking water, maintaining the quality of the groundwater becomes ever more important.

Water quality is an important aspect of groundwater management. Contamination of the groundwater, resulting in a limitation on its use, is equivalent to a reduction in total water supply with a negative impact on the water balance for the Kings Sub-basin. This loss of supply will require obtaining additional supplies or incurring additional costs for treatment of the contamination.

C. Well Abandonment

An objective of the Plan is to maintain superior water quality within the District. This is of extreme importance because the municipal, industrial and agricultural users need a dependable high quality water supply. A reduction in the quality of the groundwater is tantamount to a loss of water supply, since the quality problem will require additional funding for the construction of treatment facilities. This cleanup will be necessary to allow the water to be integrated into the system.

One of the action items listed in the Plan recommends increased monitoring of groundwater quality in selected areas. This monitoring information will be collected and utilized to evaluate the best management practices available to reduce and/or eliminate the contamination. In addition, the action items recommend working with the Department of Water Resources and the counties of jurisdiction in upgrading water well standards. Since the natural minerals occur in low concentrations, the major thrust of the water quality monitoring and recommended practices will be to prevent chemical contamination.

The quality of both surface and groundwater within the District must be maintained. The Plan provides a mechanism that will help achieve those long-term goals. The initial action of increasing the amount of monitoring will provide the additional data needed to proceed with future programs to maintain water quality.

D. Water Quality Monitoring and Protocols

The District performed general groundwater quality testing for nitrates and DBCP for a three-year period: 1997, 1998 and 1999. The reason for performing the general water quality sampling was to determine and prioritize areas of interest. In the future, the District will need to study how and why nitrate and DBCP levels are exceeding relevant water quality standards (***see Section VI. PLANNED ACTIONS AND REPORTS, B. Management Actions, 14. Regional Monitoring***).

E. Goals, Objectives and Strategies

There is little potential for increasing the water supply through wastewater reclamation in this basin. The majority of the wastewater is currently being utilized for the irrigation of agricultural crops or groundwater recharge with only a minor portion being consumed through evaporation basins. The District will continue to work with the wastewater treatment agencies, where practical, to reduce the amount of effluent disposed of through evaporation. In addition, the District will continue to promote the past practices of reusing all wastewater effluent within the local basin, in order to maintain the total water balance within the area. In a water deficient region such as the District, the reuse of the wastewater effluent is a key element of establishing and maintaining a water balance.

IV. WATER MAPPING

A. Depth to Groundwater / Water Quality Mapping

The District has been monitoring groundwater levels for the last seventy-five (75) years. This is accomplished through water level measurements taken in the late fall and early spring. A map of the District showing the well locations has been attached (***see APPENDIX, Map of Well Locations, Attachment H***). As wells are lost, new wells are substituted to maintain the continuity of the grid pattern. From these readings, groundwater contour maps have been made depicting both the water elevation and changes in groundwater levels. Groundwater level readings are obtained utilizing an electric well sounder.

Based on the water level readings, the overall trend has shown a declining groundwater level within the District. This decline has been periodically interrupted by a short-term groundwater recovery during wet years when surface water supplies are abundant and groundwater pumping is reduced. Based on this long-term data, it has been determined that it would take approximately 22,000 acre-feet per year of additional surface water to correct the overdraft situation that presently exists. Based on average porosity and specific yield considerations, this amount of overdraft results in a decline in the groundwater storage of one foot for every 7,000 acre-feet of overdraft. This storage can be regained if sufficient surface water supplies are made available to reduce the amount of groundwater pumping that is necessary to meet the water demands. In addition, the overdraft results in additional pumping costs to overcome the increased lift. As the water table continues to drop, the pumping occurs from lower portions of the aquifer, which have lower porosity and specific yield factors than those found in the upper portions of the unconfined aquifer. The long-term impact is a greater incremental reduction in the available groundwater storage capacity per acre-foot of overdraft. Using the historical data collected and the transmissivity of the aquifer, a determination can be made of the estimated quantity of inflow and/or outflow of groundwater within the limits of the District. This data also will allow the District to evaluate areas that are more severely impacted during periods of sustained drought due to the low yield of the wells and the limited depth of the aquifer. This is an important water management tool that is useful to the District in developing long-term planning decisions.

The collection of this data will be continued with the Plan. The information that has been prepared from this data in the past includes the following:

1. Maps of spring and fall water elevations.
2. Maps of spring and fall depth to groundwater.
3. Maps showing the changes in groundwater levels over time.

In addition, the groundwater reports can include estimates of changes in groundwater storage, water delivered, water use, and overdraft. This information will allow the District to better evaluate the effectiveness of various management actions as stated in Section VI.

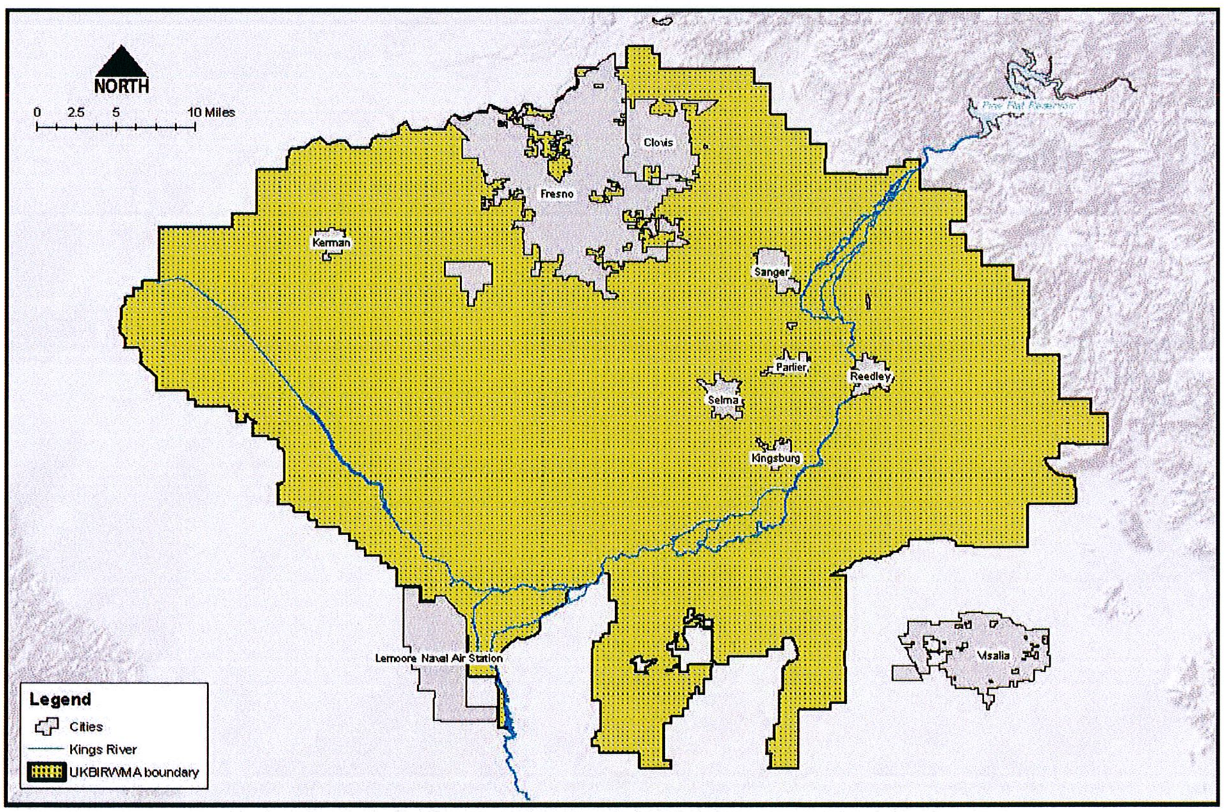
The District will use the results of water quality monitoring that is being proposed as one of the action items to augment the information obtained through the historical water level readings. The District will take water quality samples in critical areas adjacent to urban centers and known locations of contamination. By correlating the water quality tests and the groundwater level measurements, the District will improve its ability to effectively manage the groundwater by utilizing monitoring data and applying it to a management action. For example, this information can provide the additional data needed to establish programs to reduce the movement of any contaminants. Typically, the urban centers have a higher concentration of wells resulting in a cone of depression within and surrounding the community. This can accelerate the movement of contaminants towards the urban well fields. Using the information gathered through the Plan, the District could pursue an additional future action item; namely, the analysis of the potential benefits of creating a hydraulic barrier or modification of the local pumping regime to reduce or impede the migration of any contamination.

V. BASIN MANAGEMENT OBJECTIVES

A. Upper Kings IRWMP

The Upper Kings Water Forum in 2003 and 2004 reviewed criteria to determine and identify concerns, issues and purposes for an integrated planning process to be undertaken by the Upper Kings Integrated Regional Water Management Plan ("IRWMP"). The intent was to develop a framework enabling urban, agricultural and environmental interests to formulate a consensus on regional problems, issues and conflicts. The IRWMP was established on July 27, 2007.

B. Map of JPA Service Area



C. Goals and Management Objectives

As identified in the IRWMP, the constituents established goals to address the primary problems and issues in the region, which are:

1. Halt, and ultimately reverse, the current overdraft and provide for sustainable management of surface and groundwater;
2. Increase the water supply reliability , enhance operational flexibility, and reduce system constraints;
3. Improve and protect water quality;
4. Provide additional flood protection; and
5. Protect and enhance aquatic ecosystems and wildlife habitat.

Additionally, the Upper Kings Basin IRWMP established water management objectives, which are to:

1. Define local and regional opportunities for groundwater recharge, water reuse/reclamation, and drinking water treatment;
2. Develop large scale regional conjunctive use projects and artificial recharge facilities to:
    a. Enhance operational flexibility of existing water facilities, consistent with existing agreements, entitlements, and water rights;
    b. Improve the ability to store available sources of surface water in the groundwater basin;
    c. Capture storm water and flood water currently lost in the region;
    d. Provide multipurpose groundwater recharge facilities that provide flood control, recreation and ecosystem benefits; and
    e. Integrate the fishery management plan;
3. Promote 'in-lieu' groundwater recharge to reduce reliance on groundwater through reclamation and reuse of treated wastewater, surface water treatment and delivery for municipal drinking water, and delivery of untreated water for agricultural use;
4. Negotiate and develop institutional arrangements and cost sharing for water banking, water exchange, water reclamation, and water treatment;
5. Design programs to improve water conservation and water use efficiency by all water users;
6. Identify interconnections or improvement of conveyance systems to provide multiple benefits; and
7. Enhance wildlife habitat through surface water reclamation, recharge, and treatment facilities.

D. Local Agency Coordination

To plan and implement regional goals and management objectives, the IRWMP has adopted regional planning objectives (***see APPENDIX, IRWMP Chapter 5 Goals and Objectives, Attachment I***) and has provided a framework and forum to mediate conflicts among urban, agricultural and environmental interests in the region.

Currently, the Upper Kings Basin Water Forum has established an Upper Kings Basin Water Forum Joint Powers Authority ("JPA") to provide for more structure and governance in the administration and implementation of the IRWMP on September 10, 2009. The current JPA member agencies are attached (***see APPENDIX, JPA Member Agencies, Attachment J***).

VI. PLANNED ACTIONS & REPORTS

A. Historical Trends

District will prepare bi-annual reports compiling, recording and reviewing:

1. Annual monitoring data, which will include as a minimum, water quality, depth to groundwater, trends, findings and changes
2. Attainment/nonattainment of goals
3. Actions, coordination, activities and disputes with other agencies
4. Recommendations

B. Management Actions

The District will continue to pursue the thirteen (13) action items identified in the AB 3030 Plan, which will be implemented according to the Rules and Regulations (***see APPENDIX, AB 3030 Groundwater Management Plan, Attachment A***), as amended from time to time. However, this Plan will provide the additional elements required to satisfy the requirements of an SB 1938 Plan. To have a successful Plan, it is not necessary to implement all of the action items identified. The last three items would be implemented only as a last resort due to the occurrence of emergency conditions within the Basin Plan Area. It is important that all the potential action items be identified and contingency plans developed in case any one of them becomes necessary. It is recommended that the District implement items one (1) through six (6) immediately and/or as it is now continuing to pursue them. Upon approval of the Plan, the District should begin investigations into items seven (7), eight (8) and fifteen (15), and submit a staff report regarding their status within one year. Action items nine (9) thru fourteen (14) will require additional staff study, board approval, public hearing and a possibly, a funding source. If funding is necessary to implement a portion of the Plan, then an election will be required prior to instituting an assessment or other levy. The District believes that through the management activities listed in the Plan, the District can preserve the groundwater resource and avoid the drastic steps identified in the last three action items.

1. Water Monitoring: The District shall continue to monitor water levels every six months. In addition, it will also assist in water quality sampling. Further, the District will prepare maps depicting the information gathered during the monitoring phase, as well as reports quantifying the water demands, surface water and groundwater supplies. This monitoring and reporting will assist the District in evaluating the effectiveness of the various elements of the program. The monitoring process will soon detect any migration of contaminated plumes thereby allowing ample additional time for plans to be developed and implemented before presently unaffected portions of the basin are impacted. The District will coordinate and assist in implementing a management program to address groundwater quality issues, especially in the east side of the District.

2. Direct Recharge: The District will continue to use surface waters when available to recharge the underground by sinking those waters in its basins. Basin sites will be located in the areas of greatest need. The District will actively seek the cooperation of other government entities in construction of such sites.

3. Indirect/In-lieu Recharge: The District has approximately 250 miles of unlined canals. The indirect recharge is accomplished through the seepage that occurs in some reaches of the canals. In addition, during winter months many of the natural channels carry surface runoff that recharges the groundwater. These old channels are typically located in the more permeable soils. The effective amount of this recharge varies from year to year and is dependent upon the amount of runoff that occurs. Additional water supplies will be pursued for groundwater recharge in natural channels and during non-irrigation seasons in the District's canals. By providing surface water to the area, the District has reduced the amount of groundwater pumping that would have otherwise occurred, resulting in an effective in-lieu recharge program. The District will continue efforts to maximize the amount of surface water available to users within its boundaries.

4. Water Conservation - Water Regulation: The District has a long-standing practice of conjunctive water use. Conjunctive use is the integration of surface and groundwater supplies to meet the total water demand. In the past, a cooperative program termed the "mobile lab" has been operated by the Kings River Conservation District in cooperation with local irrigation districts to measure applied water efficiencies. The purpose of this program has been to promote on-farm water conservation. The District has strongly supported programs that conserve water along with enhancing crop production.

Through the construction of water regulating basins, the District has been able to conserve and more efficiently utilize water within its system. The most recent regulating basin was constructed on a 50-acre site in the southeast portion of the District.

The Alta Irrigation District, the cities and the unincorporated water purveyors, all have water conservation plans. The Plan will encourage agricultural, industrial and residential users to implement water conservation measures throughout the basin. Existing and new irrigation methods, reuse of industrial water and domestic water saving devices will all be encouraged. The water use requirements of new developments will also be evaluated to insure compatibility with this water deficient basin.

5. No Net Exportation of Groundwater: Since the District is located within an over-drafted basin, it is prudent to utilize groundwater resources within the District's boundaries. Effluent discharged by the City of Reedley ("Agency") from its sewer treatment plant into the Kings River should not be considered to be prohibited exportation of groundwater if such effluent recharges or benefits underground supplies available to landowners in the District.

6. Intra-district Water Transfer: Water transfers within the District have taken place on a routine basis. Each year the District evaluates the water transfer policy and specifies the circumstances warranting internal water transfers. Approximately 60 transfers are approved each year within the District.

7. Well Drilling and Abandonment: Portions of the groundwater have been contaminated, principally by volatile organic chemicals or nitrates. This contamination is most prevalent in the upper aquifers. Interaquifer mixing can occur through inadequate seals or improperly abandoned wells. Working through the Department of Water Resources and the county of jurisdiction, the District will seek to upgrade standards for construction and abandonment of water wells to reduce the potential for aquifer contamination.

8. Groundwater Banking: Given the scarcity of suitable recharge sites within the District, the District will cooperate with other agencies that have soil types more suitable for recharge basins. The District could then recharge (bank) surface water within their boundaries for withdrawal at a later time. This arrangement can provide benefit to the groundwater basins for both the District and the cooperating agency. The District benefits because it has few areas suitable for recharge. The participating agency receives the benefit of reduced pumping lifts during the time the water is banked and retains a percentage of the banked water that is not extracted by the District. In spite of having only limited recharge areas, the District does have two banking projects within its own boundaries and under its own management: the

Harder Pond and Traver Pond projects. In the future, the District will continue to expand its own water banking potential to address water resource issues. The intent of both banking projects is to address groundwater quality issues in the easterly areas of the District by using surface water to mitigate groundwater pumping for drinking water purposes.

9. Inter-district Water Transfer: Water transfers between different water districts are currently taking place. In the past, the District has completed such transfers on a limited basis. This mechanism would be used to increase the total water supply within the District or to augment the water supply in specific areas of the basin during critically dry years.

10. Reduction in Groundwater outflow: The direction and quantity of groundwater flow is susceptible to changes that occur to the hydraulic gradient. The groundwater level measurements taken twice a year within the District will identify the direction of groundwater flow. Typically, this outflow has been to the west and southwest creating hydraulic barriers by mounding of the groundwater can lead to a reduction in the amount of water that leaves the District. This can be an especially effective procedure along the perimeter of the District. Likewise, increased pumping by landowners along the perimeter of the basin can increase the groundwater outflow. The District will continue its efforts to assure that all necessary steps are taken to reduce the amount of such groundwater outflow.

11. Pumping Restrictions: Pumping restrictions would definitely reduce the amount of groundwater use. This is a controversial item so pumping restrictions would be the last item the District would consider. This step could have severe economic implications since the local economy that has been developed with a reliance on groundwater would be detrimentally impacted. Initially, any program requiring pumping restrictions would be voluntary rather than mandatory. From a practical standpoint, only if the urban water supplies are being severely restricted, will mandatory agricultural pumping restrictions be implemented.

12. Additional Water Supply and Storage: The generation of additional water supplies would enhance the local groundwater levels. Present political realities prevent developing additional water by building dams and surface water storage projects. As a result, additional water supplies will most likely come through water conservation efforts, recycling and storm water supplies. The limiting factor to securing additional water supplies is addressing actual or perceived environmental considerations.

13. Redistribution of Surface Water: There is a tremendous difference in the aquifer characteristics within the District. These affect both storage capability and yield. The impacts of recent droughts are evidenced by the continued lowering in groundwater levels for those areas with limited aquifer depth versus portions of the basin that are located over a deeper and higher yielding aquifer. During critically dry years, all or a disproportionately high percentage of the available surface water may need to be directed to the severely impacted areas. Increased pumping could then occur in those areas having better groundwater conditions to offset the redistribution of the available surface water supply.

14. Regional Monitoring: The District will help urban, agricultural and environmental interests to better monitor and implement management strategies affecting the region and basin. Currently, Alta Irrigation District is a founding member of the Upper Kings Basin Integrated Regional Water Management Authority ("JPA") representing portions of Fresno, Kings and Tulare Counties. The JPA would be the means to address the monitoring of groundwater levels, water quality, subsidence, impacts of changes in surface water quality or groundwater pumping that may impact groundwater quality and address regional trends on a basin or sub-basin basis.

15. Implement Locally Cost Effective Best Management Practices:

District will:

A. Lead a coordinated effort to increase groundwater pumping for irrigation purposes in the impacted area. This could result in a reduction in surface water deliveries to lands lying easterly of the communities. Increased pumping would extract the contaminated water for surface irrigation of crops and create a cone of depression to pull any contaminants away from domestic wells;
B. Hold workshops with the farm advisor to encourage more effective utilization of fertilizers;
C. Actively encourage implementation of Fresno and Tulare County's program for locating and properly abandoning of groundwater wells;
D. Work and coordinate efforts with interested parties, i.e., extension service, academic experts, etc., to identify potential sources of contamination;
E. Develop a program with the farm operators and testing laboratories to evaluate nitrate applications on individual parcels;

F. Use various media sources to disseminate information on fertilizer application, problems and availability of programs to assist farm operators;
G. Search out funding sources to help develop programs for farm operators; and
H. Lead a coordinated effort to alter surface water supplies/groundwater pumping available to the lands near those communities to more effectively manage groundwater movement to minimize the degradation of water quality.

C. Current and Future Monitoring Results

The District intends to compile, review and analyze monitoring data on an annual basis and to develop a bi-annual report to synthesize the data and trends. Incidental information that may be of landowner interest will be posted on the District's website.

D. Summary of Coordinated Actions with Water Management & Land Use Agencies

District shall endeavor to enter into a Memorandum of Understanding with Water Management and Land Use Agencies within the District ***(see APPENDIX, MOU, Attachment K)***.

E. Implementation Schedule

1. Management Action Item Number 1, (Monitoring Groundwater Levels) will continue. The District will actively pursue the implementation of programs to address groundwater quality issues.

2. Management Action Item Number 2, (Direct Recharge) will continue to be implemented.

3. Management Action Item Number 3, (Indirect/In Lieu Recharge) will continue as a basic District operation.

4. Management Action Item Number 4, (Water Conservation – Water Regulation) District will continue to promote water conservation activities and water ruse programs.

5. Management Action Item Number 5, (No Net Exportation of Groundwater) is a basic philosophy of the District that will continue.

6. Management Action Item Number 6, (Intra-District Water Transfer) is a basic philosophy of the District that will continue.

7. Management Action Item Number 7, (Well Drilling and Abandonment) is critical to maintaining groundwater quality. The District will work with agencies of jurisdiction to upgrade the standard.

8. Management Action Item Number 8, (Groundwater Banking) is a basic philosophy of the District that will continue. Currently the District is working on the Traver Pond Banking Project which is to be completed and operational on or before December 31, 2011. Currently the land has been purchased and the environmental documents are being prepared for review and comment. The District will be actively pursuing additional areas for groundwater banking in cooperation with other entities.

   Management Action Item Number 8 (Groundwater Banking) and the groundwater quality issues identified in Management Action Item Number 1 (Water Monitoring), will be addressed in a planning grant for the Orosi Water Supply Study. That grant is expected to be authorized by December 31, 2010. The estimated time to complete the planning grant is eighteen months. Listed below are the identified items to be addressed in the planning grant:

   a. Identify location for surface water treatment plant
   b. Identify Pipeline alignments and right-of-way requirements
   c. Environmental documentation
   d. 30% design level plans for project
   e. Develop organizational structure and service area
   f. Finalize Orosi and Cutler treatment plant capacity requirements
   g. Meet with adjacent communities regarding potential water needs and treatment plant capacity
   h. Identify water supply, transfer requirements and conveyance facility agreements
   i. File application for regional water supply permit
   j. Adoption of funding

Within the next five years, the Plan proposes to commence construction of a regional surface water treatment plant to serve the northeast portion of the District.

9. Management Action Item Number 9, (Inter-District Water Transfer) the District will pursue these opportunities as they develop and are beneficial to the Districts water management plan.

10. Management Action Item Number 10, (Reduction in Groundwater Outflow) this activity will continue to be studied and evaluated by the District for possible future implementation.

11. Management Action Item Number 11, (Pumping Restrictions) this activity will continue to be studied and evaluated by the District for possible future implementation.

12. Management Action Item Number 12, (Additional Water Supply and Storage) this activity will continue to be studied and evaluated by the District for possible future implementation.

13. Management Action Item Number 13, (Redistribution of Surface Water) this activity will continue to be studied and evaluated by the District for possible future implementation.

14. Management Action Item Number 14, (Regional Monitoring) is a basic philosophy of the District that will continue. Additionally the District will be implementing a subsidence network along with monitoring of groundwater and groundwater depths through the JPA on or before December 31, 2010.

15. Management Action Item Number 15, (Implement Locally Cost Effective Best Management Practices) is a basic philosophy of the District that will continue. Ongoing efforts in this regard will continue. Additional Best Management Practices will be implemented as they are deemed prudent and economically feasible.

F. Dispute Resolution

Under current law, a district with an adopted groundwater management plan, i.e., AB 3030, SB 1938, or an amended AB 3030 plan, is the groundwater authority for the lands within such defined boundaries. Alta Irrigation District has an existing obligation to manage groundwater, as defined under AB 3030, which under this Plan would also comply with the provisions of SB 1938 and the resulting obligations for implementation thereof. The Plan provides that disputes would be addressed by the Board of Directors of Alta Irrigation District.

VII. RE-EVALUATION OF PLAN

A. Amendment of Plan

Prior to amending the Plan, the District shall hold a hearing, after publication of notice pursuant to Section 6066 of the Government Code, on whether or not to adopt a resolution of intention to draft an amendment to the Plan. After the conclusion of the hearing, and if the District adopts a resolution of intention to amend the Plan, the District shall publish the resolution of intention in the same manner that notice for the hearing was published.

B. Schedule to Update the Plan

The District will review, and if necessary, update the Plan every five years on years ending in zero and five. Prior to adopting a resolution of intention to update the Plan, the District administering the Plan shall hold a hearing, after publication of notice pursuant to Section 6066 of the Government Code, on whether or not to adopt a resolution of intention to draft a resolution of intention to adopt an update to the Plan. After the conclusion of the hearing, and if the District adopts a resolution of intention to update the Plan, the District shall publish the resolution of intention in the same manner that notice for the hearing was published.

APPENDIX
SCHEDULE OF ATTACHMENTS

Attachment A	**AB 3030 Groundwater Management Plan (1994)**
Attachment B	**Notice of Intent to Adopt a SB 1938 Groundwater Management Plan (July 10, 2008)**
Attachment C	**Bulletin 118, Department of Water Resources**
Attachment D	**SB 1938 Advisory Meeting Notice and Minutes**
Attachment E	**Table 111-1, KRCD Surface Water Study (1991)**
Attachment F	**Table 9, Future District Operating Budget - Engineer's Report Proposition 218 Procedures (2005)**
Attachment G	**Water Banking Annual Report (2009)**
Attachment H	**Map of Monitoring Well Locations**
Attachment I	**Section 5 Goals and Objectives, Upper Kings Basin IRWMP**
Attachment J	**Member Agencies Upper Kings Basin IRWMP Authority**
Attachment K	**Memorandum of Understanding with Overlapping Local Agencies**

ATTACHMENT A

AB 3030 Groundwater Management Plan (1994)

Groundwater Management Plan

Adopted August 14, 1994

By

ALTA IRRIGATION DISTRICT

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GROUNDWATER MANAGEMENT PLAN

I. INTRODUCTION

A. General

The Kings River ("River"), which provides the surface water for the Alta Irrigation District, a California Irrigation District ("District"), is one of the largest streams entering the San Joaquin Valley. The River's watershed covers 1,742 square miles, ranging in elevation from 500 to 14,000 feet above sea level. The majority of the watershed area is in the high Sierra Mountains and receives heavy snowfall in the winter months. This snow melts slowly. Thus in average years, the River does not reach its highest stage until the middle of May or early June. The current yearly average runoff for the Kings River is 1,689,700 acre feet. However, the average runoff does not guarantee this quantity in any given year. Variation is great, not only from year to year, but also from month to month. As a result of this great variation, there were alternating periods of flood and drought in the drainage area of the River until Pine Flat Dam was completed in 1954.

Rainfall occurs primarily in the winter months with virtually no rainfall in the summer months. The average annual rainfall for the fifty-year period preceding 1956 was 11.39 inches with the annual crop use per acre ranging from 24 to 36 inches. As a result, the agricultural crops within the District do not depend upon rainfall for their irrigation needs; but instead depend upon surface water deliveries and deep well pumps.

Historical water deliveries were initiated in 1882 by a private water company called the "76" Land and Water Company. In 1887, the California legislature passed the Wright Act, which conferred on farming communities the powers of municipalities to purchase, construct and operate irrigation works. On July 7, 1888, sixty-six landowners interested in developing a new public irrigation district filed petitions with the Tulare County Clerk. The District would now comprise 130,000 acres in Tulare, Fresno and Kings Counties and would become the Alta Irrigation District. The present communities of Dinuba, Reedley, Traver, Cutler, and Orosi lie within these boundaries.

Historically, the district had a shallow water table; in the early 1900's the distance from the ground surface to the groundwater table averaged less than ten feet with each successive drought period resulting in an increase in the agricultural groundwater pumping, the water table has dropped significantly over the last fifty years. As agricultural land is paved over for urbanization, the competition for control of water resources among agricultural, urban and environmental interests will be significantly increased.

B. Purpose and Goals

The Alta Irrigation District has long recognized the importance of groundwater to the area. With the new state Legislation, AB 3030 (Section 10750, et. seq. California Water Code), an opportunity is available to the District to prepare and implement a Groundwater Management Plan ("Plan") on a local basis in-lieu of a mandated plan administered by the State of California Department of Water Resources. While this legislation allows for separate plans to be developed by each water purveyor, such as cities and special districts, within the irrigation district, a well conceived Plan covering the entire District will be more manageable and will have the potential to provide greater benefit. Separate plans prepared by the individual communities will not be effective, since groundwater does not recognize political boundaries. In addition, the availability of groundwater pumped to serve a community can be impacted by activities that take place a considerable distance beyond local boundaries. There is common use of the groundwater resource and it is hoped that this coordinated Plan will be of benefit to competing interests using the groundwater resource. The coordination will be accomplished through the establishment of Memorandums of Understanding between the District and the local agencies.

The proposed Plan recognizes that the conjunctive use of the water supplies within the District must be continued. To achieve this delicate hydrologic equilibrium requires the management of both surface and groundwater supplies. The long-term continuation of this balance will be the principal benefit to be derived from the Plan. Retaining all existing surface and groundwater supplies within the District is critical to maintaining this delicate balance.

The principal action item in the Plan will be gathering and evaluating additional data concerning the quantity and quality of groundwater. Action items will be developed to enhance the valuable groundwater resource by promoting those actions necessary to reduce the long-term groundwater level decline in the area. Many of the action items identified are currently being conducted or will begin with adoption of the Plan. Other action items will require further study prior to implementation.

Through the proposed Plan, duplication of activities by local jurisdictions will be reduced and the adopted Plan can be utilized in the long-term planning activities of all the agencies within the District. The Plan will be flexible allowing updates to be made as needed, based on the additional information that is gathered through the monitoring programs.

The Plan preparation is being funded by the Alta Irrigation District. The water quality sampling and testing costs will be shared among the City of Reedley, City of Dinuba, Alta Irrigation District and other local agencies. Future activities required to fully implement the Plan may require funding sources in addition to those outlined. AB 3030 allows for the levying of groundwater assessments or fees under certain circumstances and according to specific procedures. Prior to instituting a fee structure, the District must hold an election on whether or not to proceed with the enactment of the assessments. A majority of the votes cast at the election will be required to implement an additional funding assessment.

C. Institutional Requirements

Historically, the use of groundwater within the state of California has not been regulated except in a few basins where the rights have been adjudicated by the courts or special management districts have been authorized by the state legislature. Groundwater accounts for approximately one-third of the water used within the state. With the continued increasing demand being placed on the limited water supplies of the state, groundwater usage is being scrutinized to a much greater extent.

II. EXISTING CONDITIONS

A. Groundwater Basin

The Alta Irrigation District overlies a portion of a larger groundwater basin designated as the Kings River Basin. The California Department of Water Resources has designated this basin to be a critically over drafted groundwater basin. The District has been monitoring groundwater levels for at least the last seventy-five years. The results of this monitoring effort are consistent with the findings of the Department of Water Resources. The water level measurements taken within the District show a continued downward trend in the groundwater elevations within the District's boundaries. This average overdraft is approximately 22,000 acre feet per year.

The total water supply available to the District is extremely variable and dependent on the snowpack that occurs in the Sierra Nevada mountain range to the east. The pumping within the groundwater basin is inversely proportional to the surface water supply made available by runoff within the Kings River watershed.

The boundaries of the District include land within three counties, two incorporated cities and numerous unincorporated urban water districts. All of the urban communities, along with many individual residences scattered throughout the District, are dependent on the groundwater supply to meet their domestic demands. Surface water is currently not available to meet those needs. The conjunctive use of both the groundwater and surface supplies is necessary to meet the irrigation requirements within the District. This irrigation demand represents by far the largest water use within the basin.

The District recognizes that the continuation of the agricultural, municipal and industrial developments within the basin is dependent on maintaining an adequate water supply. With the conjunctive use that already occurs within the District, adequate surface water supplies are necessary to achieve a water balance. Both the groundwater and surface supplies are already fully developed and cannot be augmented by increased groundwater production.

B. Geology

The District is located in the eastern portion of the San Joaquin Valley and southern half of the Great Valley geomorphic province of California. The District is part of the valley which is a nearly flat northwest to southeast trending alluvial plain. Alluvial sediments are found within the District and are bounded on the east by granitic rocks of the Sierra Nevada. The alluvium within the District is a heterogeneous mix of clay, silt, sand and gravel (USGS, 1968). The soils within the District are complex with the unconsolidated alluvial fans being made up of varied textured material. The upper soils vary from very heavy clays near the base of the Sierra Nevada (on the east side of the District) to relatively coarse sand near the western boundary along the Kings River. Much of the area is underlain by hardpan that restricts the vertical percolation of the water. These areas are typically ripped and/or soil amendments are applied to improve the vertical percolation. Throughout the District there are isolated locations of coarse grained material with high percolation rates. These are typically found at locations where old stream beds historically meandered throughout the District.

Along the east side of the District, the basement complex is shallow and the aquifer depth is very limited. The granite bedrock slopes quickly westward within the District resulting in a deeper aquifer along the western boundary of the District. The bedrock depth is approximately 500 feet below the ground surface along the eastern perimeter of the District and increases to 5,500 feet near its southwest limits. The coarse, sandy materials that are found along the west side of the District are reflected in the higher specific yields for those soils which are typically 50 percent to100 percent greater than for the finer textured clay materials found on the east side of the District. This same correlation is also found in the deeper soils which are much less permeable and have significantly lower specific yields than the upper soils. Therefore, the specific yields from wells drilled into the deeper portions of the aquifer are considerably less than the yields from shallower wells.

C. Hydrology

The hydrology of this area is principally impacted by the snowpack that occurs within the Kings River watershed and to a limited extent by both the local runoff from the foothills lying just easterly of the District and the precipitation that occurs within the District. The water table within the District is unconfined and typically flows in a southwesterly direction. Groundwater extractions are made for agricultural, municipal and industrial purposes. These extractions are very significant during periods when there is little surface water available to augment the water needs within the District. The groundwater levels, during those periods, experience a significant decline. Surface water made available to the irrigation canals and pipelines through diversion from the Kings River provides a stabilizing factor on the groundwater levels. This surface water supply reduces the amount of pumping, provides recharge and is the principal contributing factor that influences the groundwater conditions. This effect is evident in years of below normal runoff when a rapid decline in the groundwater level is experienced. Based on the District's fall 1993 groundwater measurements, the average groundwater level was 53.16 feet below ground.

D. Climate

The area is semi-arid with mild winters and hot, dry summers. The average rainfall, based on District records, is approximately 11 inches per year. The majority of this rainfall occurs from November through April. With the long, hot summers that normally occur in the valley, there is about 6 feet of evaporation per year with the majority of that evaporation occurring during the period May through October. The winds in the area are principally from the northwest with a southeast wind usually indicating that a rain storm is imminent.

E. Surface Water Management

Alta Irrigation District operates a "demand" system allowing farmers to order water on or off within the system. Primarily, water orders are called in between 7:00 a.m. and 8:00 a.m. each morning; with a subsequent coordinating meeting each morning to determine changes within the system. The conjunctive use pattern of utilizing surface water in wet years and relying more on ground water in dry years helps to maintain sufficient water supplies to the District's significant acreage of permanent crops. The most beneficial use of surface water is to turn off the farmer's groundwater pump, thus conserving the groundwater to be utilized when needed.

All primary canal and pipeline measuring locations are measured daily prior to 7:00 a.m. Each farmer's delivery is measured at least once a day. The District uses a calibrated submerged orifice to determine the instantaneous flow rate. The District is in the process of updating its distribution system by requiring cumulative flow meters on all turnouts when open canals are replaced by pipelines.

In 1990, Alta Irrigation District commissioned the Kings River Conservation District to complete a "Surface Water Study" to study and review the District's surface water delivery system. A system water balance was evaluated in wet and dry years to determine seepage evaporation, evapotranspiration (ET) of bank vegetation, and operational spillage. The study showed that seepage (estimated to be approximately 23 percent of the District's total diversion) was the most significant loss in the system (see Exhibit "A").

The water flow in the District's canals and pipelines is measured by means of overflow weirs, undershot gates, parshall flumes and a current meter. The District has developed rating tables to set the proper flow rate in each of the canals and pipelines. However, the District may reallocate water from the different laterals if the demand warrants such reallocation.

The District has instituted a water allocation formula to equitably distribute water to farmers. The formula is based on four days per twenty acres utilizing one cubic foot per second per entitlement percentage. Approximately eighty percent of the District's irrigable acres receive one-hundred percent entitlement; the remaining acreage is entitled to receive seventy-five percent, fifty percent, twenty-five percent, or no surface water entitlement. Historically, the lower water entitlement areas either were not farmed or were being farmed to low value crops. The allocation formula is set by the Board of Directors and can be adjusted by lengthening or shortening the number of irrigation days per twenty acres. Typically, in less than average water years, water is held in storage until peak demand occurs in May, June and July.

Water regulating reservoirs have been designed to better maintain constant flows in the lower areas of the district. In 1991 the district developed the fifty-seven acre Button Ponding Basin which is fed by five tributary canals. The flow rates within the canals served by the pond, have been prone to large fluctuation between mid-week and weekend days. All the inflow is now funneled into the ponding basin with a single discharge point: the result being that on weekend's additional water *is* stored in the basin; and on weekdays, when there is normally higher demand, additional water is used from the storage basin. Additional regulating reservoirs are being evaluated for future construction.

F. Surface Water supply

The District *is* located east of the Kings River in the Central San Joaquin Valley (see Exhibit "B"). To the east of the District are the Sierra Nevada Foothills. The District is composed primarily of alluvial fans sloping to the southwest with elevations ranging from about 425 feet at the northern point to 270 feet in the southwest corner. The incorporated communities within the district are Reedley (population 18,000) and Dinuba (population 13,700). There are also several unincorporated communities, housing clusters and individual rural residences.

The primary economy within the District is agriculture or agriculturally related business. The primary crops grown within the region are grapes (22,056 acres), nectarines (14,394 acres), plums (12,285 acres), and peaches (10,080 acres). Due to the relatively high land prices and high production costs in terms of hand labor, spraying and fertilizer costs, the average parcel size is approximately 36 acres. There are approximately 4,000 farm parcels within the district.

Initially, agricultural production in the region was primarily dry land farming; but with the development of a dependable surface water supply and a willingness of farmers to risk high value crops, the cropping pattern changed to perennial crops and need for a stable water supply became apparent.

The estimated crop demand within the District is 325,000 acre feet and the average surface water supply is 148,416 acre feet; therefore, there is a strong reliance on an alternate water supply; i.e., groundwater.

The District diverts water from the Kings River at the "Cobbles Weir" and measures water into the District at a computerized headgate ("Headgate") located near the community of Piedra. Downstream of the Headgate are 78 ditch laterals serving approximately 4,000 farm parcels. The total length of canals and pipelines is between 350 and 400 miles. The canal widths vary from 4 to 70 feet; lengths range from 3,000 feet to nearly 18 miles (see Exhibit "D")

The annual diversions from the Headgate during a recent twenty-year period were as follows: 253,269 acre feet in 1980 (highest annual diversion); 38,721 acre feet in 1977 (lowest annual diversion) and 148,446 acre was the average annual diversion.

The average time period for each water run within such twenty-year period is 112 days; the shortest water run being 28 days; and the longest water run being 195 days (see Exhibit "C"). The District's diversion and storage rights are based upon riparian and appropriative claims as well as contractual agreements and licenses granted by the state Water Resources Control Board. Such agreements stipulate the use of District's rights in conjunction with the rights of the other twenty-seven (27) entities storing and diverting water from the Kings River: the twenty-eight (28) entities comprise the Kings River Water Association. It is typical for weather patterns and the resulting water storage to vary significantly from year to year, thus illustrating the value of water storage in the production of perennial crops.

III. WATER QUALITY

A. Groundwater Quality

Overall, the quality of the groundwater within the basin is very good. This is the result of the excellent quality of the basin recharge waters originating in the Kings River watershed. The most prevalent water quality problems occurring within this basin are caused by synthetic chemicals. The predominant chemical contamination is DBCP. When the groundwater is used for domestic purposes, construction of ground level treatment facilities to remove the contaminants or the drilling of deeper uncontaminated wells has been required. The contamination has not resulted in any problems when the well water is used for irrigation purposes. Additional contaminates of the water used for domestic purposes include nitrate and bacteriological. The nitrate contamination is usually the result of agricultural fertilizer, domestic sewage, or livestock wastes. In some isolated locations, nitrate levels in groundwater have also caused problems for the agricultural pumpers. The groundwater management plan will include recommended procedures to maintain the existing excellent water quality. Initially, this will include additional water quality monitoring.

Groundwater wells are prevalent throughout the District. The wells are used by cities, agricultural producers, industrial developments and individual homeowners. With the many water production wells, there is a risk that cross aquifer contamination can occur. The greatest potential for groundwater contamination within the basin is cross aquifer contamination through abandoned wells and the improper sealing of new wells. Therefore, it is necessary that proper sealing of new wells and abandonment of old wells is always accomplished. At a minimum, the water well standards of Tulare, Kings & Fresno Counties along with Bulletin 74 requirements must be met. In addition, it may be advantageous to require construction standards that exceed those presently mandated by either the county or state. With the continual raising of standards for drinking water, maintaining the quality of the groundwater becomes ever more important.

B. Surface Water Quality

The surface supply for the District consists principally of diversions from the Kings River. The snowpack and rainfall within the Kings River watershed produce extremely high quality water with very low amounts of dissolved salts. This has allowed consistently high yields to occur on the heavier soils that are not freely drained without the development of a serious drainage problem. The surface water also provides an excellent source of water for recharging the District's groundwater supply. It is important that the quality of this water be maintained. To this end, the District has been active in identifying surface water discharges within the Basin that may impact water quality. These will be continually monitored and may require the issuance of permits through the NPDES process. Anyone causing overland surface flows that are found to be detrimental to the District's water supply will be put on notice that they must either eliminate or clean those flows to avoid impacting the quality of the District's water supply.

Municipal storm water discharges into District facilities are regulated by permits between the discharger and the District. The permits are specific as to area being drained and/or flow allowed to be discharged. Permit conditions require that the quality of this water meet the existing and future standards set by the Regional Water Quality Control Board. The right to discharge can be terminated at any time the conditions of the permit are not met by the discharger.

C. Water Quality Requirements/Objectives

A primary objective of the Plan is to maintain the water quality within the District. This is of extreme importance because the municipal, industrial and agricultural users need a dependable high quality water supply. A reduction in the quality of the groundwater is tantamount to a loss of water supply, since the quality problem will require additional costs for the construction of treatment facilities. This cleanup will be necessary to allow the water to be integrated into the system.

One of the action items listed in the Plan recommends increased monitoring of groundwater quality in selected areas. This monitoring information will be collected and utilized to evaluate the best management practices to reduce and/or eliminate the contamination. In addition, the action items recommend working with the Department of Water Resources and the counties of jurisdiction in upgrading certain provisions of the water well standards. Since the natural minerals occur in low concentrations, the major thrust of the water quality monitoring and recommended practices will be to prevent chemical contamination.

The quality of both surface and groundwater within the District must be maintained. The Plan provides a mechanism that will help achieve those long-term goals. The initial action of increasing the amount of monitoring will provide the additional data needed to proceed with future programs to maintain water quality.

D. Wastewater Reclamation

There is little potential for increasing the water supply through wastewater reclamation in this basin. The majority of the wastewater is currently being utilized for the irrigation of agricultural crops or groundwater recharge with only a minor portion being consumed through evaporation basins. The District will continue to work with the wastewater agencies, where practical, to reduce the amount of effluent disposed of through evaporation. In addition, the District will continue to promote the past practices of reusing all wastewater effluent within the local basin, in order to maintain the total water balance within the area. In a water deficient region such as the Alta Irrigation District, the reuse of the wastewater effluent is a key element of establishing a water balance.

IV. GROUNDWATBR CONDITIONS

A. Groundwater Mapping

The District has been monitoring- the groundwater level for the last seventy-five (75) years. This is accomplished through water level measurements taken in the late fall and early spring. A map of the District showing the well locations has been attached (see Exhibit "E"). As wells are lost, new wells are substituted to maintain the continuity of the grid pattern. From these readings, groundwater contour maps have been made depicting both the water elevation and changes in groundwater levels. This mapping has shown drastic differences between various regions of the District during the last drought period.

Based on the water level readings, the overall trend has shown a declining groundwater level within the District. This decline has been periodically interrupted by a short-term groundwater recovery. Based on this long-term data, it has been determined that it would take approximately 22,000 acre-feet per year of additional surface water to correct the overdraft situation that presently exists. Based on average porosity and specific yield considerations, this results in a decline in the groundwater storage of one foot for every 7,000 acre-feet of overdraft. This storage can be regained if sufficient surface water supplies are made available to reduce the amount of groundwater pumping that is necessary to meet the water demands. In addition, the overdraft results in additional pumping costs to overcome the increased lift. As the water table continues to drop, the pumping occurs from lower portions of the aquifer which have lower porosity and specific yield factors than those found in the upper portions of the unconfined aquifer. The long-term impact is a greater incremental reduction in the available groundwater storage per acre foot of overdraft. Using the historical data collected and the transmissivity of the aquifer, a determination can be made of the estimated quantity of inflow and/or outflow of groundwater within the limits of the District. This data also will allow the District to evaluate areas that are more severely impacted during periods of sustained drought due to the low yield of the wells and the limited depth of the aquifer. This is an important water management tool that is useful to the District in developing long term planning decisions.

The collection of this data will be continued with the Plan. The information that has been prepared from this data in the past includes the following:

1. Maps of spring and fall water elevations.
2. Maps of spring and fall depths to groundwater.
3. Maps showing the changes in groundwater levels over time.

In addition, the groundwater reports can include estimates of changes in groundwater storage, water delivered, water use, and overdraft. This will allow an evaluation of the management activities to be made.

The water quality monitoring that is being proposed as one of the action items will be used to augment the information obtained through the historical water level readings. The water quality samples will be taken *in* critical areas adjacent to urban centers and known locations of contamination. With the compilation of the quality tests and the groundwater level measurement, the District will improve its ability to effectively manage the groundwater.

This information can provide the additional data needed to establish programs to reduce the movement of the contaminates. Typically, the urban centers have a higher concentration of wells resulting in a cone of depression within and surrounding the community. This can accelerate the movement of contaminates towards the urban well fields with the information gathered through the Plan, an additional future action item could include the analysis of the potential benefits of creating a hydraulic barrier or modification of the local pumping regime to reduce or impede the migration of the contamination.

B. Groundwater Recharge

In any conjunctive use area, groundwater recharge is a critical part of the overall Plan. For many years, the District has maintained recharge basins along the southwesterly perimeter of its boundaries. They are located in areas of highly permeable soils. In addition, some amount of affective recharge is also obtained through the District's 700 miles of canals, even though the majority of the soil types are such that the recharge capability of the soil is very limited.

The District has been conducting extensive research to locate additional recharge sites in the eastern portion of the District, since that area is severely impacted in dry years due to the low specific yields and the limited depth of the aquifers. In 1987, the District was selected for funding through the Proposition 44 program to develop a groundwater recharge basin in an area that had limited groundwater resources. The site appeared to have soil types that would be conducive to recharge efforts. An in-depth geological study was undertaken and it was determined that the site would not be effective for groundwater recharge. The District has continued in their efforts to locate additional sites, but so far a suitable location has not been found.

To proceed with a groundwater recharge program, additional surface water supplies are necessary to fully implement the Plan. The District's average annual water supply is already committed. The surface water necessary to conduct an extensive program is available only in wet years when additional water supplies or flood waters are available on the Kings River. The District's goal has been and will continue in the future to make beneficial use of those waters by recharging the underground. For the most part, District conveyance facilities are currently available to transport these waters to the basin locations. Unfortunately, the prospects for locating effective recharge basin sites within the areas of greatest need are not promising.

The District will also be looking at joint recharge sites with the cities. If suitable sites are located within the boundaries of a municipal jurisdiction, the possibility of a joint use facility would be evaluated. The potential exists for water to be delivered to all or part of the site for recharge purposes during a portion of the year, with consideration given to other uses during the remainder of the year.

As a complement to the District's local recharge program, one of the action items is to evaluate "groundwater banking". This could be accomplished by assisting the recharge efforts of other districts that have access to better groundwater recharge sites. Flood waters would be recharged (banked) in a particular district thereby improving their groundwater levels. The amount of water banked would be quantified on an annual basis and an agreement developed so that the District would have .rights to a stipulated portion of the water banked through the joint agreement. In both the short and long terms, this approach appears to be the most effective way for the Basin Plan Area to proceed. In addition, investigations will continue on potential local recharge sites.

V. ACTION ITEMS

A. Groundwater Management Program

There have been thirteen (13) action items identified for the Plan and those items will be implemented according to the Rules and Regulations (see Exhibit "Fit), as amended from time to time. To have a successful Plan, it is not necessary to implement all of the action items identified. The last three items would be required only as a last resort due to the occurrence of emergency conditions within the Basin Plan Area. It is important that all the potential action items be identified and contingency plans developed in case anyone of them becomes necessary. It is recommended that items one (1) through six (6) be implemented immediately. Investigations into items seven (7) and eight (8) should begin upon approval of the Plan with a staff report regarding their status provided within one year. Action items nine (9) through thirteen (13) will require additional staff study, board approval and public hearings. If funding is necessary to implement a portion of the Plan, then an election will be required prior to instituting an assessment. It is felt that through the management activities listed in the Plan, the District can preserve the groundwater resource and avoid the drastic steps identified in the last three action items.

1. Water Monitoring: The District shall continue to monitor water levels every six months In addition, it will also assist in sampling for water quality testing. Further, the District will prepare maps depicting the information gathered through the monitoring phase, as well as reports quantifying the water demands, surface water and groundwater supplies. These summaries will assist the District in evaluating the effectiveness of the various elements of the program. The migration of contaminated plumes can be detected earlier though the monitoring process allowing additional time for plans to be developed and implemented before additional portions of the basin are impacted.

2. Direct Recharge: The District will continue to use surface waters when available to recharge the underground by sinking those waters in its basins. Basin sites will be located in the areas of greatest need. The District will actively seek the cooperation of other government entities in construction of such sites.

3. Indirect/In-lieu Recharge: The District has approximately 250 miles of unlined canals. The indirect recharge *is* accomplished through the seepage that occurs in some reaches of the canals. In addition, during winter months many of the natural channels carry surface runoff that recharges the groundwater. These old channels are typically located in the more permeable soils. The effective amount of this recharge varies from year to year and is dependent upon the amount of rainfall that occurs. Additional water supplies will be pursued for groundwater recharge in natural channels and during non-irrigation seasons in the District's canals. By providing surface water to the area, the District has reduced the amount of groundwater pumping, resulting in an effective in-lieu recharge program. The District will continue efforts to maximize the amount of surface water available to users within its boundaries.

4. Water Conservation - Water Regulation: The District has a long standing practice of conjunctive water use. Conjunctive use is the integration of surface and groundwater supplies to meet the total water demand. Recently, a cooperative program called the "mobile lab," has been operated by the Kings River Conservation District with support from the local irrigation districts. The purpose of this program has been to promote on-farm water conservation. The District has strongly supported programs that conserve water along with enhancing crop production. Through the construction of water regulating basins, the District has been able to conserve and more efficiently utilize water within its system. The most recent regulating basin was constructed on a 50-acre site in the southeast portion of the District. The Alta Irrigation District, the cities and the unincorporated water purveyors, all have water conservation plans. Water conservation efforts will be encouraged throughout the basin for agricultural, industrial and residential users. Existing and new irrigation methods, reuse of industrial water and domestic water saving devices will all be encouraged. The water use requirements of new developments will also be evaluated to insure compatibility with this water deficient basin.

5. No Exportation of Groundwater: Since the District is located within an overdrafted basin, it is prudent to utilize groundwater resources within the District's boundaries. Effluent discharged by the City of Reedley ("Agency") from its sewer treatment plant into the Kings River should not be considered to be prohibited exportation of groundwater if such effluent recharges or benefits underground supplies available to landowners in the District.

6. Intra-district Water Transfer: Water transfers within the District have taken place on a routine basis. Each year the District evaluates the water transfer policy and specifies the circumstances warranting internal water transfers. Approximately 60 transfers are approved each year within the District.

7. Well Drilling and Abandonment: Portions of the groundwater have been contaminated principally by volatile organic chemicals or nitrates. This contamination is most prevalent in the upper aquifers. Interaquifer mixing can occur through inadequate seals or improperly abandoned wells. Working through the Department of Water Resources and the county of jurisdiction, the District will seek to upgrade standards for construction and abandonment of water wells to reduce the potential for aquifer contamination.

8. Groundwater Banking: With the scarcity of suitable recharge sites within the District, the Alta Irrigation District will look to other agencies that have soil types more suitable for recharge basins. The District could then recharge (bank) surface water within the boundaries of the Agency for withdrawal at a later time. This arrangement can provide benefit to the groundwater basins for both the and the cooperating Agency. The District benefits since otherwise it has few areas suitable for recharge and the participating Agency receives the benefit of reduced pumping lifts during the time the water is banked.

9. Inter-district Water Transfer: Water transfers between different water districts are currently taking place. New legislation is being proposed that will enhance the water transfer process. In the past, the District has completed such transfers on a limited basis. This mechanism would be used to increase the total water supply within the District or to augment the water supply in specific areas of the basin during critically dry years.

10. Reduction in Groundwater outflow: The direction and quantity of groundwater flow is susceptible to changes that occur to the hydraulic gradient. The groundwater level measurements taken twice a year within the District will identify the direction of groundwater flow. Typically, this outflow has been to the west and southwest creating hydraulic barriers by mounding of the groundwater can lead to a reduction in the amount of water that leaves the District. This can be an especially effective procedure along the perimeter of the District. Likewise, increased pumping by landowners along the perimeter of the basin can increase the groundwater outflow. The District will continue its efforts to assure that all necessary steps are taken to reduce the amount of such groundwater outflow.

11. Pumping Restrictions: Pumping restrictions would definitely reduce the amount of groundwater use. This is a controversial item and pumping restrictions would be the last item to be considered. This step could have severe economic implications since the local economy that has been developed with a reliance on groundwater would be detrimentally impacted. Initially, any program requiring pumping restrictions would be voluntary rather than mandatory. From a practical standpoint, only if the urban water supplies are being severely restricted, will mandatory agricultural pumping restrictions be implemented.

12. Additional Water supply and Storage: The generation of additional water supplies would enhance the local groundwater. Present political realities prevent developing additional water by building dams and water storage projects. As a result, additional water supplies will most likely come through water conservation efforts, recycling and storm water supplies. The limiting factor to securing additional water supplies is addressing actual or perceived environmental considerations.

13. Redistribution of Surface Water: There is a tremendous difference in the aquifer characteristics within the District. This is evident in both storage capability and yield. The impact of the recent and apparently ongoing drought is evidenced by the larger drop in water level for those areas with limited aquifer depth versus portions of the basin that are located over a deeper and higher yielding aquifer. During critically dry years, all or a disportionately high percentage of the available surface water may need to be directed to the severely impacted areas. Increased pumping could then occur in those areas having better groundwater conditions to offset the redistribution of the available surface water supply.

B. Memorandum of understanding

The District shall endeavor to enter into a Memorandum of Understanding with public or private entities providing water service in accordance with Water Code section 10755.2. It is hoped that such local agencies will adopt and implement this Plan within their boundaries to provide a coordinated groundwater management program in accordance with that section.

IN WITNESS WHEREOF, the Alta Irrigation District has executed this Groundwater Management Plan as of **October 14, 1994.**

"DISTRICT"

ALTA IRRIGATION DISTRICT, a
California Irrigation District

BY Norman Waldner
Norman Waldner, President

BY Janelle M. Cochran
Janelle M. Cochran, Secretary

MEMORANDUM OF UNDERSTANDING BETWEEN ALTA IRRIGATION DISTRICT AND LOCAL AGENCY

ARTICLE I – AGREEMENT

The articles and provisions contained herein constitute a bilateral and binding agreement by and between ALTA IRRIGATION DISTRICT, a California Irrigation District ("District") and LOCAL AGBNCY, A Public Agency ("Agency").

ARTICLE II – RECOGNTION

The District has developed a Groundwater Management Plan ("Plan") with input from several local agencies which are water purveyors with overlapping spheres of influence within the District. It is the intent of District to allow and encourage such agencies to coordinate efforts and be a part of the District's Plan by means of a separate Memorandum of Understanding ("MOU") between each agency and District.

ARTICLE III - PURPOSE

It is the purpose of this MOU, entered willingly, between District and Agency, to document the interests and responsibilities of both parties in the adoption and implementation of a coordinated Plan. It is also hoped that such MOU will promote and provide a means to establish an orderly process to share information, develop a course of action and resolve any misunderstandings or differences that may arise.

ARTICLE IV - COORDINATION

There shall be an annual coordinating meeting ("Meeting") between the District and the Agency. District shall give notice to the Agency thirty (30) days prior to date of the Meeting. If there are concerns or questions regarding the Plan, Agency shall transmit its concerns in writing to District seven (7) days prior to the Meeting.

ARTICLE IV - OBLIGATIONS

The Plan shall be binding on the parties hereto unless superseded by the MOU or amendment thereto. It is agreed between both parties that District shall pay one-third of the cost and expense of water quality testing I sampling and monitoring and Agency shall pay prorated portion of two-thirds of such cost provided that the total annual cost payable by each party shall not exceed six thousand eight hundred dollars ($6,800). Within one year from the date hereof, the parties shall establish procedures and arrangements to carry out such sampling, testing and monitoring.

ARTICLE VI – AREA OF PLAN

The plan shall be effective in all areas within the Agency boundaries. The Plan shall also be effective in any area annexed to the Agency Subsequent to the adoption of the Plan.

ARTICLE VII – TERM

The initial term of the MOU shall commence on the date hereof and continue for five (5) years, and shall continue year to year thereafter, unless terminated by written notice given at least one (1) year prior to such termination.

"DISTRICT"

ALTA IRRIGATION DISTRICT, a California Irrigation District

By________________________________
Norman Waldner, President

By________________________________
Janelle M. Cochran, Secretary

"AGENCY"

LOCAL AGENCY, a Public Agency

By________________________________

By________________________________

Table III-1
Alta I.D. Canal Seepage for Wet (1984) and Dry (1990) Years

Canal Name	Length (mi)	Seepage (cfs)	1984 Seepage (AF)	1984 Seepage % of Diversion	1990 Seepage (AF)	1990 Seepage % of Diversion
Alta Main	8.9	11.2	3,592	1.7%	1,071	1.8%
A.B. Clark	4.4	2.5	810	0.4%	242	0.4%
A.N. Smith	1.8	0.2	62	0.0% *	18	0.0% *
A.W. Clark	2.9	0.6	186	0.1%	56	0.1%
Andrews	2.5	0.4	130	0.1%	39	0.1%
Ballard	2.8	0.2	79	0.0% *	23	0.0% *
Banks	17.7	4.4	1,409	0.7%	151	0.3%
Bowhay	3.1	1.1	336	0.2%	100	0.2%
Bump & Edmison	1.8	0.2	64	0.0% *	19	0.0%
Button	15.0	4.2	1,345	0.6%	281	0.5%
Buttonwillow	11.0	8.9	2,830	1.3%	844	1.4%
Caesar	5.3	4.4	1,397	0.7%	417	0.7%
California Vineyard	6.9	6.1	1,938	0.9%	578	1.0%
Carey-Hunter	7.7	2.8	885	0.4%	263	0.5%
Carpenter	1.2	0.0	10	0.0% *	3	0.0% *
Clapp	1.5	0.0	5	0.0% *	2	0.0% *
Clements	4.0	2.1	667	0.3%	199	0.3%
Clough	3.9	1.6	502	0.2%	15	0.0% *
Cross Creek W.W.	1.9	0.4	129	0.1%	4	0.0% *
Curtis Cutoff	1.5	0.5	155	0.1%	46	0.1%
Lower Curtis Cutoff	0.9	0.2	73	0.0% *	22	0.0% *
Upper Curtis Cutoff	1.0	0.1	19	0.0% *	6	0.0% *
Dinuba Town	8.8	4.7	1,507	0.7%	449	0.8%
East Branch	15.5	18.0	5,753	2.7%	1,715	2.9%
East Gould	1.5	0.1	31	0.0% *	9	0.0% *
East Reedley	5.5	1.8	563	0.3%	168	0.3%
East Section 20	1.2	0.1	20	0.0% *	6	0.0% *
Elter	2.5	0.1	38	0.0% *	11	0.0% *
Floyd	1.5	0.1	42	0.0% *	13	0.0% *
Frane	1.4	0.0	3	0.0% *	1	0.0% *
Gordon	1.0	0.1	41	0.0% *	12	0.0% *
Grove	1.7	0.0	16	0.0% *	5	0.0% *
Haden & Boone	2.7	0.4	141	0.1%	42	0.1%
Hogan	2.1	0.1	37	0.0% *	11	0.0% *
Horsman	5.0	1.7	550	0.3%	164	0.3%
J.T. Williams	2.4	0.0	9	0.0% *	3	0.0% *
Jack	1.2	0.3	103	0.0% *	31	0.1%
Kennedy School House	5.0	0.3	82	0.0% *	24	0.0% *
Kennedy Waste Way	7.3	3.7	1,168	0.5%	347	0.6%

Canal Name	Length (mi)	Seepage (cfs)	1984 Seepage (AF)	1984 Seepage % of Diversion	1990 Seepage (AF)	1990 Seepage % of Diversion
King	4.4	3.1	979	0.5%	206	0.4%
Kirk	1.7	0.3	84	0.0% *	25	0.0% *
Knestric	5.6	0.8	254	0.1%	76	0.1%
Loper	3.2	0.5	162	0.1%	48	0.1%
Lovell	2.0	0.4	136	0.1%	41	0.1%
McBriar	2.0	0.0	8	0.0% *	2	0.0% *
McClanahan	5.9	4.8	1,527	0.7%	446	0.8%
Mc Gee	1.9	0.2	54	0.0% *	16	0.0% *
Monson	7.0	3.5	1,128	0.5%	336	0.6%
Montague	1.3	0.2	52	0.0% *	16	0.0% *
Mt. Campbell	3.7	1.5	466	0.2%	139	0.2%
Nichols-Cann	1.9	0.0	6	0.0% *	2	0.0% *
Nuss	1.2	0.0	2	0.0% *	1	0.0% *
Orosi School House	3.2	0.9	279	0.1%	83	0.1%
Parenti	1.3	0.0	4	0.0% *	1	0.0% *
Parks	1.5	0.2	78	0.0% *	23	0.0% *
Peck	0.6	0.0	2	0.0% *	0	0.0% *
Red Williams	1.5	0.2	67	0.0% *	10	0.0% *
Reedley Main	3.0	2.9	917	0.4%	273	0.5%
Reo	1.5	0.2	63	0.0% *	19	0.0%
Rice-Brubaker	2.2	0.3	99	0.0% *	30	0.1%
Sandridge	2.9	0.4	140	0.1%	42	0.1%
Segrue	0.3	0.0	1	0.0% *	0	0.0% *
Smith Mountain	9.3	3.1	977	0.5%	291	0.5%
Sontag	6.7	0.2	59	0.0% *	14	0.0% *
Tout	6.0	1.4	439	0.2%	131	0.2%
Traver Creek	10.1	12.1	3,878	1.8%	1,156	2.0%
Traver Canal	12.3	21.6	6,910	3.2%	1,788	3.1%
Uphill	0.6	0.0	2	0.0% *	0	0.0% *
Van Noy	2.2	0.3	96	0.0% *	18	0.0% *
Wahtoke	5.1	0.7	224	0.1%	67	0.1%
Weise	1.0	0.3	80	0.0% *	2	0.0% *
West Gould	4.9	0.9	281	0.1%	84	0.1%
West Reedley	5.6	1.4	442	0.2%	132	0.2%
West Section 20	1.8	0.1	26	0.0% *	8	0.0% *
Wilson	10.7	7.0	2,220	1.0%	662	1.1%
Wilson Hunter	1.5	0.5	151	0.1%	45	0.1%
Wilson School House	3.4	0.9	287	0.1%	85	0.1%
Windsor	1.3	0.0	3	0.0%	1	0.0%
TOTAL	316.7	154	49,306	23.1%	13,727	23.6%

Note: * Indicates that canal seepage is less than 0.05% of Alta's total district diversion.

Reference: Kings River Conservation District (KRCD)

SCHEDULE OF DIVERSIONS & WATER RUN, 1973 - 1992

DIVERSIONS FROM HEADGATE		WATER RUN	
1973	86,773 Acre Feet	04/16-08/31	138 Days
1974	220,041 Acre Feet	05/15-08/31	139 Days
1975	184,034 Acre Feet	04/21-08/22	124 Days
1976	43,381 Acre Feet	06/14-07/17	34 Days
1977	38,721 Acre Feet	07/01-07/28	28 Days
1978	246,204 Acre Feet	05/11-10/31 & 5 days in Sept.	169 Days
1979	181,999 Acre Feet	05/01-08/31	123 Days
1980	253,269 Acre Feet	04/01-09/13	166 Days
1981	145,581 Acre Feet	05/04-08/14	103 Days
1982	247,599 Acre Feet	04/20-10/31	195 Days
1983	205,445 Acre Feet	04/28-09/29 & 10/02-10/14	167 Days
1984	214,165 Acre Feet	03/31-09/07	161 Days
1985	170,826 Acre Feet	04/28-08/26	121 Days
1986	227,709 Acre Feet	04/07-09/30	177 Days
1987	121,270 Acre Feet	05/04-08/04	93 Days
1988	59,118 Acre Feet	06/13-08/01	50 Days
1989	89,983 Acre Feet	05/28-08/04	69 Days
1990	58,468 Acre Feet	06/21-08/07	48 Days
1991	107,706 Acre Feet	05/21-08/10	82 Days
1992	66,623 Acre Feet	05/28-07/26	59 Days
AVERAGE	**148,446 Acre Feet**	**AVERAGE**	**112 Days**
MOST	**253,269 Acre Feet**	**LONGEST**	**195 Days**
LEAST	**38,721 Acre Feet**	**SHORTEST**	**28 Days**

Reference: Alta Irrigation District
1992 Annual Report

Figure I - 1
Location of Alta Irrigation District

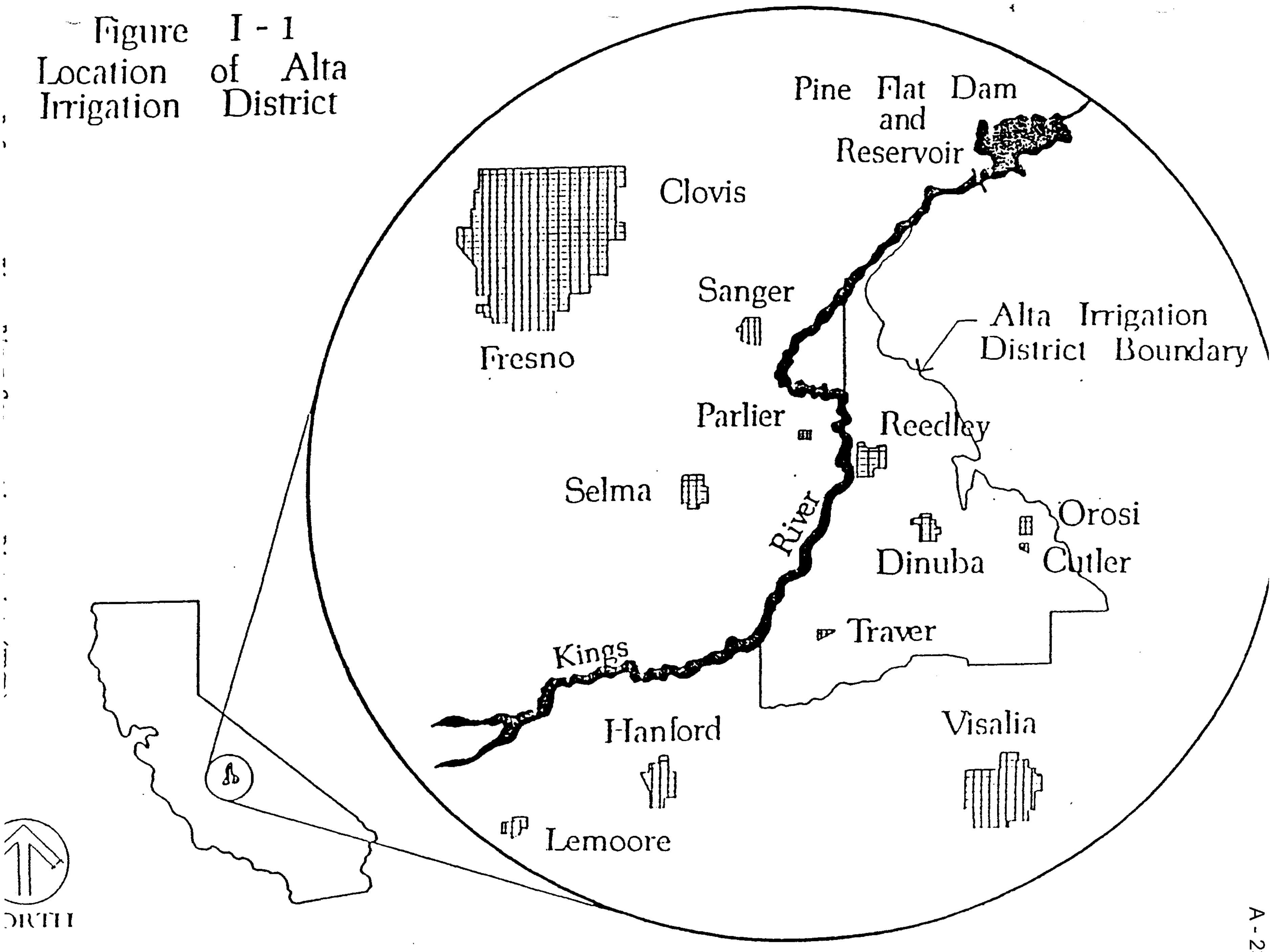


Table I-1
Alta I.D. Canal Specifications

Canal Name	Length (mi)	Average Top Width (ft)	Average Cross Sectional Area (sq ft)	Canal Volume (AF)	Canal Name	Length (mi)	Average Top Width (ft)	Average Cross Sectional Area (sq ft)	Canal Volume (AF)
Alta Main	8.9	72.4	245	265.3	King	4.4	13.8	19	10.1
A.B. Clark	4.4	12.4	19	8.8	Kirk	1.7	4.6	4	0.7
A.N. Smith	1.8	5.7	5	0.7	Knestric	5.6	6.2	4	2.6
A.W. Clark	2.9	8.3	9	2.6	Loper	3.2	6.3	4	1.7
Andrews	2.5	4.0	3	1.0	Lovell	2.0	5.7	5	1.1
Ballard	2.8	9.3	11	1.5	McBriar	2.0	N/A	N/A	0.8
Banks	17.7	13.2	21	44.8	McClanahan	5.9	15.1	27	18.3
Bowhay	3.1	12.6	20	7.5	Mc Gee	1.9	4.6	4	1.3
Bump & Edmison	1.8	7.3	7	0.6	Monson	7.0	13.9	27	23.0
Button	15.0	17.7	28	50.9	Montague	1.3	4.4	4	0.5
Buttonwillow	11.0	19.9	48	60.4	Mt. Campbell	3.7	12.8	20	6.4
Caesar	5.3	15.7	27	17.1	Nichols-Cann	1.9	N/A	N/A	0.5
California Vineyard	6.9	19.2	46	37.6	Nuss	1.2	N/A	N/A	0.1
Carey-Hunter	7.7	12.9	19	16.0	Orosi School House	3.2	7.5	7	2.8
Carpenter	1.2	10.9	15	1.0	Parenti	1.3	N/A	N/A	0.3
Clapp	1.5	6.1	6	0.3	Parks	1.5	7.7	9	0.9
Clements	4.0	13.5	20	9.7	Peck	0.6	N/A	N/A	0.1
Clough	3.9	10.7	14	6.8	Red Williams	1.5	16.1	18	3.3
Cross Creek W.W.	1.9	11.6	17	3.9	Reedley Main	3.0	21.5	45	16.7
Curtis Cutoff	1.5	15.0	24	2.3	Reo	1.5	4.5	2	0.4
Lower Curtis Cutoff	0.9	10.2	13	1.0	Rice-Brubaker	2.2	5.4	5	0.8
Upper Curtis Cutoff	1.0	11.0	14	0.5	Sandridge	2.9	15.4	30	5.8
Dinuba Town	8.8	13.9	24	24.5	Segrue	0.3	N/A	N/A	0.1
East Branch	15.5	42.8	123	231.5	Smith Mountain	9.3	12.8	17	17.9
East Gould	1.5	4.5	2	0.2	Sontag	6.7	9.5	12	9.3
East Reedley	5.5	17.5	46	18.1	Tout	6.0	10.2	13	8.2
East Section 20	1.2	8.3	10	1.4	Traver Creek	10.1	28.0	78	95.6
Elter	2.5	6.5	5	1.5	Traver Canal	12.3	39.4	58	86.6
Floyd	1.5	4.8	4	0.6	Uphill	0.6	N/A	N/A	0.1
Frane	1.4	N/A	N/A	0.1	Van Noy	2.2	8.9	12	3.3
Gordon	1.0	5.7	6	0.5	Wahtoke	5.1	12.8	15	7.1
Grove	1.7	7.5	10	1.2	Weise	1.0	9.1	11	1.3
Haden & Boone	2.7	6.0	6	1.3	West Gould	4.9	7.6	10	4.8
Hogan	2.1	5.4	5	0.4	West Reedley	5.6	10.6	13	7.6
Horsman	5.0	9.2	9	5.7	West Section 20	1.8	7.5	7	1.5
J.T. Williams	2.4	N/A	N/A	0.8	Wilson	10.7	16.4	31	40.1
Jack	1.2	8.0	10	1.4	Wilson Hunter	1.5	10.4	18	3.3
Kennedy School House	5.0	13.4	23	2.9	Wilson School House	3.4	11.1	16	6.2
Kennedy Waste Way	7.3	13.4	22	15.2	Windsor	1.3	N/A	N/A	0.2
					TOTAL	316.7			1,239.1

Notes: Width and area values as N/A denote canals that are completely piped.
Width and area values are for open channel segments only.

Reference: Kings River Conversation District (KRCD)

WELL LOCATIONS
ALTA IRRIGATION DISTRICT

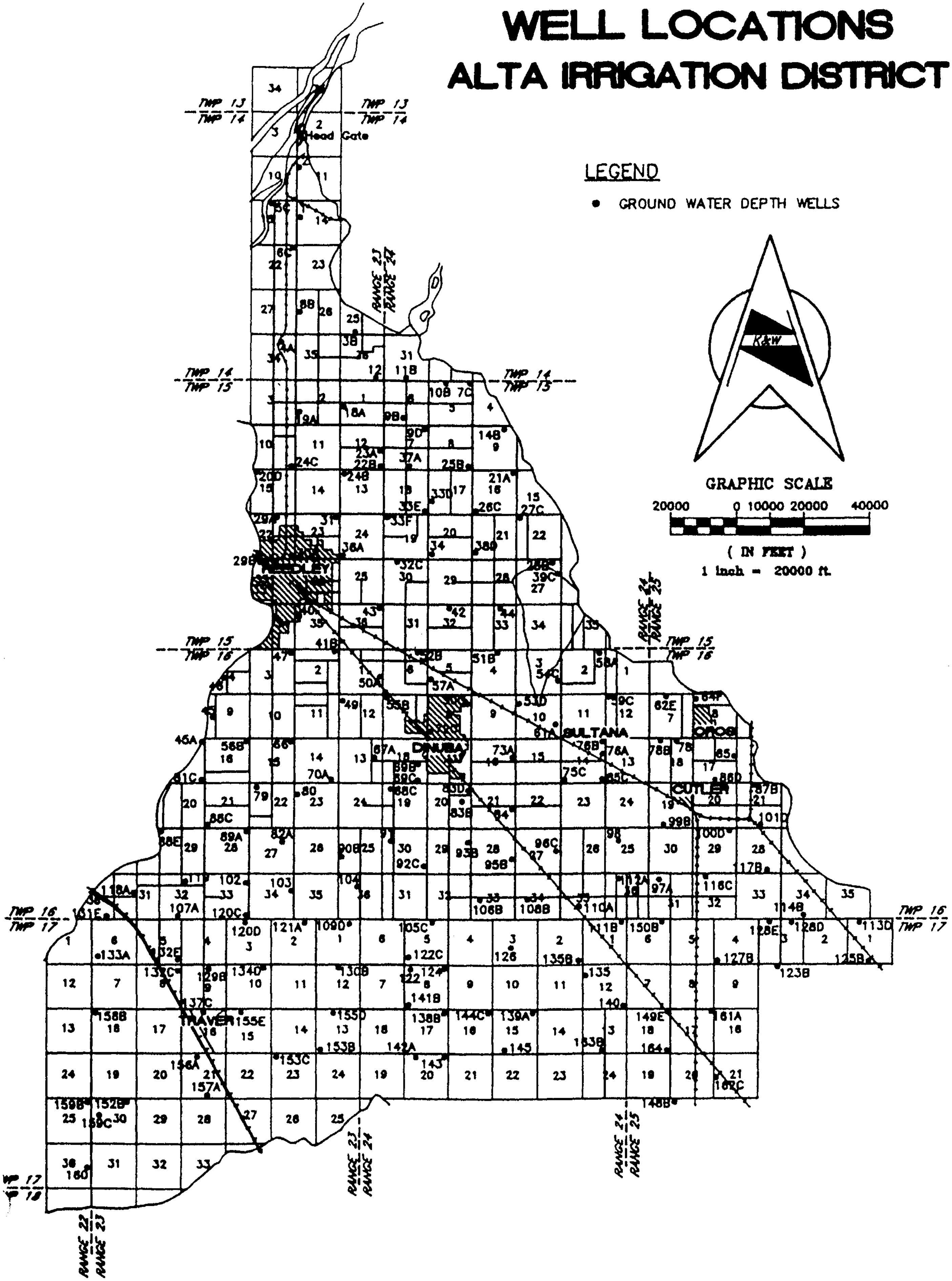


EXHIBIT "F"
GROUNDWATER MANAGEMENT PLAN
RULES AND REGULATIONS
TO IMPLEMENT THE
GROUNDWATER MANAGEMENT PLAN
OF
ALTA IRRIGATION DISTRICT

1. Rules and Regulations Governing Distribution of Water and Maintenance of Distribution System to Alta Irrigation District: The Rules and Regulation adopted by the District on March 9, 1990 and attached hereto as Exhibit "G" are hereby incorporated in these Rules and Regulations.

2. Water Monitoring:

(a) Semi-annual Groundwater Level Measurement: At least twice per year, District shall provide staff at its expense to monitor and measure the depth to standing groundwater at well sites within District. In its sole discretion, District shall select the number and location of well sites. District shall prepare maps as required by the Plan.

(b) Water Quality sampling and testing: District along with other local agencies as defined in water Code Section 10752g, ("Local Agencies") shall implement a water sampling and monitoring program for water quality purposes in accordance with a Memorandum of Understanding entered into by District and those Local Agencies.

3. Direct Recharge: When feasible, District will consider delivery of water to recharge basins owned and maintained by Local Exhibit "F" Agencies within the District. All such deliveries of recharge water shall be at the discretion of District Board of Directors. ("Board of Directors"). The Local Agency owning the recharge basin shall be liable for any damages connected with or arising out of transportation use, storage or recharge of such water. District shall be responsible for any damage to Agency resulting from the intentional or negligent acts of District or its employees or agents.

4. Indirect Recharge:

(a) Canal Recharge: District shall endeavor to monitor and evaluate recharge from canals when appropriate, as determined by District. Canals with good recharge capabilities will be evaluated for potential use as groundwater recharge facilities to receive recharge water during the off-irrigation season.

(b) Surface Water/Groundwater Pumping: The District shall continue to divert and deliver surface water supplies of the District to reduce groundwater pumping.

5. Water Conservation - Water Regulation: District's policies and procedures promote the beneficial use of water. Specific examples include instantaneous (orifice type of metering) flow measurements at all turnouts; with propeller meters at all turnouts associated with current or future pipeline projects. The District shall continue to promote policies that enhance water conservation policies (see enclosed Alta Irrigation District Rules and Regulations, adopted March 9, 1990). The District Board of Directors has the authority to adopt water conservation and water regulation policies for the District. If Agency adopts and enforces a water conservation plan within its boundaries, such Plan shall be effective to the extent it is not inconsistent with the District's Plan.

6. No Exportation of Groundwater: After the adoption hereof, there shall be no exportation of groundwater that results in any additional net loss to District's total available water supplies. Minor amounts of urban drainage shall not be considered groundwater exportation subject to this paragraph. The District Board of Directors has the authority to renew any mitigating measures proposed to prevent such net loss.

7. Well Drilling and Abandonment: District will work with the agencies of jurisdiction in amending the water well ordinance applicable within the District to require a minimum of fifty (50) foot annular seal on all gravel packed wells.

8. Groundwater Banking: District shall endeavor to promote advantageous groundwater banking projects. The Board of Directors has the authority to control the destination of the District's Kings River water under appropriate licenses.

9. Intra-district water Transfer: District annually adopts a specific policy to address the issue of internal water transfers within the District. The District desires to reduce pumping from the groundwater by better utilization of surface water supplies. The Board of Directors has the authority to control the destination of the District's Kings River water under appropriate licenses.

10. Inter-district water Transfer: District shall endeavor to promote advantageous water transfers (water transfers that increase the water supply available within the District) between the District and other entities. The Board of Directors has the authority to initiate such transfers.

11. Reduction in Groundwater outflow: The District's current water entitlement allocations result in additional pumping in the south and southwesterly areas of the District which may reduce groundwater outflow under certain circumstances. The groundwater outflow from the District is principally to the south and west. Existing surface water along with supplemental water,' when available, will be used to improve the groundwater barrier along the perimeter of the District to reduce the amount of outflow. The Board of Directors has the authority to adjust water entitlement allocations.

12. Pumping Restrictions: Only under special circumstances would pumping restrictions be imposed. The Board of Directors shall not impose such restrictions until after consulting with Local Agencies and holding a mandatory public hearing at least sixty (60) days prior to the effective date of such restrictions.

13. Additional Water Supply and storage: The Board of Directors could impose such action only by Resolution.

14. Redistribution of Surface Water: The Board of Directors could impose such action by Resolution adopted after a mandatory public hearing held at least sixty (60) days prior to imposing such action.

ATTACHMENT B

Notice of Intent to Adopt a SB 1938 Groundwater Management Plan (July 10, 2008)

RESOLUTION OF INTENT

A RESOLUTION FOR THE ALTA IRRIGATION DISTRICT TO APPROVE AND AUTHORIZE THE NOTICE OF AN INTENT TO UPDATE ALTA IRRIGATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN UNDER Section 10750 et seq. TO BE IN COMPLIANCE WITH SB 1938(Stats 2002, Ch 603)

WHEREAS, **ALTA IRRIGATION DISTRICT**, a public agency duly organized and existing under and by virtue of the laws of the State of California (the "Entity"), has determined that it is in the best interest and to the advantage of the Entity to update its current groundwater management plan. The current groundwater management plan is a AB 3030 type of plan and it is intent of Entity to update its current plan to meet the requirements of a SB 1938 type of plan; and

WHEREAS, the Entity is located in Fresno, Tulare and Kings Counties; and

WHEREAS, participation will include local agencies and interested parties located within the Entity; and

WHEREAS, The Entity will act as the lead agency in the governance of the groundwater management plan, as updated.

NOW, THEREFORE, BE IT RESOLVED BY THE GOVERNING BODY OF THE ENTITY AS FOLLOWS:

Section 1. Findings. The Entity's Governing Body hereby specifically finds and determines that the actions authorized hereby relate to the public affairs of the Entity and the inter-relationship with other water interests within the Upper Kings Sub Basin.

Section 2. Memorandum of Understandings. Existing Memorandum of Understandings, to be updated and entered into by and between the Entity and the local agencies with overlapping spheres of interest within the Entity.

Section 3. Effective Date. This Resolution of Intent shall be advertised under the prescribed guidelines of Government Code 6066 prior to action being considered.

PASSED AND ADOPTED this 10th day of July, 2008 by the following vote:

AYES: Waldner, Marshall, Astiasuain and Halford

NOES: None

ABSENT: Belknap, Krahn and Warkentin

Attested by: Chris M. Kapheim

Chris M. Kapheim, General Manager/Secretary

ATTACHMENT C

Bulletin 118, Department of Water Resources

Tulare Lake Hydrologic Region

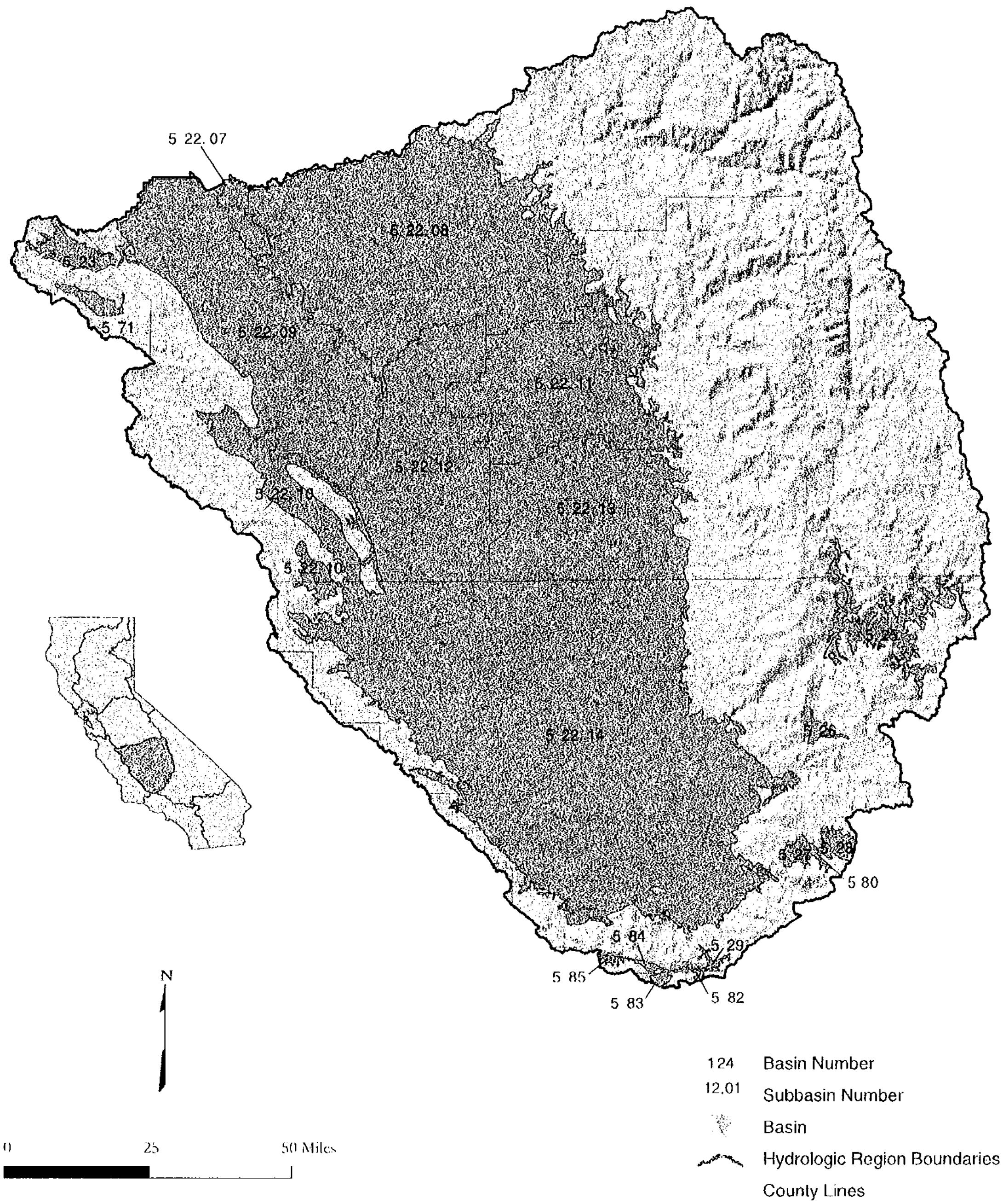


Figure 37 Tulare Lake Hydrologic Region

Basins and Subbasins of Tulare Lake Hydrologic Region

Basin/subbasin	Basin name
5-22	San Joaquin Valley
5-22.08	Kings
5-22.09	Westside
5-22.10	Pleasant Valley
5-22.11	Kaweah
5-22.12	Tulare Lake
5-22.13	Tule
5-22.14	Kern County
5-23	Panoche Valley
5-25	Kern River Valley
5-26	Walker Basin Creek Valley
5-27	Cummings Valley
5-28	Tehachapi Valley West
5-29	Castaic Lake Valley
5-71	Vallecitos Creek Valley
5-80	Brite Valley
5-82	Cuddy Canyon Valley
5-83	Cuddy Ranch Area
5-84	Cuddy Valley
5-85	Mil Potrero Area

Description of the Region

The Tulare Lake HR covers approximately 10.9 million acres (17,000 square miles) and includes all of Kings and Tulare counties and most of Fresno and Kern counties (Figure 37). The region corresponds to approximately the southern one-third of RWQCB 5. Significant geographic features include the southern half of the San Joaquin Valley, the Temblor Range to the west, the Tehachapi Mountains to the south, and the southern Sierra Nevada to the east. The region is home to more than 1.7 million people as of 1995 (DWR, 1998). Major population centers include Fresno, Bakersfield, and Visalia. The cities of Fresno and Visalia are entirely dependent on groundwater for their supply, with Fresno being the second largest city in the United States reliant solely on groundwater.

Groundwater Development

The region has 12 distinct groundwater basins and 7 subbasins of the San Joaquin Valley Groundwater Basin, which crosses north into the San Joaquin River HR. These basins underlie approximately 5.33 million acres (8,330 square miles) or 49 percent of the entire HR area.

Groundwater has historically been important to both urban and agricultural uses, accounting for 41 percent of the region's total annual supply and 35 percent of all groundwater use in the State. Groundwater use in the region represents about 10 percent of the State's overall supply for agricultural and urban uses (DWR 1998).

The aquifers are generally quite thick in the San Joaquin Valley subbasins with groundwater wells commonly exceeding 1,000 feet in depth. The maximum thickness of freshwater-bearing deposits (4,400 feet) occurs at the southern end of the San Joaquin Valley. Typical well yields in the San Joaquin Valley range from 300 gpm to 2,000 gpm with yields of 4,000 gpm possible. The smaller basins in the mountains surrounding the San Joaquin Valley have thinner aquifers and generally lower well yields averaging less than 500 gpm.

The cities of Fresno, Bakersfield, and Visalia have groundwater recharge programs to ensure that groundwater will continue to be a viable water supply in the future. Extensive groundwater recharge programs are also in place in the south valley where water districts have recharged several million acre-feet for future use and transfer through water banking programs.

The extensive use of groundwater in the San Joaquin Valley has historically caused subsidence of the land surface primarily along the west side and south end of the valley.

Groundwater Quality

In general, groundwater quality throughout the region is suitable for most urban and agricultural uses with only local impairments. The primary constituents of concern are high TDS, nitrate, arsenic, and organic compounds.

The areas of high TDS content are primarily along the west side of the San Joaquin Valley and in the trough of the valley. High TDS content of west-side water is due to recharge of stream flow originating from marine sediments in the Coast Range. High TDS content in the trough of the valley is the result of concentration of salts because of evaporation and poor drainage. In the central and west-side portions of the valley, where the Corcoran Clay confining layer exists, water quality is generally better beneath the clay than above it. Nitrates may occur naturally or as a result of disposal of human and animal waste products and fertilizer. Areas of high nitrate concentrations are known to exist near the town of Shafter and other isolated areas in the San Joaquin Valley. High levels of arsenic occur locally and appear to be associated with lakebed areas. Elevated arsenic levels have been reported in the Tulare Lake, Kern Lake and Buena Vista Lake bed areas. Organic contaminants can be broken into two categories, agricultural and industrial. Agricultural pesticides and herbicides have been detected throughout the valley, but primarily along the east side where soil permeability is higher and depth to groundwater is shallower. The most notable agricultural contaminant is DBCP, a now-banned soil fumigant and known carcinogen once used extensively on grapes. Industrial organic contaminants include TCE, DCE, and other solvents. They are found in groundwater near airports, industrial areas, and landfills.

Water Quality in Public Supply Wells

From 1994 through 2000, 1,476 public supply water wells were sampled in 14 of the 19 groundwater basins and subbasins in the Tulare Lake HR. Evaluation of analyzed samples shows that 1,049 of the wells, or 71 percent, met the state primary MCLs for drinking water. Four-hundred-twenty-seven wells, or 29 percent, exceeded one or more MCL. Figure 38 shows the percentages of each contaminant group that exceeded MCLs in the 427 wells.

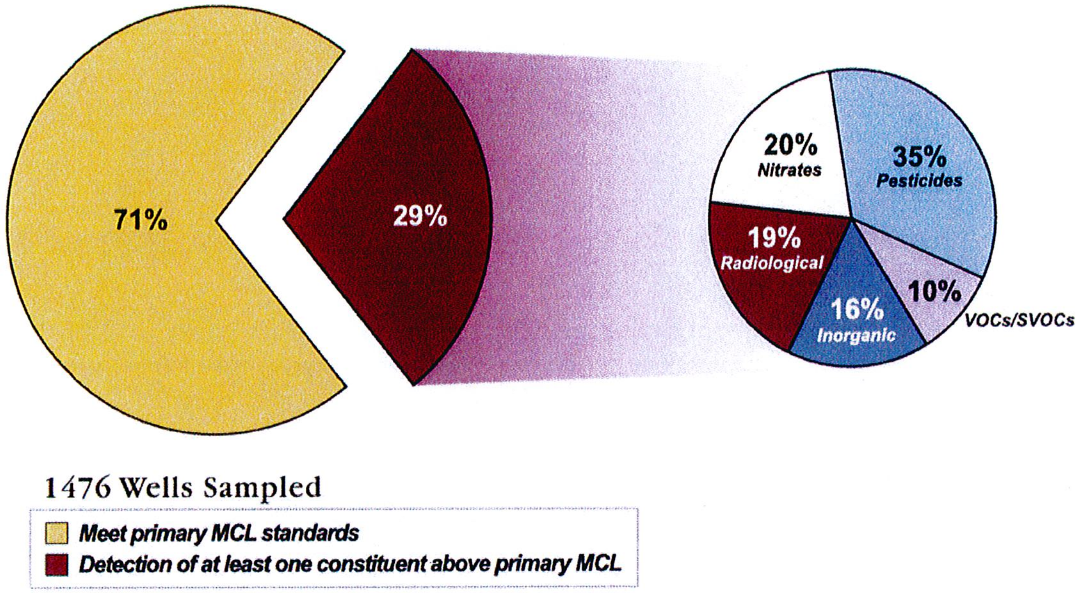


Figure 38 MCL exceedances by contaminant group in public supply wells in the Tulare Lake Hydrologic Region

Table 31 lists the three most frequently occurring contaminants in each of the six contaminant groups and shows the number of wells in the HR that exceeded the MCL for those contaminants.

Table 31 Most frequently occurring contaminants by contaminant group in the Tulare Lake Hydrologic Region

Contaminant group	Contaminant - # of wells	Contaminant - # of wells	Contaminant - # of wells
Inorganics - Primary	Fluoride – 32	Arsenic – 16	Aluminum – 13
Inorganics - Secondary	Iron – 155	Manganese – 82	TDS – 9
Radiological	Gross Alpha – 74	Uranium – 24	Radium 228 – 8
Nitrates	Nitrate(as NO_3) – 83	Nitrate + Nitrite – 14	Nitrite(as N) – 3
Pesticides	DBCP – 130	EDB – 24	Di(2-Ethylhexyl)phthalate – 7
VOCs/SVOCs	TCE – 17	PCE – 16	Benzene – 6 MTBE – 6

DBCP = Dibromochloropropane
EDB = Ethylenedibromide
TCE = Trichloroethylene
PCE = Tetrachloroehylene
VOC = Volatile organic compound
SVOC = Semivolatile organic compound

Changes from Bulletin 118-80

There are no newly defined basins since Bulletin 118-80. However, the subbasins of the San Joaquin Valley, which were delineated as part of the 118-80 update, are given their first numeric designation in this report (Table 32).

Table 32 Modifications since Bulletin 118-80 of groundwater basins and subbasins in Tulare Lake Hydrologic Region

Subbasin name	New number	Old number
Kings	5-22.08	5-22
Westside	5-22.09	5-22
Pleasant Valley	5-22.10	5-22
Kaweah	5-22.11	5-22
Tulare Lake	5-22.12	5-22
Tule	5-22.13	5-22
Kern County	5-22.14	5-22
Squaw Valley	deleted	5-24
Cedar Grove Area	deleted	5-72
Three Rivers Area	deleted	5-73
Springville Area	deleted	5-74
Templeton Mountain Area	deleted	5-75
Manache Meadow Area	deleted	5-76
Sacator Canyon Valley	deleted	5-77
Rockhouse Meadows Valley	deleted	5-78
Inns Valley	deleted	5-79
Bear Valley	deleted	5-81

Several basins have been deleted from the Bulletin 118-80 report. In Squaw Valley (5-24) all 118 wells are completed in hard rock. Cedar Grove Area (5-72) is a narrow river valley in Kings Canyon National Park with no wells. Three Rivers Area (5-73) has a thin alluvial terrace deposit but 128 of 130 wells are completed in hard rock. Springville Area (5-74) is this strip of alluvium adjacent to Tule River and all wells are completed in hard rock. Templeton Mountain Area (5-75), Manache Meadow Area (5-76), and Sacator Canyon Valley (5-77) are all at the crest of mountains with no wells. Rockhouse Meadows Valley (5-78) is in wilderness with no wells. Inns Valley (5-79) and Bear Valley (5-81) both have all wells completed in hard rock.

Table 33 Tulare Lake Hydrologic Region groundwater data

Basin/Subbasin	Basin Name	Area (acres)	Groundwater Budget Type	Well Yields (gpm)		Types of Monitoring			TDS (mg/L)	
				Maximum	Average	Levels	Quality	Title 22	Average	Range
5-22	SAN JOAQUIN VALLEY									
5-22.08	KINGS	976,000	C	3,000	500-1,500	909	-	722	200-700	40-2000
5-22.09	WESTSIDE	640,000	C	2,000	1,100	960	-	50	520	220-35,000
5-22.10	PLEASANT VALLEY	146,000	B	3,300	-	151	-	2	1,500	1000-3000
5-22.11	KAWEAH	446,000	B	2,500	1,000-2,000	568	-	270	189	35-580
5-22.12	TULARE LAKE	524,000	B	3,000	300-1,000	241	-	86	200-600	200-40,000
5-22.13	TULE	467,000	B	3,000	-	459	-	150	256	200-30,000
5-22.14	KERN COUNTY	1,950,000	A	4,000	1,200-1,500	2,258	249	476	400-450	150-5000
5-23	PANOCHE VALLEY	33,100	C	-	-	48	-	-	1,300	394-3530
5-25	KERN RIVER VALLEY	74,000	C	3,650	350	-	-	92	378	253-480
5-26	WALKER BASIN CREEK VALLEY	7,670	C	650	-	-	-	1	-	-
5-27	CUMMINGS VALLEY	10,000	A	150	56	51	-	15	344	-
5-28	TEHACHAPI VALLEY WEST	14,800	A	1,500	454	64	-	19	315	280-365
5-29	CASTAC LAKE VALLEY	3,600	C	400	375	-	-	3	583	570-605
5-71	VALLECITOS CREEK VALLEY	15,100	C	-	-	-	-	0	-	-
5-80	BRITE VALLEY	3,170	A	500	50	-	-	-	-	-
5-82	CUDDY CANYON VALLEY	3,300	C	500	400	-	-	3	693	695
5-83	CUDDY RANCH AREA	4,200	C	300	180	-	-	4	550	480-645
5-84	CUDDY VALLEY	3,500	A	160	135	3	-	3	407	325-645
5-85	MIL POTRERO AREA	2,300	C	3,200	240	7	-	7	460	372-657

gpm - gallons per minute
mg/L - milligram per liter
TDS -total dissolved solids

ATTACHMENT D

SB 1938 Advisory Meeting Notice and Minutes

SB 1938 Advisory Meeting
Alta ID Board Room
Thursday, April 9, 2009, 8:00 a.m.

AGENDA

1. Introductions

2. Review of Handouts

    a. Tulare Lake Hydrologic Region

    b. Requirements of 1938 Plan

    c. Alta's AB 3030 Plan

    d. Specific Goals and Objectives

3. Other Items for Discussion

SB 1938 AVDISORY MEETING
ALTA IRRIGATION DISTRICT BOARD ROOM
Thursday, April 9, 2009, 8:00 a.m.

CALL TO ORDER: The first advisory meeting for the SB 1938 groundwater plan was called to order at 8:00am by Chris Kapheim w/AID. Members present were David Cone w/KRCD, Laurel Firestone w/Community Water Center, Jerry Halford w/AID, David Orth w/KRCD, Russ Robertson w/City of Reedley, Dean Uota w/City of Dinuba, Norman Waldner w/AID, Jim Wegley w/Keller Wegley Engineering, Steve Worthley w/Tulare County and Mike Ayala w/AID.

INTRODUCTIONS: The advisory committee members all did a short self-introduction stating their organization and position.

REVIEW OF HANDOUTS:

Tulare Lake Hydrologic Region: Reviewed existing bulletin

Requirements of 1938 Plan: Committee discussed water quality & groundwater level information, monitoring and reporting plan. The committee discussed integrating regional goals and objectives from the Upper Kings IRWMP to correspond with the District's SB 1398 plan. Furthermore, it was discussed that it would be beneficial to also review data from surrounding areas outside of the Kings sub basin.

Additionally, abandoned wells was discussed as a concern that needs to be addressed county wide. Discussion focused on finding cost efficient means to initiate an incentive based program with landowners to give a reasonable time frame to abandon wells; funding and coordination of such efforts will require further input.

Water Quality Testing was reviewed, with nitrates being a principal concern. KRCD will evaluate current irrigation efficiency analysis to include nitrate testing of pumps.

The Committee reviewed Alta's water quality monitoring efforts for nitrates and DBCP and discussed the County's efforts in nitrate monitoring.

Alta's AB 3030 Plan: Alta's current groundwater plan was reviewed

Specific Goals and Objectives: Reviewed potential goals and objectives:

1. Evaluate a coordinated effort to increase groundwater pumping for irrigation purposes in the impacted area. This could result in a reduction in surface water to lands overlying the lands lying easterly of the communities. Excess pumping would remove the contaminated water for surface irrigation of crops and create a cone of depression away from the domestic wells;

2. Hold workshops with the farm advisor to encourage more effective utilization of fertilizers;

3. Actively encourage implementation of Tulare County's program for locating and properly abandoning of groundwater wells;
4. Work and coordinate efforts with interested parties, i.e., extension service, academic experts, etc., to identify potential sources of contamination;

5. Develop a program with the farm operators and testing laboratories to evaluate nitrate applications on individual parcels;

6. Use various media sources to disseminate information on fertilizer application, problems and availability of programs to assist farm operators;

7. Search out funding sources to work with and develop programs for farm operators; and

8. Evaluate a coordinated effort to alter surface water supplies/groundwater pumping available to the lands to more effectively manage groundwater movement to minimize the degradation to water quality.

ADDITIONAL ITEMS FOR DISCCUSSION: Information will be forwarded to the committee to be reviewed prior to further discussion.

ADJOURNMENT: There being no further items to discuss the meeting was adjourned until the next Advisory Meeting.

Sincerely,

Chris M. Kapheim

Chris M. Kapheim
SB 1938 Advisory Committee

CMK: ma

ATTACHMENT E

Table 111-1, KRCD Surface Water Study (1991)

Table III-1

Alta I.D. Canal Seepage for Wet (1984) and Dry (1990) Years

			1984 Seepage		1990 Seepage					1984 Seepage		1990 Seepage	
	Length	Seepage		% of		% of		Length	Seepage		% of		% of
Canal Name	(mi)	(cfs)	(AF)	Diversion	(AF)	Diversion	Canal Name	(mi)	(cfs)	(AF)	Diversion	(AF)	Diversion
Alta Main	8.9	11.2	3,592	1.7%	1,071	1.8%	King	4.4	3.1	979	0.5%	206	0.4%
A.B. Clark	4.4	2.5	810	0.4%	242	0.4%	Kirk	1.7	0.3	84	0.0% *	25	0.0% *
A.N. Smith	1.8	0.2	62	0.0% *	18	0.0% *	Knestric	5.6	0.8	254	0.1%	76	0.1%
A.W. Clark	2.9	0.6	186	0.1%	56	0.1%	Loper	3.2	0.5	162	0.1%	48	0.1%
Andrews	2.5	0.4	130	0.1%	39	0.1%	Lovell	2.0	0.4	136	0.1%	41	0.1%
Ballard	2.8	0.2	79	0.0% *	23	0.0% *	McBriar	2.0	0.0	8	0.0% *	2	0.0% *
Banks	17.7	4.4	1,409	0.7%	151	0.3%	McClanahan	5.9	4.8	1,527	0.7%	446	0.8%
Bowhay	3.1	1.1	336	0.2%	100	0.2%	Mc Gee	1.9	0.2	54	0.0% *	16	0.0% *
Bump & Edmiston	1.8	0.2	64	0.0% *	19	0.0% *	Monson	7.0	3.5	1,128	0.5%	336	0.6%
Button	15.0	4.2	1,345	0.6%	281	0.5%	Montague	1.3	0.2	52	0.0% *	16	0.0% *
Buttonwillow	11.0	8.9	2,830	1.3%	844	1.4%	Mt. Campbell	3.7	1.5	466	0.2%	139	0.2%
Caesar	5.3	4.4	1,397	0.7%	417	0.7%	Nichols-Cann	1.9	0.0	6	0.0% *	2	0.0% *
California Vineyard	6.9	6.1	1,938	0.9%	578	1.0%	Nuss	1.2	0.0	2	0.0% *	1	0.0% *
Cary-Hunter	7.7	2.8	885	0.4%	263	0.5%	Orosi School House	3.2	0.9	279	0.1%	83	0.1%
Carpenter	1.2	0.0	10	0.0% *	3	0.0% *	Parenti	1.3	0.0	4	0.0% *	1	0.0% *
Clapp	1.5	0.0	5	0.0% *	2	0.0% *	Parks	1.5	0.2	78	0.0% *	23	0.0% *
Clements	4.0	2.1	667	0.3%	199	0.3%	Peck	0.6	0.0	2	0.0% *	0	0.0% *
Clough	3.9	1.6	502	0.2%	15	0.0% *	Red Williams	1.5	0.2	67	0.0% *	10	0.0% *
Cross Creek W.W.	1.9	0.4	129	0.1%	4	0.0% *	Reedley Main	3.0	2.9	917	0.4%	273	0.5%
Curtis Cutoff	1.5	0.5	155	0.1%	46	0.1%	Reo	1.5	0.2	63	0.0% *	19	0.0% *
Lower Curtis Cutoff	0.9	0.2	73	0.0% *	22	0.0% *	Rice-Brubaker	2.2	0.3	99	0.0% *	30	0.1%
Upper Curtis Cutoff	1.0	0.1	19	0.0% *	6	0.0% *	Sandridge	2.9	0.4	140	0.1%	42	0.1%
Dinuba Town	8.8	4.7	1,507	0.7%	449	0.8%	Segrue	0.3	0.0	1	0.0% *	0	0.0% *
East Branch	15.5	18.0	5,753	2.7%	1,715	2.9%	Smith Mountain	9.3	3.1	977	0.5%	291	0.5%
East Gould	1.5	0.1	31	0.0% *	9	0.0% *	Sontag	6.7	0.2	59	0.0% *	14	0.0% *
East Reedley	5.5	1.8	563	0.3%	168	0.3%	Tout	6.0	1.4	439	0.2%	131	0.2%
East Section 20	1.2	0.1	20	0.0% *	6	0.0% *	Traver Creek	10.1	12.1	3,878	1.8%	1,156	2.0%
Elter	2.5	0.1	38	0.0% *	11	0.0% *	Traver Canal	12.3	21.6	6,910	3.2%	1,788	3.1%
Floyd	1.5	0.1	42	0.0% *	13	0.0% *	Uphill	0.6	0.0	2	0.0% *	0	0.0% *
Frane	1.4	0.0	3	0.0% *	1	0.0% *	Van Noy	2.2	0.3	96	0.0% *	18	0.0% *
Gordon	1.0	0.1	41	0.0% *	12	0.0% *	Wahtoke	5.1	0.7	224	0.1%	67	0.1%
Grove	1.7	0.0	16	0.0% *	5	0.0% *	Weisse	1.0	0.3	80	0.0% *	2	0.0% *
Haden & Boone	2.7	0.4	141	0.1%	42	0.1%	West Gould	4.9	0.9	281	0.1%	84	0.1%
Hogan	2.1	0.1	37	0.0% *	11	0.0% *	West Reedley	5.6	1.4	442	0.2%	132	0.2%
Horseman	5.0	1.7	550	0.3%	164	0.3%	West Section 20	1.8	0.1	26	0.0% *	8	0.0% *
J.T. Williams	2.4	0.0	9	0.0% *	3	0.0% *	Wilson	10.7	7.0	2,220	1.0%	662	1.1%
Jack	1.2	0.3	103	0.0% *	31	0.1%	Wilson Hunter	1.5	0.5	151	0.1%	45	0.1%
Kennedy School Hous	5.0	0.3	82	0.0% *	24	0.0% *	Wilson School House	3.4	0.9	287	0.1%	85	0.1%
Kennedy Waste Way	7.3	3.7	1,166	0.5%	347	0.6%	Windsor	1.3	0.0	3	0.0%	1	0.0%
							Total	316.7	154	49,306	23.1%	13,727	23.6%

Note: * indicates that canal seepage is less than 0.05% of Alta's total district diversion.

ATTACHMENT F

Table 9, Future District Operating Budget –

Engineers Report Proposition 218 Procedures (2005)

TABLE 9
FUTURE DISTRICT OPERATIONAL BUDGETS

Volumetric Water Surcharge		**$3.65**		**$3.76**		**$3.90**		**$4.10**
Fiscal Year		**06/07**		**07/08**		**08/09**		**09/10**
Water Run Revenues								
Water Surcharge	$	365,000	$	376,000	$	390,000	$	410,000
Water Surcharge Penalty		500		500		500		500
Pine Flat Power Income 50%		84,476		84,476		84,476		84,476
Total Water Run Revenues	$	449,976	$	460,976	$	474,976	$	494,976
Water Run Costs								
Maintenance Ditchtender Trucks	$	8,000	$	8,400	$	8,800	$	9,200
Fuel - Ditchtender trucks		30,000		33,000		36,000		39,000
Cell Phone - Ditchtenders		6,000		6,000		6,000		6,000
Answering Service		400		400		400		400
Algicide		24,000		24,000		24,000		24,000
Operational Payroll		263,423		270,535		277,840		285,342
Payroll Tax/Benefits		84,885		87,177		89,531		91,948
Drop Boards		6,100		6,400		6,800		7,200
Total Water Run Costs	$	422,808	$	435,913	$	449,371	$	463,090
Add reserves for maintenance of pipelines	$	25,000	$	25,000	$	25,000	$	25,000
Net Operational Cash Flow	$	2,168	$	63	$	605	$	6,886

ATTACHMENT G

Water Banking Annual Report (2009)

ALTA IRRIGATION DISTRICT

WATER BANKING

2009 ANNUAL REPORT

Adopted 03/11/2010

TABLE OF CONTENTS

Water Banking Implementation Strategy

Project Yield: Project Yield is determined by measuring the water efficiency benefits of the project which result in a measured volume of conserved water. The basic premise of the program is that it is efficient from a water management perspective to make water deliveries at the lower end of the system from a localized source in the vicinity of the targeted water deliveries rather than delivering water more than 38 miles from the Kings River from AID's storage account in Pine Flat Reservoir. System readjustments and changing variables of demand diminish the efficiency of system deliveries from the Kings River by a factor of two (2).

It would take at least twice the volume of releases from the Kings River to meet surface water demands down steam from localized project sources in the lower reaches of the District. Localized projects can more efficiently meet surface water demands by pumping groundwater that was previously recharged. As a result, the water management efficiency for that delivery has been shown to require a 50% of the water release required to meet localized surface water demands. Making water deliveries from a localized source allows for greater system flexibility and water use efficiency with an end result of more reliable deliveries.

Water Resource Benefits: The Project Yield for Harder and Traver Banking Projects is to be used to address long-term water resource issues within the District. Long-term, where the planning horizon is more than five years, water will be developed for water transfers to meet Cutler-Orosi surface water demands. Short-term, where the planning horizon is less than five years, water will be developed for water transfers to address and improve water use efficiency issues for groundwater or surface water, i.e., Wahtoke Lake Pumping Project.

Available Recharge: Water available for recharge is the total water recharged in the project basins minus fifteen percent minus the extracted water. It is the intent to coordinate pumping during the mid-week periods of Tuesday through Friday to compliment enhanced irrigation demand during the mid-week period. During the non-operational irrigation period, water will be transferred from the East Branch to the Traver Canal via the Willow Creek Project to supply flows to Harder and Traver Banking Projects. The origin of Willow Creek flows is eastside watershed and the measured volume of water utilized shall be accounted for accordingly. In addition, there will also be inflow from the Kings River Watershed that will be accounted for in the water banking program.

Notes of Meeting (Avenue 384 and HW 99) June 12, 2008

Banking Advisory Committee

ATTENDANCE :

Chris Kapheim, Alta ID (GM)
Tom Marshall, Alta ID (Board Member)
Jim Wegley, Alta ID (Consulting Engineer)
Mike Swanson, landowner
Robert Jackson, landowner
Brad Jones, landowner
Jason George, landowner

DISCUSSION:

Chris Kapheim gave a general overview of the Harder Pond and proposed Traver Banking projects and their relative importance to the region. It was emphasized that monitoring data would be shared with Advisory Committee members to encourage information sharing and questions on the banking process. It is anticipated that there will be at least one annual meeting to review the performance of banking projects. Projects will allow water to be recharged in designed projects that will enable the District to address (i) uncontrolled flood flows, (ii) enhance groundwater recharge, (iii) improve water deliveries to downstream landowners from a groundwater source, and (iv) improve the District's water balance (new water) by being able to capture previously uncontrolled sources of water with application to a beneficial use. Furthermore, it was stated that of recharged water, at least 15% would be designated for recharge. Of the water to be extracted for landowner deliveries, such extracted water would be used incrementally to provide better service to landowner demands where it can be shown that there would be no negative influence on neighboring wells. Monitoring would be designed to show operational use of the banking process and resulting groundwater impacts, i.e., landowner groundwater and banking groundwater.

Discussion focused on the need for groundwater extraction. It was mentioned that there will be two wells located at each of the project sites. Water will not be extracted until sufficient groundwater recharge has taken place. It was further explained, that at some District projects (London Pond, Avenue 384) diversion pumps deliver stored water from basins to meet demand from downstream landowners. The London Pond site, based on its soil characteristics, recharges very slowly thus enabling the District to use the stored water for reregulation purposes. Both the Harder Pond and Traver pond have greater recharge potential thus storing the water in the soil aquifer and pumping on demand when necessary has been incorporated into their design features. It was also emphasized that efforts would be implemented to enhance sources of water to banking locations. On wet water years summer flows and winter flows would be utilized.

Banking Advisory Committee

ATTENDANCE:

Chris Kapheim, Alta ID (GM)
Tom Marshall, Alta ID (Board Member)
Jim Wegley, Alta ID (Consulting Engineer)
Dean Thonesen, landowner
Brad Jones, landowner
Mike Swanson, landowner

NOT IN ATTENDANCE:

Brent Smittcamp, landowner

DISCUSSION:

1. Review of the AID Banking Program.

The banking program consists of developing recharge and extraction sites that provide the following benefits: groundwater recharge, flood control, enhanced surface water efficiency and address water quality issues. Water delivered from the Kings River to the lower reaches of the AID has limitations in terms of timing with ordered demands, changes in environmental conditions (weather) and distance from inception to destination (approximately 38 miles). As a result, it has been determined that it is more efficient to store surplus waters in engineered basins and extract necessary volumes to meet demand as opposed to delivering water over extended distances that in some cases take two to three days from the Kings River to landowner delivery. As a result, extracted water from the banking project (Pumping) has a conserved value or Project Yield of twice the amount pumped. The Project Yield is the water available to address groundwater water quality issues in the easterly portion of AID, i.e., Cutler-Orosi areas. Furthermore, the program will take advantage of wintertime storm water flows. Such storm water flows will be recharged into Harder, Dinuba & Traver Pond recharge basins.

2. Review of the Harder Pond Banking Annual Report

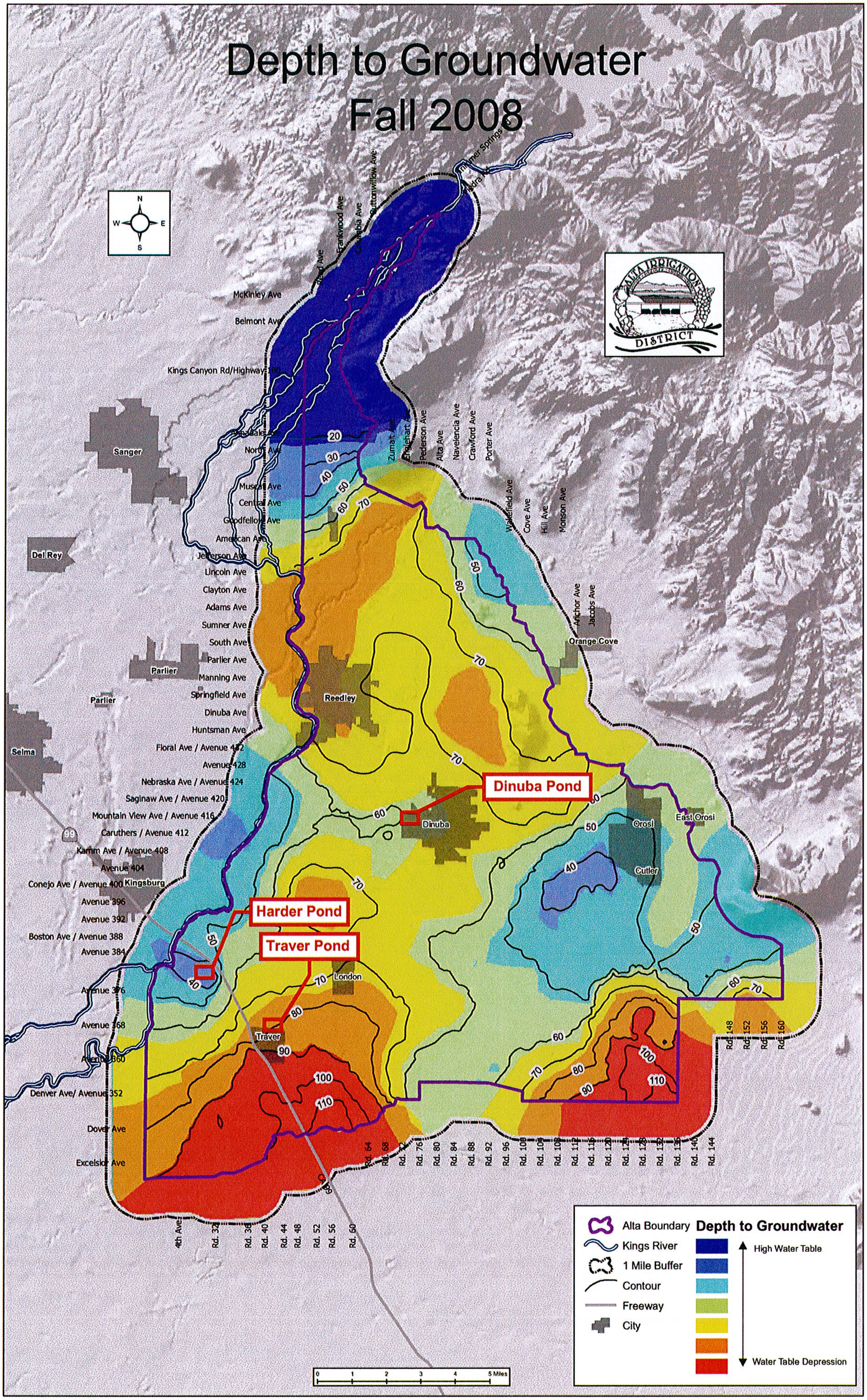
Discussion was held on the review of past practices and results for years 2008 and 2009 for AID's water banking program. AID showed data that illustrated the amount of water recharged in 2008, 563 acre-feet, and an additional 399 acre-feet in 2009. In 2009 188 acre-feet was extracted from the Harder Pond Banking Project. The result for 2009 was that forty-seven percent (47%) of the water recharged in the basins was extracted leaving a remainder of fifty-three percent (53%) for recharge. It was further discussed that in the future AID would extract up to eighty-five (85%) of the recharged water in the basins.

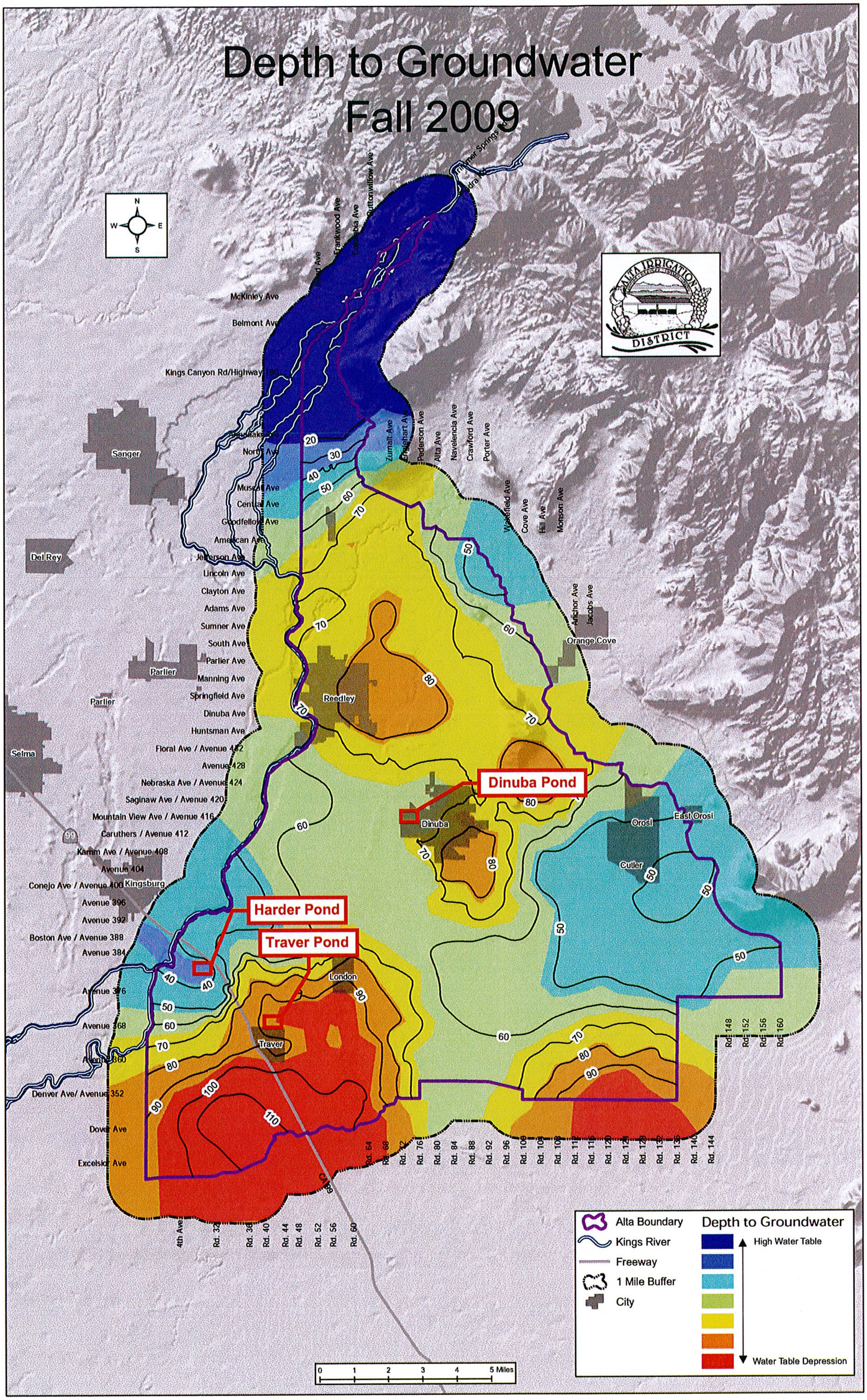
AID did review the monitoring of project wells and adjacent landowners wells. The results thus far illustrate no negative impacts of water extractions from the project site.

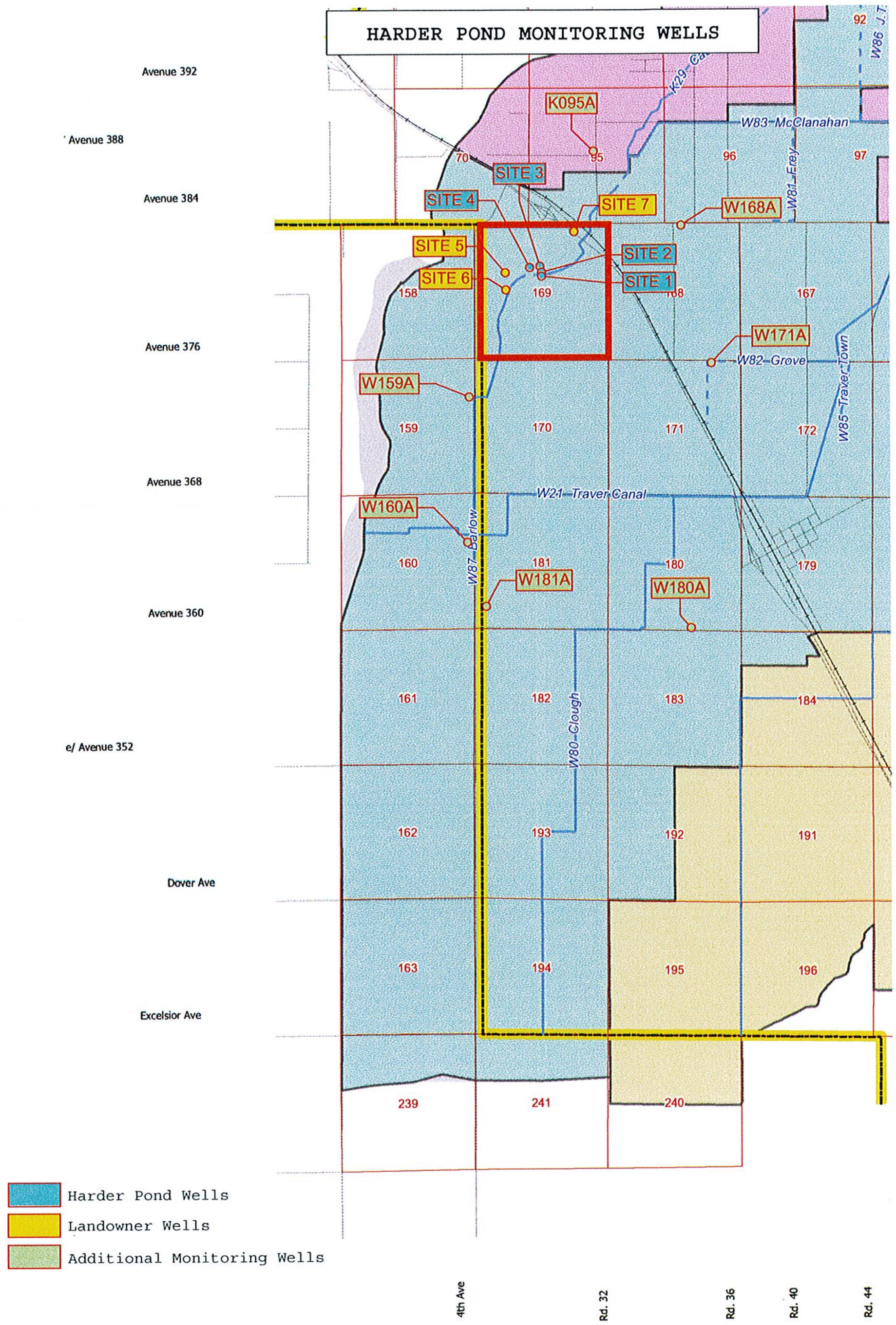
A review of regional benefits was discussed in terms of utilization of conserved water from the project and use on an interim basis. In 2009, 113.30 acre-feet was sold to a landowner that was experiencing groundwater limitations.

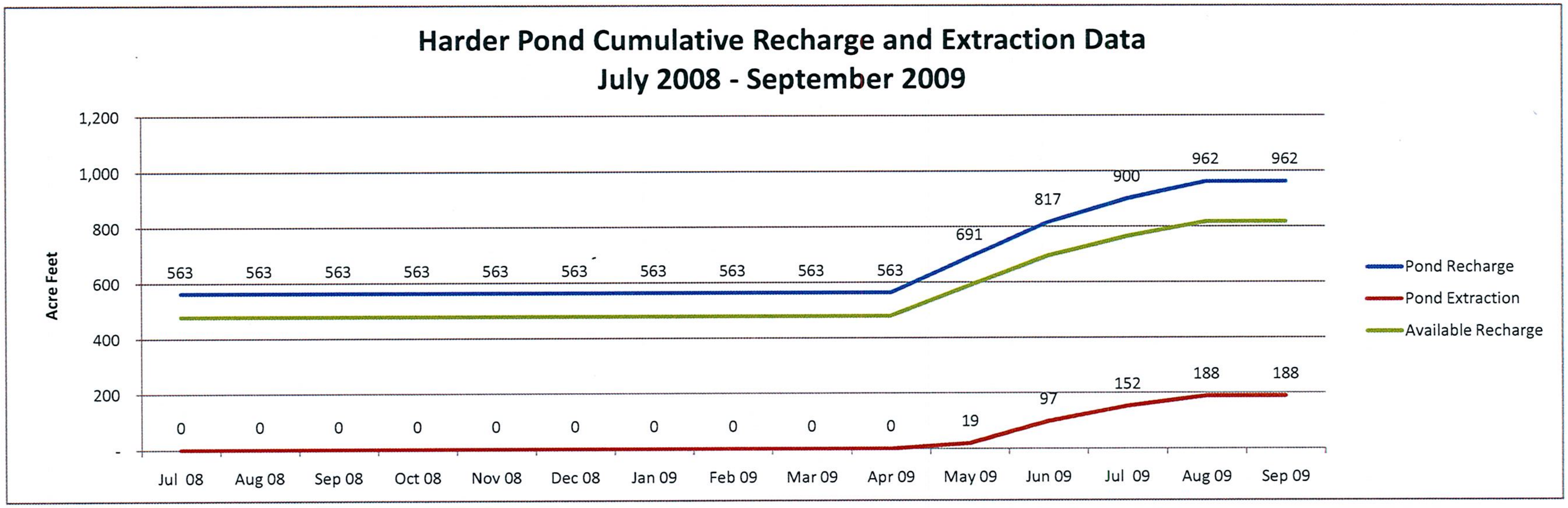
3. Review of the Traver Banking Project:

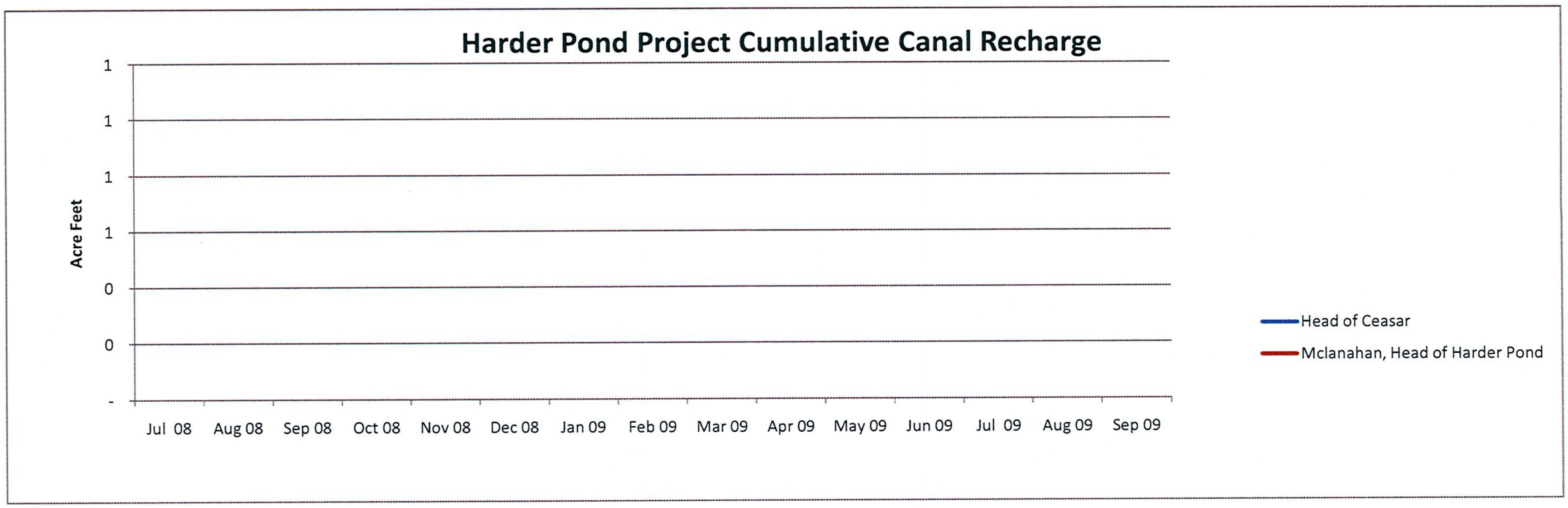
AID will be closing escrow in February of 2010 on the Anderson Property (28 acres) in the vicinity of Road 44 and 376. Discussion of how the project will operate and improve water resource flexibility.

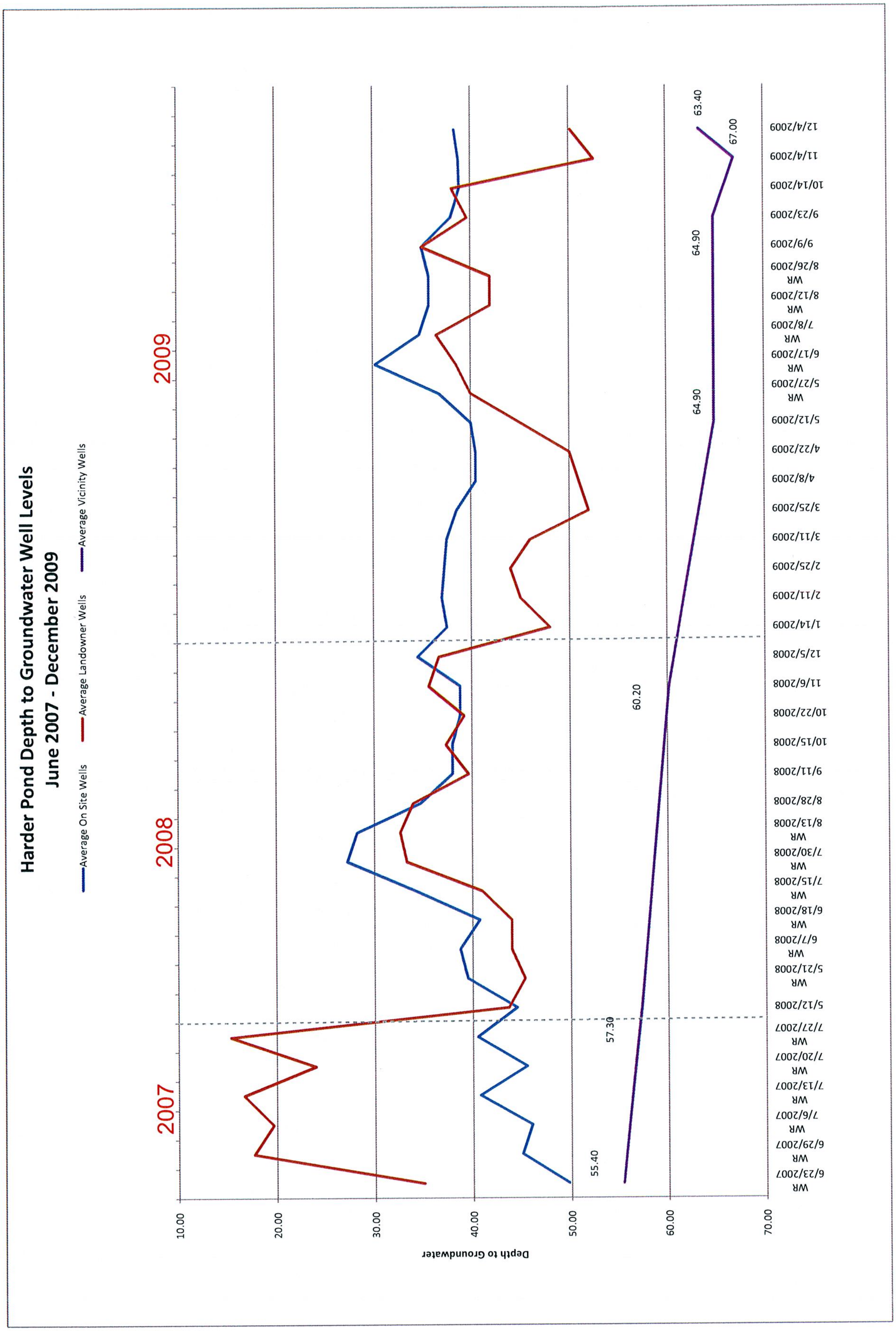

Depth to Groundwater
Fall 2008
N
E
S
W
ALTA IRRIGATION DISTRICT
Dinuba Pond
Harder Pond
Traver Pond
Sanger
Del Rey
Parlier
Selma
Reedley
Dinuba
Orosi
East Orosi
Cutler
Orange Cove
Kingsburg
London
Traver
McKinley Ave
Belmont Ave
Kings Canyon Rd/Highway 180
North Ave
Central Ave
American Ave
Lincoln Ave
Clayton Ave
Adams Ave
Sumner Ave
South Ave
Parlier Ave
Manning Ave
Springfield Ave
Dinuba Ave
Huntsman Ave
Avenue 428
Saginaw Ave / Avenue 420
Mountain View Ave / Avenue 416
Caruthers / Avenue 412
Kamm Ave / Avenue 408
Avenue 404
Conejo Ave / Avenue 400
Avenue 396
Avenue 392
Boston Ave / Avenue 388
Avenue 384
Avenue 368
Denver Ave/ Avenue 352
Dover Ave
Excelsior Ave
Alta Ave
Navelencia Ave
Crawford Ave
Porter Ave
Pederson Ave
Wakefield Ave
Cove Ave
Hill Ave
Anchor Ave
Jacobs Ave
4th Ave
Rd. 40
Rd. 44
Rd. 48
Rd. 52
Rd. 56
Rd. 60
Rd. 64
Rd. 80
Rd. 84
Rd. 88
Rd. 92
Rd. 96
Rd. 144
Rd. 148
Rd. 152
Rd. 156
Rd. 160
20
30
40
50
60
70
80
90
100
110
99
0
1
2
3
4
5 Miles
Alta Boundary
Kings River
1 Mile Buffer
Contour
Freeway
City
Depth to Groundwater
High Water Table
Water Table Depression


Depth to Groundwater
Fall 2009
Dinuba Pond
Harder Pond
Traver Pond
Sanger
Del Rey
Parlier
Selma
Reedley
Dinuba
Orosi
East Orosi
Cutler
Orange Cove
London
Traver
Kingsburg
McKinley Ave
Belmont Ave
Kings Canyon Rd/Highway 180
Lincoln Ave
Clayton Ave
Adams Ave
Sumner Ave
South Ave
Parlier Ave
Manning Ave
Springfield Ave
Dinuba Ave
Huntsman Ave
Floral Ave / Avenue 432
Avenue 428
Nebraska Ave / Avenue 424
Saginaw Ave / Avenue 420
Mountain View Ave / Avenue 416
Caruthers / Avenue 412
Kamm Ave / Avenue 408
Avenue 404
Conejo Ave / Avenue 400
Avenue 396
Avenue 392
Boston Ave / Avenue 388
Avenue 384
Avenue 376
Avenue 368
Denver Ave/ Avenue 352
Dover Ave
Excelsior Ave
Alta Boundary
Kings River
Freeway
1 Mile Buffer
City
Depth to Groundwater
High Water Table
Water Table Depression
0 1 2 3 4 5 Miles


HARDER POND MONITORING WELLS
Avenue 392
Avenue 388
Avenue 384
Avenue 376
Avenue 368
Avenue 360
e/ Avenue 352
Dover Ave
Excelsior Ave
K095A
SITE 3
SITE 4
SITE 7
W168A
SITE 5
SITE 2
SITE 6
SITE 1
W171A
W159A
W160A
W181A
W180A
W83-McClanahan
W81-Erey
W82-Grove
W85-Traver-Town
W21-Traver Canal
W87-Barlow
W80-Clough
70
95
96
97
92
158
169
167
159
170
171
172
160
181
180
179
161
182
183
184
162
193
192
191
163
194
195
196
239
241
240
Harder Pond Wells
Landowner Wells
Additional Monitoring Wells
4th Ave
Rd. 32
Rd. 36
Rd. 40
Rd. 44


Harder Pond Cumulative Recharge and Extraction Data
July 2008 - September 2009
Acre Feet
1,200
1,000
800
600
400
200
-
563 563 563 563 563 563 563 563 563 563 691 817 900 962 962
0 0 0 0 0 0 0 0 0 0 19 97 152 188 188
Jul 08 Aug 08 Sep 08 Oct 08 Nov 08 Dec 08 Jan 09 Feb 09 Mar 09 Apr 09 May 09 Jun 09 Jul 09 Aug 09 Sep 09
Pond Recharge
Pond Extraction
Available Recharge


Harder Pond Project Cumulative Canal Recharge
Acre Feet
1
1
1
1
0
0
-
Jul 08 Aug 08 Sep 08 Oct 08 Nov 08 Dec 08 Jan 09 Feb 09 Mar 09 Apr 09 May 09 Jun 09 Jul 09 Aug 09 Sep 09
Head of Ceasar
Mclanahan, Head of Harder Pond


Harder Pond Depth to Groundwater Well Levels
June 2007 - December 2009
Average On Site Wells
Average Landowner Wells
Average Vicinity Wells
2007
2008
2009
Depth to Groundwater
10.00
20.00
30.00
40.00
50.00
60.00
70.00
55.40
57.30
60.20
64.90
64.90
67.00
63.40
WR 6/23/2007
WR 6/29/2007
WR 7/6/2007
WR 7/13/2007
WR 7/20/2007
WR 7/27/2007
5/12/2008
WR 5/21/2008
WR 6/7/2008
WR 6/18/2008
WR 7/15/2008
WR 7/30/2008
WR 8/13/2008
8/28/2008
9/11/2008
10/15/2008
10/22/2008
11/6/2008
12/5/2008
1/14/2009
2/11/2009
2/25/2009
3/11/2009
3/25/2009
4/8/2009
4/22/2009
5/12/2009
WR 5/27/2009
WR 6/17/2009
WR 7/8/2009
WR 8/12/2009
WR 8/26/2009
9/9/2009
9/23/2009
10/14/2009
11/4/2009
12/4/2009

Harder Pond Summary and Conclusion

In May of 2008, during the 2009 operational season (water run) water recharge was initiated at the Harder Pond Project ("Project"). Measured flows at the Harder Pond were used to meet downstream agricultural demand with excess flows being recharged in on-site basins. From May through August of 2008 water was recharged with no extraction of recharged water resulting in 562.9 acre-feet of recharged water credited to the Project. The following winter months resulted in less than average rainfall and snowpack thus precluding the recharge of storm water in the Project.

2009 Water run deliveries were initiated on May 14, 2009 and continued until August 28, 2009. Measured recharged water for the period was 399.3 acre-feet. During the same period 188.31 acre-feet of water was extracted from the Project. For the 2009 water run, the ratio of recharged water to extracted water is forty-seven percent. The pre-determined cumulative maximum recharge to extraction ration for the project is eighty-five percent. As a result, the Project recharge to extraction ratio was well under the allowable maximum.

In review of the Harder Pond Depth to Groundwater Levels (June 2007 – December 2009), adjacent area groundwater levels have dropped from 20 feet in June 2007 to 50 feet in November of 2009. The drop in depicted surrounding groundwater levels is primarily due to less than average water years resulting in lower precipitation and snowpack levels thus reducing surface water deliveries and increasing agricultural groundwater pumping. There was no correlation of groundwater pumping from the Project enhancing the decline of adjacent area groundwater levels. Harder Pond depth to groundwater levels for 2008 and 2009 ranged in the 30 to 40 feet range which is higher than surrounding groundwater levels (see attached Harder Pond Depth to Groundwater Levels on page 6).

Harder Pond Regional Benefits

The Available Recharge water from the Hard Pond Project ("Project") will have short-term and long-term regional benefits. Ultimately, the Available Recharge from the Project will be used to address water quality and supply issues in the easterly portion of the District, i.e., Cutler and Orosi areas. On a short-term basis the Available Recharge can be used to address other local water resource issues.

In 2009, local groundwater resources in the vicinity of Smith Mountain, within the District, experienced significant groundwater limitations. A landowner desired to acquire additional surface water supplies to mitigate groundwater pumping near Smith Mountain. As a result, 500 acre-feet of water was sold from the Project to mitigate the Smith Mountain groundwater impacts. In 2009 operational season, 113.30 acre feet were delivered to landowners with the balance available the following year's operational season.

Financial Data on Harder Pond
For Year Ending 09/30/09

PGE pump costs (2 meters)

10/2008	$	-
11/2008	$	-
12/2008	$	-
1/2009	$	-
2/2009	$	322.14
3/2009	$	115.87
4/2009	$	651.85
5/2009	$	110.43
6/2009		
7/2009	$	1,413.05
8/2009	$	1,195.97
9/2009	$	1,010.47
	$	4,819.78

PGE Power	$	4,819.78
Engineering	$	317.09
Well Monitoring	$	4,069.00
Cash Expenses	$	9,205.87
Depreciation	$	41,263
Total Expenses	$	50,468.54

Engineering (Management)

9/2009	$	317.09
	$	317.09

Well Monitoring

	Quantity	Miles (RT)	Hours		Rate		Total
Vehicle	26	30	0	$	0.55	$	429.00
Employee	26		4	$	35.00	$	3,640.00
						$	4,069.00

based on bi-weekly well monitoring, supervisor rates

5 years on SCADA
15 years on pumps
40 years for everything else

Depreciation

				5 Year		15 Year		40 Year		Not Depreciable
Land	$	134,817.81							$	134,817.81
Extraction Wells and Pumps	$	189,229.08			$	100,000.00	$	89,229.08		
Flow Measurement and SCADA	$	73,250.80	$	73,250.80						
Monitoring Wells	$	33,699.03					$	33,699.03		
IRTC Flap Gates	$	16,397.00					$	16,397.00		
Other	$	658,508.79					$	658,508.79		
	$	1,105,902.51	$	73,250.80	$	100,000.00	$	797,833.90	$	134,817.81

Annual Depreciation

1-5 years	$	41,262.67
6-15 years	$	26,612.51
16-40 years	$	19,945.85

GLOSSARY OF TERMS

A. Project Yield (PY)

= Conserved Water = Water Available for Transfers
= 2x Pumped Water (PW)
PY=2xPW
50% efficiency from Non Project source, i.e. Kings River

B. Available Water Resource Benefits (AWRB) Long/Short Term

Long Term > 5 years - Water Transfers available for Cutler/Orosi
Short Term > 5 years - Water Transfers available to address/improving water use efficiency

WRB = Project Yield less Water Transferred Delivered
WRB = 2x Pumped Water less Water Transferred Delivered
WRB = 2xPW – WTD

C. Water Transferred (WT)

Total amount of water transferred

D. Water Transferred Delivered (WTD)

Total amount of water transferred measured to date

E. Water Transferred Outstanding Balance (WTOB)

= WT – WTD

F. Available Recharge (AR)

Tracked by water shed = Water Availability

= Meter Readings into the pond, less 15% protected recharge, less pumped water
AR = MR-(.15xMR) – PW
AR = .85MR – PW

G. Project Recharge to Extraction Ratio must be less than 85%

H. Canal Recharge (CR)

Accrued during non operational season
CR = Meter reading at the Head of the Caesar – Meter Reading into the Pond

I. Kings River Water Shed – All water attributed to the Kings River Water Shed

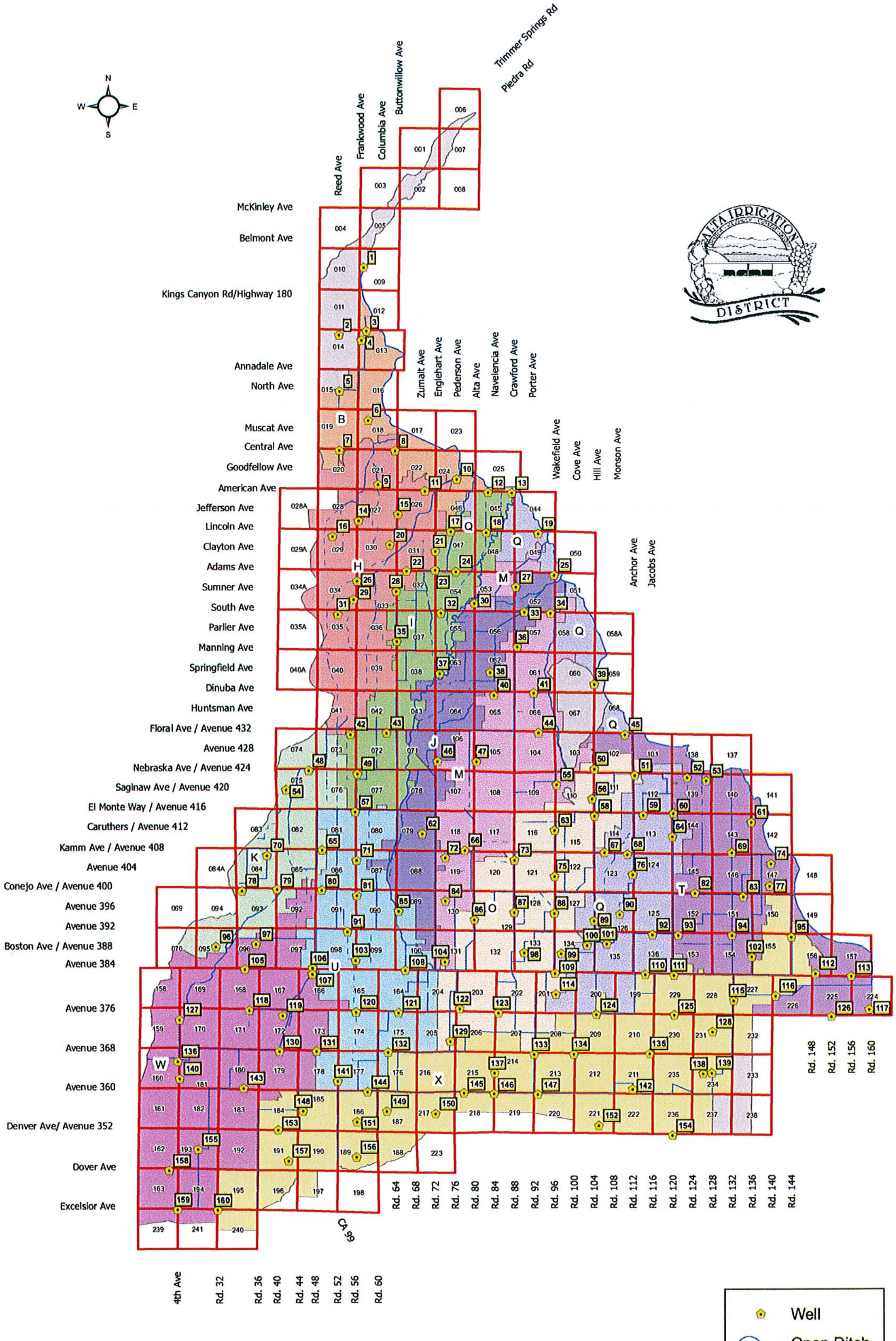
J. Non-Kings River Watershed

Wet Year, watershed attributed to Willow Creek flows

ATTACHMENT H

Map of Monitoring Well Locations

Depth to Groundwater Monitoring Wells



ATTACHMENT I

Section 5 Goals and Objectives, Upper Kings Basin IRWMP

CHAPTER 5 GOALS AND OBJECTIVES

An explanation of the regional planning process and overall integration strategy used to develop the Upper Kings Basin IRWMP is provided in this section along with the description of the goals and objectives. This IRWMP provides a planning framework and management structure from which local water management policies, projects, and programs can be formulated, evaluated, integrated, and implemented. The Water Forum first worked to develop a consensus on the regional problems, issues, and potential conflicts. Goals and objectives were then established to address these issues and to set the stage for the development of the projects, programs, and actions. A planning framework and integration strategy was defined to help the Water Forum work with stakeholders to prioritize projects and alternatives to be included in the IRWMP.

5.1 PROCESS OF DETERMINATION OF REGIONAL PLANNING ISSUES, GOALS, AND OBJECTIVES

The Water Forum worked through the fall of 2003 and winter of 2004 to identify priority problems and issues, and generate a consensus on the purpose and need for the IRWMP. A number of existing information sources, as listed below, were reviewed during this process:

- The original MOU adopted in May 2001 by the DWR, KRCD, AID, CID, and FID;
- The Water Forum Concept Paper (2004);
- Basin Assessment Report (WRIME, 2003b); and
- IRWMP Guidelines (DWR, 2004).

On the basis of the above review, the Water Forum members developed the IRWMP goals, regional planning objectives, and specific water management objectives for the region. These goals and objectives were adopted at the February 2004 Water Forum meeting. These were forwarded to each of the stakeholder groups for consideration before adopting the Resolution of Support for the IRWMP.

5.2 REGIONAL PROBLEMS, ISSUES, AND CONFLICTS

Water Forum participants have identified and developed consensus on priority problems, issues, and sources of potential conflicts in the Kings Basin.

5.2.1 GROUNDWATER OVERDRAFT

Overdraft of the groundwater resource is the primary problem to be addressed in the Upper Kings Basin IRWMP. Overdraft provides a unifying theme for the IRWMP and is the major "driver" for the planning process. The Basin Advisory Panel (BAP) composed of original MOU partners documented that the Kings groundwater basin was in overdraft condition (WRIME, 2003) and recommended that the Water Forum support development of the Kings IGSM to provide a tool to analyze the regional water budget and quantify the nature and extent of overdraft. The Kings IGSM was developed and applied under direction of the Water Forum's Technical Analysis and Data Work Group. The Kings IGSM provides the scientific and technical basis for quantifying the current and potential future overdraft (WRIME 2007b). The area water budget and model results are further explained in Chapter 4 and in Appendix B.

The model and related technical work helped the Water Forum by providing data and analysis results to conclude that the primary water management goal should be to "halt and ultimately reverse the current overdraft of the groundwater aquifer". It is expected that attainment of this goal would "lead to overall maintenance or improvement in the quantity, quality and cost of development of groundwater resources in the region." The continued overdraft over a long period has resulted in the loss of groundwater supply in some areas in the eastern part of the Kings Basin and is not sustainable.

Overdraft increases the competition for the available supply and creates conflicts between agricultural, environmental, and urban water users, and between geographic areas within the region. Declining groundwater levels and groundwater migration across jurisdictional boundaries are also a potential source of increased conflict. In addition, site-specific issues associated with groundwater quality, groundwater recharge, and the need for water and wastewater management facilities to address overdraft have been identified as high priority issues.

5.2.2 WATER SUPPLY RELIABILITY

Water demand has exceeded the available surface and groundwater supplies as they are currently developed and managed with the existing capital facilities and institutional arrangements. A reliable surface water supply is not assured in normal and dry years. Groundwater makes up the balance of urban and agricultural water demands when surface water is not available. In addition, some areas in the basin are entirely reliant on groundwater. Therefore, the long-term sustainability and reliability of the surface and groundwater supply must be addressed in the IRWMP.

An improvement in the capture and storage of storm water and flood water both annually (winter storage for summer use) and during multi-year climatic variations (wet year storage to meet dry year demands) will increase the water supply reliability in the region. The ability to utilize the available groundwater storage is contingent upon construction of capital facilities and on agreements for how to operate and manage the available groundwater storage space. The community, through the Water Forum and IRWMP process, seeks to avoid litigation over water resources and to develop a consensus solution for creating sustainable water supplies with minimum environmental impact.

5.2.3 DEGRADATION OF WATER QUALITY

Degradation of water quality in parts of the IRWMP Region has the potential to reduce the available supply or increase treatment costs. Also, the migration of poor quality water is a factor in the operation of the groundwater basin. Therefore, existing water quality needs to be maintained or improved to ensure that there is water of acceptable quality to meet current and future agricultural, urban, and environmental requirements. A wide range of local, state, and federal programs, both regulatory and voluntary, need to be better coordinated to avoid additional burdensome regulations and to provide benefits to the region.

5.2.4 URBAN DEVELOPMENT

Significant urban development is occurring throughout the planning area, placing increased demands on already stressed resources and increasing the potential for conflicts between existing and new water users. Recent legislation requires urban areas to document and prove that long-term water supplies are available. Potential conflicts exist due to inconsistent planning horizons, lack of compatibility between land use and water supply plans, decreased water quality, and increased treatment costs and requirements for both drinking water and wastewater treatment. Urban areas reduce the amount of applied irrigation water and have a potential effect on the amount of groundwater recharge. Urban water use serves to "harden" the water demand and require a reliable supply of high quality water as compared to agricultural uses. Current urban use is not measured in some areas.

5.2.5 PROTECTION OF WATER RIGHTS

A complex system of water rights exists and is managed by the KRWA on behalf of its 28 members. This water rights system and the associated agreements were put in place to resolve long standing historical conflicts. These agreements demonstrate that local interests can solve and manage conflicts at a local level. The existing agreements, rights, and entitlements will provide the basis for further basin planning and management because the protection of existing rights is a premise for the IRWMP planning effort and is required to avoid conflicts.

Overlying groundwater rights must also be protected to avoid conflicts. Agreements, similar to those that are used in surface water management, need to be developed for the operation of the groundwater basin and any potential groundwater management facilities for recharge and storage.

5.2.6 SUSTAINING THE AGRICULTURAL ECONOMY

The Kings Basin is a rich agricultural region, and agriculture is a pillar of the local economic and cultural landscape. Agricultural interests developed and paid for many of the local water supply facilities and hold some of the most senior water rights in the Kings Basin. Agricultural and urban users have differences in the ability to pay for new water supplies. Existing agricultural land uses need to be protected to avoid conflicts associated with water and land use conversions.

5.2.7 PROTECTION OF LIFE AND PROPERTY FROM FLOODING

Major storm events have the potential for impacts to existing land use. Regional and local flood control facilities may need improvement to better manage flood runoff and protect existing or proposed land uses. Urbanization increases impervious areas and therefore, will increase runoff, which will have impacts on existing drainage, water delivery infrastructure, and downstream agricultural land uses. Cities and water districts need to work together to avoid these impacts and plan for long-term regional flood control solutions.

5.2.8 PROTECTION OF THE ENVIRONMENT

Community and social programs designed to protect or enhance environmental conditions must be identified and factored into project designs. Environmental protection goals and objectives may be in conflict with other economic development goals and objectives. Integrated solutions to land use and water supply issues also need to factor in potential ecosystem management benefits and costs. Ignoring ecosystem needs could result in projects that do not meet regulatory requirements, are subject to legal challenge, and therefore are subject to schedule delays, cost overruns, or abandonment.

5.2.9 Environmental Justice

Environmental justice issues can be a source of conflict for IRWMP projects. Therefore, a scientific and open approach needs to be followed in selecting potential project sites. The project sites will be selected based upon soil conditions, water availability, water delivery facilities, agency coordination, and landowner cooperation. Potential projects in areas, towns, or cities will not be rated and prioritized based upon characters of size, ethnicity, economics, or religious beliefs.

5.3 REGIONAL GOALS AND PLANNING OBJECTIVES

The regional goals and planning objectives were established to guide the development of the IRWMP and the planning process. These objectives also defined how the Kings Basin stakeholders integrated other community values into the process to define water management strategies.

5.3.1 Regional Goals

The regional goals are the broadest statement of intent or purpose for the IRWMP and are intended to address the primary problems and resource conflicts in the region. The Water Forum consulted and elaborated on the original goals and objectives developed by the Basin Advisory Panel (WRIME, 2003b). The goals of the IRWMP are:

- Halt, and ultimately reverse, the current overdraft and provide for sustainable management of surface and groundwater;
- Increase the water supply reliability, enhance operational flexibility, and reduce system constraints;
- Improve and protect water quality;
- Provide additional flood protection; and
- Protect and enhance aquatic ecosystems and wildlife habitat.

5.3.2 Regional Water Resources Objectives

Regional water resources objectives were adopted by the Water Forum to address specifically the water resources issues. They are designed to address the priority water supply problems by integrating land, water, and environmental management strategies that will provide multiple benefits and the greatest return on investment. It should be noted that resolution of the groundwater overdraft is still a primary purpose and unifying theme for the IRWMP. The IRWMP water management objectives are:

- Define local and regional opportunities for groundwater recharge, water reuse/reclamation, and drinking water treatment;
- Develop large scale regional conjunctive use projects and artificial recharge facilities to:
  - Enhance operational flexibility of existing water facilities, consistent with existing agreements, entitlements, and water rights;
  - Improve the ability to store available sources of surface water in the groundwater basin;
  - Capture storm water and flood water currently lost in the region;
  - Provide multipurpose groundwater recharge facilities that provide flood control, recreation, and ecosystem benefits; and
  - Integrate the fishery management plan;
- Promote 'in-lieu' groundwater recharge to reduce reliance on groundwater through reclamation and reuse of treated wastewater, surface water treatment and delivery for municipal drinking water, and delivery of untreated water for agricultural use;
- Negotiate and develop institutional arrangements and cost sharing for water banking, water exchange, water reclamation, and water treatment;
- Design programs to improve water conservation and water use efficiency by all water users;
- Identify interconnections or improvement of conveyance systems to provide multiple benefits; and
- Enhance wildlife habitat through surface water reclamation, recharge, and treatment facilities.

5.3.3 Regional Planning Objectives for the Upper Kings Basin IRWMP and Planning Process

The regional planning objectives were adopted by the Water Forum to guide the Upper Kings Basin IRWMP development process. The regional planning objectives reflect community values and acknowledge a range of stakeholder perspectives towards land use, water supply, and environmental resources. Proposed regional planning objectives included:

- Use the Water Forum to help:
  - Create a framework for ongoing regional collaboration and conflict resolution;
  - Coordinate the regional planning process to produce an IRWMP;
  - Define local and regional water management strategies;
  - Evaluate and compare alternatives;

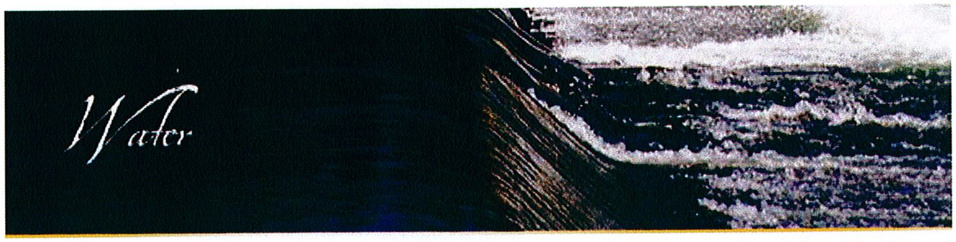
    - Prioritize cost effective local and regional solutions; and
    - Increase public understanding of water management issues.
- Collect and compile water quality baseline data for the region and define opportunities to integrate existing local, state, and federal programs.
- Investigate and resolve legal and institutional issues that may affect project development.
- Identify and pursue sources of funding needed to support project development.
- Compile an inventory of existing water resources plans and policies for the region (including state agencies); include an inventory of local government and water district strategies and initiatives for dealing with water resources problems.
- Develop an integrated hydrologic model to determine regional water budgets, understand how the groundwater basin operates, evaluate and compare alternatives, and support decision making.
- Involve local water districts and land use agencies in generating and confirming the current and future water needs.
- Seek to ensure compatibility and consistency with land use and water supply plans.
- Create and define opportunities to share data and information.
- Develop and implement a community affairs strategy to provide outreach and educate the public and decision makers on water management problems and solutions.
- Evaluate local and regional economic impacts and benefits of proposed projects.
- Identify potential environmental and ecosystem benefits associated with developing the IRWMP.
- Avoid environmental impacts during planning and project design where possible.
- Coordinate needed environmental review of the final alternative projects and programs.

During development of the IRWMP, the Water Forum has realized many of the preliminary planning objectives that were initially established in 2005. The implementation plan contained herein updates the approach to oversight and coordination and establishes long-term strategies for ongoing Water Forum operations. The Water Forum will continue to coordinate stakeholder involvement during implementation of the Upper Kings Basin IRWMP and will use adaptive management to continuously respond to changing circumstances.

ATTACHMENT J

Member Agencies Upper Kings Basin IRWMP Authority

KRCD
Kings River Conservation District
Reliable resources for the Valley



Directors

The Upper Kings Basin Integrated Regional Water Management Authority is governed by a board of directors, which is composed of one representative from each of the 15 member agencies. The directors and alternates are appointed by each member's governing board.

Member Agency	Director
Alta Irrigation District	Norman Waldner, Director Alternate: Chris Kapheim, General Manager
City of Clovis	Harry Armstrong, Mayor Alternate: Mike Leonardo, Public Utilities Director Alternate: Lisa Koehn, Assistant Public Utilities Director
City of Dinuba	Mark Wallace, Mayor Alternate: Dan Meinert, Deputy City Manager Alternate: Dean K. Uota, City Engineer
City of Fresno	Andreas Borgeas, Council Member Alternate: Rene Ramirez, Department of Public Utilities Director
City of Kerman	Trinidad M. Rodriquez, Mayor Alternate: Ken Moore, Public Works Director
City of Kingsburg	Bruce Blayney, Mayor Alternate: David Karstetter, Mayor Pro Tem
City of Parlier	Armando Lopez, Mayor Alternate: Lou Martinez, City Manager
City of Reedley	Steven Rapada, Council Member Alternate: Anita Betancourt, Council Member
City of Sanger	José R. Villarreal, Mayor Alternate: John White, Interim City Manager
City of Selma	Dennis Lujan, Mayor Alternate: D-B Heusser, City Manager Alternate: Roseann Galvan, Administrative Analyst
Consolidated Irrigation District	Robert Nielsen, Jr., Board President Alternate: Phillip Desatoff, General Manager
Fresno Irrigation District	Jeffrey Boswell, Board President Alternate: Gary Serrato, General Manager
Kings County Water District	Barry McCutcheon, President Alternate: Donald Mills, General Manager
Kings River Conservation District	Mark McKean, Board President Alternate: David Orth, General Manager
Raisin City Water District	Jerry K. Boren, President

Alternate:

Board Officers

Chair
Harry Armstrong, Mayor
City of Clovis

Vice Chair
Gary Serrato, General Manager
Fresno Irrigation District

Secretary/Treasurer
David Orth, General Manager
Kings River Conservation District

Last updated 02-26-10

4886 East Jensen Avenue
Fresno, CA 93725

Tel: 559-237-5567
Fax: 559-237-5560

ATTACHMENT K

Memorandum of Understanding with Overlapping Local Agencies

MEMORANDUM OF UNDERSTANDING
BETWEEN
ALTA IRRIGATION DISTRICT
AND
LOCAL AGENCY

ARTICLE I - AGREEMENT

The articles and provisions contained herein constitute a bilateral and binding agreement by and between ALTA IRRIGATION DISTRICT, a California Irrigation District ("District") and LOCAL AGENCY, A Public Agency ("Agency").

ARTICLE II - RECOGNTION

The District has developed an amended Groundwater Management Plan ("Plan") with input from several local agencies which are water purveyors with overlapping spheres of influence within the District. It is the intent of the District to implement the plan with the support and coordination of such local agencies by means of a separate Memorandum of Understanding ("MOU") between each agency and the District.

ARTICLE III - PURPOSE

It is the purpose of this MOU, entered willingly, between District and Agency, to document the interests and responsibilities of both parties in the adoption and implementation of a coordinated Plan. It is also hoped that such MOU will promote and provide a means to establish an orderly process to share information, develop a course of action and resolve any misunderstandings or differences that may arise.

ARTICLE IV - COORDINATION

There shall be bi-annual coordinating meeting ("Meeting") between the District and the Agency. District shall give notice to the Agency thirty (30) days prior to date of the Meeting. If there are concerns or questions regarding the Plan, Agency shall transmit its concerns in writing to District seven (7) days prior to the Meeting.

ARTICLE V - OBLIGATIONS

The Plan shall be binding on the parties hereto unless superseded by the MOU or amendment thereto. It is agreed between both parties that information pertaining to depth to groundwater and groundwater quality shall be shared and coordinated between the parties.

ARTICLE VI - AREA OF PLAN

The plan shall be effective in all areas within the Agency boundaries. The Plan shall also be effective in any area annexed to the Agency Subsequent to the adoption of the Plan.

ARTICLE VII - TERM

The initial term of the MOD shall commence on the date hereof and continue for five (5) years, and shall continue year to year thereafter, unless terminated by written notice given at least one (l) year prior to such termination.

ALTA IRRIGATION DISTRICT

____
Norman Waldner, President

____ __________________________
Chris Kapheim, Secretary Date

LOCAL AGENCY

____
Members Name, President

____ __________________________
Members Name, Secretary Date

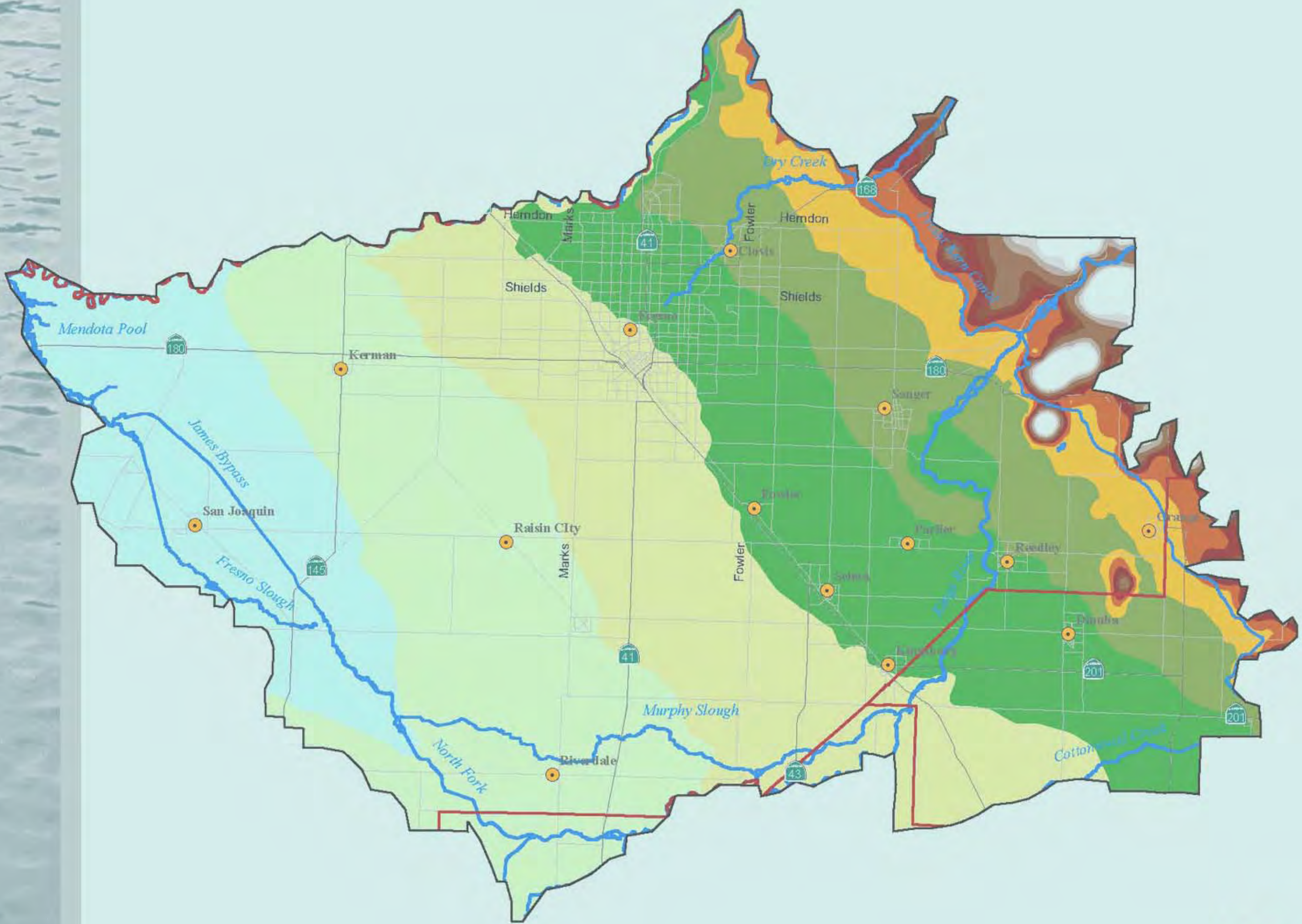
Groundwater Management Plan

Consolidated Irrigation District

Consolidated Irrigation District

Groundwater Management Plan

March 2009



GEI Consultants

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Consolidated Irrigation District Groundwater Management Plan

Submitted to:
Consolidated Irrigation District

Date: March 6, 2009
Project No. 073350

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Tables

Figures

Abbreviations and Acronyms

AID	Alta Irrigation District
BAP	Basin Advisory Panel
Basin	San Joaquin Valley Groundwater Basin
bgs	below ground surface
BMOs	basin management objectives
BMPs	Best Management Practices
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CHK	Cortese-Hetzberg-Knox
CID	Consolidated Irrigation District
CIMIS	California Irrigation Management Information System
CPT	cone penetrometer
CU3	Conjunctive Use Element 3
CVP	Central Valley Project
DCE	dichloroethane
Delta	Sacramento-San Joaquin River Delta
DHS	Department of Health Services
DMS	Data Management Systems
DWR	California Department of Water Resources
DWSAP	Drinking Water Source and Protection
EHD	Environmental Health Division
ET	evapotranspiration
EWA	Environmental Water Account
EWMP	Efficient Water Management Practices
FID	Fresno Irrigation District
GAC	GroundwaterAdvisory Committee
GAMA	Groundwater Ambient Monitoring and Assessment
GWMP	Groundwater Management Plan
gpd/ft	gallons per day per foot
gpm	gallons per minute

GWMP	Groundwater Management Plan
IRWMP	Integrated Regional Water Management Plan
IGSM	Integrated Groundwater and Surface Water Model
IS/MND	Initial Study/Mitigated Negative Declaration
Kings IGSM	Kings Basin Integrated Groundwater and Surface water Model
KRCD	Kings River Conservation District
KRWA	Kings River Water Association
LAFCO	Local Agency Formation Commission
LUST	leaking underground storage tank
M&I	municipal and industrial
MCL	maximum contaminant level
mg/L	milligrams per liter
MMR	Monitoring, Measurement, and Reporting
M&O	maintenance and operations
MOU	Memorandum of Understanding
MSL	Mean Sea Level
NCDC	National Climatic Data Center
NOD	Notice of Determination
NRCS	Natural Resources Conservation Service
OPR	Office of Planning and Research
PAEP	Project Assessment and Evaluation Plan
PBE	Physical Barrier Effectiveness
PCAs	Potential Contamination Activities
PCE	tetrachloroethylene
ppb	parts per billion
Program	Groundwater Mitigation and Banking Program
PSP	Proposal Solicitation Package
QAPP	Quality Assurance Project Plan
RCUP	Regional Conductive Use Program
Region	Upper Kings Region
RWQCB	Regional Water Quality Control Board
SB	Senate Bill

SCADA	Supervisory Control and Data Acquisition
SOI	sphere of influence
SSJVWQC	South San Joaquin Valley Water Quality Coalition
SWAMP	Surface Water Ambient Monitoring Program
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
TAF	thousand acre-feet
TCE	trichloroethylene
TDS	total dissolved solids
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey
UWMPs	Urban Water Management Plans
VOC	volitile organic compound
Water Forum	Upper Kings Water Forum
WHPA	Wellhead Protection Area

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Executive Summary

Background

The purpose of this document is to update the 1995 Consolidated Irrigation District (CID) Groundwater Management Plan (GWMP). It defines management actions to be implemented by CID to ensure that there is a long-term, sustainable supply for current and future water needs.

The proposed projects, programs and policies defined in the GWMP are intended to complement the existing CID conjunctive use program which has been in operation since 1921, when the District was formed. CID has actively managed its Kings River water through conjunctive use which is the combined management of surface water and groundwater supplies and storage.

CID encompasses 145,000 acres of which the largest land use is agriculture and the majority of the water demand is to support the agricultural economy. Crop water requirements are met through irrigation application of both surface and groundwater. Surface water delivered to agriculture reduces the reliance on groundwater. Part of the surface water applied to agricultural, specifically that not consumed by the crops, percolates downward and recharges the groundwater basin. The intentional use of surface water in lieu of groundwater pumping is part of CID conjunctive use operations. Incorporated cities within the boundaries of CID include Fowler, Kingsburg, Parlier, Sanger, and Selma (CID Cities). Total urban water demands are much smaller than the total agricultural water demands, but the growing urbanized areas are reliant exclusively on groundwater.

Purpose and Need for Groundwater Management Planning

Despite the active management of Kings River water by CID and the other overlying water districts, groundwater overdraft is occurring in the Kings Basin on an average annual basis. This means that on average more groundwater is removed than recharged. This is shown by the long-term decline in groundwater levels. The results of the analysis of the regional water budget using the Kings Basin Integrated Groundwater and Surface Water Model (Kings IGSM) also demonstrate overdraft conditions. Based on the Kings IGSM, the average annual overdraft within CID for the 40 year period from 1964 to 2004 was approximately 24,000 acre-feet. The entire Kings River Basin was overdrafted by approximately 160,000 acre-feet per year during the same time period.

Long-term overdraft is not sustainable. Potential effects of overdraft include land subsidence, increased pumping costs, migration of poor quality water, and reduced economic activity in both agricultural and urban sectors. Overdraft may create conflicts between overlying land owners; between different types of water users; or between existing and new users that are all reliant on the common groundwater supplies. The worst case scenario is that the overdraft would spawn conflicts that result in litigation over the rights and entitlements to groundwater and a loss of local control.

Historically, the management of the groundwater resources in the Kings Basin has been limited to independent operations by overlying local water agencies and individual water users. Piecemeal planning has constrained the potential for solutions to overdraft.

The CID Board of Directors has recognized that continued groundwater overdraft and the urban growth pressure call for improved water resources management within CID and the overall Kings Basin. CID GWMP will help the Board of Directors work with the community to plot a course of action to address overdraft and gain a consensus on project solutions and funding.

> The Upper Kings IRWMP defined the Regional Conjunctive Use Program (RCUP) to reduce overdraft. CID will implement RCUP concepts through the Groundwater Management Plan.

CID has been part of the Upper Kings Water Forum (Water Forum) that has prepared the Upper Kings Integrated Regional Water Management Plan (Upper Upper Kings IRWMP) to address the larger regional overdraft. The Water Forum has provided a diverse range of perspectives from cities, counties, irrigation districts, environmental interests, and other stakeholders regarding the long-term strategies needed to manage available water supplies. The Upper Kings IRWMP recommended that the irrigation districts update their GWMPs as needed to be responsive to the unique operational, infrastructure, and institutional environments within their jurisdictional areas.

GWMP Goals and Objectives

The CID Board established the following goals and objectives for the CID GWMP:

- Halt and ultimately reverse overdraft and provide for sustainable management of surface water and groundwater.
- Increase the water supply reliability, enhance operation flexibility, and reduce system constraints.
- Improve and protect water quality.

To be compatible with the Upper Kings IRWMP, the CID GWMP incorporates the following general objectives from the Upper Kings IRWMP:

- Define local and regional opportunities for groundwater recharge, water reuse/reclamation, and drinking water treatment.
- Develop large-scale regional conjunctive use projects and artificial recharge facilities.

- Negotiate and develop institutional arrangements and cost sharing for water banking, water exchange, water reclamation, and water treatment.

Additional GWMP general objectives adopted by CID are to:

- Support cities in streamlining project reviews.
- Provide a GWMP that will serve as a regional water supply assessment for purposes of evaluating proposed development.
- Through funding, adoption, and participation in the GWMP; provide CID Cities with a mechanism to verify a water supply for proposed projects and for mitigating groundwater supply impacts.
- Develop a standard practice by which CID can develop financing for land and water purchases; evaluate land for its recharge potential; and obtain environmental clearances to acquire property and water for purposes of recharge and overdraft reduction.
- Develop the necessary environmental documentation that would support the recharge programs.

Potential Uses of the GWMP

Opportunities exist for CID and the land use agencies to integrate General Plan, UWMPs, and GWMP requirements to streamline the decision process; avoid conflicts; meet current and future demands; and sustain the local economy. CID is the regional water agency with appropriate powers and authorities to develop the GWMP for the region. CID intends to use the GWMP to define projects that ensure a reliable water supply is available. The potential uses of the GWMP are as follows:

- Streamline development review process for CID Cities, water suppliers, and CID.
- Document regional water demand and supply sources to a level of detail such that the GWMP would serve as a regional water supply assessment for CID Cities when considering new development.
- Define projects (physical solutions) to overdraft that will provide mitigations for groundwater impacts related to new projects that increase groundwater demands.
- Provide the mechanism for CID Cities to verify water supply availability and adopt legally defensible findings of sufficiency.

GWMP Components

In addition to the Upper Kings IRWMP RCUP components that are integrated into the 2008 CID GWMP, there are three additional components intended to ensure compliance with the water code. These include seven (7) mandatory components from SB 1938, twelve (12) voluntary components of AB 3030 and SB 1938, and seven (7) suggested components identified in DWR Bulletin 118 (DWR, 2003).

The GWMP summarizes the water resources regionally and within the CID area. It includes a discussion of the current and future land use and associated water demands, water supplies and sources, existing water supply facilities, groundwater levels, and water quality conditions; and the historical and baseline conditions of the water resources within CID.

The GWMP presents and evaluates alternative water management strategies that the Board considered during development of the overall groundwater management strategy. Many of the programs identified by DWR for consideration in the GWMP have been addressed in the Upper Kings IRWMP, and CID will meet some of the GWMP requirements through the continued participation in the Water Forum and implementation of the Upper Kings IRWMP. The CID Board analyzed water management constraints and opportunities, made specific findings and identified subsequent actions for:

- Conjunctive use, groundwater storage and banking
- Land acquisition and protection of recharge areas
- Conveyance and extraction facilities
- Coordination with land use planning agencies
- Groundwater and related monitoring

Conjunctive Use, Groundwater Storage, and Banking

In general, the CID Board found that overdraft requires a dedicated response if local control and management are to be preserved. CID will use the CID GWMP as a guide to define, fund, and implement a Groundwater Mitigation and Banking Program that will include capital facilities projects, programs, and policies to manage available groundwater storage capacity and provide mitigations to groundwater impacts of new urban development.

CID will supplement local resources and keep local costs down by identifying federal, state, and regional funding opportunities. The Board is committed to protecting overlying groundwater rights; and to working with the cities to develop the institutional arrangements and agreements that provide funding for recharge facilities with tangible yields that provide a long-term, sustainable water supply for new development.

On the plus side, the GWMP notes that there is surface water available to CID for recharge; that there is available capacity within CID facilities to convey water, though some conveyance facilities may need to be modified or expanded; and that there is land within CID that has appropriate hydrogeologic conditions for additional recharge ponds and that is located near useable CID conveyance facilities.

The CID GWMP provides guidelines for the groundwater mitigation and banking program that are intended to avoid environmental impacts and third party effects. The Board is committed to expanding the groundwater recharge operations by pursuing new in-lieu or direct recharge projects using available surface water and flood water; improving and protecting canal conveyance capacity; developing agreements and funding mechanisms in cooperation with CID Cities; and by acquiring additional lands for purposes of developing additional recharge capabilities.

In addition, CID will evaluate maintenance and operations at existing recharge ponds to identify opportunities to increase recharge rates; and investigate the feasibility for constructing extraction facilities to improve the distribution of recharged and banked water. Longer term actions include coordinating with other Kings Basin Water Forum members to aggressively pursue development of additional regional facilities for conjunctive use.

Surface Water Treatment

There is no current imperative to develop municipal surface water treatment plants in CID Cities, but this may be necessary in the future. If urban lands continue to develop and rely exclusively on groundwater, and if recharge facilities are not developed to help meet future urban demands, treatment of surface water for municipal use in lieu of groundwater may be needed.

Land Acquisition

One of the biggest constraints to further development of recharge facilities is related to the ability for CID to acquire land. A cooperative program between CID and the cities is needed to generate revenues to acquire lands when they are available. CID will work with CID Cities and Fresno County to acquire land for multiple benefits including flood control, recharge, open space, and recreation purposes; and to further develop and implement a land acquisition process for acquiring lands through purchase (for direct recharge facilities) or easement (for spreading).

Conveyance

CID conveyance facilities move water from the Kings River to agricultural water users and recharge facilities. The conveyance facilities include natural channels and constructed facilities, such as canals, pipelines, and diversion structures. Groundwater aquifers also convey water from recharge areas to areas of pumping. Improvements to the existing conveyance system could provide more flexibility to move water from the available supply sources to existing, improved, or new groundwater recharge facilities. Improved conveyance facilities might also allow surface water to be delivered to a larger irrigation service area within CID in lieu of groundwater pumping. There is a backlog of deferred maintenance on CID facilities and a need to modernize some components of the existing system. CID Cities currently derive uncompensated benefits from use of the irrigation canals and conveyance facilities for both groundwater recharge and storm water disposal. CID needs to work with the cities to protect, preserve, or improve existing capacities in developing areas.

Land Use and Water Supply Planning

The Board found that there are opportunities for improving interagency coordination during decisions on new development. City general plans and UWMPs do not recognize overdraft or the limitation of the groundwater source, nor do they define how cities will mitigate water supply impacts of new development. Without firm plans for developing and funding water supply projects and ensuring that water supplies are available to meet current and future water demands, CID Cities may have trouble making sufficiency determinations and complying with statutory requirements; land use decisions may be subject to successful legal challenge; and economic development could be affected. CID Cities need to mitigate for the groundwater impacts of new development during the development review process. This can be done through demonstrating that the city is not contributing to overdraft (e.g., requiring the developer or city to procure a new water supply in lieu of using groundwater) or by participating in a groundwater mitigation and banking program.

To help address the issues, CID will continue to act as responsible agency and actively engage in the development review process of CID Cities and Fresno County to ensure impacts to groundwater and CID facilities are mitigated. The CID Board will make findings and adopt policies to be used by staff and the cities such that groundwater impacts are recognized and mitigated during the development review or CEQA review process. Where appropriate, CID will work with the developers or water purveyors to provide groundwater mitigations and banking solutions where cities have not mitigated groundwater impacts of new development; and will continue to work with Fresno County LAFCO to ensure that CID Cities are responsive and that the development review and annexation process are used to effectively mitigate groundwater impacts and impacts to CID facilities.

Groundwater and Related Monitoring

The purpose of monitoring is to provide the data needed to identify problems; define and evaluate alternatives; reduce uncertainty when making important resources decisions; measure and document progress in meeting basin management objectives; and to provide data to demonstrate that the anticipated benefits of proposed projects and programs are being realized. CID has been monitoring groundwater levels since the 1920s and has well-established quality control and assurance procedures, and will continue to maintain and support the current water level monitoring efforts, participating in more regional efforts in the Kings Basin when such a program is developed. The District will use an annual water resources report that describes water resources and groundwater conditions; including groundwater levels hydrographs, groundwater contours, diversions, recharge estimates, and change in storage. This report could also include a summary of hydrologic conditions in the Kings Basin and describes the progress made in implementing management activities and the effects of these activities on meeting basin-wide goals and objectives. When projects are to be built, CID will adopt pre- and post-project monitoring protocols to support project development and to document project benefits.

Recycling

The Upper Kings IRWMP contained an evaluation of recycled water use. The Upper Kings IRWMP found that use of recycled water in lieu of groundwater pumping for non-potable uses, including agriculture, would benefit the Kings Basin by allowing more water to remain in groundwater storage, but that the water budget benefits and yield of recycled or reclaimed water projects only accrue where the sources of wastewater are originally from surface water, and not from pumped groundwater. The Forum also found that wastewater treatment plant upgrades and 'purple' pipe distribution facilities are expensive and not cost effective when compared to currently permitted practices for disposal of wastewater in most areas of the Upper Kings Region and within CID. To achieve that potential, CID and others in the Upper Kings Region would need to make substantial investments in additional treatment and distribution infrastructure. Within CID the Selma-Kingsburg-Fowler (SKF) Regional Sanitation District and the other municipalities treat and dispose of wastewater under permit from the RWQCB. There is currently very little wastewater discharged directly to the Kings River, and therefore, very little wastewater currently is flowing out of the CID area. There is a potential to match treated water quality to appropriate uses (e.g., power generation, urban landscaping) as part of an In-Lieu Recharge Program. The current wastewater disposal practices result in recharge to the groundwater basin consistent with the current standards, permits, and requirements of the RWQCB and actions to upgrade to higher levels of treatment to allow for direct reuse are not currently cost effective. CID will work with cities and the SKF Regional Sanitation District to support the reclamation and reuse of reclaimed wastewater when determined to be cost effective and safe in comparison to other alternative supplies.

Program Description and Plan Implementation

The Groundwater Mitigation and Banking Program (CID Program) is comprised of a preliminary list of proposed projects and management actions. The management actions include the programs, policies, and agreements that are needed to be funded and implemented. CID is working with the community to finalize the projects, programs, policies, and agreements based on the findings and actions related to the overall Groundwater Mitigation Banking Program. CID proposes to develop, own, operate, and maintain the groundwater banking facilities and manage the banked groundwater on behalf of overlying land owners and the participants in the program.

CID projects will meet the overall GWMP and Upper Kings IRWMP Basin Management Objectives (BMO). These BMO quantities are the result of the engineering feasibility studies and preliminary designs; historical operations at the existing 1,300 acres of recharge ponds; and best engineering judgments. Consistent with near-term (1 to 3 years) BMOs, the CID Program is to design and develop up to 10,000 acre-feet per year of recharge project capacity on 100-200 acres with an instantaneous recharge rate between 150-300 cubic feet per second (cfs). This will be accomplished throughout the CID system.

The common Groundwater Mitigation and Banking Program Elements include:

- Land Acquisition, Purchase, Easements
- Surface Water Sources
- Project Sizing and Phasing
- Diversion, Conveyance Facilities, and Wheeling
- Pond Construction and Maintenance
- Extraction of Stored Water
- Environmental Features
- Project Specific Monitoring

The program implementation plan discusses the project sponsors and role, potential participants, and funding along with discussion of how progress will be reported and measured; community affairs and public outreach; integration with land use plans and GWMP; and environmental compliance for the GWMP.

A priority for CID is to develop recharge projects along the C&K Canal, but this does not exclude development of projects on viable recharge sites that may be located throughout CID's jurisdictional area. CID is actively seeking to acquire controlling interest in potential project properties consistent with the intent of the GWMP. CID will also work to further identify canal improvements and pond facilities that would increase operational flexibility and increase recharge system-wide. Improvements to existing ponds, including changes to the maintenance routines, will be investigated to increase recharge, determine if the ponds performance could be improved and how the existing ponds may provide multiple benefits for both groundwater recharge and storm water management.

Surface water for purposes of recharge will come from (1) CID water entitlements; (2) CID diversion of unregulated Pine Flat flood releases; (3) CID diversion of fish flow releases from Pine Flat Reservoir; (4) Central Valley Project (CVP) 215 flood releases; or (5) other Kings River water rights of Kings River Water Association members. Floodwater would be diverted and recharged primarily in wet years

The proposed projects will be developed over the next five to ten years based primarily on the availability of funding, number of sponsors or participants, and a project contribution to meeting measurable basin management objectives. Each of the individual projects will be developed in context of the overall program and will need to go through a specific design, development, and permitting process.

1 Introduction

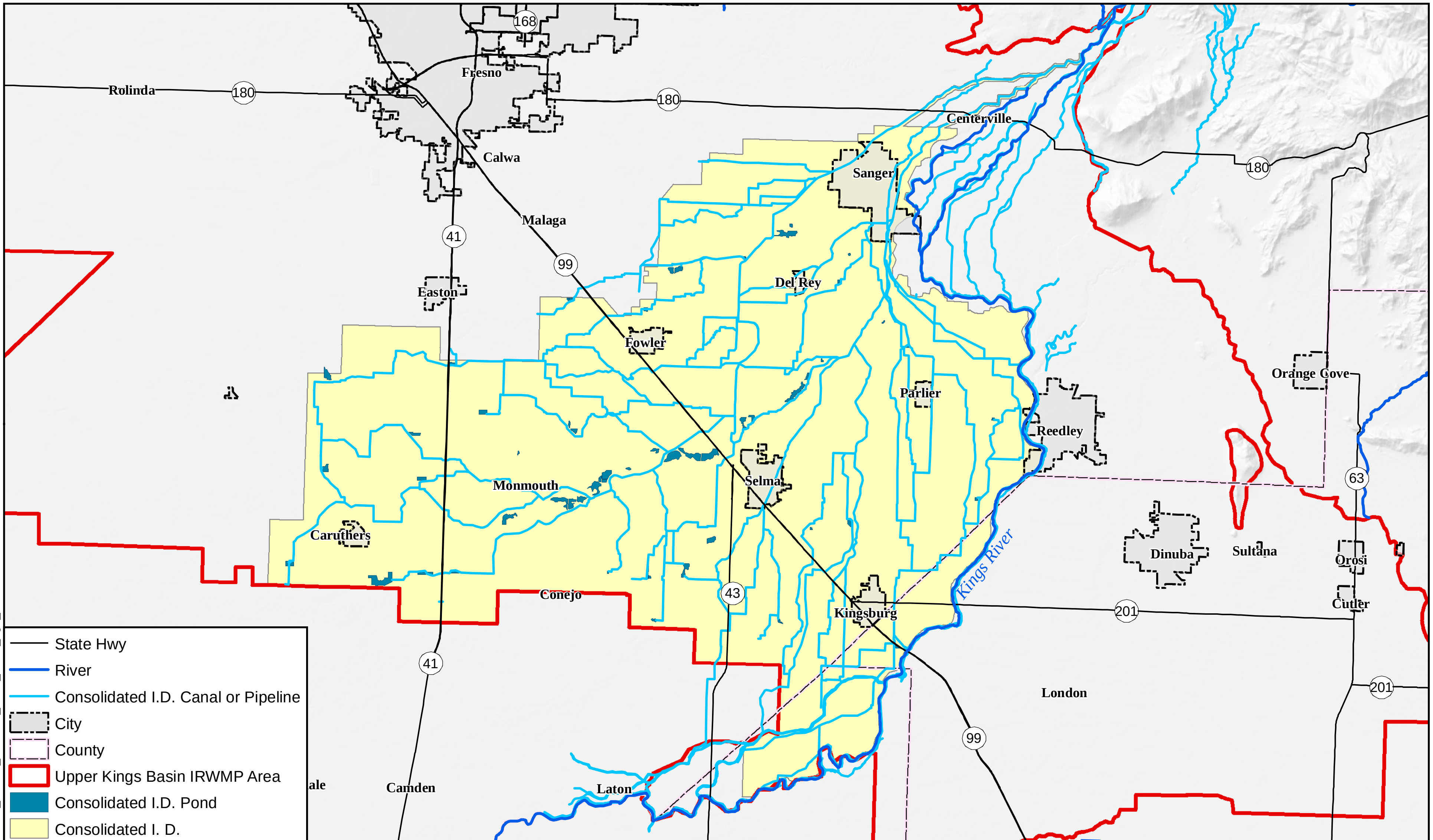
1.1 Introduction and Plan Area

Consolidated Irrigation District (CID) is located in the San Joaquin Valley, on the eastern side of Fresno County, and includes small portions of Tulare and Kings Counties. Figure 1.1 shows the boundaries of CID, CID canals and recharge ponds, and the developed areas. CID overlies the Kings Groundwater Subbasin (Kings Basin), which is part of the larger San Joaquin Groundwater Basin, as defined in the California Department of Water Resources (DWR) Bulletin 118 (DWR, 2003). Figure 1.2 shows the surrounding groundwater basins, institutional and planning boundaries, and the area of the Upper Kings Basin Integrated Regional Water Management Plan (Upper Kings IRWMP; KRCD, 2007).

The purpose of this document is to update the 1995 CID Groundwater Management Plan (GWMP) and define management actions to be implemented by CID to better manage groundwater. These actions are intended to complement the existing efforts of CID which has maintained a longstanding program of groundwater recharge and management. It is also intended that actions defined herein are consistent with policies and programs identified in the Upper Kings IRWMP.

CID was organized on September 8, 1921, in accordance with the California Water Code and has been actively managing local water supplies through conjunctive use since the agency was formed. **Conjunctive use** is the combined management of surface water and groundwater supplies and storage. The District's historic conjunctive use program includes the diversion, in wetter years, of allocated Kings River water and Kings River flood releases into the District's service area for irrigation and groundwater recharge. In drier years, growers irrigate with available surface water supplies supplemented by pumping of recharged groundwater

CID is comprised of 145,000 acres, the majority of which is in agricultural production. Incorporated cities within the boundaries of CID include Fowler, Kingsburg, Parlier, Sanger, and Selma (CID Cities). Other smaller urban enclaves are found in the unincorporated areas and include Caruthers and Del Rey. Total urban water demands are much smaller than the total agricultural water demands, but the growing urbanized areas are reliant exclusively on groundwater. The majority of the water demand within CID is to support the agricultural economy. Crop water requirements are met through irrigation application of both surface and groundwater. Surface water delivered to agriculture reduces the reliance on groundwater.



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N W E S

GEI Consultants

Consolidated Irrigation District
Groundwater Management Plan

CID Boundaries and Facilities

May 2008

Figure 1.1

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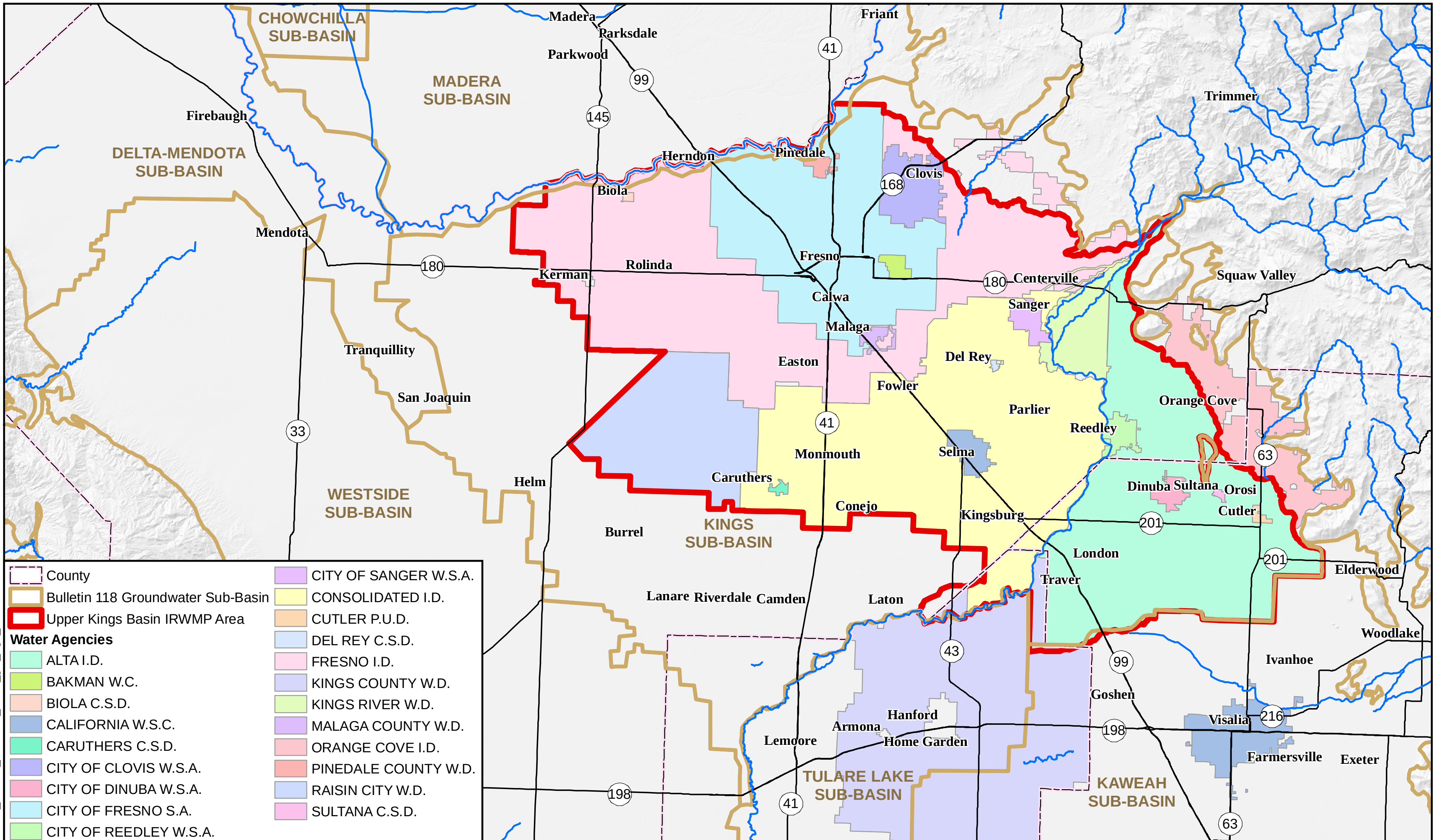

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GEI Consultants

Consolidated Irrigation District
Groundwater Management Plan

Institutional and Planning Boundaries

May 2008

Figure 1.2

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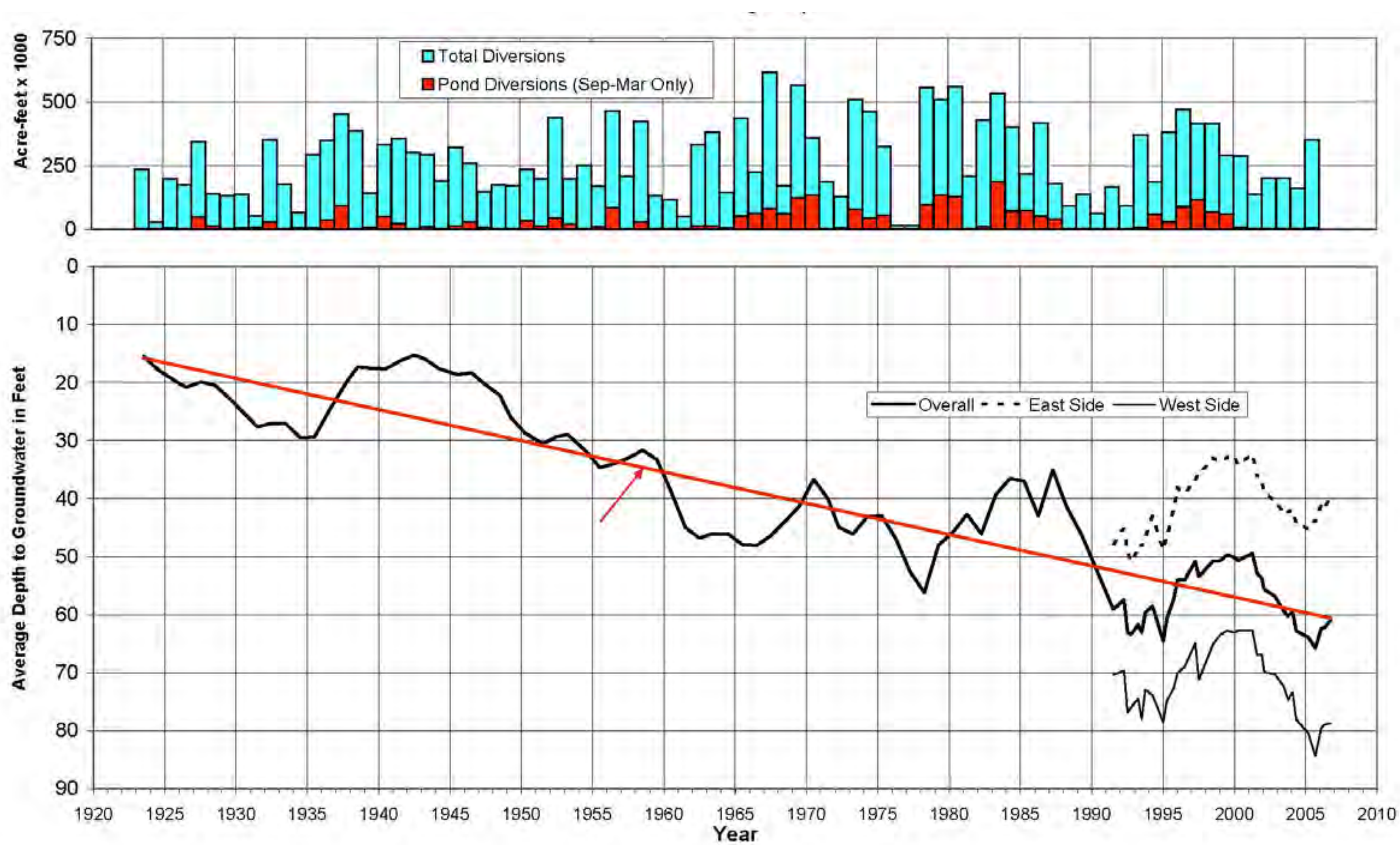
Part of the surface water applied to agricultural, specifically that not consumed by the crops, percolates downward and recharges the groundwater basin. The intentional use of surface water in lieu of groundwater pumping is part of the CID conjunctive use operations.

CID has water rights to the flow of the Kings River and storage rights in Pine Flat Reservoir. Surface water is stored in Pine Flat and diverted by CID from the Kings River for distribution through 350 miles of canals. Water flowing down the canals also recharges the groundwater basin. Part of the diverted surface water is delivered to 1,300 acres of recharge ponds located throughout the District. The average annual surface water supply is approximately 238,000 acre-feet, but can vary from the low of 13,500 acre-feet in 1976, to a high of 616,000 acre-feet in 1967. Average pond recharge is approximately 30,000 acre-feet, ranging from zero in the direst of years, to a maximum of 187,000 acre-feet. While CID is comprised of 145,000 acres, diverted water is used for surface irrigation on approximately 95,000 acres. The remaining areas of CID, including the cities and unincorporated communities, rely exclusively on groundwater. Figure 1.3 shows historic surface water diversions and the averaged decline in the water table underlying the District.

Despite the active management of Kings River water by CID and the other overlying water districts, **groundwater overdraft** is occurring in the Kings Basin on an average annual basis. This means that, while in some years more water is recharged than removed and groundwater levels rise, on average, more groundwater is removed than is recharged. This is evidenced by the long-term decline in groundwater levels depicted in Figure 1.3. Based on measured groundwater level declines since 1923 and geologic properties of the underlying aquifer, CID estimates the annual average overdraft within its boundaries to be approximately 13,500 acre-feet. In addition, and as discussed further in this report, the Kings Basin Integrated Groundwater and Surface Water Model (Kings IGSM) was used to evaluate the regional water budget and to quantify overdraft for the more recent period of 1964 to 2004. Based on the Kings IGSM, the average annual overdraft within CID for the 40 year period was approximately 24,000 acre-feet. The entire Kings River Basin was overdrafted by approximately 160,000 acre-feet per year during the same time period.

Long-term overdraft is not sustainable and has the potential to result in conflicts between competing water users. Other potential effects of overdraft include land subsidence, increased pumping costs, migration of poor quality water, and reduced economic activity in both agricultural and urban sectors, including disadvantaged communities.



GEI Consultants	**Consolidated Irrigation District** **Groundwater Management Plan** Surface Water Diversions vs. Average Depth to Groundwater	**May 2008** **Figure 1.3**

1.2 Authority to Prepare Groundwater Management Plan

CID has the authority to manage the groundwater resources within its service area through California Water Code, Division 6, Part 2.75 (Sections 10750 et seq.). It is the primary agency responsible for this GWMP, and it provides for management of the groundwater basin within its political boundary. CID has prepared this GWMP and has invited the cities of Sanger, Selma, Fowler, Kingsburg, and Parlier; Kings River Conservation District; and other water agencies to participate in its development. This GWMP is consistent with the provisions of California Water Code, Sections 10750 et seq., as amended January 1, 2003.

1.3 Related Groundwater and Water Management Activities

1.3.1 CID 1995 Groundwater Management Plan

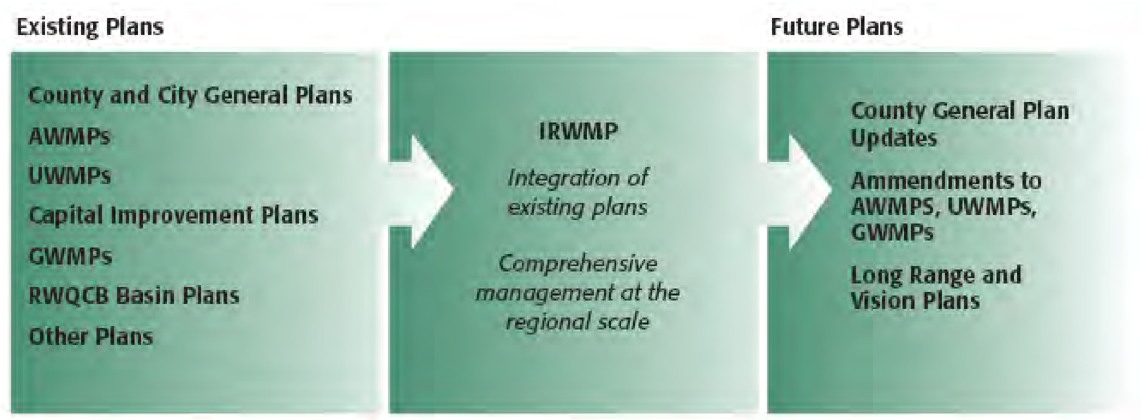
The 1995 Groundwater Management Plan was prepared in accordance with state requirements in place at that time. The 1995 plan documented the groundwater management activities that the District has implemented throughout its existence and provided a framework for expanding groundwater management within CID. The California State Legislature subsequently amended the parts of the California Water Code related to local agency management of groundwater (CWC § 10750 *et seq*.). The new requirements were defined in Senate Bill (SB) 1938.

To help implement recommendations in the 1995 CID GWMP, CID and other local districts initiated a process of regional cooperation in 2001 to address the overdraft problem and develop practical solutions. CID, Kings River Conservation District (KRCD), Alta Irrigation District (AID), and Fresno Irrigation District (FID) formed a Basin Advisory Panel (BAP); sought technical, facilitation, and financial support from the California Department of Water Resources (DWR); and signed a Memorandum of Understanding (MOU) that defined how they would work together to manage existing supplies and develop new supplies for the Upper Kings Region. This water management group was formed pursuant to the IRWMP standards and guidelines (DWR, 2004a).

1.3.2 Upper Kings Basin Integrated Regional Water Management Plan

CID and the BAP made significant progress by working together to define the water resources problems, but realized that the involvement of other stakeholders in the basin would be necessary if regional solutions were to be developed. Recognizing that the Kings Basin is an interconnected hydrologic system; CID, AID, and FID initiated a larger regional planning effort in 2003. As a result of these early efforts, CID and other water districts solicited wider stakeholder participation and the Upper Kings Water Forum (Water Forum) was formed in 2004 to coordinate water resources planning in the Region. The Water Forum has provided a diverse range of perspectives from cities, counties, irrigation districts, environmental interests, and other stakeholders regarding the long-term strategies needed to manage available water supplies.

Figure 1.4 IRWMP and GWMP Linkages



CID has participated in the stakeholder process that was used to develop the IRWMP and will follow a process for update of the GWMP that is consistent with the IRWMP and Water Code requirements defined in §10750. The Upper Kings IRWMP has integrated groundwater management activities within the Upper Kings Basin and is intended to support the independent water districts in updating their GWMPs as needed to be responsive to the unique operational, infrastructure, and institutional environments within their jurisdictional areas. The Upper Kings IRWMP is incorporated by reference into this CID GWMP (Figure 1.4).

One of the primary goals of the Upper Kings IRWMP is to reduce overdraft through conjunctive use and groundwater management using both structural projects (direct/in-lieu recharge) and non-structure management measures (monitoring; integration of land use and water supply plans; adaptive management; etc.).

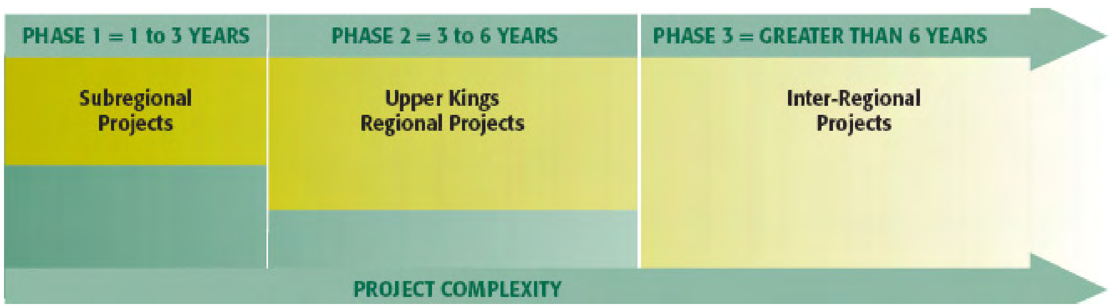
> The Upper Kings IRWMP defined the Regional Conjunctive Use Program (RCUP) to reduce overdraft. CID will implement RCUP concepts through the Groundwater Management Plan.

The Water Forum made a finding that groundwater management is critical to the Upper Kings Region and the success of any conjunctive use program, and recommended that each of the overlying water districts in the Upper Kings Region work with stakeholders in their respective jurisdictions to update and implement their individual groundwater management plans. Within one year of the adoption of the IRWMP, all of the irrigation districts were to be in compliance with the Groundwater Management Plan (SB 1938) requirements.

The Upper Kings IRWMP integrated the existing GWMPs of the irrigation districts; defined a **Regional Conjunctive Use Program (RCUP)**; and provided a basis for the local irrigation districts to cost effectively update their GWMPs as needed to meet the revised SB 1938 requirements.

The RCUP includes multiple projects in the overall program and will be further developed and integrated by CID and the Water Forum in three phases and three geographic project scales. The Upper Kings IRWMP substantively meets many of the SB 1938 requirements, including definition of specific **Basin Management Objectives (BMOs)**. One of the recommendations in the Upper Kings IRWMP was for CID to work with the cities and stakeholders in the CID jurisdiction to update the GWMP plan to be consistent with the SB 1938 requirements and implement the overall upper Kings Basin RCUP at the local level (Figure 1.5).

Figure 1.5 RCUP Phases and Geographic Scales



In recognition of the water management responsibilities and engineering expertise of the irrigation districts, the Water Forum recommended that each district further implement the RCUP at the local level. As part of the GWMP, CID is proposing to develop Phase 1, "near-term" (one to three years) direct recharge projects. This includes 200 to 300 acres of direct recharge facilities to percolate CID water from the Kings River; unregulated Kings River flood flows; and Central Valley Project, Friant Unit 215 flood waters and yield an average of 10,000 to 14,000 acre-feet per year. The purpose of the proposed facilities is to reduce overdraft associated with existing municipal and agricultural uses and provide water to mitigate for the increased groundwater pumping from new urban developments.

In recognition of the powers and authorities of the local cities for managing land use, the Water Forum also recommended that cities and the irrigation districts work together to better integrate land use and water supply plans and the planning process; as well as work to ensure that new development has a secure and reliable water supply.

1.3.3 Other GWMPs in the Kings Basin and Surrounding Areas

Within the Upper Kings Basin, the FID has an SB 1938 compliant groundwater management plan (FID, 2005), and the AID has an older GWMP that needs to be updated. The KRCD has worked with the irrigation districts and overlying landowners in the western part of the

Kings Basin to produce the Lower Kings Basin Groundwater Management Plan (KRCD, 2005). This plan also covered areas to the south of the Kings Groundwater Basin in the Tulare Lake Basin.

1.3.4 Other Historic CID Groundwater Management Activities

In the early 1980's CID and the five cities within the overall boundary of the District executed individual cooperative agreements. Among other things, the agreements allowed cities to construct hydraulic connections between CID's canals and city storm water basins for the purpose of delivering additional recharge water to the city ponds. The cooperative agreements are currently being renegotiated with a greater emphasis on mitigating groundwater impacts caused by urban development.

1.4 GWMP Components

In addition to the Upper Kings IRWMP RCUP components that are integrated into the 2009 CID GWMP, there are three additional components intended to ensure compliance with the water code. These include seven (7) mandatory components from SB 1938, twelve (12) voluntary components of AB 3030 and SB 1938, and seven (7) suggested components identified in DWR Bulletin 118 (DWR, 2003).Table 1-1 lists the required and recommended components and identifies the specific location within this GWMP where the information can be found.

Table 1-1. Guide to How the GWMP Meets State Standards

Description (ALL CH 5 REFERENCES NEED UPDATING)	Chapter, Figures, Section
SB 1938 Mandatory Components	
1. Documentation of public involvement statement	Appendix D
2. Basin Management Objectives (BMOs)	3.2
3. Monitoring and management of groundwater elevations, groundwater quality, inelastic land subsidence, and changes in surface water flows and quality that directly affect groundwater levels or quality or are caused by pumping	5.1, 5.2, 5.6
4. Plan to involve other agencies located in the groundwater basin	1,3.3, 2.1.3, & 6
5. Adoption of monitoring protocols	5.6
6. Map of groundwater basin boundary, as delineated by DWR Bulletin 118, with agency boundaries that are subject to GMP	1.1; Figure 1.2
7. For agencies not overlying groundwater basins, prepare the GMP using appropriate geologic and hydrogeologic principles	1.1, Figure 1.2, 3.3, & 4
AB 3030 and SB 1938 Voluntary Components	
1. Control of saline water intrusion	5.5.1
2. Identify and manage well protection and recharge areas	5.5.2; 5.5.3
3. Regulate the migration of contaminated groundwater	5.5.4
4. Administer well abandonment and destruction program	5.5.5
5. Control and mitigate groundwater overdraft	5.1, 5.2, 7
6. Replenish groundwater	5.1, 5.2, 7
7. Monitor groundwater levels	5.6
8. Develop and operate conjunctive use projects	5.1, 5.2, 7
9. Identify well-construction policies	5.3.6
10. Develop and operate groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects	5.5.7, 5.2.1
11. Develop relationships with state and federal regulatory agencies	5.3.11
12. Review land use plans and coordinate with land use planning agencies to assess activities that create reasonable risk of groundwater contamination	2.1.3, 5.2.2
DWR Bulletin 118 Suggested Components	
1. Manage with guidance of advisory committee	5.4.1, 6
2. Describe area to be managed under GMP	1.1, 4
3. Create links between BMOs and goals and actions of GMP	3
4. Describe GMP monitoring programs	5.6
5. Describe integrated water management planning efforts	1.3.3, 2.1.3, 3.3
6. Report of implementation of GMP	7.3
7. Evaluate GMP periodically	7.3

1.5 Report Content

The following provides a description of each section and appendix included in this GWMP:

- **Section 1 Introduction:** Background information and context for the GWMP.
- **Section 2 Purpose and Need for Groundwater Management Planning:** Provides information regarding the legislative background for groundwater planning.
- **Section 3 Goals and Objectives:** Discusses GWMP goals and general objectives. Specific, measurable Basin Management Objectives (BMOs) have been developed to help quantify and track progress in meeting the goals and more general objectives.
- **Section 4 Water Resources Settings:** Defines the water supply and management problems to be addressed in the GWMP, describes the baseline conditions, and presents the information that was used to establish GWMP goals and objectives. The water budget is presented. It also provides an overview of the engineered, or as-built environment; and the physical setting, including the climate, soils, and geology that present both the planning opportunities and constraints. Current and future land use, water demands, water sources, existing water supply facilities, groundwater conditions, and water quality are presented.
- **Section 5 Alternative Water Management Strategies:** This section describes the water management strategies that were considered, the current activities within CID, constraints to implementation and the actions to be implemented. The action statements are also used to define CID policy with regards to the management actions.
- **Section 6 Stakeholder Involvement:** Provides the framework for public involvement in the preparation and implementation of the GWMP, for involvement and coordination with other water agencies, for developing relationships with state and federal agencies, and for developing a dispute resolution process.
- **Section 7 Program Description and Plan Implementation:** Provides information regarding the plan components and how the plan will be managed and implemented, including the work plans, schedules, and budgets.
- **Section 8 References**

1.6 Technical References and Attachments

There are a number of Technical Attachments incorporated by reference that are contained on the CD enclosed in this document.

- Technical Attachment A, Kings River IGSM Model Development and Calibration Report.
- Technical Attachment B, Memorandum, Floodwater Availability for CID from the Kings River.

- Technical Attachment C, Technical Memorandum, Analysis of Water Supplies in the Kings Basin, Phase 1, Task 4.
- Technical Attachment D, Memorandum, Kings Basin Conjunctive Use Feasibility Analysis.
- Technical Attachment E, Draft Technical Memorandum- Review of City and County General Plans.
- Technical Attachment F, Technical Memorandum, Analysis of Water Demand in the Kings Basin. Phase 1, Task 3.
- Technical Attachment G, Draft Engineer's Report, Urban Impacts Study, Summers Engineering.
- Technical Attachment H, Technical Memorandum, Water Quality Standards, Conditions, and Constraints. WRIME, 2007.
- Technical Attachment I, Memorandum, 2005 Existing Conditions and 2030 Baseline Conditions and Assumptions. WRIME, 2006.

2 Purpose and Need for Groundwater Management Planning

The CID GWMP will help the Board of Directors work with the community to plot a course of action to address overdraft and other related water management issues, and to gain a consensus on project solutions and funding.

Historically, the management of the groundwater resources in the Kings Basin has been limited to independent operations by overlying local water agencies and individual water users. Piecemeal planning constrains the potential for solutions to the area's most pressing issues and increases the potential for competition and conflict over the available water supplies. The CID Board has recognized that CID, acting independently, cannot address overdraft by working alone. Regional, multi-participant efforts are required. The CID Board of Directors also recognizes that continued groundwater overdraft and the urban growth pressure call for improved water resources management in CID and in the overall Kings Basin.

There is both a physical and policy basis for the CID GWMP. The physical basis is associated with the overdraft of the groundwater basin. The policy basis is related to the need for CID and CID cities to: a) qualify for state funding; and b) streamline decision making and comply with updates to the water code and other planning related statutes that require improved coordination between water agencies and land use agencies during the discretionary review of proposed projects. The latter point, streamline decision making and interagency coordination, is necessary when projects will increase water demands or have the potential to impact existing water users, water rights, or water supplies.

2.1 Overdraft

Understanding the available groundwater resources allows for informed decisions regarding resolution of historical problems and for selecting definitive projects to meet future water needs. There is substantial, widely recognized evidence that overdraft of the Kings Basin is occurring. Historical, current, and expected groundwater conditions have been documented in the Upper Kings Basin Integrated Regional Water Management Plan, the Kings Basin IGSM Model Development and Calibration Report (WRIME, 2007), and Technical Memorandum Phase 1, Task 15 Baseline Conditions (WRIME, 2006). These are summarized in Section 4 of this GWMP. The DWR also has declared the Kings Basin to be in a critical state of overdraft (DWR, 2003). There is substantial evidence to document groundwater overdraft.

Historical data (Figure 1.3) and the Kings IGSM document overdraft in the Kings Basin and CID area. The Upper Kings IRWMP documents historical and future water budgets as simulated by the Kings Basin Integrated Groundwater and Surface Water Model (Kings IGSM). The analyses of future build-out conditions indicate that new development will contribute to overdraft and decrease groundwater levels in the area where pumping will increase. CID has also evaluated the nexus between new development and impacts to groundwater, and has concluded that increased groundwater pumping to meet the water demands of new development will contribute to overdraft and should be mitigated (Summers, 2007).

Other negative consequences of overdraft include the potential for land subsidence that could result in structural damage to existing infrastructure and permanent loss of groundwater storage space. Overdraft can change the rate and direction of groundwater flow, result in migration of poor quality water into the area, or an increased loss of stream flow and related negative effects. Overdraft may create conflicts between overlying land owners; between different types of water users; or between existing and new users that are all reliant on the common groundwater supplies.

The worst case scenario is that the overdraft would spawn conflicts that result in litigation over the rights and entitlements to groundwater. Adjudication by the courts represents a loss of local control. Adjudication can be initiated by an individual land owner or by the State Water Resources Control Board if there is a direct impairment to water quality as a result of the overdraft. Adjudication in other basins in the State demonstrates that such a process involves high costs for attorneys, engineers, and experts; and may take many years and millions of dollars to resolve. Ultimately the court ordains a "physical solution" in a stipulated judgment that may include cut-backs on existing users, limitations on new uses of water, defined capital projects, appointment of a water master, mandatory funding guidelines, and a timeline for compliance with mandated requirements. During the proceedings, the uncertainty can stifle economic development and affect the local economy.

A locally-driven planning process that includes key stakeholders in the basin and is based on communication, cooperation, and collaboration is preferred. Such a process is designed to develop the same type of physical solutions and can significantly reduce or eliminate overdraft without litigation.

2.2 Legislative Requirements for GWMPs and IRWMP

Groundwater management is planned and coordinated locally to ensure a sustainable groundwater basin to meet future water supply needs. At present, the State seeks to preserve local control of groundwater by encouraging local entities to adopt GWMPs and by providing funding for studies and project construction. With the passage of AB 3030 in

1992, local water agencies were provided a systematic way of formulating GWMPs (California Water Code, Sections 10750 et seq.). AB 3030 also encouraged coordination between local entities through joint power authorities or MOUs.

The California Water Code was amended in 2002 with the passage of The Groundwater Management and Planning Act of 2002 (SB 1938). The act amends existing law related to groundwater management by local agencies. The law requires any public agency seeking State funds administered through DWR for the construction of groundwater projects or groundwater quality projects to prepare and implement a GWMP with certain specified components. New requirements include establishing BMOs, preparing a plan to involve other local agencies in a cooperative planning effort, and adopting monitoring protocols that promote efficient and effective groundwater management. Local entities seeking bond funds under Propositions 50 and 84 need to have adopted IRWMP and GWMPs if they are to qualify for funding under part of the proposed statutes. The legislative intent is clear, and it is anticipated that future bonds that may provide funding for groundwater management projects will include similar requirements.

2.3 Requirements for Integrating Land Use and Water Supply Planning

In the past, many project and policy decisions surrounding land use and water supplies were made independently. Court precedents and legislative decisions have changed the procedural and informational requirements for land use and water agencies. As part of the GWMP development, a briefing was prepared that discussed changes to the Water and Government Codes and the policy “drivers” that influence the GWMP development and implementation. Appendix A presents this briefing.

Changes to the Government Code and the Water Code created procedural requirements for local governments and water agencies to consult when determining whether there will be enough water to supply a proposed development project. The changes also increased the requirements related to the information that must be produced and used when making findings and discretionary project decisions. Government land use agencies must now use more highly detailed and complete evidence to make critical land and water resources decisions.

The key policy and statutory requirements are briefly discussed below and are related to:

- General Plans
- Urban Water Management Planning Act and Senate Bills 610 and 221
- Crotese-Hertzberg-Knox Local Government Reorganization Act
- California Environmental Quality Act

2.3.1 General Plans

The city and county general plans were reviewed as part of the Upper Kings IRWMP (WRIME, February 2007). Under California law, the management of land use is the responsibility of local government. City and county general plans and the associated goals, policies, objectives, and programs define land use planning requirements for each jurisdiction. By law, general plans guide land use decisions at the city and county level, and by their very nature, are comprehensive and integrated across the full spectrum of land, water, and natural resources management elements. The breadth of the general plans may result in less detailed or comprehensive review of regional water issues. The city and county general plans, and the land use planning process, provide local government with an opportunity to integrate land use and water supply decisions and meet the goals of the cities and counties.

In general, it was found that the county general plans, being regional in nature, acknowledged overdraft and other water supply problems and proposed goals, policies, and objectives to address the issues. The CID area is contiguous with the unincorporated Fresno County. The CID GWMP seeks to be consistent with the Fresno County General Plan. Specifically, the GWMP will be consistent with, and help realize, the following Fresno County General Plan policies:

- Policy PF-A: Ensure the timely development of public facilities and to maintain an adequate level of service to meet the needs of existing and future development.
- Policy PF-C: Ensure the availability of an adequate water supply for domestic and agricultural consumption.
- Policy PF-C.1: Engage in and support efforts of others to retain existing water supplies.
- Policy PF-C.2: Support the efforts of others to import flood, surplus, and other available waters.
- Policy PF-C.3: Reduce the demand on county's groundwater resources and encourage the use of surface water.
- Policy PF-C.4: Support the efforts to expand groundwater and/or surface water storage.
- Policy PF-C.6: Support water banking.

When CID cities annex lands, they detach from CID. The City General Plans apply to these annexed lands. The CID Cities' general plans identify groundwater as the sole source of supply. CID does not purvey surface water to any of the cities. In general, CID Cities' general plans do not recognize groundwater overdraft in the Kings Basin, and therefore do not contain goals, policies, objectives or programs that address the regional water supply issues. Since CID Cities' general plans do not recognize the limitation of the groundwater supply source, they do not define how cities will mitigate groundwater supply impacts of new development or document how the cities will provide a sustainable, reliable water supply. The State of California General Plan Guidelines, updated by the Office of Planning and Research (OPR) 2003, recommends that local governments consider preparing an optional Water Element in their general plans. The OPR Guidelines seek to be consistent with other State requirements intended to improve the coordination between water supply and land use planning processes at the local level. The CID GWMP provides information that could help CID Cities when they update their general plans and or Urban Water Management Plan (UWMPs) prepared pursuant to State law.

The CID GWMP will provide a mechanism for CID Cities to define projects to mitigate groundwater impacts of future development; and document a long-term, sustainable water supply for proposed projects and current municipal users. If CID Cities choose to participate and fund CID GWMP projects, these supplies could be factored into the cities' updated general plan and UWMP, and this could support CID Cities in making the necessary findings when adopting annexations to the city or approving new development consistent with the requirements of California Environmental Quality Act (CEQA) and the California Water Code.

2.3.2 Urban Water Management Planning Act and Senate Bills 610 and 221

Senate Bills (SB) 610 and 221 significantly elevated the planning function of UWMPs by creating water supply assessments and verification requirements. SB 610 and SB 221 amended state law, effective January 1, 2002, to improve the link between information on water supply availability and certain land use decisions made by cities and counties. SB 610 and SB 221 are companion measures which seek to promote more collaborative planning between local water suppliers and cities and counties. The State statutes dictate information requirements and procedural requirements for land use and water supply agencies to follow when making discretionary decisions and approving projects. They also increase the burden of proof for documenting findings related to water supplies. In general, CID Cities' UWMP does not recognize or address overdraft or document solutions for increasing the water supply reliability from groundwater sources.

The changes in the Water Code also require verification of sufficient water supplies as a condition of approval for development; compel urban water suppliers to provide more information on reliability; and require average and drought year conditions be addressed. Additional requirements to address groundwater sources were added. A supplier relying on groundwater to meet its customers' demands must provide detailed information regarding the limitations of that source, and to the extent available, the historical uses of the basin.

2.3.3 Cortese-Hertzberg-Knox Local Government Reorganization Act

Local Agency Formation Commissions (LAFCOs) are tasked with ensuring water supplies are available at the time when city or special district boundaries are to be amended. The Cortese-Hetzberg-Knox (CHK) Act passed in 2000 amended the Government Code. Proposals for reorganization are subject to the CHK and to review by the LAFCO, and LAFCOs are required by State law to review and make a determination of approval or denial of all annexations or other changes of organization to cities and special districts. LAFCOs serve as the legislature's watchdog, operating at the intersection of land use, services (including water), finance, and governance. Important changes and added responsibility include requirements to determine that there are timely and available water supplies; prepare comprehensive water services reviews; and assess firm yield water supply availability, reliability, and quality for annexations and extension of services. The legislature also tasked LAFCOs with considering water and wastewater management regionally, including evaluating the ability of public facilities to meet current and future service needs, or to extend services outside of existing boundaries.

The CHK defines the factors to be considered in the review of a proposal. This includes whether the city annexing land is able to provide the services needed, including the sufficiency of revenues for those services following the proposed boundary change, and the timely availability of water supplies adequate for projected needs. As such, CID Cities need to not only evaluate the water supplies available, but the source of supply to a project and how such new supplies will be financed. This is challenging given the overdraft in the Kings Basin.

The CHK further clarifies the legislative intent for ensuring that there be close coordination and consultation between water supply agencies and land use approval agencies to ensure that proper water supply planning occurs. The intent is to address projects that will result in increased demands on water supplies through a standardized process for determining the adequacy of existing and planned future water supplies to meet existing and planned future demands on these water supplies.

2.3.4 California Environmental Quality Act

As part of their CEQA reviews, CID Cities need to identify impacts and mitigate for the groundwater impacts of new development during the development review process. Without firm plans for developing and funding water supply projects and ensuring that water supplies are available to meet current and future water demands, CID Cities could have trouble making sufficiency determinations; complying with CEQA statutory requirements; and making findings related to mitigation of impacts to groundwater. As a result, land use decisions could be subject to successful legal challenge. Mitigating groundwater impacts could be done through demonstrating that the city is not contributing to overdraft (e.g., requiring the developer to procure a new water supply in lieu of using groundwater), or through some other appropriate project or agreements to mitigate for the increased groundwater consumption.

3 Goals, Objectives, and Intended Use of GWMP

This chapter defines the goals for the GWMP. Once the broad goals and general objectives were established, quantitative Basin Management Objectives (BMOs) were developed to help measure progress. The goals and objectives were used by the Board of Directors to define and prioritize GWMP actions, plans, and strategies to be implemented.

3.1 Goals and Objectives

The following goals and objectives for the CID GWMP were established by the CID Board and are consistent with the Upper Kings IRWMP:

- Halt and ultimately reverse overdraft and provide for sustainable management of surface water and groundwater.
- Increase the water supply reliability, enhance operational flexibility, and reduce system constraints.
- Improve and protect water quality.

The Upper Kings IRWMP included two goals supported by CID for the regional effort that are not as relevant to the GWMP. This includes the Upper Kings IRWMP goals to: (1) provide additional flood protection; and (2) protect and enhance aquatic ecosystems and wildlife habitat. Nothing in this GWMP would preclude or reduce the ability to meet the Upper Kings IRWMP goals and, where applicable, CID will seek to use the GWMP to meet the IRWMP goals. For example, GWMP projects will avoid impacts to ecosystem and wildlife habitat and will seek to improve ecosystem and wildlife habitat where possible. Further, the GWMP will seek to include opportunities to integrate flood retention and detention into recharge pond designs where possible and cost effective, and where such actions would be financially supported by other participants.

To be compatible with the Upper Kings IRWMP, the CID GWMP is also compatible with the following general objectives from the Upper Kings IRWMP:

- Define local and regional opportunities for groundwater recharge, water reuse/reclamation, and drinking water treatment.
- Develop large-scale regional conjunctive use projects and artificial recharge facilities to:
  - Enhance operational flexibility of existing water facilities, consistent with existing agreements, entitlements, and water rights.

- Improve the ability to store available sources of surface water in the groundwater basin.
  - Capture storm water and floodwater currently lost in the region.
  - Develop multipurpose groundwater recharge facilities that provide flood control, recreation, and ecosystem benefits.
  - Integrate the fishery management plan.

- Negotiate and develop institutional arrangements and cost sharing for water banking, water exchange, water reclamation, and water treatment.

Additional GWMP general objectives adopted by CID are to:

- Support cities in streamlining project reviews.
- Provide a GWMP that will serve as a regional water supply assessment for purposes of evaluating proposed development.
- Through funding, adoption, and participation in the GWMP; provide CID Cities with a mechanism to verify a water supply for proposed projects and for mitigating groundwater supply impacts.
- Develop a standard practice by which CID can develop financing for land and water purchase; evaluate land for its recharge potential; and obtain environmental clearances to acquire property and water for purposes of recharge and overdraft reduction.
- Develop the necessary environmental documentation that would support the recharge programs.

3.2 Basin Management Objectives

The State advocates the concept of local BMOs that are quantitative and measurable so that progress toward achieving the objective can be tracked and monitored. The BMO concept was also developed to meet the groundwater management needs within a basin that has different groundwater users and/or overlapping jurisdictional agencies. The BMOs for CID are specific to the management and groundwater conditions found within the District. The BMOs provide the mechanism for measurement and evaluation of project performance.[1] In the future, the BMOs may be used by CID to initiate subsequent management actions or to respond to changing circumstances and new information. The BMOs are intended to:

[1] Upper Kings IRWMP Section 9.4.1 Regional Conjunctive Use Program Basin Management Objectives and Performance Measures.

- Provide a framework for assessment and evaluation of project performance.
- Determine whether the anticipated benefits of the GWMP are being achieved.
- Identify measures that can be used to monitor progress toward achieving goals.
- Provide metrics the can be used to pursue grant funding opportunities.
- Support planning of future projects.
- Maximize the return on public investments.

The BMOs for CID are specific to the management and groundwater conditions found within the District. These BMOs are listed and quantified in Table 3-1.

Table 3-1. Groundwater Management BMO

BMO Component	IRWMP/GWMP BMO
Reduce Overdraft	Immediate/Near-Term (within next 5 years) = 10,000 acre-feet per year Mid-Term (5 to 20 years) = 20,000 acre-feet per year Long-Term (20 to 40 years) = 50,000 acre-feet per year
Increase Total Recharge Pond Area in CID	Immediate/Near-Term = 100-200 acres Mid-Term = 200-400 acres Long-Term = 1,200 acres
Increase Instantaneous Recharge Capacity of CID System	Immediate/Near-Term = 150-300 cfs Mid-Term = 400 cfs Long-Term = Greater than 500 cfs

The quantities included in Table 3-1 are the results of engineering feasibility studies and preliminary designs;[2] historical operations of CID's existing 1,300 acres of recharge ponds; and base engineering judgments.

3.3 Potential Uses of the GWMP

Opportunities exist for CID and the land use agencies to integrate General Plan, UWMPs, and GWMP requirements to streamline the decision process; avoid conflicts; meet current and future demands; and sustain the local economy. CID is the regional water agency with appropriate powers and authorities to develop the GWMP for the region. CID intends to use the GWMP to define projects that ensure a reliable water supply is available.

[2] Technical Memorandum on Floodwater Availability for the CID from the Kings River (WRIME, 2007); Analysis of Water Supplies in the Kings Basin, Technical Memorandum, Phase 1, Task 4 (WRIME, 2006); Kings Basin Conjunctive Use Feasibility Analysis (WRIME, 2006)

The potential uses of the GWMP are as follows:

- Streamline development review process for CID Cities, water suppliers, and CID.
- Document regional water demand and supply sources to a level of detail such that the GWMP would serve as a regional water supply assessment for CID Cities when considering new development.
- Define projects (physical solutions) to reduce overdraft and provide mitigations for groundwater impacts related to new municipal, industrial or commercial development which increase groundwater demands.
- Provide the mechanism for CID Cities to verify water supply availability and adopt legally defensible findings of sufficiency.

4 Water Resource Settings

This section summarizes the water resources conditions present in the GWMP area. It describes the historical and baseline conditions of the water resources in CID and contains an overview of the physical setting, including the climate, soils, and geology and describes the major planning considerations related to those issues. This includes a discussion of the current and future land use and associated water demands, water supplies and sources, existing water supply facilities, groundwater levels, and water quality conditions.

4.1 Physical Setting

4.1.1 CID Geography and Water Use

CID is comprised of 145,000 acres, the majority of which is in agricultural production. Incorporated cities within the boundaries of CID include Fowler, Kingsburg, Parlier, Sanger, and Selma (CID Cities). Other smaller urban enclaves are found in the unincorporated areas and include Caruthers and Del Rey. Total urban demands are much smaller than the total agricultural demands, but the growing urbanized areas are reliant exclusively on groundwater. The majority of the water demand is to support the agricultural economy. Crop water requirements are met through irrigation application of both surface and groundwater. Surface water delivered to agriculture reduces the reliance on groundwater. Part of the surface water applied to agriculture, that water which is not consumed by the crops, percolates downward and recharges the groundwater basin. The intentional use of surface water in lieu of groundwater pumping is part of CID's conjunctive use operations.

CID has water rights to the flow of the Kings River and storage rights in Pine Flat Reservoir. Surface water is stored in Pine Flat and diverted from the Kings River for distribution through CID's canals. Water flowing down the canals also recharges the groundwater basin. The diverted water is used for surface irrigation on approximately 95,000 acres. Surface water irrigation must be supplemented with groundwater to meet the annual water demands of the crops. The remaining agricultural areas of CID rely exclusively on groundwater. Part of the diverted surface water is also delivered to recharge ponds located throughout the District. The average annual surface water supply is approximately 238,000 acre-feet, but can vary from the low of 13,500 acre-feet in 1976, to a high of 616,000 acre-feet in 1967. Average pond recharge is approximately 30,000 acre-feet, ranging from zero in the dry years, to a maximum of 187,000 acre-feet.

4.1.2 CID Facilities and Operations

Surface water deliveries are made through 350 miles of open channels that include constructed ditches and canals and channelized drains and sloughs. There are numerous lateral pipelines and piped portions of the main channels. The headwork of the water system is a diversion structure on the Kings River. Two main channels, the Fowler Switch and Centerville and Kingsburg Canals, branch out near this location and serve the majority of lateral channels and pipelines that fan out across CID. An additional main channel, the Lone Tree Canal, diverts water from Fresno Irrigation District. A portion of the water delivered through the Lone Tree system is categorized as "Church" water and carries a higher water reliability.

The District provides two types of water service to its members. The first service is surface water deliveries that are made through the CID water delivery system. The annual duration of water supply varies on the storage conditions in Pine Flat Reservoir and on runoff in the Kings River. Typically, surface water supplies are made available in April and end in August. During drier hydrologic conditions, the surface water supplies are provided over a shorter period of time.

The other service provided by CID is groundwater recharge. The recharge is provided through two methods: direct recharge and in-lieu recharge. The direct recharge occurs through seepage from the earthen channels when they are used for water delivery and in dedicated recharge basins. The types of soils throughout much of the District allow for relatively rapid infiltration and recharge to the groundwater surface. The dedicated recharge system includes over 50 dedicated recharge basins with a surface area of approximately 1,300 acres.

In-lieu recharge in CID occurs when growers use surface water instead of groundwater. By foregoing pumping, groundwater can remain in storage or it can be used by other growers that do not have access to surface water or by municipalities that cannot use untreated surface water.

CID maintains a system of approximately 80 groundwater monitoring wells located on a two mile square grid pattern throughout the District. The water levels in these wells have been measured and recorded by District staff since the inception of the District. Typically all wells were read on a monthly basis up until 2001. Since then readings have been taken no less than two times per year. As groundwater levels have fallen or surface conditions have changed, CID has repaired or replaced the monitoring wells to maintain the monitoring program. From the mid-1990s until 2003, CID replaced nearly half of its monitoring wells. New wells were constructed with 4-inch or 6-inch diameter perforated casings and guard posts and lockable caps at the surface. The well replacement program was funded with a combination of District reserves and an AB303 State Grant. These efforts are an indication of CID's on-going commitment to groundwater management.

4.1.3 Surface Water Supply and Diversions

Figure 4.1 shows the surface water supply for CID. On average, CID received approximately 238,000 acre-feet per year (from 1964-2004). The surface water supply is based on pre-1914 and senior appropriative rights to the Kings River.

4.1.4 Groundwater Use

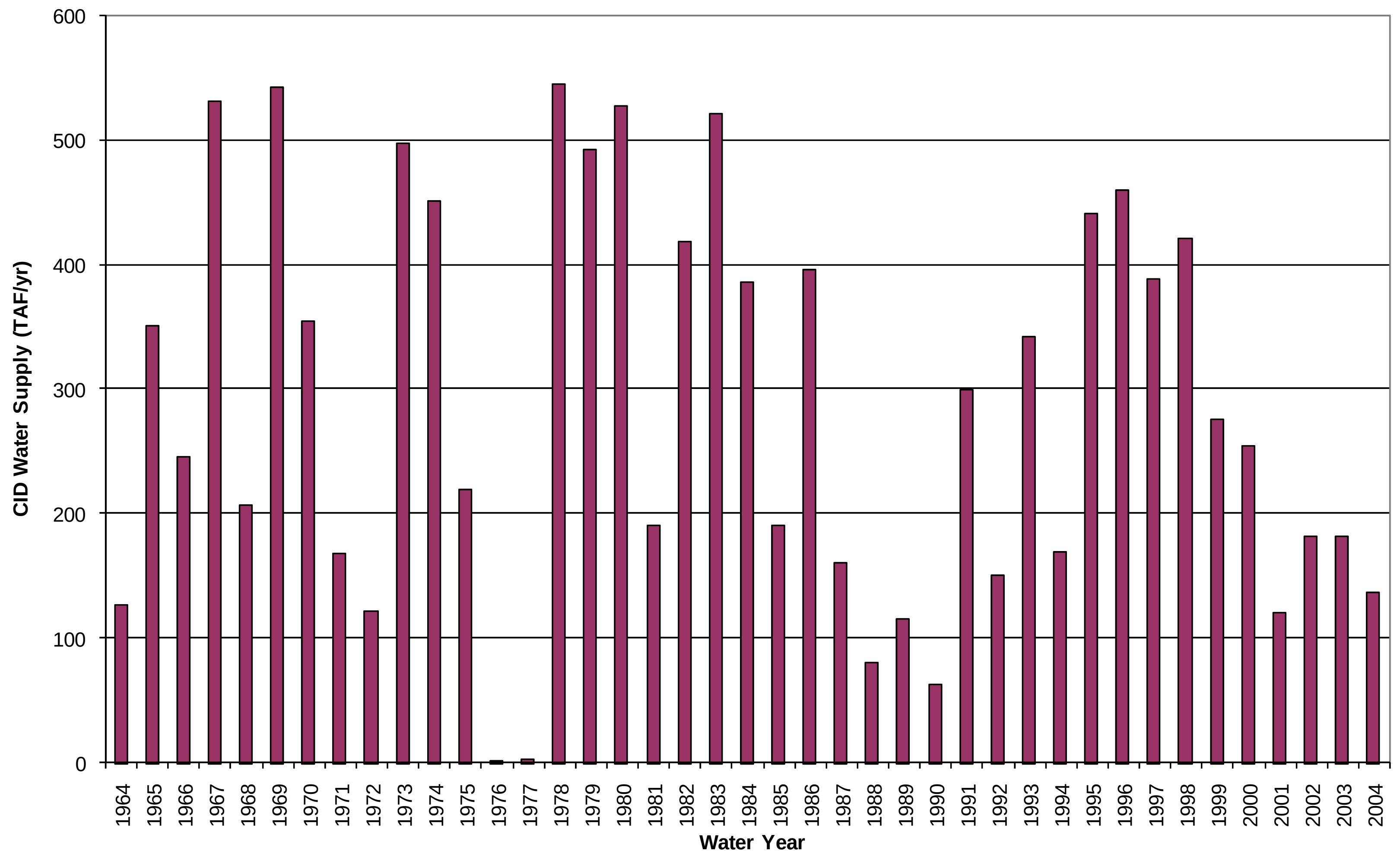
Groundwater pumping occurs throughout CID, with concentration occurring in and around the Cities of Sanger, Fowler, Selma, Kingsburg, Sanger, and Parlier and in agricultural areas that do not have access to surface water supplies. Agricultural areas with access to surface water pump groundwater to supplement surface water supplies.

4.1.5 Groundwater Basin

Consolidated Irrigation District lies within the Kings River Subbasin (DWR, Bulletin 118 basin number 5-22.08) in the San Joaquin Valley Hydrologic Region. The area of the subbasin is approximately 1,500 square miles. As shown in Figure 4.2, the subbasin is bounded on the north by the San Joaquin River, on the east by the Sierra Nevada foothills, on the west by the Westside and Delta-Mendota Subbasins, and on the South by the Kings River and Kaweah Subbasin.

4.1.6 Basin Topography

The Kings River Basin watershed drains 1,850 square miles of the Sierra Nevada and releases onto alluvial fans and plains of the Tulare Lake basin south of Fresno as shown in Figure 4.2. The water in the basin comes primarily from precipitation and snowmelt from the Sierras. The Kings River is within the Tulare Lake basin. (DWR, Bulletin 160-98) The upper portion of the fan near the foothills is highly dissected by the Kings River and tributaries, and the fan surface does not get inundated regularly by flood waters. (Page and LeBlanc, 1969) The lower reaches contain flood plain deposits of fine-grained materials as well as a series of sand dunes that vary in height from 5 to 20 feet. (Page and LeBlanc, 1969) The watershed ranges in elevation from 500 to 14,000 feet above mean sea level (msl) above the foothills and 150 to 500 feet msl below the foothills.



GEI Consultants

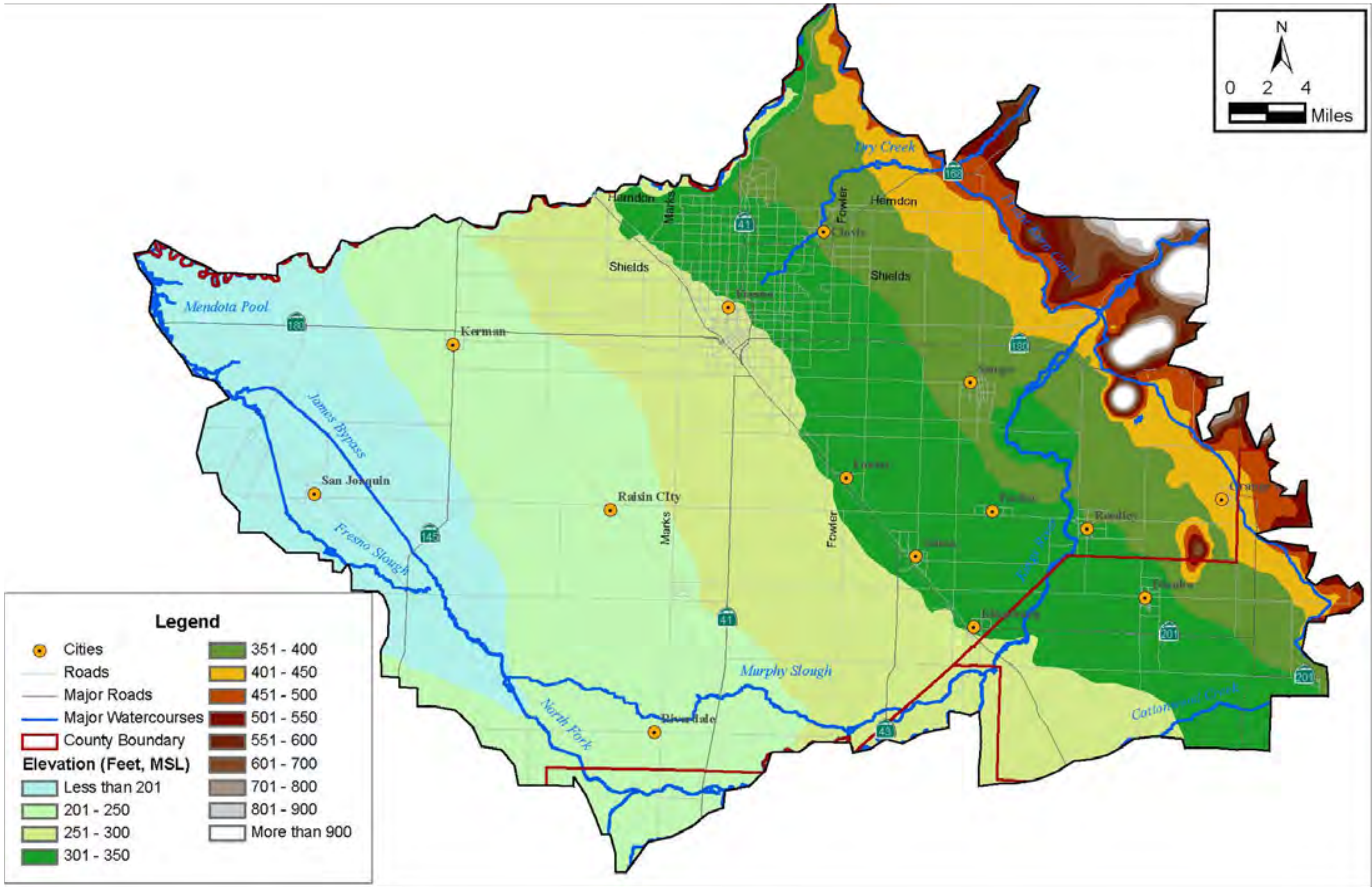
Consolidated Irrigation District
Groundwater Management Plan

CID Annual Water Supply

Source: Kings Basin Integrated Groundwater and Surface Model Development and Collaboration. Analysis of Water Supplies in Kings Basin, Phase 1, Task 4.

May 2008

Figure 4.1



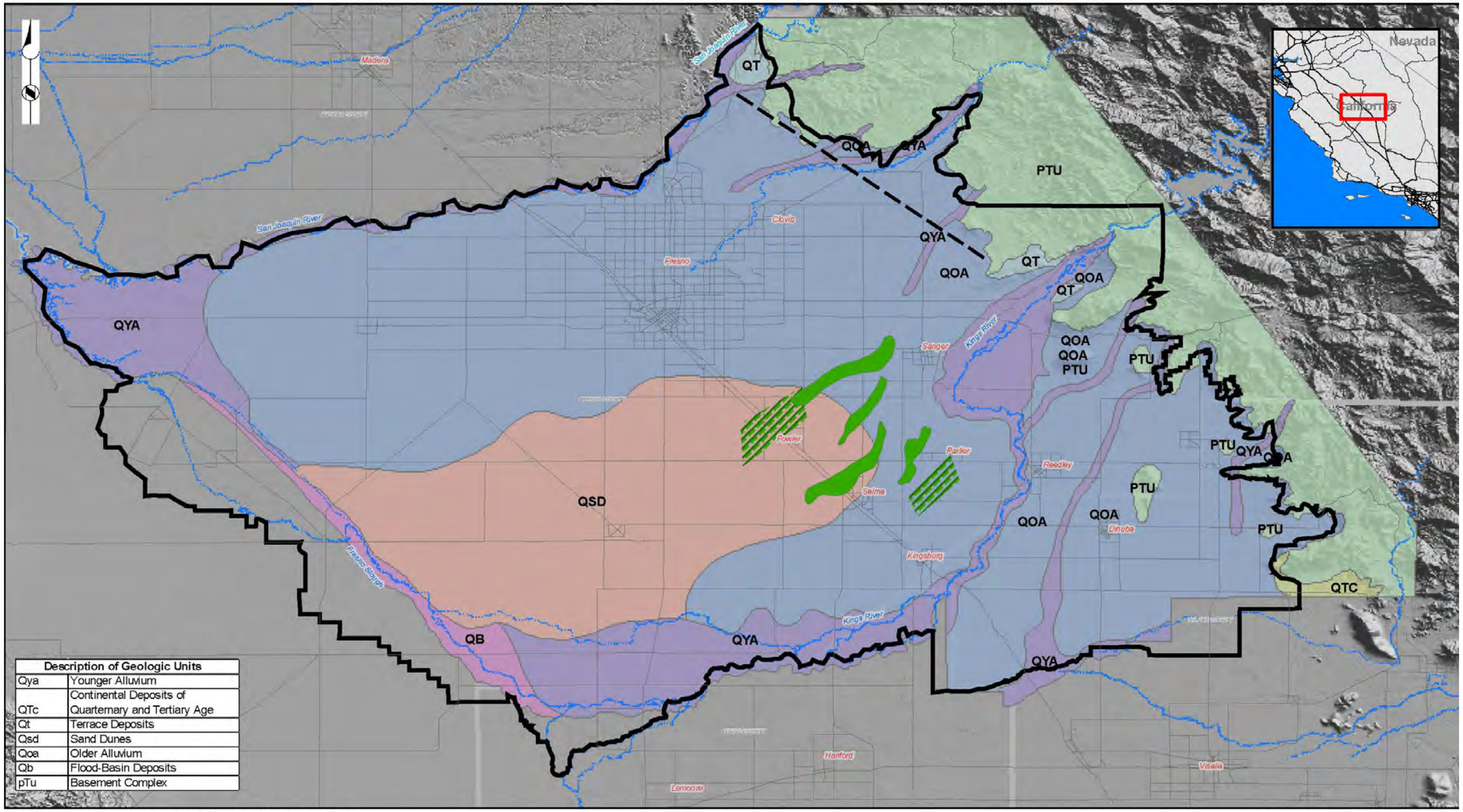
GEI Consultants	**Consolidated Irrigation District** **Groundwater Management Plan** Ground Surface Elevation Source: **Kings IGSM Model Development and Calibration Report, 2007**	**May 2008** **Figure 4.2**

4.1.7 Geology

CID is in a structural trough between the Sierra Nevada Batholith to the east and the folded and faulted coast range to the west. The valley is about 55 miles wide near the Kings River and consists primarily of Tertiary to Quaternary unconsolidated continental and alluvial deposits that are underlain by a basement complex of pre-tertiary metamorphic and igneous rocks associated with the Sierra Nevada. The alluvial fan deposited by the Kings River originates at the northeast corner of the Kings Groundwater Subbasin and radiates throughout the district. The alluvium consists of arkosic gravel, sands, silts, and clays with coarser sediments concentrated near the apex of the fan and near stream channels, and finer sediments at the lower elevations and on flood plains adjacent to river channels.

Geologic structures are mostly limited to the basement complex that has been faulted and jointed, and although the rock material is virtually impermeable, the joints provide small yields of groundwater. The complex is tilted to the southwest with the fault block of the Sierra Nevada. There is some minor folding and faulting within the sediments that overlie the basement, but these structures do not substantially affect the occurrence and movement of groundwater. (Page and LeBlanc, 1969) The structures that do affect groundwater flow within the alluvium are the shelf of the basement complex at the foothills and the gentle southwestward tilt of the sediments along the backslope of the Sierras (Page and LeBlanc, 1969).

The unconsolidated deposits are divided into older deposits of Tertiary and Quaternary age and younger deposits of quaternary age as shown on Figure 4.3. The Tertiary and Quaternary deposits are only present in the extreme southeastern part of the area, and are not significant to groundwater supply. The Quaternary deposits are divided into four units based on age and depositional environment. These units are Older Alluvium, Lacustrine and Marsh Deposits, Younger Alluvium, and Flood Basin Deposits. Figures 4.4 and 4.5 are conceptual cross-sections of the area. Figure 4.6 shows that confining layers associated with the Lacustrine and Marsh Deposits are only present west of CID. The alluvial deposits do not have laterally extensive confining layers that inhibit groundwater flow. The sand dunes do not inhibit groundwater flow and recharge potential. (Brown and Caldwell; WRIME, 2006)



SOURCE: GEOLOGIC MAP OF THE FRESNO AREA, SAN JOAQUIN VALLEY, CALIFORNIA; US GEOLOGICAL SURVEY, 1969 PAGE AND LABLANC (1969)

0 1.5 3 6 Mi

GEI Consultants

EXPLANATION

- Incised Valley Fill (Weissman et al, 2002a)
- Incised Valley Fill (Cehrs et al, 1980)
- Inferred Fault
- Model Boundary

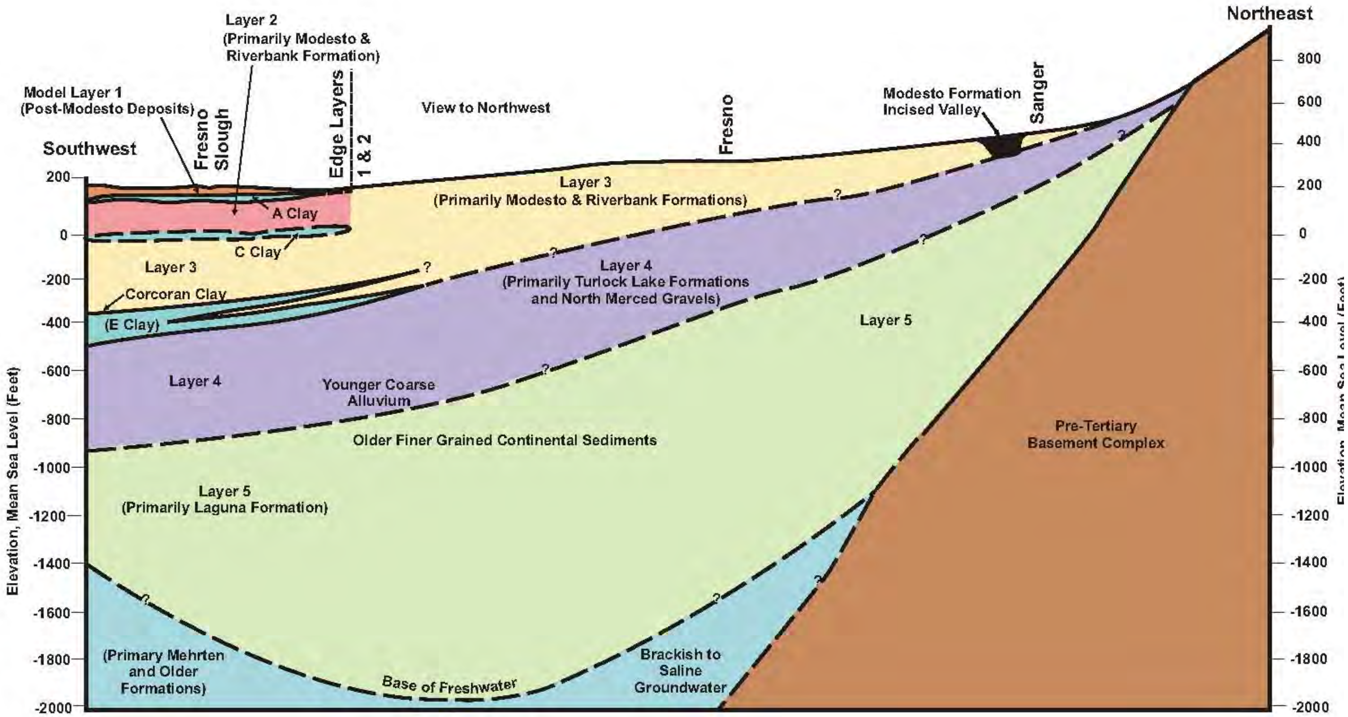
Source: Kings Basin Hydrogeology TM, 2006

Consolidated Irrigation District
Groundwater Management Plan

Kings Basin Geology

May 2008

Figure 4.3



Primary Sources

Croft, 1969
Muir, 1977
Lettis, 1982
Page and LeBlanc, 1969
Cehrs, et. al. 1980
Wiseman, et. al; 2002b

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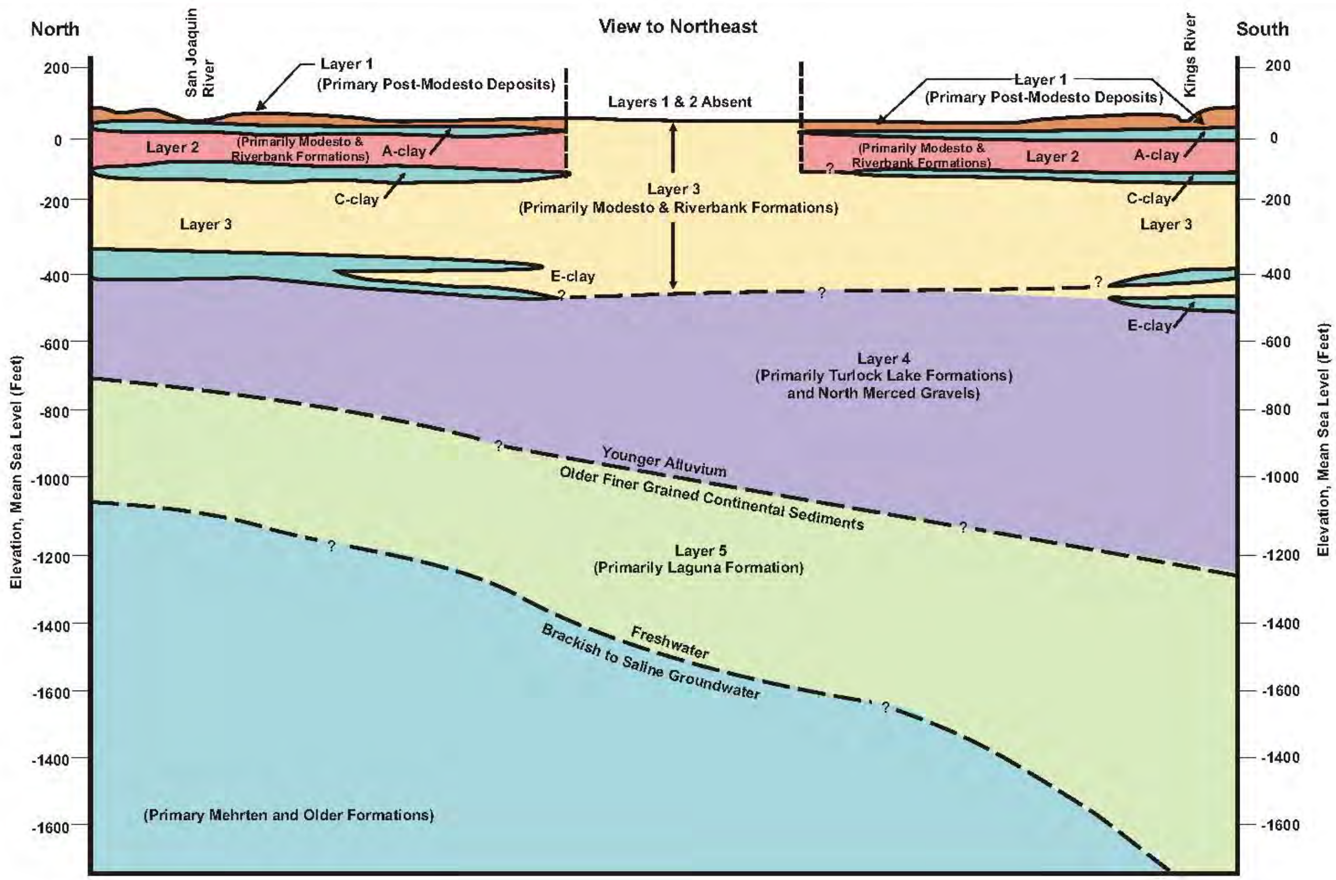
Consolidated Irrigation District
Groundwater Management Plan

Southwest – Northwest
Conceptual Hydrogeologic Cross Section

Source: Kings Basin Hydrogeology TM, 2006

May 2008

Figure 4.4

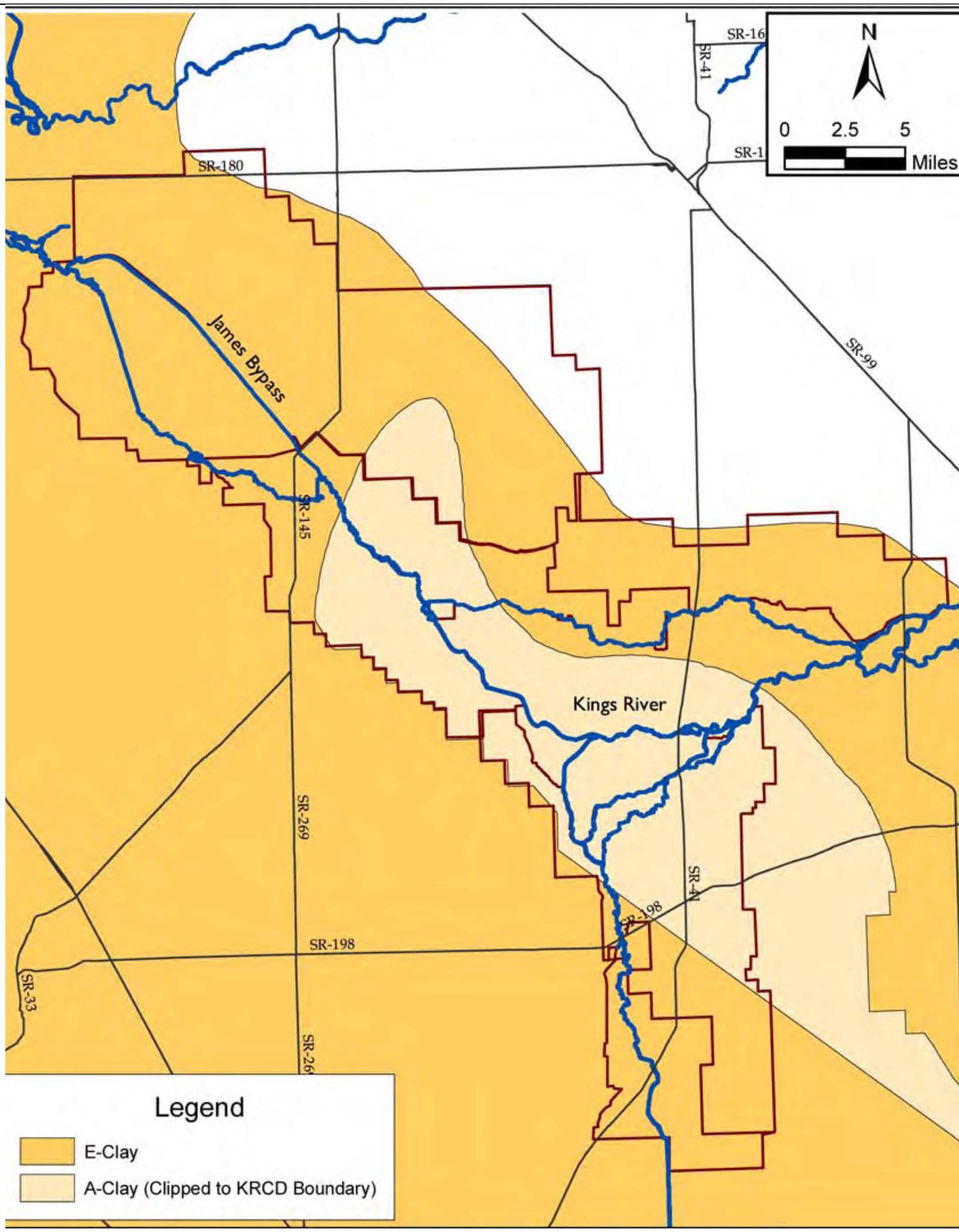


Primary Data Sources

Croft, 1969

Page and LeBlanc, 1969

GEI Consultants	**Consolidated Irrigation District** **Groundwater Management Plan**	**May 2008**
	Northwest – Southwest Conceptual Hydrogeologic Cross Section Source: Kings Basin Hydrogeology TM, 2006	**Figure 4.5**



GEI Consultants

Consolidated Irrigation District Groundwater Management Plan

Impermeable Clay Layers

Source: **Lower Kings Basin GWMP Update, 2005**

May 2008

Figure 4.6

4.1.8 Formations

4.1.8.1 Consolidated Formations

The consolidated rocks that underlie the Kings Groundwater Subbasin consist of the basement complex of pre-tertiary igneous and metamorphic rocks associated with the Sierra Nevada, but are overlain by marine and continental sedimentary rocks of Cretaceous and Tertiary ages. The basement complex is shallow near the eastern edge of the basin, but drop off to a maximum depth of 13,000 feet beneath the alluvium lower in the valley. The rocks are virtually impermeable, but with many weathered and jointed surfaces, small yields of groundwater have been obtained from these formations. (Page and LeBlanc, 1969) The consolidated marine and continental sedimentary rocks overlie the basement complex at great depth beneath the Fresno area. They do not crop out at the surface and are not of significant importance to groundwater resources.

4.1.8.2 Older Alluvium

The Older Alluvium is the most important water-bearing unit in the area. (Page and LeBlanc, 1969) It is exposed on the surface as terrace deposits near the foothills areas but continues toward the east to a maximum depth of about 300 feet below ground surface. It is more coarse-grained than underlying deposits, but is generally finer toward the west and coarser toward the east. It consists of interbedded lenses of arkosic clay, silt, sand, and some gravel. Water-bearing properties vary laterally depending on the proportion of fine and coarse material, but transmissivities are generally on the order of 52,000 to 160,000 gpd/ft.

4.1.8.3 Lacustrine and Marsh Deposits

In the Kings Subbasin, the Lacustrine and Marsh Deposits are primarily associated with virtually impermeable tongues of gypsiferous sand, silt, and clay that emanate from the plug beneath Tulare Lake (Croft and Gordon, 1968). These tongues are named informally as F to A, from oldest to youngest. Only clays E, C, and A are delineated in the Kings Subbasin, and Clay E is associated with the Corcoran Clay. The deposits are interbedded within the alluvium but only extend into the western end of the Kings groundwater subbasin to the western border of CID. The E Clay is much more extensive and important as hydrologic confining layers than the C and A clays that underlie only about 120 square miles west of CID as shown in Figure 4.6. (Page and LeBlanc, 1969)

4.1.8.4 Younger Alluvium

The Younger Alluvium was deposited in the Holocene, primarily near the current location of the Kings River and other channels as shown in Figure 4.3. It lies unconformable over the older alluvium and is difficult to distinguish since the arkosic lithology of the older and younger sediments is similar. It is estimated, however, that the thickness of the younger alluvium ranges from 0 to 70 feet. It is interbedded with Lacustrine and Marsh Deposits, in the western portion of the District.

4.1.8.5 Flood Basin Deposits

Flood Basin Deposits occur in the western edge of the District along Fresno Slough. They consist of deposits of sand, silt, and clay.

4.1.9 Aquifer Definition

The groundwater system within CID is primarily an unconfined aquifer. The aquifer is primarily comprised of the older and younger alluvium. There is a confined aquifer west of CID that is comprised of the older and younger alluvium overlain by the E, C, and A clays of the Lacustrine and Marsh Deposits.

4.1.10 Hydraulic Characteristics

The hydraulic characteristics of the unconfined aquifer are highly variable. Wells in the older alluvium produce 20 to 3500 gpm, averaging about 900 gpm; however, pumping test data are limited. The transmissivity in the older alluvium ranges between 52,000 to 160,000 gallons per day per foot (gpd/ft). Where thicker sequences of sand are present, the transmissivity may be higher. The specific yield can range between 0.2 percent and 36 percent.

4.1.11 Groundwater Levels and Flow Direction

Groundwater levels fluctuate in response to rates of recharge, discharge, and extraction. Much of the fluctuation can be attributed to natural variability in yearly precipitation and hydrologic conditions of surface waters, especially the Kings River. However, long-term changes are attributed primarily to rates of groundwater extraction.

Groundwater levels have been monitored for many years by CID and others in the Kings Basin. Figure 1.3 in Chapter 1 showed the long-term average groundwater level in CID area is declining. Individual well hydrographs and historical groundwater level contours were used extensively in developing the Kings Basin Integrated Groundwater Surface Water Model (Kings IGSM). Groundwater level contour maps have also been prepared by CID, KRCD and others to help explain the regional variations in groundwater levels and explain the reasons for the changes.

Figures 4.7 and 4.8 are groundwater contour maps that show the water levels and direction of groundwater flow in 1950 and 2000, respectively. The groundwater flow direction is typically 90 degrees to the groundwater contour. Flow in CID is generally from the east and north to the west and south following the gentle dip of the alluvium that follows the backslope of the Sierra Nevada Mountains. Flow directions within CID have not changed substantially, although the gradient has steepened. The most recent water level contour map was produced by KRCD in 2006 and is shown in Figure 4.9.

Groundwater level difference contours shown in Figure 4.10 indicate changes in water surface elevation in this same time period of at least 150 feet west of CID, with less severe changes in water levels in the eastern portion of CID.

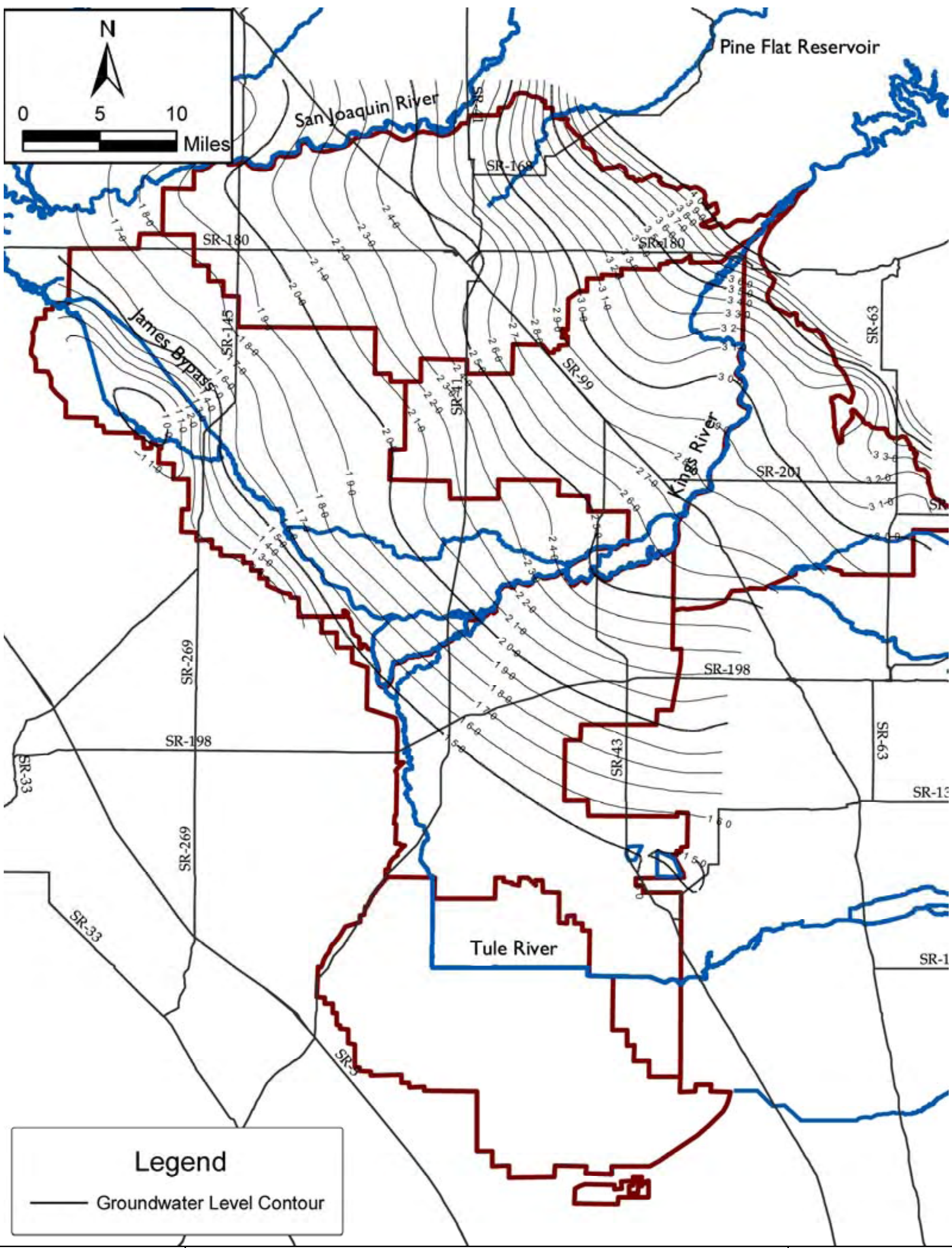
Groundwater levels in CID have been strongly influenced by the groundwater management activities in CID and surrounding areas. Groundwater levels from 52 representative wells in the lower Kings River Basin, primarily west of CID, were analyzed as part of the Lower Kings Groundwater Management Plan. As is observed in Figure 4.11, groundwater levels have dropped an average of over 100 feet between 1950 and 2000.

Figure 4.12 shows the color-shaded contours from the year 1964. This year was chosen for purposes of comparison because KRWA finalized operating agreements for Pine Flat Reservoir. Figure 4.13 shows the color shaded contour map for fall 2004.

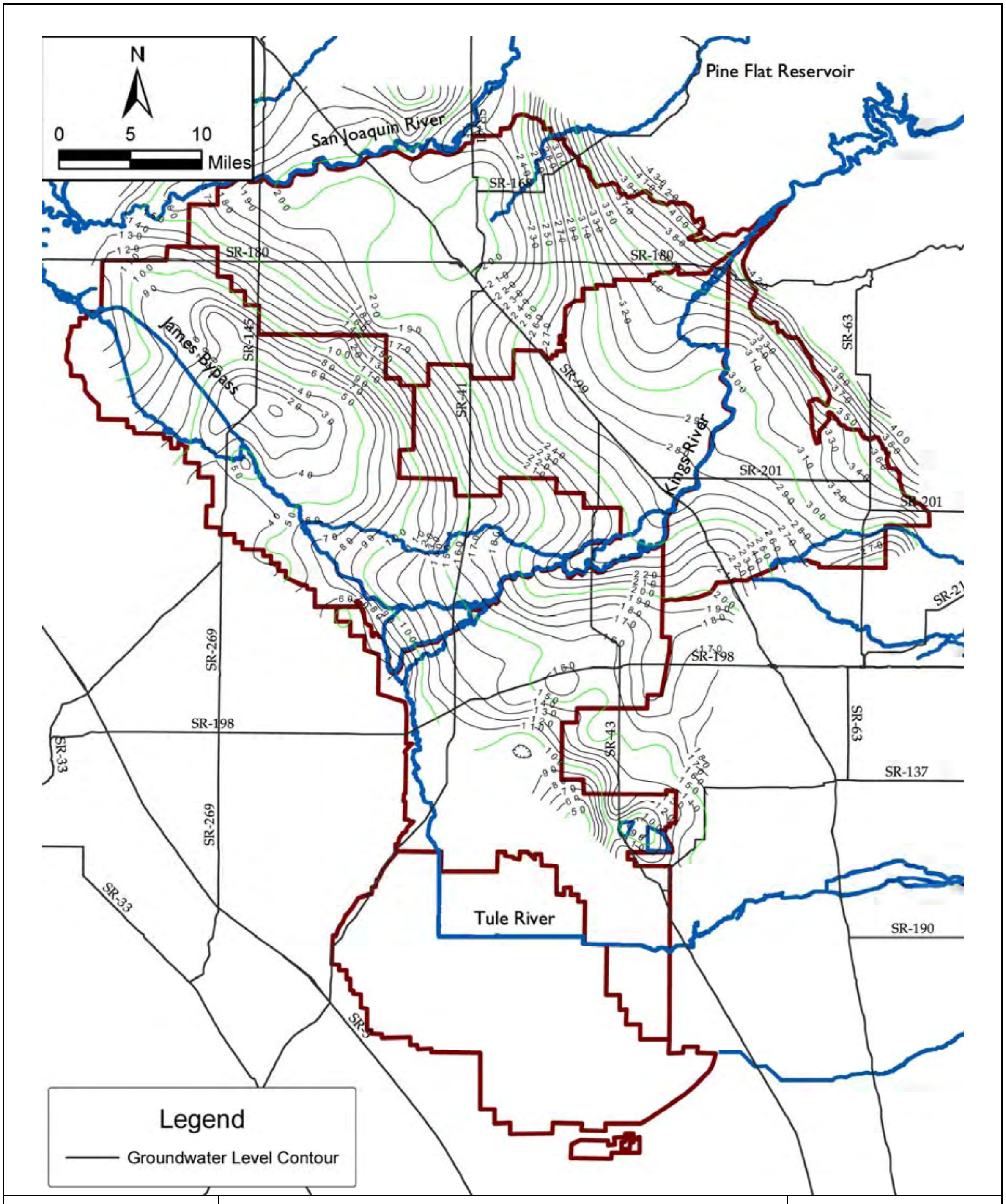
The Kings IGSM was used to evaluate what groundwater levels would be at the end of the 40 year period, assuming that current 2005 land uses continued over the planning horizon, that future water conditions could be represented by the 1964 to 2004 hydrologic period, and that no other management actions were taken. The water level contours that would be observed at the end of the 40 year simulation period are shown in Figure 4.14, also showing the location of a profile of the water table.

Figure 4.15 shows a water table profile, comparing the gradient that existed in 1964, 2004, and at the end of the 40 year projection. The profile shows that the gradient and direction of flow is from east to west, and that this gradient has steepened over time. A steeper gradient indicates that more water would be moving from east to west in 2004 than would have occurred in 1964. The Kings IGSM water budgets also indicated that this was the case.

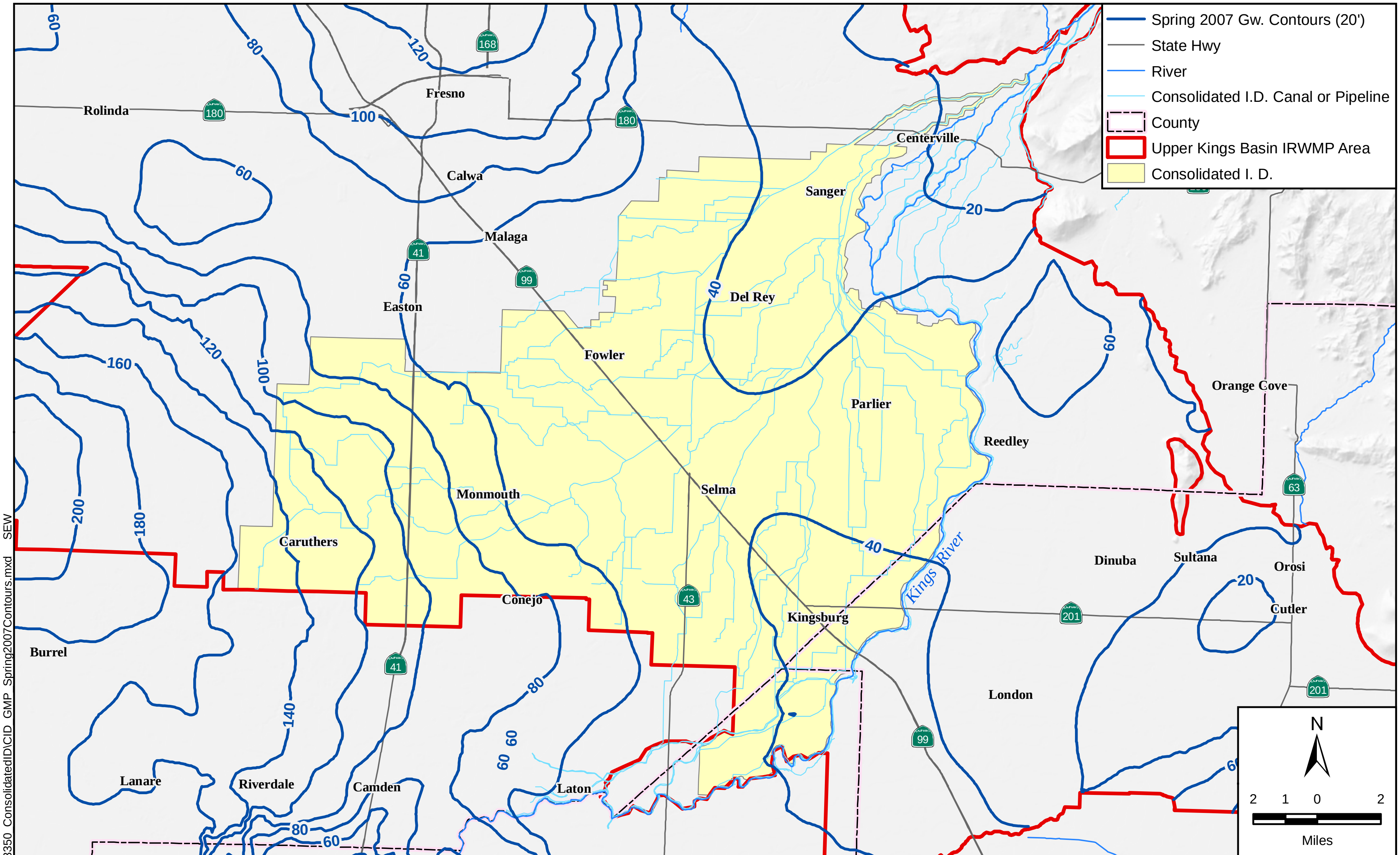
The area to the west of CID is reliant exclusively on groundwater. Pumping in this area creates a steep groundwater gradient from east to west, resulting in the movement of water from CID towards the trough in the lower part of the Kings Basin. Throughout the central and western portions of CID, the westward gradient has steepened and groundwater levels have dropped as much as 80 to 100 feet. The steepened gradient and the trend for declining water levels are likely to continue into the future.



GEI Consultants	**Consolidated Irrigation District Groundwater Management Plan** Groundwater Level Contours Spring 1950 Source: Lower Kings Basin GWMP Update, 2005	**May 2008** **Figure 4.7**



GEI Consultants	**Consolidated Irrigation District Groundwater Management Plan**	**May 2008**
	Groundwater Level Contours Spring 2000	**Figure 4.8**
	Source: Lower Kings Basin GWMP Update, 2005	



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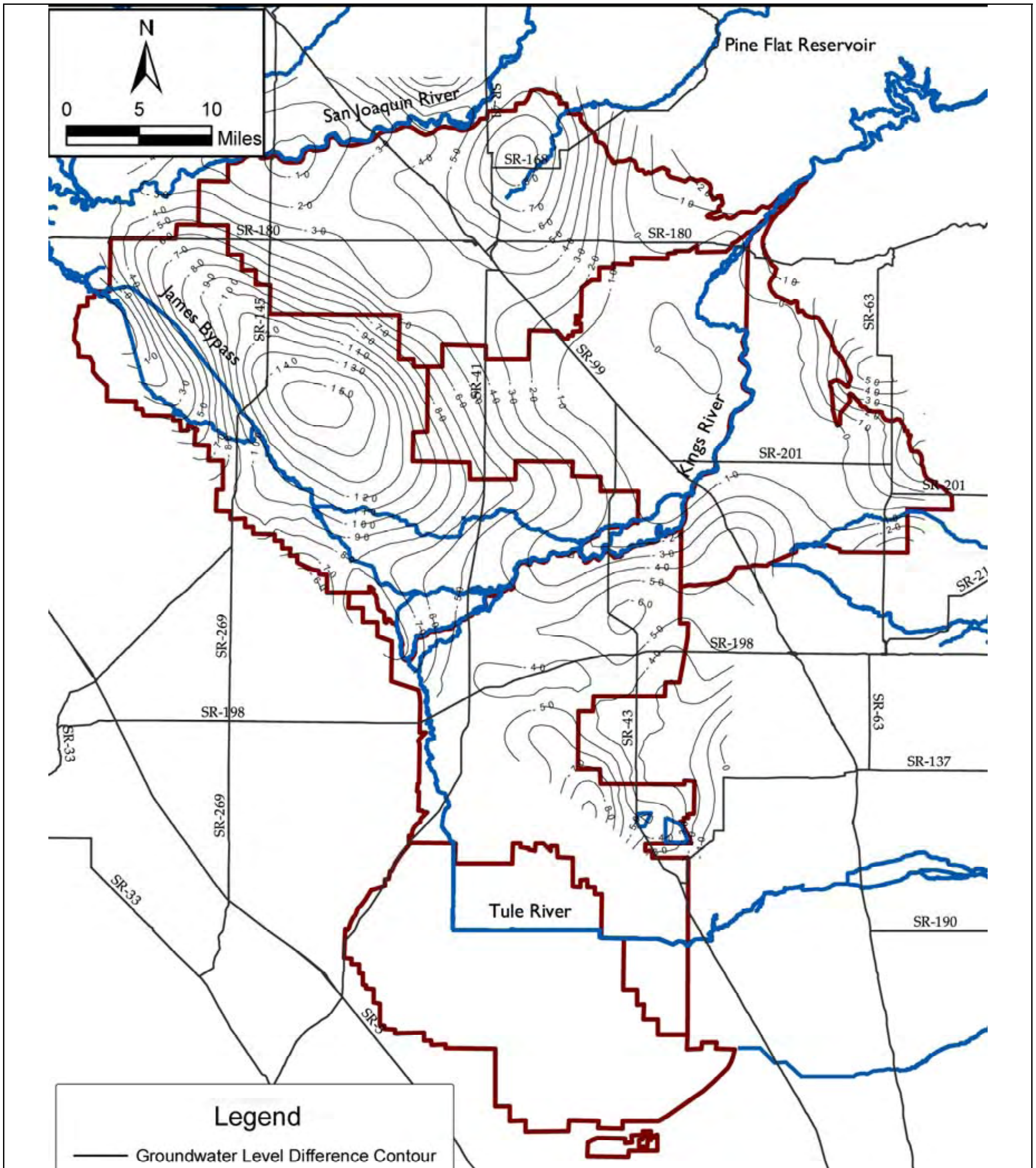
Consolidated Irrigation District
Groundwater Management Plan

Spring 2007 Groundwater Contours

SOURCE: Kings River Conservation District

May 2008

Figure 4.9



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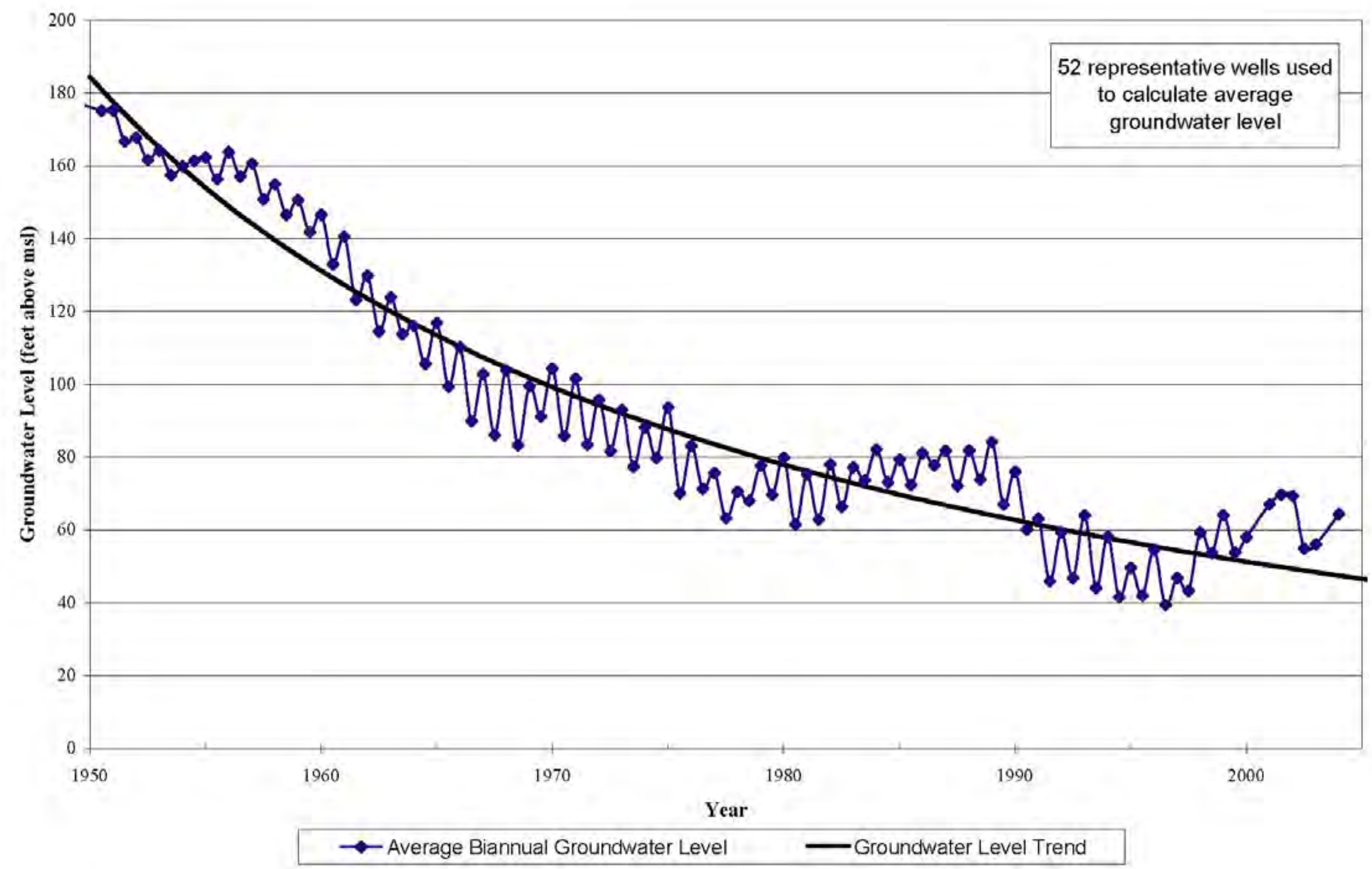
Consolidated Irrigation District Groundwater Management Plan

Change in Groundwater Levels Between Spring 2000 and Spring 1950

Source: Lower Kings Basin GWMP Update, 2005

May 2008

Figure 4.10



GEI Consultants	**Consolidated Irrigation District** **Groundwater Management Plan** Groundwater Trends in Western CID Source: Lower Kings Basin GWMP Update, 2005	**May 2008** **Figure 4.11**

Figure 4.12 Groundwater Table in Fall 1964

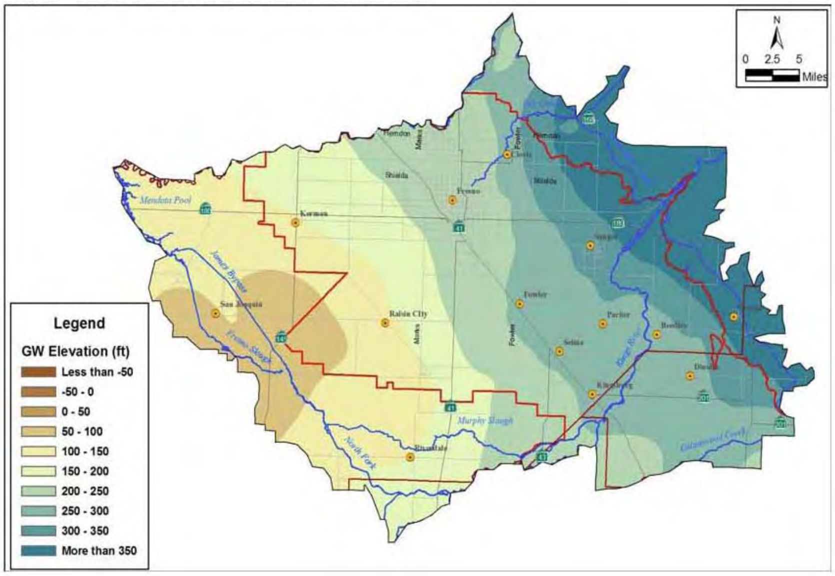


Figure 4.13 Groundwater Table in Fall 2004

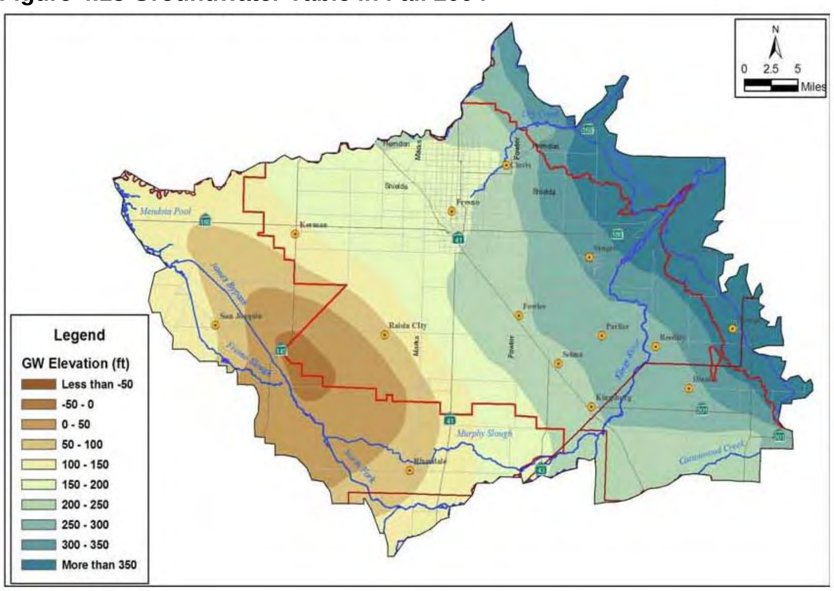


Figure 4.14 Groundwater Table, 40-Year Projection with Existing 2005 Land Use Conditions

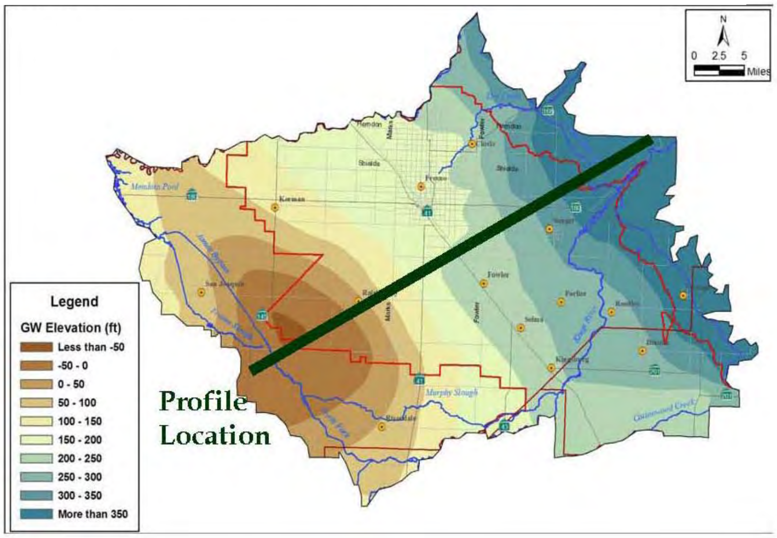
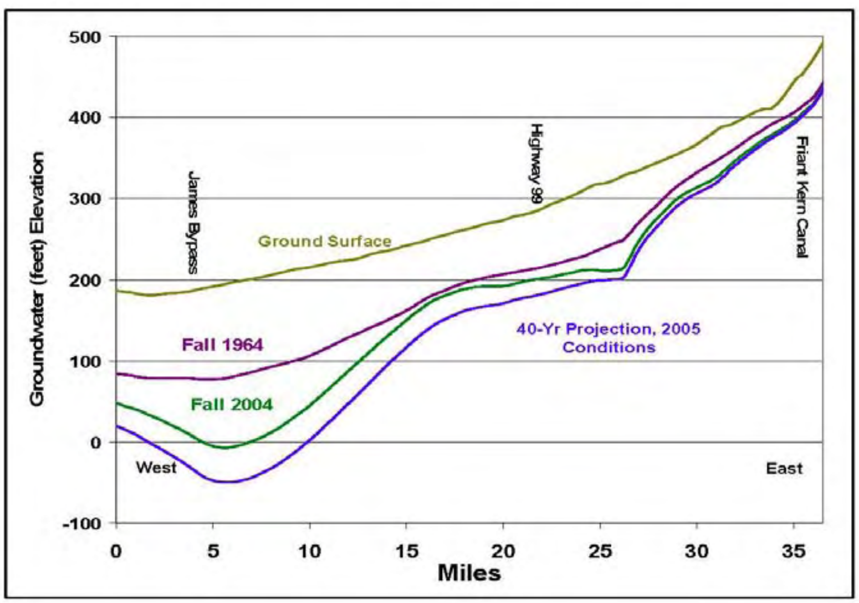


Figure 4.15 Groundwater Table Profiles for 1964, 2004, and 40-Year Projection with Existing 2005 Land Use Conditions



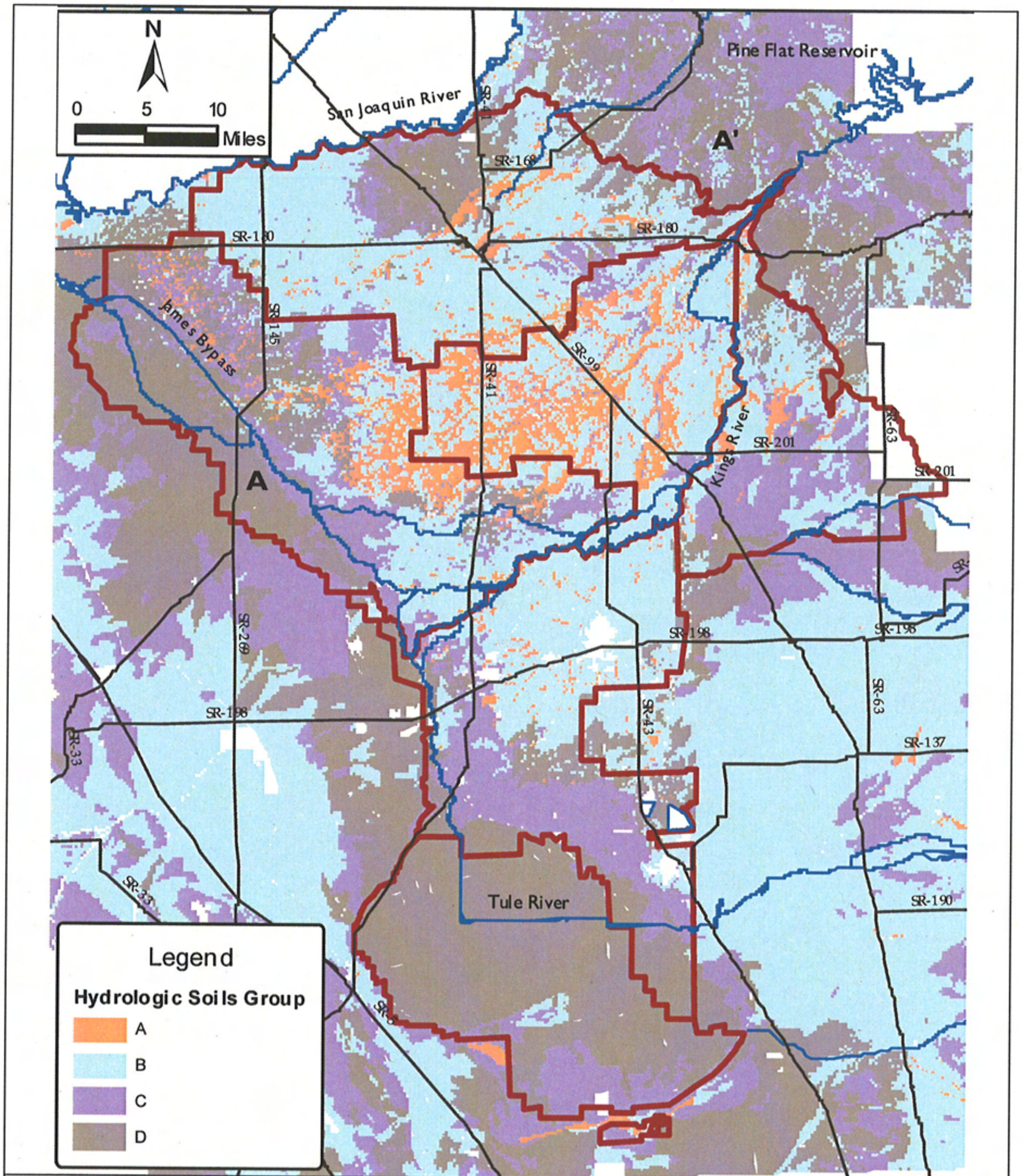
4.1.12 Groundwater Recharge and Discharge Areas

Groundwater recharge in the unconfined aquifer occurs from rainfall, applied water, and infiltration by the rivers and creeks. Figure 4.16 shows surface recharge potential based on hydrologic soil groups from the Natural Resources Conservation Service (NRCS), Hydrologic soil groups are classified according to their ability to infiltrate water and affect runoff. The soils are grouped according to the amount of water infiltration when the soils are thoroughly wet and receive additional precipitation. The four hydrologic soil groups are:

- **Group A**: Soils having a high infiltration rate (low runoff potential) when thoroughly wet
- **Group B**: Soils having a moderate infiltration rate when thoroughly wet
- **Group C**: Soils having a slow infiltration rate when thoroughly wet
- **Group D**: Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet

Figure 4.16 shows the hydrologic soil groups in CID. The area associated with soils with the highest infiltration rate (Group A) and Group B soils are present throughout CID with Group B as the predominate hydrologic soil type. The remaining soil types (slow and very slow infiltration rates) are primarily located along sloughs, canals, and rivers. The underlying older and younger alluvium do not have laterally extensive layers of fine sediment that would prohibit infiltration.

Recharge from rainfall and applied water occurs throughout the District. The most significant source of recharge, however, is likely from the Kings River occurring primarily in the eastern portion of the District and moving through the subsurface toward the west and south as indicated by the groundwater contours in Figure 4.8. Water is extracted from the ground for agricultural uses throughout the District, significant groundwater is pumped by the cities and much groundwater flows out of the western boundary of the District toward the groundwater depression near the James Bypass.



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Consolidated Irrigation District Groundwater Management Plan

Hydrologic Soils Group

Source: Lower Kings Basin GWMP Update, 2005

May 2008

Figure 4.16

4.1.13 Groundwater Quality

Groundwater in CID is, for the most part, of good quality. Source water from the Sierras is very clean and has low TDS concentrations. TDS concentrations generally increase from east to west and also with depth. The base of fresh groundwater is considered to be where the TDS concentration exceeds 2000 mg/l and is located at a depth of about 1200 to 1800 feet. (Page and Leblanc, 1969) However, high TDS concentrations are not generally a problem for most extraction wells in CID. There are some chemicals that have had concentrations above their MCL (maximum contaminant level), including DBCP, EDB, Gross Alpha, Nitrate, and Uranium. The following sections discuss these problem constituents, their probable source, and the extent of contamination. Identification of these problem constituents is based on the WRIME (2007) study that identified wells that exceeded MCLs at any time between January 1999 and September 2006.

4.1.13.1 Arsenic

Arsenic is a naturally occurring element in some rock formations, but can also enter the groundwater aquifer from agricultural or industrial practices. Arsenic is not a problem throughout most of CID, except for several wells in the southwestern portion of CID where the levels have exceeded the MCL of 10 ug/L.

4.1.13.2 DBCP and EDB

Dibromochloropropane (DBCP) and Ethylene dibromide (EDB) contamination in CID comes from pesticides used for agriculture. MCLs for these constituents are 0.2 ug/l and 0.05 ug/l respectively and were exceeded in locations near Sanger, Parlier, north of Selma, and in the southwest corner of CID.

4.1.13.3 Gross Alpha

Gross alpha is naturally occurring radiation emitted from minerals. High gross alpha measurements appear to be seasonal and could possibly be controlled by management of well operations. Emissions above the MCL (15 PC/L) were detected at several wells throughout the western portion of CID.

4.1.13.4 Nitrate

Sources of Nitrate to groundwater come from agriculture fertilizer application and wastewater treatment infiltration. Nitrate is not a significant problem throughout most of CID. Detections in excess of the MCL (45 mg/L) have occurred in the south end of Fresno and in the southwest corner of CID.

4.1.13.5 Uranium

Uranium is a naturally occurring, radioactive element that occurs in low concentrations in earth materials. As with gross alpha concentrations, high Uranium concentrations appear to be seasonal. Concentrations above the MCL (20 pCi/L) occur in several wells scattered throughout CID.

4.2 Land and Water Uses within Plan Area

Water demands vary by land use and crop type. This section summarizes current and future land and water demands. Current land use and water demands were analyzed using the most recent land use surveys (2004 Kings County, 2000 Fresno County, 1999 Tulare County) completed by the California Department of Water Resources. Future land use and water demand were developed using estimates of expected land use at the current sphere of influence (SOI) for the cities of Sanger, Fowler, Selma, Kingsburg, and Parlier.

4.2.1 Existing and Build-Out Land and Water Use

Figure 4.17 shows the generalized existing land use conditions in CID. The figure includes delineation of urban areas as they currently exist and the projected SOI for the cities. Table 4-1 estimates the total water demand, which is met by a combination of groundwater and surface water supplies for this land use distribution. The water demand was estimated by applying water duty factors to each type of land use and specific crop type found in CID.

Table 4-1. Summary of Land Use and Demand

	Area			Water Demand (AF)
	Agriculture (acres)	*Undeveloped (acres)*	*Urban (acres)*	
Existing Conditions	144,700	4,300	9,800	477,000
2030 Build-Out Conditions	130,500	4,300	24,000	456,000

For existing conditions, agricultural land use in CID totaled approximately 91 percent of the area, with about 6 percent in urban use. The remaining three percent of land area is undeveloped. Agricultural water demand in CID was estimated to be 459,000 acre-feet with urban water demand estimated in the groundwater model at about 18,000 acre-feet in 2004. More recent data from updated 2007 surveys indicate that the total pumping from the five cities totaled 24,561 acre-feet, indicating that the model estimates may have underestimated urban uses. Agricultural water demand represents approximately 96 percent of total water demand within CID.

The effects of the urbanization of agricultural land on regional groundwater levels were analyzed by preparing groundwater level contours, as simulated by the King Basin IGSM, for the 2005 Existing Conditions. The groundwater elevation at the end of model simulation for the 2005 Existing Conditions is shown in Figure 4.18.

4.2.2 2030 Build-Out Land and Water Use

Projected land use and water demand data were developed for build-out conditions for the cities within CID. The primary change in land use is the conversion of agricultural and native lands to urban development near or adjacent to the cities. The projected land use was based on information obtained from the Local Agency Formation Commission (LAFCO) for Fresno, Kings, and Tulare Counties. LAFCOs work with the cities in CID and with departments in the county governments to develop SOIs that define boundaries for urban growth. Using the LAFCO data, it is expected that urban areas will expand by 14,200 acres from existing conditions and agricultural acreage will be reduced by an equal amount. The land use is based on the cities' sphere of influence (SOI). It is assumed that the cities will reach build-out conditions by 2030 and will not expand beyond their SOI (Figure 4.19).

The change in land use represents a 10 percent reduction in total agricultural area and a 144 percent increase in urban development from current conditions. There is a corresponding change in water demand with the changes in land use. The current crop mix is assumed to remain unchanged so future agricultural water demand will be 10 percent less than it is currently.

Assuming future urban water demand per acre is similar to 2005 conditions; urban water demand will increase 144 percent. It is important to note that although the total water demand indicated in Table 4-1 is projected to go down, the total pumping will actually increase. This transformation occurs because much of the acreage that will go out of production currently uses imported surface water for irrigation, but all of the urban land replacing it will use groundwater only. This is discussed in greater detail in the next section.

Figure 4.20 shows the groundwater elevation for the 2030 Baseline Conditions at the end of the King Basin IGSM simulation. The water level contours were then used to calculate the difference in water levels at the end of the simulation period between the 2005 Existing Conditions and the 2030 Baseline Conditions as shown in Figure 4.21. The figure shows the amount of additional decline that would be attributed to the increased land use at build-out conditions in 2030. The areas that show a decline in the groundwater level are related to the changes in land use from agricultural to urban. The areas in the northern boundaries of CID and the Highway 99 corridor show a reduction in groundwater elevation of 5 to 9 feet. The "impacted" areas due to urbanization extends from the north west of CID to the south into Kingsburg, and to the northeast into Sanger, as shown by the contour range indicating a decline in groundwater elevation of 0 to 4 feet.

4.2.3 Comparison of Groundwater Pumping

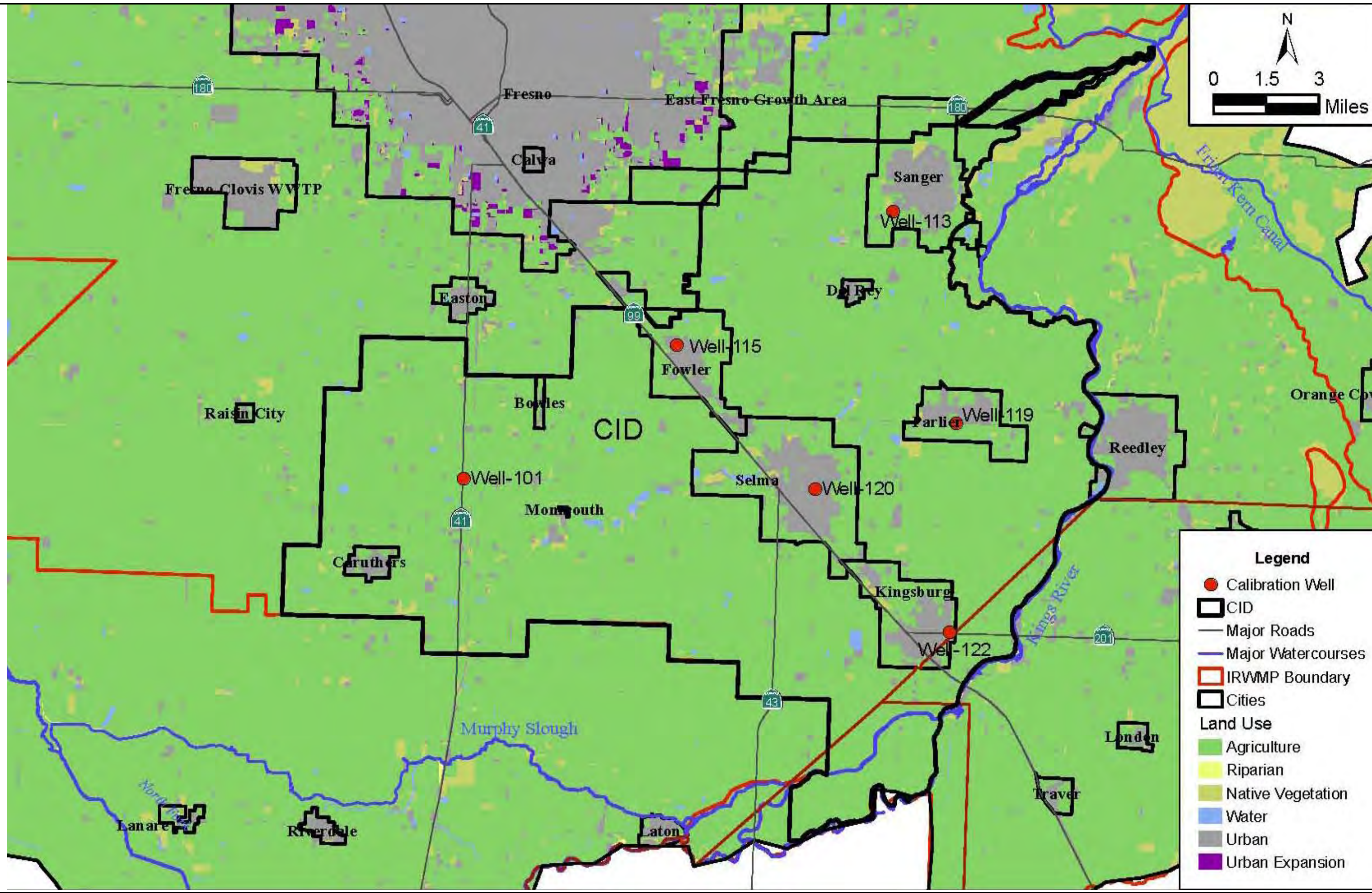
The Kings IGSM model was used to calculate the total groundwater pumping needed to meet the water demands from agricultural and urban land use within the cities' SOI. Water use outside the cities' SOI will remain approximately the same. Table 4-2 is a summary of the water demand met by groundwater. The agricultural water demand (Ag Demand) is calculated by the King IGSM model based on crop acreage within the SOI and crop specific water duty values. For the 2005 conditions the average annual Ag Demand is 51.5 TAF, which is met by both delivered surface water and groundwater pumping. The Ag Demand is reduced to zero within the SOI for the 2030 conditions because of the assumption that the cities are fully developed. The urban water demand is assumed to be met entirely by groundwater and thus is equal to the water demand.

Table 4-2. Comparison of Groundwater Pumping Between 2005 Existing Conditions and 2030 Baseline

	Agricultural Demand (TAF)	Agricultural Demand Met by Groundwater (TAF)	Urban Demand Met by Groundwater (TAF)	Total Groundwater Pumping (TAF)
2005 Existing Conditions	51.5	4.7	18.7	23.4
2030 Projected Conditions	0	0	43	43
Difference	-51.5	-4.7	24.3	19.6

The sum of the columns (urban and agricultural demand that is met by using groundwater) is representative of the total groundwater pumping that occurs within the SOI. Urban demand for groundwater is 18.7 TAF (2005 Existing Conditions) and 43.0 TAF (2030 Projected Conditions). This is an increase in groundwater demand of 24.3 TAF. Total groundwater pumping is 23.4 TAF (2005 Existing Conditions) and 43.0 TAF (2030 Projected Condition). This projected increase in groundwater pumping of 19.6 TAF is due to the increased urbanization that will occur within CID.

For the 2005 Existing Condition, surface water is used to meet much of the agricultural demand. The difference between the total Ag Demand of 51.5 TAF and the 4.7 TAF of Ag Demand Met by groundwater is 46.8 TAF, which is the amount of surface water applied. This application of surface water is discontinued when agricultural land is converted for urban purposes. The amount of Ag Demand drops to zero in 2030, and as a result the amount of surface water supplied to the area is also decreased by 46.8 TAF. Therefore, the impact on groundwater is caused not only by the increase in urban groundwater pumping, but also by the decrease in the amount of surface water applied. Assuming an irrigation efficiency of 75 percent, the net reduction of groundwater recharge from the applied irrigation water is approximately 11.7 TAF (25 percent of 46.8 TAF).



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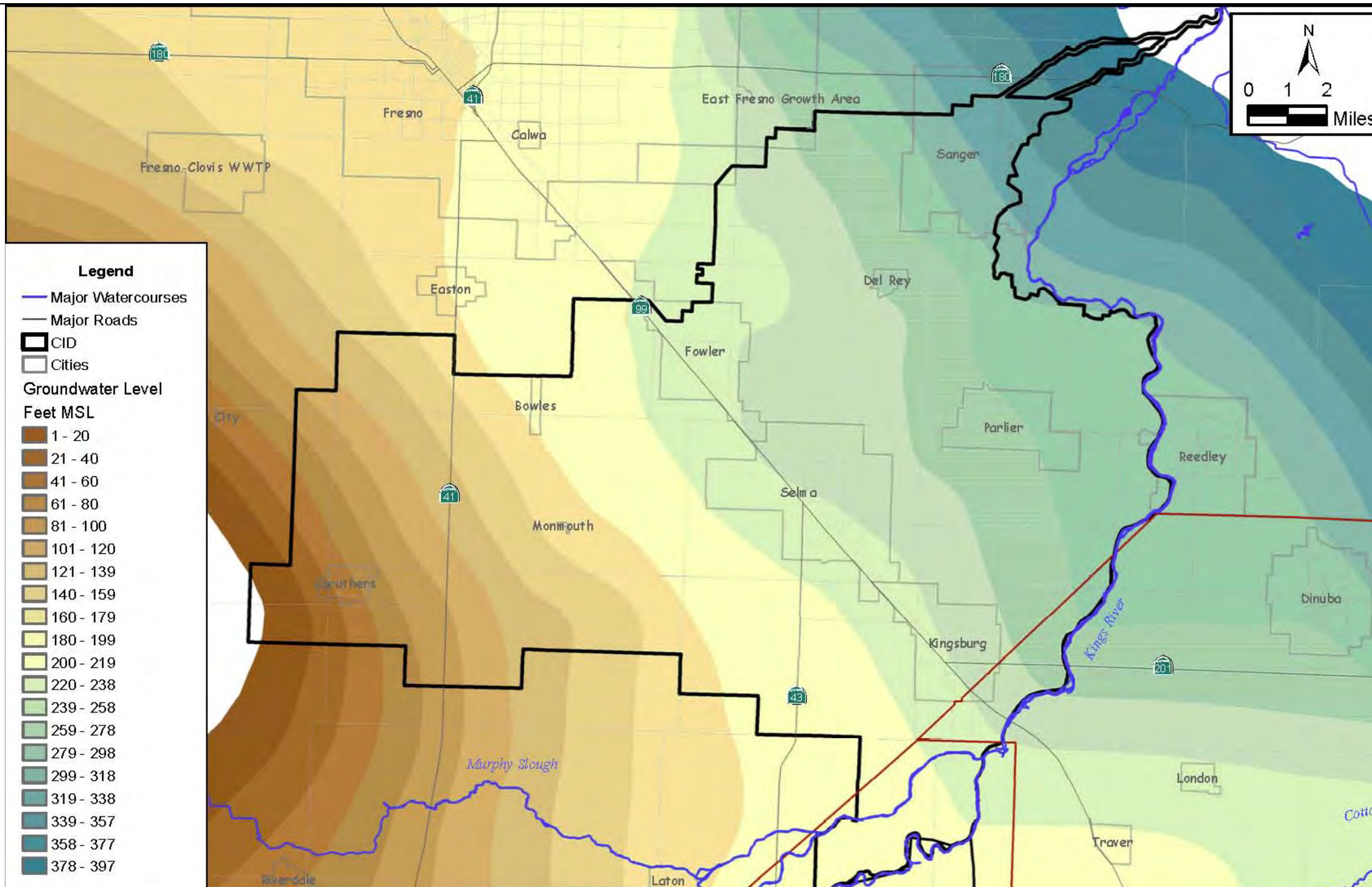
Consolidated Irrigation District
Groundwater Management Plan

Land Use for 2005 Existing Conditions

Source: CID Groundwater Impact Analysis Memorandum, 2007

May 2008

Figure 4.17



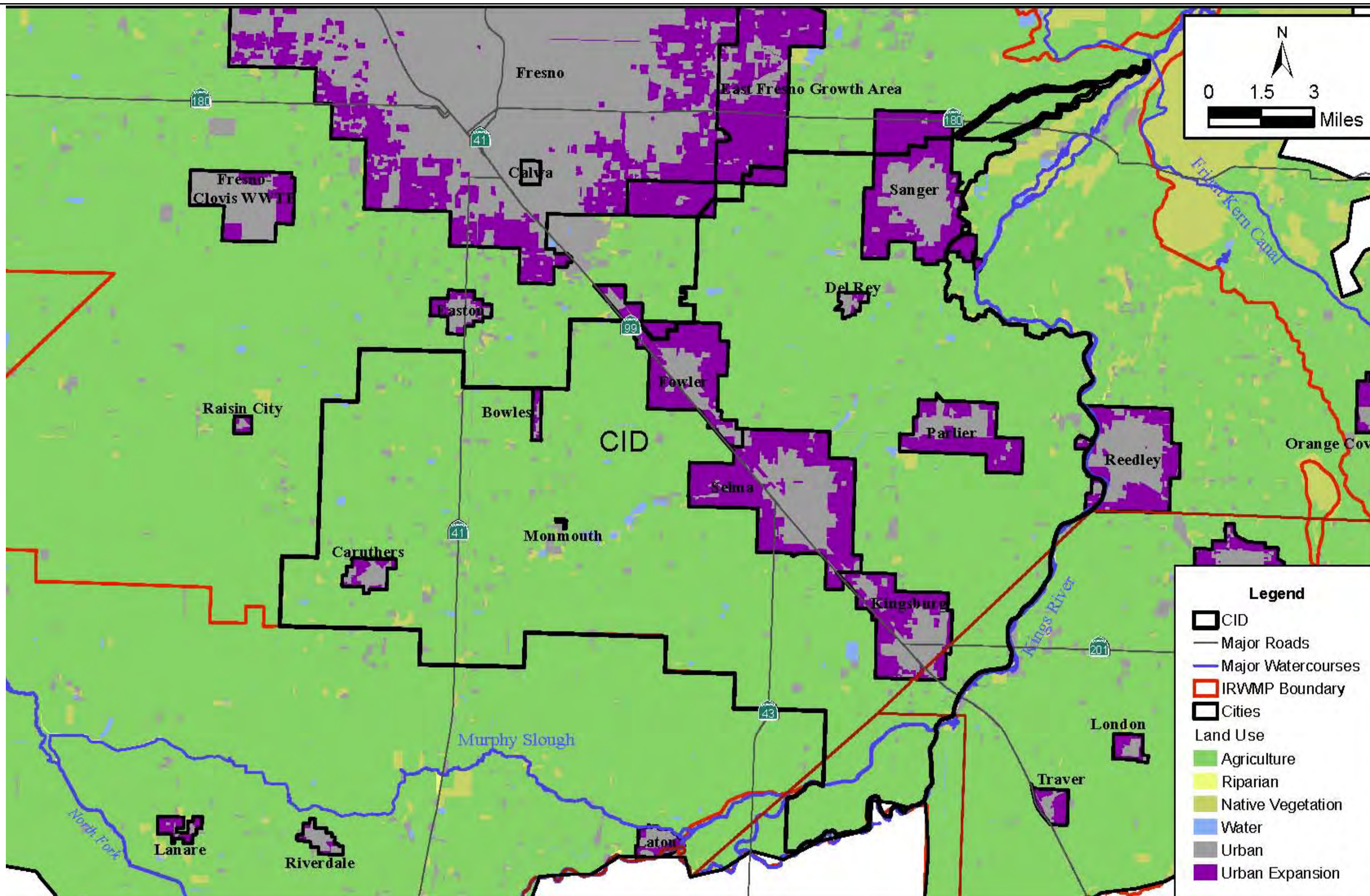
Consolidated Irrigation District
Groundwater Management Plan

End of Simulation: Existing Conditions

Source: CID Groundwater Impact Analysis Memorandum, 2007

May 2008

Figure 4.18



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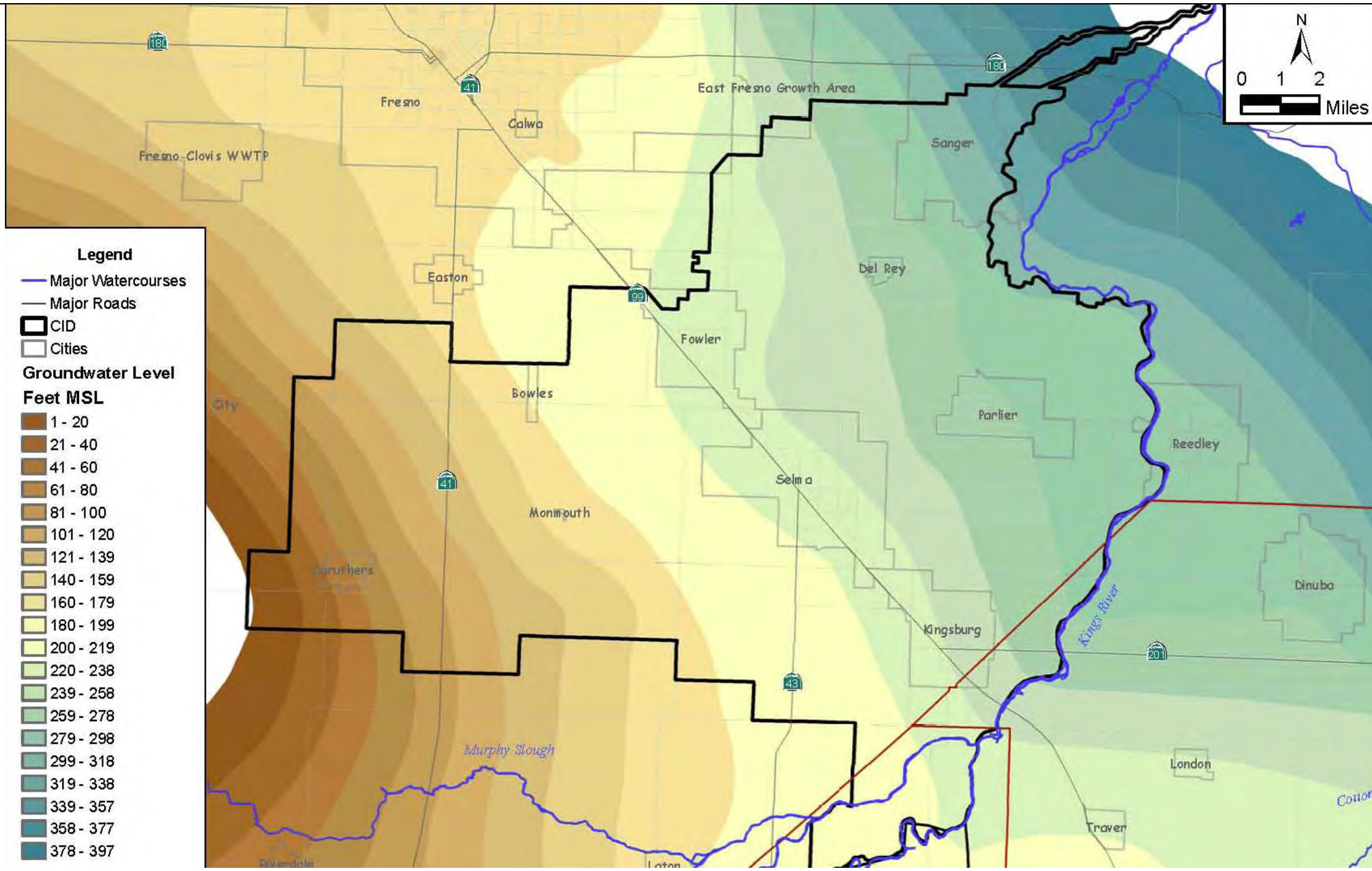
Consolidated Irrigation District
Groundwater Management Plan

Land Use: 2030 Baseline Conditions

Source: CID Groundwater Impact Analysis Memorandum, 2007

May 2008

Figure 4.19



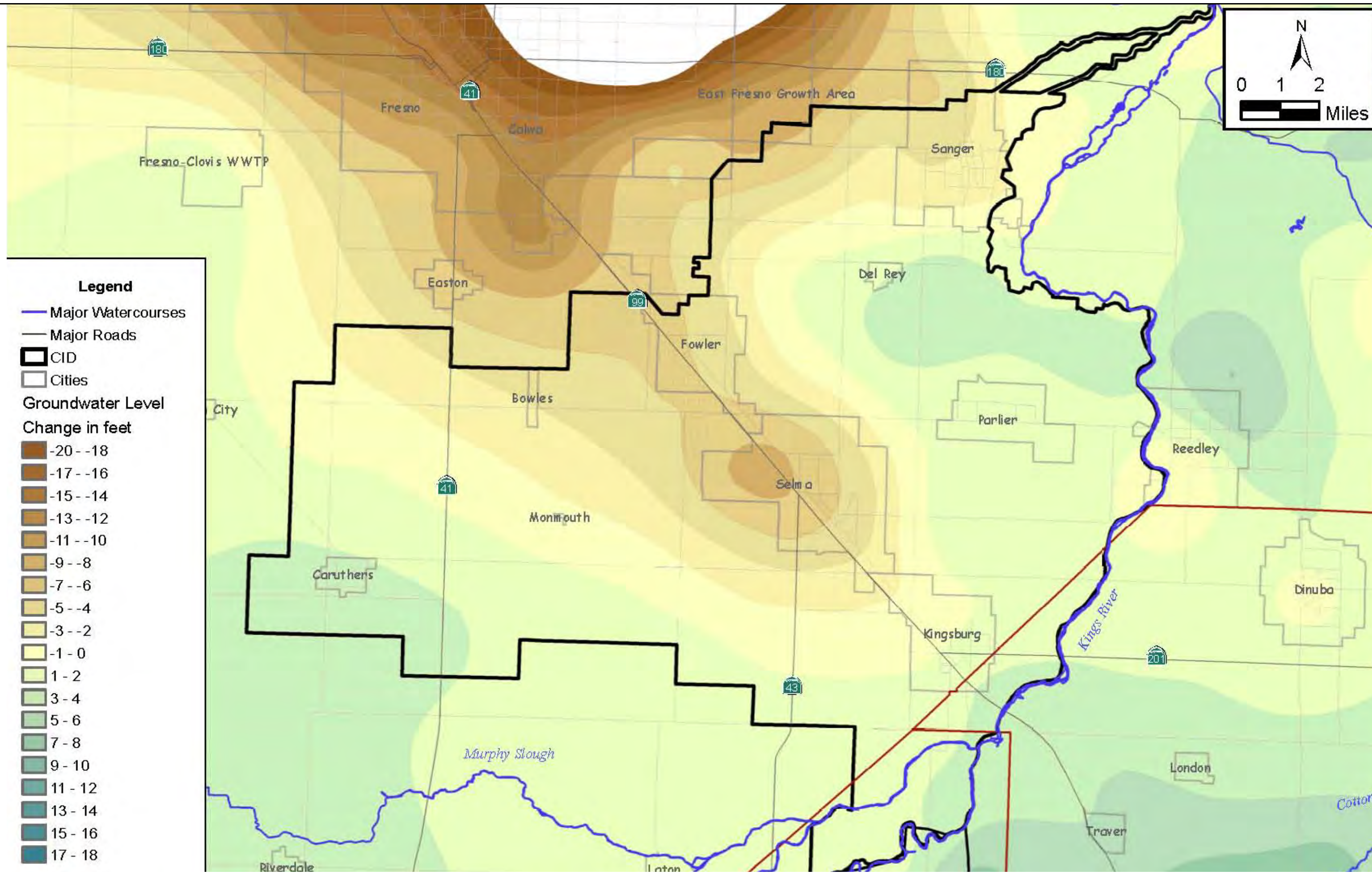
Consolidated Irrigation District
Groundwater Management Plan

End of Simulation: Baseline 2030

Source: CID Groundwater Impact Analysis Memorandum, 2007

May 2008

Figure 4.20



GEI Consultants	**Consolidated Irrigation District Groundwater Management Plan** End of Simulation: Baseline 2030 minus Existing Conditions Source: CID Groundwater Impact Analysis Memorandum, 2007	**May 2008** **Figure 4.21**

4.3 1964-2004 Water Budget

Components that comprise a water budget are categorized into recharge components and discharge components. For a groundwater budget, the difference between discharge and recharge is referred to as overdraft if discharge is larger than recharge. Table 4-3 shows the components of the groundwater budget and the resulting values for CID.

Table 4-3. Average Annual CID Groundwater Budget from 1964 to 2004

Budget Component	Recharge (TAF)	Discharge (TAF)
Percolation from rainfall and irrigation	187	0
Recharge from streams and canals	25	0
Recharge from ponds	90	0
Groundwater pumping – Agricultural	0	231
Groundwater pumping – Urban	0	15
Groundwater flow out of CID	0	80
Overdraft	24	

Source: Upper Kings Basin IGSM

From Table 4-3, the average annual overdraft for CID is 24 TAF per year. The entire Kings River Basin experienced overdraft of approximately 162 TAF acre-feet per year during the same time period.

4.4 Conclusions

The evaluation of the basin water budget using the Kings IGSM indicates that the average annual overdraft within the CID area during the 1964-2004 period was approximately 24 TAF per year. Overdraft for the entire King River Basin was approximately 162 TAF per year over the same time period. The groundwater pumping to support urban development was about 18 TAF per year in 2004 at the end of the simulated modeling period. More recent reporting of pumping for the CID Cities indicates pumping is in the order of 24 TAF. The amount of urban pumping is projected to increase to 43 TAF under future conditions. Urban development is solely reliant on groundwater for water supply. This development will result in a decrease in recharge to groundwater storage within the urbanized areas from the loss of applied surface water for irrigation and rainfall of approximately 15 TAF per year. Both the increase in pumping and decrease in irrigation of applied surface water result in changes in groundwater elevations and storage.

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5 Alternative Water Management Strategies

This chapter reviews the overall groundwater management strategy and the alternative water management strategies that were considered for inclusion in the CID GWMP, including those that are mandatory components pursuant to SB 1938, those which were considered voluntary under AB 3030 and SB 1938, and those that are recommended by DWR. Many of the programs identified by DWR for consideration in the GWMP have been addressed in the Upper Kings IRWMP, and CID will meet some of the GWMP requirements through the continued participation in the Water Forum and through implementation of the Upper Kings IRWMP. For a comprehensive review of the wide array of water management strategies, the reader is referred to the Upper Kings IRWMP and supporting materials (WRIME, 2006e and 2007f).

The overall CID groundwater management strategy is discussed first. This is followed by discussion of the alternative water management concepts that were evaluated for inclusion in the CID GWMP. The alternative strategies are described along with the current status of programs in CID, discussion of constraints, and the final recommended actions to be part of the GWMP.

5.1 Overall Approach to Groundwater Management

Within the Kings Basin there is no integrated system to manage groundwater to ensure equity, efficiently allocate resources, and solve overdraft. The Kings River Water Association (KRWA) has a mature surface water management program and institutional arrangements, but there is no similar organization or set of agreements to manage and protect groundwater.

The CID GWMP and the Upper Kings IRWMP will be used to increase the collaboration across boundaries to solve overdraft, develop and implement projects, and create the management system that will increase the yield of the Kings Basin. The Upper Kings IRWMP identifies cost effective approaches for avoiding redundant or duplicative efforts, such as sharing monitoring costs and data, developing analysis tools, and managing and reporting of groundwater data.

5.1.1 Methods for Groundwater Management

DWR has identified six methods of groundwater management in California (DWR, 2003) and identified the management authority and the responsible entity (listed in parentheses) in the chronological order in which they have been developed:

- Overlying Property Rights (property owner)
- Statutory Authority (legislatively defined local agency or district)
- Groundwater Management Districts or Agencies (legislatively defined local agency or district)
- Groundwater Management Plans (local agency or district)
- Adjudicated Groundwater Basins (groundwater basin, water master, or court)
- City and County Ordinances (city or county)

These methods provide a framework for discussing the overall approach to groundwater management in CID. In the past, the overlying property owners and CID managed groundwater through the conjunctive use and groundwater recharge program. The overlying property owners formed CID and paid assessments to build and maintain projects. CID recharged groundwater for the benefit of overlying users in CID.

CID founding legislation does grant the agency specific statutory authority to manage groundwater. CID adopted the original GWMP in 1995 to begin to develop programs to better manage groundwater and preserve local control. As an irrigation district, CID can adopt a GWMP and expand its ability to manage groundwater pursuant to the Water Code.

The courts have not adjudicated the Kings Basin. Adjudication is the process of quantifying and perfecting the rights and entitlements of overlying users to groundwater in a basin and is initiated by overlying users. The process is expensive and time consuming.

Fresno County has used police powers and authorities to adopt local groundwater ordinances and require permits for groundwater export. The purpose of the ordinance is to hold project proponents accountable for impacts that may occur as a result of proposed export projects. Neither Kings nor Tulare Counties have adopted a groundwater ordinance.

5.1.2 Groundwater Management Concepts

A number of key concepts are defined for purposes of the CID Board development and implementation of the GWMP.

Conjunctive Use. The coordinated and planned management of both surface and groundwater resources in order to maximize the efficient use of the resource; that is, the planned and managed operation of a groundwater basin and a surface water storage system combined through a coordinated conveyance infrastructure. Water is stored in the groundwater basin for later and planned use by intentionally recharging the basin during years of above-average surface water supply.

Groundwater Storage. Groundwater storage is the intentional or artificial recharge of surface water and an important part of CID's conjunctive use program. CID intentionally recharges water for groundwater storage either by direct or in-lieu recharge actions, including diverting water down the canal networks; putting surface water into constructed spreading basins; and delivery of irrigation water to agricultural lands in-lieu of groundwater pumping. In-lieu recharge includes the volume of applied water that is in excess of the crop consumptive use requirements and percolates downward to groundwater storage.

Overdraft. The condition of a groundwater basin where the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average conditions. The CID Board and the Upper Kings Basin Water Forum have found that the Kings Basin is in overdraft. This is distinguished from "Critical Conditions of Overdraft," which is a basin where continuation of present practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts. The definition was created after an extensive public input process during the development of the Bulletin 118-80 report. DWR has declared the Kings Basin, including those portions underlying CID, to be in a critical state of overdraft.

Groundwater Storage Capacity. The volume of a groundwater basin that is unsaturated and capable of storing groundwater within CID jurisdictional boundaries, or within the Kings Basin, that could be utilized for purposes of storage and management of CID waters.

Groundwater Banking. Like groundwater recharge, groundwater banking is a water management tool designed to increase water supply reliability. Like CIDs historical groundwater recharge activities, groundwater banking would use dewatered aquifer space to store water during wet years (years when there is abundant rainfall and surplus water available), so that it can be pumped and used during normal and dry years. The difference between groundwater storage is that groundwater banking includes greater accounting of the water that is intentionally stored in the groundwater basin. Groundwater banking would include accounting for the benefits associated with the incremental increase in the yield of the groundwater basin that would be a direct result of the management actions and projects implemented by CID. The CID Board defines groundwater banking to include use of existing or new facilities and operations that would:

- Result in an increase in the operational yield of the Kings Basin.
- Make use of and manage the available Kings Basin groundwater storage capacity.
- Provide a net reduction in historical overdraft or avoid future, incremental contributions to overdraft that would be the result of water consumed by a proposed project.
- Improve reliability and ensure a long-term, sustainable water supply to partners that participate in the program and provide funding through agreements with CID.

5.1.3 Constraints to Groundwater Management

New urban water users are not currently required to mitigate for impacts to groundwater. Cities and other land owners overlying the groundwater basin do not have "ownership" of the overdraft problem and do not recognize the need for physical solutions. Funding is a constraint to further development of projects, policies, and programs to improve groundwater management.

The institutional constraints to changes in the groundwater management regime were discussed in the Upper Kings IRWMP and include:

- Inability of local and regional water management governance entities to build trust, resolve internal and external differences, and share control.
- Inability to match benefits and funding burdens in ways that are acceptable to all parties, including third parties.
- Lack of sufficient federal, state, and regional financial incentives to encourage groundwater conjunctive use to meet statewide water needs.
- Legal constraints regarding storage rights, basin judgments, area of origin, water rights, and indemnification.
- Inability to address quality difference in "put" versus "take" water; standards for injection, export, and reclaimed water; and unforeseeable future groundwater degradation.
- Risk that water stored cannot be extracted when needed because of infrastructure, water quality or water level, politics, and institutional or contractual provisions.
- Lack of assurances to prevent third-party impacts and increase willingness of local citizens to participate.
- Lack of creativity in developing lasting "win-win" conjunctive use programs and agreements.
- Different roles and expectations of supplemental suppliers and water managers in relation to conjunctive use.

5.1.4 Findings and Actions for Groundwater Management

5.1.4.1 Findings

- Overdraft requires a response. CID has the appropriate facilities, engineering expertise, and authority to combat overdraft, develop additional conjunctive use opportunities, and develop groundwater recharge and banking projects.
- CID supports local control and management of groundwater through locally adopted and supported GWMPs, and through participation of both CID and CID Cities in the Upper Kings IRWMP.

- CID believes that adjudication should be avoided since it is a complex and confrontational legal process that would redirect resources; both money and time, to court proceedings and expensive studies, and that these resources would be better allocated to developing consensus, designing projects, and implementing the GWMP actions.
- Groundwater banking programs cannot have third party or environmental impacts that are not mitigated in accordance with local, state, and federal requirements.

5.1.4.2 Actions

CID actions identified in the CID GWMP are intended to help overcome constraints and create opportunities. CID will:

- Continue to reach out to the community in order to:
  - Build trust, resolve internal and external differences, and share responsibility for groundwater management.
  - Coordinate economic analysis and equitably match benefits and funding burdens in ways that are acceptable to all parties.
  - Create awareness and understanding regarding overdraft and the problems and opportunities for water management.
- Use the CID GWMP as a guide to define, fund, and implement a Groundwater Mitigation and Banking Program that will include capital facilities projects, programs, and policies to manage available groundwater storage capacity and provide mitigations to groundwater impacts of new urban development.
- Identify federal, state, and regional funding opportunities and seek grants and low interest loans to encourage conjunctive use and groundwater banking.
- Protect overlying groundwater rights and CID rights to the water that is intentionally recharged for the benefits of landowners and rate payers within CID.
- Work with the cities to develop the institutional arrangements and agreements that provide for local control and management of groundwater and establish funding for recharge facilities with tangible yields that provide a long-term, sustainable water supply for new development.

Other primary groundwater management actions include:

- Continue to support the development and maintenance of the Kings Basin Integrated Groundwater Surface Water Model (IGSM) since this is a valuable tool for understanding the regional water budget and how the basin operates (IRWMP Foundational Action No. 16).

- Participate in the Upper Kings Water Forum to evaluate and implement integrated regional projects and solutions.

5.2 Conjunctive Use, Groundwater Recharge, and Banking

Conjunctive use is an important water management strategy recommended by DWR for inclusion in a groundwater management plan.[3] Since overdraft has a potential to cause conflicts within CID and throughout the Kings River Basin, both the CID Board of Directors and the Kings Basin Water Forum have established a priority to develop and implement conjunctive use projects. Development of conjunctive use facilities for groundwater recharge and banking is a primary objective of the CID GWMP.

Conjunctive management of surface and groundwater will improve water supply reliability and reduce groundwater overdraft. Through conjunctive use, CID recharges surface water to increase groundwater storage in the underlying aquifer. Groundwater recharge can be accomplished in two ways: (1) direct recharge by allowing water to infiltrate through recharge ponds or by injecting water into the aquifer using wells, and (2) in-lieu, or indirect recharge which involves providing surface water for irrigation or other uses to replace groundwater pumping. In-lieu recharge leaves groundwater in storage for later use. Surface water can be provided to agriculture without treatment, whereas municipal use of surface water would require construction of water treatment plants. Urban areas cannot use surface water directly unless it is treated, but can benefit from recharge with surface water for subsequent extraction by municipal supply wells.

CID has not developed a groundwater banking program where the benefits of recharged water are specifically accounted for against a specific use or set of users. The historical overdraft and anticipated increases in urban groundwater demands make it appropriate to increase accountability and improve groundwater management through banking.

CID currently does not own or operate wells or other extraction. CID may develop groundwater extraction wells to remove water that it has intentionally stored in the groundwater basin for distribution and use within the service area.

To increase conjunctive use and develop additional groundwater recharge operations, there are three primary considerations; (1) identifying a source of water, (2) defining conveyance to move water to the place of use, and (3) acquiring access to land for construction of recharge facilities.

[3] Conjunctive use, control and mitigate groundwater overdraft, and replenish groundwater are all voluntary components that must be considered for inclusion in the groundwater management plan pursuant to state legislation.

CID surface water sources include its water rights to the Kings River; unregulated flood releases and other local storm water; flood water from the Central Valley Project (CVP) ("215 floodwater"); and imported water from outside the Kings Basin obtained through purchase, exchange, or transfer. Although the Kings River is fully appropriated, there is unregulated floodwater that flows out of the Kings Basin that can be captured and managed for groundwater recharge.

CID conveyance canals are used to deliver surface water for in-lieu or direct recharge. Changes in current operations, expansion of existing conveyance facilities, and/or new facilities will be needed to fully realize the conjunctive use potential within CID.

Land for recharge is needed (through easement or purchase) to construct and operate recharge facilities. Land adjacent or near CID conveyance facilities could be acquired to develop recharge facilities.

5.2.1 Constraints to Conjunctive Use, Groundwater Recharge and Banking

Use of flood flows and other water for recharge and groundwater banking is constrained by conveyance capacity and pond space available for recharge. During the irrigation season, canal capacity to convey flood water is limited. On the canal system that serves the western portion of the District, there is disproportionately greater ponding area and canal capacity has historically been the factor that constrains recharge. On the canal system that serves the eastern part of the District, ponding area is much more limited and is the factor that constrains recharge. Outside of the irrigation season, use of available flood water is constrained by ponding capacity on both systems.

CID's canal system has two main arterials, the Fowler Switch and C&K Canals. Most of the District's recharge ponds are located along the Fowler Switch Canal and its laterals and therefore these ponds can only receive water deliveries through the Fowler Switch. When flood water is available from the Kings River, the Fowler Switch is typically operated near its capacity to deliver recharge water. There are much fewer and smaller recharge ponds located along the C&K Canal. Typically there is capacity available in the C&K when flood water is available from the Kings River, but there are not enough recharge ponds to optimize the available flood water with the capacity of the C&K.

The same can be true of the CVP 215 floodwater from the San Joaquin River, which may be available at the same time that the District's recharge system is operating at full capacity to deliver Kings River flood water. Water imported through transfer or exchange for purposes of recharge and overdraft reduction may be available when CID's canals are not being used for irrigation or flood water diversions, but the price would be high. There is likely to be increased competition and subsequent market prices for Kings River flood water in the future as other entities in the Kings Basin seek to develop this supply.

Previously, there was not accounting of the recharge water that was applied. Creating systems for increased accountability is likely to encounter resistance from those that previously received benefits without charge.

Access to land has been the biggest constraint to the development of new recharge basins. Land acquisition has been constrained by lack of ready cash to respond when land is on the market, and time delays associated with environmental review by public agencies when purchasing land for a specific project. A specific land acquisition program to overcome the constraints is discussed in the next section. Funding limitations and lack of political support from urban interests constrain implementation of physical solutions.

5.2.2 Findings and Actions for Conjunctive Use, Groundwater Recharge and Banking

5.2.2.1 Findings

- Based on evaluations conducted as part of the Upper Kings IRWMP (WRIME, 2006f, 2007b, 2007d;), the CID Board finds that:

    - There is surface water available to CID for recharge.
    - There is available capacity within CID facilities to convey water, though some conveyance facilities may need to be modified or expanded to fully realize the conjunctive use and groundwater banking opportunities.
    - There is land within CID that has appropriate hydrogeologic conditions for additional recharge ponds and that is located near useable CID conveyance facilities.

- The Upper Kings IRWMP provided guidelines for the Integrated Regional Conjunctive Use Program. The guidelines have been, and will be, used by the CID Board to formulate projects to be included in the CID GWMP and groundwater mitigation and banking program.
- Groundwater mitigation and banking projects developed as part of the conjunctive use program will cost effectively meet the goals and objectives of the CID GWMP and Upper Kings IRWMP, while also avoiding environmental impacts, when the following design guidelines are followed.

    - All projects considered must have a tangible, measurable yield in terms of reducing overdraft, increasing regional water supplies, and contributing to overall reliability and the basin's ability to withstand drought.
    - Recharge, flood retention, recreation, and habitat benefits should be integrated as project features where feasible and cost effective.

- Recharge facilities should be located up-gradient of urban areas in order for clean Kings River or imported waters to percolate into the groundwater basin and flow toward municipal well fields.
- Retention ponds may also be located down-slope of developing areas to provide multipurpose storm water and recharge benefits.
- Combined recharge and operational/regulatory storage must be designed into existing irrigation distribution facilities to optimize delivery, improve and protect water quality, and provide environmental benefits where cost effective.
- When possible, incorporate environmental design concepts as recommended by the Water Forum Environmental Work Group.
- Land in critical recharge zones needs to be managed, protected, or acquired.
- Urban expansion should mitigate for loss of recharge from applied surface water irrigation on lands converted from agricultural to urban uses.
- Water stored and banked in the groundwater basin must be recoverable by those that participated and funded development of facilities.
- Recharge operations must not result in migration of any known contaminant plume that would impair water quality for municipal or agricultural uses.
- Groundwater levels will not be allowed to rise to the point where they would affect crops or agriculture productivity.
- The long-term, unmitigated export of native groundwater is prohibited.
- Third party and environmental impacts must be mitigated.
- Those who receive benefits from the project should pay a proportionate share of the costs.
- The benefits of any groundwater banking operation must be clearly identified and measured.
- Any groundwater banking program using imported water will be required to leave a portion of the water in the groundwater basin to benefit the Kings Basin.

5.2.2.2 Actions

Near Term Actions include:

- Expanding the Groundwater Recharge and Banking Program by:
  - Aggressively pursuing new in-lieu or direct recharge projects using available surface water and flood water.
  - Improving and protecting canal conveyance capacity.
  - Developing agreements and funding mechanisms in cooperation with CID Cities.

- Acquiring additional lands for purposes of developing additional recharge capabilities.

- Seek state and federal grant funding or low interest loans to acquire property, design projects, and build facilities in the CID area that are needed to meet BMOs.
- Evaluate maintenance and operations at existing recharge ponds to identify opportunities to increase recharge rates.
- Evaluate the feasibility and opportunity to construct extraction facilities to improve the distribution of recharged and banked water.
- Work with local cities and growers to develop stable funding and financial resources to acquire land and water; provide a local match for state and federal grants; and to design, permit, and build groundwater mitigation, recharge, and banking facilities.
- Evaluate bonding potential for CID.

Longer Term actions include:

- Coordinating with other Kings Basin Water Forum members to aggressively pursue development of additional regional facilities for conjunctive use.
- Using the Water Forum and Upper Kings IRWMP to establish priorities and develop regional conjunctive use facilities.
- Working with CID Cities to evaluate long-term water supply needs.

There is no current imperative to develop municipal surface water treatment plants in CID Cities, but this may be necessary in the future. If urban lands continue to develop and rely exclusively on groundwater, and if recharge facilities are not developed to help meet future urban demands, treatment of surface water for municipal use in lieu of groundwater may be needed. The Upper Kings IRWMP reviews how the cities of Clovis and Fresno have developed surface water treatment facilities to address overdraft in the northern part of the Kings Basin.

5.3 Land Acquisition and Protection of Recharge Areas

Land could be acquired or reserved through a dedicated land acquisition program. In addition to providing water supply benefits, land set aside for recharge or storm water management can also provide multiple benefits for open space, recreation, and habitat. Acquiring the land is the best way to protect vital recharge areas needed to develop projects. Recharge areas can be protected to allow for natural recharge, development of groundwater recharge facilities, and to mitigate the effects of land conversion and urban development. Local city and county land use agencies could apply their land use authorities and develop policies to protect recharge areas or require mitigation for groundwater impacts associated with new development.

5.3.1 Constraints for Land Acquisition

Development pressure in urbanizing areas can result in increased land values, loss of prime recharge areas, and increases in impervious surfaces which results in reduced recharge. The principal constraints to land acquisition are increasing land costs, lack of readily available capital, and inability to rapidly act when willing sellers put land on the market. CID does not have the financial capacity or reserves to take action when viable properties come on the market. As a public agency, CID needs environmental clearance pursuant to the California Environmental Quality Act (CEQA) to acquire property for a specific project purpose such as developing recharge facilities, and this can significantly delay purchase or result in loss of opportunities to purchase property.

5.3.2 Findings and Actions for Land Acquisition for Recharge Purposes

5.3.2.1 Findings

- A cooperative program between CID and the cities is needed to generate revenues to acquire lands when they are available for multiple purposes.
- The CEQA process for recharge projects should be streamlined as much as possible to minimize the evaluation time prior to acquiring the land.
- Eminent domain should not be used except to acquire property for recharge projects. It should be avoided unless there are no other feasible alternatives.

5.3.2.2 Actions

CID will:

- Work with CID Cities and Fresno County to acquire land for multiple benefits including flood control, recharge, open space, and recreation purposes.
- Develop and implement a land acquisition process for acquiring lands through purchase (for direct recharge facilities) or easement (for spreading).
- Streamline the environmental review process to allow a more rapid response to property acquisition opportunities.
- Pursue funding mechanisms to build capital reserves that can be used to acquire property or purchase water for groundwater mitigation and banking purposes.

5.4 Conveyance and Extraction Facilities

CID conveyance facilities move water from the Kings River to agricultural water users and recharge facilities. The conveyance facilities include natural channels and constructed facilities, such as canals, pipelines, and diversion structures. Groundwater aquifers also convey water from recharge areas to areas of pumping. Improvements to the existing conveyance system could provide more flexibility to move water from the available supply sources to existing, improved, or new groundwater recharge facilities. Improved conveyance facilities might also allow surface water to be delivered to a larger irrigation service area within CID in lieu of groundwater pumping. In general, it is believed that adding recharge ponds to the eastern part of the District would be more economically feasible and would provide greater benefits to groundwater than conveyance improvements. Current CID conveyance facilities are also used to provide incidental storm water conveyance benefits. CID currently does not have facilities for extracting groundwater that is intentionally recharged. Such facilities, coupled with the existing conveyance system, could be used to improve operational flexibility and increase the yield. Additional operational constraints are related to the closure of CID canal outlets to the Kings River that were closed as part of the agricultural waivers program. This affects water deliveries and has the potential to limit the full utilization of the canal systems.

5.4.1 Constraints to Conveyance Systems and Extractions

CID does not have funding to construct improvements to its conveyance system. Capital reserves and additional revenue streams would be needed to improve, operate, and maintain conveyance facilities to meet multiple purposes for conjunctive use and storm water conveyance. CID would need to work with cities to resolve funding of conveyance improvements for the purpose of mitigating groundwater impacts. Also, canal recharge is an important part of CID water budget, but recharge rates in existing canals are not well defined, and the benefits of this recharge are hard to document given the limited water measurement capabilities of the District. Extracting and redistributing groundwater for purposes of increasing the operational flexibility and yield could garner resistance from land owners near the extraction location(s).

5.4.2 Findings and Actions for Managing Conveyance Systems

5.4.2.1 Finding

- There is a backlog of deferred maintenance on CID facilities and a need to modernize some components of the existing system.
- There are likely to be conveyance constraints that have not been fully identified that could limit the full utilization of the systems for both storm water and water supply purposes.
- CID Cities currently derive uncompensated benefits from use of the irrigation canals and conveyance facilities for both groundwater recharge and storm water disposal.
- CID needs to work with the cities to protect, preserve, or improve existing capacities in developing areas.

5.4.2.2 Actions

CID will:

- Conduct a study to evaluate conveyance systems constraints and opportunities; identify systems deficiencies and the backlog of deferred maintenance; define priorities; establish costs; and develop a canal improvements plan to meet both supply distribution and storm water conveyance needs.
- Develop a Supervisory Control and Automated Data Acquisition (SCADA) system to improve the monitoring and management of surface water delivered to growers and to recharge facilities, and quantify the benefits. (Consistent with Upper Kings IRWMP Monitoring, Measurement, and Reporting Action 7 – SCADA).
- Work cooperatively with the cities to develop mitigation of impacts to CID facilities associated with new development, increased conveyance of flood waters from the Kings River, and integration of storm water and conjunctive use operations.

In regards to developing a SCADA system, CID recently received grant funding from DWR as part of the DWR's Water Use Efficiency program as discussed further below in the conservation section. CID will begin purchasing equipment to measure and remotely monitor canal operations and report information back to CID headquarters. The program will also result in a plan for further automation to modernize the canal monitoring system, automate operations, and improve District wide water use efficiency and effectiveness.

5.5 Coordinate with Land Use Planning Agencies

Under California law, the management of land use is the responsibility of local government. City and county general plans and the associated goals, policies, objectives, and programs define land use planning requirements for each jurisdiction. General plans guide land use decisions at the city and county level regarding land, water, and natural resources. General plans typically do not provide detailed and comprehensive analysis of water issues since this has been the purview of the water agencies or districts. The city and county general plans and the land use planning process provide local government with an opportunity to integrate land use and water supply decisions. The CID GWMP and IRWMP provide water districts that opportunity to resolve land use and water supply related issues. Changes to state legislation and recent court decisions have increased the informational and procedural requirements regarding consultation between the water management agencies and cities. Appendix A presents a briefing prepared for the CID Board to help evaluate land use and water supply plan integration opportunities.

The Water Forum and IRWMP process provided an opportunity to discuss how to integrate land and water supply plans in order to meet current and future water needs, streamline subsequent project reviews, and avoid potential legal challenges and project delays (WRIME, 2007a). The approach for the IRWMP analysis of land use and water supply integration opportunities was to evaluate how the IRWMP could serve as a tool to further support the city and county general plans goals and objectives. The evaluation was also conducted to identify areas where the general plans could be complemented by the greater detail and emphasis on regional water resources issues available through the Upper Kings IRWMP and the GWMPs for each of the irrigation districts.

5.5.1 Constraints Integrating Land Use and Water Supply Planning

CID Cities' general plans tend to focus on capacity of water and wastewater utilities, and do not recognize the groundwater issues or overdraft. Long-term plans and strategies to mitigate overdraft are not included in CID city general plans or UWMP. City environmental reviews have not recognized overdraft, identified cumulative impacts to groundwater in the Kings Basin, nor identified mitigations for developments which increase groundwater pumping. When new developments are approved, there have not been conditions or requirements to mitigate for groundwater impacts. The Fresno LAFCO has taken an active role in seeking to address groundwater issues prior to permitting annexations.

Development pressure in urbanizing areas can result in increased land values, loss of prime recharge areas, and increases in impervious surfaces that result in reduced recharge. Municipal development in CID relies exclusively on groundwater pumping to meet water demand, whereas agricultural uses prior to development relied generally on surface water to meet water demand. The reduction in applied water upon conversion from agriculture to urban uses reduces incidental groundwater recharge from agricultural irrigation water.

5.5.2 Findings and Actions for Land Use and Water Supply Planning

5.5.2.1 Findings

- City general plans and UWMPs do not recognize overdraft or the limitation of the groundwater source, nor do they define how cities will mitigate water supply impacts of new development by providing a sustainable water supply and defining what projects are planned to meet the total projects' water use.
- Without firm plans for developing and funding water supply projects and ensuring that water supplies are available to meet current and future water demands, the cities will have trouble making sufficiency determinations and complying with statutory requirements; land use decisions may be subject to legal challenge; and economic development could be affected.
- CID Cities need to mitigate for the groundwater impacts of new development as part of the development review process. This can be done through demonstrating that the city is not contributing to overdraft (e.g., requiring the developer or city to procure a new water supply in lieu of using groundwater.

5.5.2.2 Actions

CID will:

- Act as responsible agency and actively engage in the development review process of CID Cities and Fresno County to integrate land use and water supply planning; and ensure impacts to groundwater and CID facilities are mitigated.
- Make findings and adopt policies to be used by staff and the cities such that groundwater impacts are recognized and mitigated during the development review or CEQA review process.
- Encourage CID Cities to use the GWMP as a regional water supply assessment for purposes of complying with SB 610 and 221, but only when such cities have adopted the GWMP and developed plans and funding strategies.
- Work with the developers or water purveyors to provide groundwater mitigations and banking solutions where cities have not mitigated groundwater impacts of new development.
- Continue to work with Fresno County LAFCO to ensure that CID Cities are responsive to CID, acting as a special District, and that the development review process and annexation process are used to effectively mitigate groundwater impacts and impacts to CID facilities, and that approvals of development proposals are conditioned such that impacts are mitigated and funded to the satisfaction of CID.

CID will consider groundwater impact and mitigation fees on urban development, but only in such instances where CID has not developed alternative agreements and funding strategies with CID Cities.

5.6 Groundwater and Related Monitoring

SB 1938 requires that a GWMP describe actions to monitoring and management of groundwater elevations, groundwater quality, inelastic land subsidence, and changes in surface water flows and quality that directly affect groundwater levels or quality or are caused by pumping; and to adopt monitoring protocols. The AB 3030 and SB 1938 voluntary components also recommend monitoring groundwater levels.

The purpose of monitoring is to provide the data needed to identify problems; define and evaluate alternatives; reduce uncertainty when making important resources decisions; measure and document progress in meeting basin management objectives; and to provide data to demonstrate that the anticipated benefits of proposed projects and programs are being realized.

5.6.1 Current Program Efforts

5.6.1.1 Groundwater levels

CID has been monitoring groundwater levels since the 1920s and has well-established quality control and assurance procedures. The current groundwater monitoring program consists of about 80 wells spaced on a 2-mile grid throughout the District. These data are submitted to both KRCD and DWR and are compatible with the formats and requirements for submission to DWR for the Groundwater Ambient Monitoring and Assessment (GAMA) Program.

Figure 5.1 shows the location of the wells in the current network. Figure 1.3 presented in Chapter 1 provided a summary of the long-term groundwater trends based on an average of these wells. Individual well hydrographs can be provided at the specific well locations that are included in the program. In addition, the well data can be used to prepare water level contour maps for specific time periods. Chapter 4 provided examples of regional water level maps and how they are used to help create understanding of the groundwater conditions and storage changes over the region.

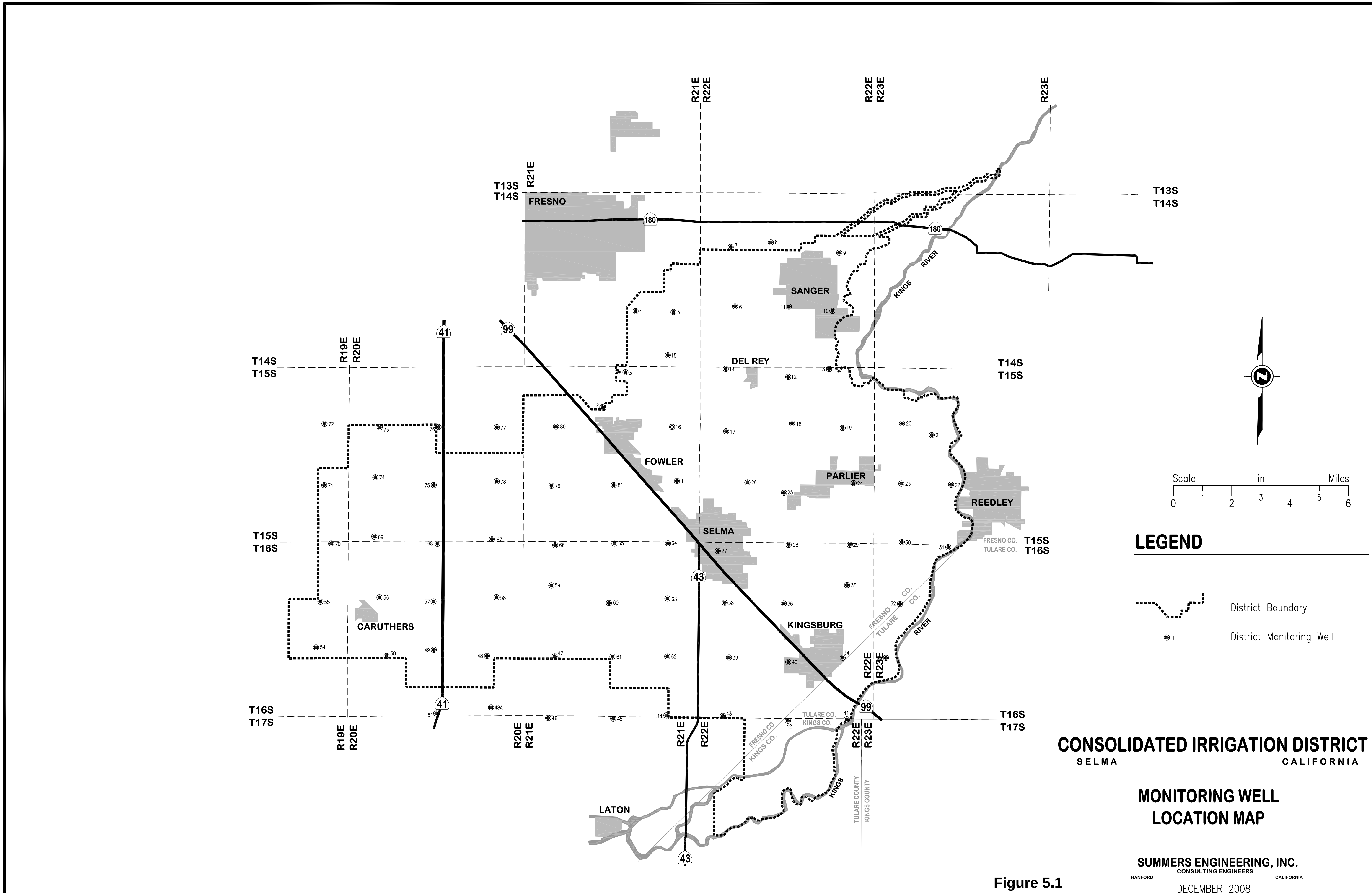
5.6.1.2 Groundwater Quality

As part of the Upper Kings IRWMP, the report "Water Quality Standards, Conditions, and Constraints" (WRIME, 2007c) was produced to document regional water quality conditions. It explained the sources of surface and groundwater quality information, reviewed the historical and current groundwater and surface water conditions, identified data gaps, and evaluated the groundwater and surface water effects for purposes of recharge project development. It further documented a monitoring program intended to qualify sites for recharge, support environmental compliance, and document post-project benefits. The report provided a first step in defining pre- and post-project monitoring approaches to be implemented as part of the recharge project development process.

There is no regional, ambient groundwater quality monitoring network. CID does not monitor groundwater quality. CID Cities monitor water quality at municipal wells to ensure compliance with drinking water standards and this data is available through Department of Health Services (DHS).

There are a large number of groundwater monitoring sites related to ongoing remediation and groundwater clean-up operations. Some of this data may be available for multiple years and could have value in evaluating sites for recharge projects.

CID's well replacement program, which was discussed earlier, includes the use of larger (4" or 6") diameter well casings for all new wells to accommodate pumping and sampling for water quality data.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SANGER
DEL REY
FOWLER
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REEDLEY
SELMA
KINGSBURG
CARUTHERS
LATON
KINGS RIVER
LEGEND
District Boundary
District Monitoring Well
Scale in Miles
0 1 2 3 4 5 6
CONSOLIDATED IRRIGATION DISTRICT
SELMA CALIFORNIA
MONITORING WELL
LOCATION MAP
SUMMERS ENGINEERING, INC.
CONSULTING ENGINEERS
HANFORD CALIFORNIA
DECEMBER 2008

Figure 5.1

5.6.1.3 Inelastic Land Subsidence

There is currently no local or regional program to monitor land subsidence in the Upper Kings River area. Such a program was recommended for development as part of the Upper Kings IRWMP.

5.6.1.4 Surface Water Flows and Quality

Surface water flows are regularly monitored by the USGS. In addition, KRWA collects diversion and flow data and maintains an extensive database on the releases from Pine Flat Reservoir. More recently, KRCD monitors surface conditions and fishery health as part of the Fishery Management Program.

There is limited long-term surface water quality data available for most of the water bodies in the San Joaquin and Tulare Lake region, including the Kings River. There has been no long-term comprehensive ambient monitoring or assessment program, although recent efforts by the South San Joaquin Valley Water Quality Coalition (SSJVWQC) have resulted in monitoring of sites on the Kings River since 2004 under the Regional Water Quality Control Board's (RWQCB) Irrigated Lands Conditional Waiver Program. This effort is coordinated by KRCD in the Upper Kings Region.

5.6.1.5 Data Management and Reporting

CID maintains its own groundwater level and surface water diversion data sets. Collected data is managed in spreadsheets by CID. The data is also provided to KRCD and DWR for inclusion in the monitoring and reporting program for the entire Upper Kings Region. In the past, CID has supported KRCD in developing regional reports of the groundwater conditions. The USGS gauged flows are available on line. KRWA annually reports surface water diversions from the Kings River. Surface water and groundwater quality data are contained in a host of local, state, and federal databases. DWR and KRCD are working to develop regional data management tools that can be used to access both surface water and groundwater data via the internet.

5.6.1.6 Special Studies and Investigations

There have been a host of studies with specific and limited objectives and these provide valuable insights in terms of pre- project planning and feasibility study. The IRWMP technical reports should be referenced for further information. These reports may be used to explain background conditions, support environmental determinations, focus feasibility studies, and design efforts for CID proposed projects.

5.6.1.7 Recommended Upper Kings Monitoring Program

In order to increase the cost effectiveness and utility of the various data collection efforts in the Upper Kings Region, the Upper Kings IRWMP included monitoring, measuring, and reporting (MMR) and Data Management (DM) Actions. These include:

- MMR Action 1 - Upper Kings IRWMP Annual Reporting.
- MMR Action 2 - Groundwater Level, Quality, and Flow Monitoring of Recharge Facilities.
- MMR Action 3 - Conduct data network evaluation and design regional monitoring plan.
- MMR Action 4 - Develop regional monitoring wells.
- MMR Action 5 - Fishery monitoring program.
- MMR Action 7 - Supervisory Control and Automated Data Acquisition for Irrigation Systems.
- MMR Action 6 - Water Quality Monitoring.
- DM Action 1 - Develop and Implement Regional Data Management System.
- DM Action 2 - Expand Regional Data Management System and Connect to Statewide System.

The monitoring network evaluation will more firmly establish procedures, locations, and frequencies for measurements or samples to be taken, and will seek to build upon the work of the GAMA program. The DMS is intended to facilitate transfer and reporting not only locally but also to the Surface Water Ambient Monitoring Program (SWAMP) and GAMA Program. The results of the existing and expanded program will be reported annually to the Forum and used to track progress in meeting the BMOs and to change and reprioritize actions as part of the adaptive management strategy included in the IRWMP. The resulting data and reporting will also support the community affairs and outreach program and be used to gain support for further groundwater management actions and capital projects, including use of the information when preparing engineering reports and informing the public when seeking to gain voter approvals as required by Proposition 218. All projects will collect data to monitor individual project performance to demonstrate any required mitigations are implemented and the anticipated benefits are being realized. Monitoring will address the following issues and lead to efficient and effective management.

- Groundwater quality degradation; changes in surface flow and surface water quality. The IRWMP report, Water Quality Standards, Conditions, and Constraints Technical Memorandum (2006), documented baseline water quality conditions and provides a yardstick from which to compare future changes under “with” and “without” project conditions.
- Inelastic land surface subsidence. The need for monitoring to evaluate subsidence is to be evaluated as part of the data network evaluation.

- Groundwater levels, availability, water in storage, and/or beneficial uses. Each project is subject to monitoring requirements under a specific quality assurance plan. An annual report prepared by KRCD with support from CID will be used to evaluate project implementation benefits and trigger subsequent actions.

5.6.2 Constraints to Regional Monitoring

There are limited financial resources to support regional monitoring or to conduct specific studies of current conditions. The general lack of data and the limited accessibility presents a challenge to clearly documenting existing water quality conditions. Available water quality data is in both hard copy and digital formats and widely dispersed with many agencies. Hard copy data are not readily accessible, and electronic data are in multiple formats that complicate capture, comparison, and evaluation. There was limited continuous data to document changes over time or evaluate seasonal cycles that can affect water quality and recharge operations. Groundwater data was also spatially limited and did not represent the entire CID or IRWMP geographic area or all of the possible depths where water is pumped. Significant information was available for the area near cities such as Fresno and Clovis and in depth ranges typically utilized for water supply while limited information was available for more agricultural portions of the Upper Kings IRWMP Region and for aquifers above or below typical water supply aquifers.

5.6.3 Findings and Actions for Monitoring

5.6.3.1 Findings

- CID has a comprehensive groundwater level monitoring program in place, which utilizes an existing grid of District-owned and maintained monitoring wells.

- Water quality conditions and available data in the Kings Basin indicate that:

  - The water released from Pine Flat is of excellent quality suitable for agricultural uses and groundwater recharge.
  - Kings River water or water imported from the San Joaquin River through the Friant Kern Canal may also be suitable for municipal use with moderate levels of treatment.
  - Available data for inorganic, trace element, and organic water quality constituents did not show major design or regulatory compliance issues or constraints with surface water sources available to the Upper Kings Region.
  - Groundwater is generally clean and meets water quality standards in most areas, though there have been some problems in meeting requirements at a number of drinking water wells.

- Recharge of high quality Kings River surface water will provide a net benefit to groundwater quality.

- Participation by CID and the cities within CID in the Upper Kings proposed monitoring will decrease the overall cost and increase the overall information content and should be supported.

5.6.3.2 Actions

CID will:

- Continue, and may expand, its current groundwater level monitoring program; including its monitoring and maintenance and replacement efforts.
- Adopt pre- and post-project monitoring protocols to support project development and to document project benefits.
- Conduct Phase I Environmental Assessments for all potential recharge sites.
- Consider participation and co-sponsor in a regional monitoring program to evaluate subsidence should such a multi-participant program be developed.
- Produce an annual water resources report that:
  - Describes water resources and groundwater conditions; including groundwater levels hydrographs, groundwater contours, diversions, recharge estimates, and change in storage. This report could also include a summary of hydrologic conditions in the Kings Basin.
  - Describes the progress made in implementing management activities and the effects of these activities on meeting basin-wide and local management area BMOs; present details of implementation activities and describe developments in the basin that are not part of the groundwater management plan implementation, but that impact groundwater conditions in the basin (e.g., level of development, siting of new industrial facilities, newly identified contaminant plumes, and trends on water quality).

- Continue to participate in and support KRCD Groundwater Levels Monitoring and Annual Reporting program as defined in the Upper Kings IRWMP implementation plan (Upper Kings IRWMP Foundational Action No. 15 and No. 17).
- Support KRCD in implementing a Water Resources Data Base Management Enhancement Program as defined in the Upper Kings IRWMP implementation plan (IRWMP Foundational Action No. 14).

5.7 Other AB 3030 and SB 1938 Voluntary Components of the GWMP

This section briefly discusses each of the management measures that are voluntary components of a GWMP and were considered by the Board.

5.7.1 Conservation

5.7.1.1 Urban

Urban water suppliers are required by the Urban Water Management Planning Act to update their UWMP and submit a complete plan to DWR every five years. An UWMP is required in order for a water supplier to be eligible for DWR administered State grants and loans and drought assistance. An UWMP is considered to be a source of information for Water Supply Assessments (Senate Bill 610) Water Code §10613 et seq. (Added by Stats. 2001, c. 643), and Written Verifications of Water Supply (SB 221) Water Code §66473.7 (Added by Stats. 2001, c. 642).

A UWMP should serve as a long-range planning document for water supply, a source of data for development of a regional water plan like the Upper Kings IRWMP and CID GWMP, and a source document for cities and counties as they update General Plans. CID and the Water Forum used the UWMPs of cities and their general plans to prepare the historical and future water budgets and apply the Kings IGSM. The Kings IGSM water budgets documented overdraft and the information is part of the Upper Kings IRWMP and CID GWMP (Chapter 4). CID recommends that the cities incorporate the regional water budget information into the updates of their UWMP.

Since CID Cities are 100 percent reliant on groundwater, they should also anticipate including a copy of the CID GWMP into their UWMP (Water Code section 10631). This will also meet UWMP requirements to provide a description of any groundwater basin from which the urban water supplier pumps groundwater. The UWMP will need to note that DWR has identified the Kings Basin as being overdrafted and reference the technical studies from the Upper Kings IRWMP which provide substantial evidence of overdraft. Pursuant to State law, CID Cities, or the utility serving the city, must provide a detailed description of the efforts being undertaken to eliminate the long-term overdraft condition.

Projects being included in the GWMP could help CID Cities identify water supply that could be included in the cities' UWMP and help the cities document that there is a long- term, sustainable water supply available in normal, dry, and multiple dry years over the 20 year planning horizon.

CID encourages CID Cities to implement the water conservation best management practices into their UWMP as recommended by the California Urban Water Conservation Council and DWR (DWR, 2005).

5.7.1.2 Agricultural

Through the conjunctive use operations, CID makes best use of available natural runoff and manages the Kings River water rights as efficiently as possible. District wide efficiency is measured by the amount of water diverted versus the amount of water that is delivered to independent farming operations or that is recharged to the groundwater basin. District wide efficiency within CID is very high since there are virtually no return flows to the Kings River and very little water is lost within the system. Non-evaporative conveyance losses in CID's unlined canals benefit the groundwater basin through deep percolation. Likewise, applied irrigation that is not consumed through evapotranspiration provides benefits to the groundwater basin as a result of deep percolation. CID also advocates efficient on-farm practices through the publication of its periodic newsletter.

The Agricultural Water Management Council works with agricultural water districts like CID to define Efficient Water Management Practices (EWMPs). The status of EWMP in CID is briefly discussed below.

- **Preparing and adopting water management plans**. CID is not required to adopt an agricultural water management plan since it is not a federal water contractor. CID works with growers, KRCD and other irrigation districts in the Kings Basin to implement EWMPs.

- **Supporting water management services**. KRCD is designated as a water conservation coordinator in the Upper Kings Region and provides Mobile Irrigation Laboratory services to CID. KRCD also provides pump efficiency testing as part of the integrated water and energy conservation program supported by CID.

- **Improving communication and cooperation.** Both KRCD and KRWA work to improve communications and cooperation regarding agricultural water conservation and conservation of the King River. The Water Forum, along with the existing KRCD and KRWA communications channels, will continue to be used by CID.

- **Evaluating the need, if any, for changes in policies of the institutions**. The greatest opportunities for further conserving CID Kings River water is through the GWMP and expansion of the District's historic conjunctive use and banking program. As discussed in other parts of the GWMP, development and implementation of projects may imply some changes in CID policies and institutional arrangements for funding, land use planning, and working with CID Cities and Fresno LAFCO.

The following are conditionally approved EWMPs that are subject to net benefit analysis.

- **Facilitating alternative land use.** Within the Upper Kings Region, crop usage is the purview of the landowners, which decide the appropriate crop mix and type. Local government at the city and county level is responsible for general land use and zoning decisions. The Upper Kings IRWMP and CID GWMP seek to define policies and actions to integrate land and water use plans and decision-making, protect recharge areas, and provide multiple benefits.

- **Facilitating financing of capital improvements for on-farm irrigation systems**. Currently there are no local programs to finance on-farm improvements. The most cost-effective improvements with conservation benefits are related to capital investments in existing or new facilities, and improvements like the proposed SCADA system.

- **Facilitating voluntary water transfers that do not unreasonably affect water users, water suppliers, the environment, or third parties.** CID works to facilitate voluntary water transfers that do not unreasonably affect water users in their districts or others in the KRWA. Transfers have historically occurred with the KRWA family under the specific policies and procedures that govern transfers of Kings River water between KRWA members or other entities. Transfers between districts can also provide for additional groundwater storage in wet years. If a district with soils not well suited for percolation transfers their water to a district with highly permeable soils, that water may stay in the basin rather than being lost through the James Bypass. Fresno County also has policies to prevent any transfers of water that would have impacts to a third party and specifically prohibits the transfer of water out of the county. CID may enter into contracts to transfer surface water to municipal entities as part of the program to reduce groundwater use and provide direct or "in lieu" surface water.

- **Lining or piping ditches and canals**. Lining and piping ditches within CID to conserve water only makes sense in specific conditions. Water "lost" during conveyance from the point of diversion to the point of use is a "gain" to the groundwater basin and an important part of the conjunctive use and groundwater recharge program. CID lines or pipes ditches when necessary to improve delivery efficiency to their customers or at times when new urban development would affect operations or increase liability. CID may also line canals due to high water tables or seepage areas that are impacting permanent crops. Otherwise, unlined canals and ditches are consciously used as part of the conjunctive use operations of existing facilities and provide additional groundwater recharge within the basin.

- **Increasing flexibility in water ordering.** CID has a well-defined system for ordering and delivery.

- **Constructing and operating water supplier spill and tailwater recovery systems.** CID connections to the Kings River that historically allowed operational spills back to the river have been closed as part of the agricultural waivers program. As a result, there are no lost operational spills available for recovery and tailwater that is not beneficially used for agricultural purposes is recharged to the groundwater basin. The loss of connection to the Kings River has resulted in some operational inefficiencies and reduced the ability to make best use of some of the canals. This also has increased the need to incorporate operational storage into proposed recharge ponds along some of the canals.

- **Automating canal structures**. With a grant from DWR's water use efficiency program, CID is currently conducting an evaluation and pilot study for a canal level monitoring network that might eventually be expanded to a Supervisory Control and Automated Data System (SCADA). The study will also identify opportunities for further operational improvements, documenting groundwater recharge benefits, and improving water accounting.

- **Development of a regional groundwater model**. CID, as part of the Upper Kings Water Forum, participated in development of the Kings IGSM. The ability of this model to predict hydrologic response to management decisions will aid CID in planning for the future of the basin.

- **Development of a plan for basin-wide groundwater quality monitoring**. The development of a basin-wide groundwater quality monitoring program would assist in identification of groundwater contamination. CID would consider participating in a Kings Basin regional water quality monitoring program should one be developed for the Upper Kings Region.

5.7.1.3 Findings and Actions for CID for Water Conservation

5.7.1.3.1 Findings

The Water Forum adopted solutions for conservation that were included in the Agreements in Principle adopted by the elected bodies of the stakeholders. These have been adapted for inclusion in the CID GWMP:

- CID will support urban and agricultural water conservation.
- UWMPs should be developed by CID Cities as required by state law to guide public agency investments in water conservation within the region and to help consolidate water resource data for purposes of water resource planning.
- CID works with growers, irrigation districts, and KRCD to implement on-farm practices that are consistent with the guidelines and requirements of the Agricultural Water Conservation Council.
- CID area-wide efficiencies are relatively high and any delivery system losses are gains to the groundwater basin.
- On-farm efficiencies are high when the return flows to the groundwater basin from surface water applications are accounted for and recharge benefits are recognized.
- The benefits of on-farm or municipal conservation are primarily associated with the reductions in groundwater pumping that come with increased efficiency and result in water remaining in storage in the groundwater basin for use in a dry period.

5.7.1.3.2 Actions for Water Conservation

CID will:

- Work with the cities to:
    - Integrate the CID GWMP into the UWMP and to define capital facilities that could help CID Cities ensure a long-term, sustainable water supply.
    - Adopt Best Management Practices (BMPs) defined by the Urban Water Conservation Council.
- Work with the KRCD and other irrigation districts to investigate the feasibility of developing a program with low interest loans and grant funding from the state to assist growers in acquiring water saving technologies.
- Continue to promote the use of the KRCD mobile irrigation laboratory by growers within CID.
- Complete the canal monitoring and SCADA system study and continue to seek grants and funding to implement a canal modernization plan (See Upper Kings IRWMP Monitoring, Measuring, and Reporting Action 7- SCADA).

- Implement EWMP where they will lead to real water savings and are proven cost effective through net benefit analysis.
- Work with KRCD and the other Water Forum members to operate and maintain the Kings Integrated Groundwater Surface Water Model.

5.7.2 Recycling

The Upper Kings IRWMP contained an evaluation of the use of recycled water. The Upper Kings IRWMP found that use of recycled water in lieu of groundwater pumping for non-potable uses, including agriculture, would benefit the Kings Basin by allowing more water to remain in groundwater storage, but that the water budget benefits and yield of recycled or reclaimed water projects only accrue where the sources of wastewater are originally from surface water, and not from pumped groundwater. The Forum also found that wastewater treatment plant upgrades and 'purple' pipe distribution facilities are expensive and not cost effective when compared to currently permitted practices for disposal of wastewater in most areas of the Upper Kings Region. Specific recycled water opportunities that should be reviewed in greater detail include the Selma-Kingsburg-Fowler Sanitation District regional treatment plant.

To achieve that potential, CID and others in the Upper Kings Region would need to make substantial investments in additional treatment and distribution infrastructure. Within CID the Selma-Kingsburg-Fowler Regional Sanitation District and the other municipalities treat and dispose of wastewater under permit from the RWQCB. There is currently very little wastewater discharged directly to the Kings River, and therefore, very little wastewater currently is flowing out of the CID area. There is a potential to match treated water quality to appropriate uses (e.g., power generation, urban landscaping) as part of an In-Lieu Recharge Program.

5.7.2.1 Findings and Actions for Recycling

The current wastewater disposal practices result in recharge to the groundwater basin consistent with the current standards, permits and requirements of the RWQCB and actions to upgrade to higher levels of treatment to allow for direct reuse are not currently cost effective.

5.7.2.2 Actions for CID for Water Conservation

CID will work with cities and the SKF Regional Sanitation District to support the reclamation and reuse of reclaimed wastewater when determined to be cost effective and safe in comparison to other alternative supplies.

CID will encourage the use of reclaimed wastewater in-lieu of groundwater.

5.7.3 Identify Recharge Areas

Analysis conducted as part of the Upper Kings IRWMP resulted in regional characterization, identification, and mapping of areas with a potential for recharge. In the long term, loss of these recharge areas through urbanization could have significant impacts on the water budget of the basin. The areas using surface water for irrigation are a key component of the overall water budget and the conjunctive use operations in the Kings Basin. Areas using surface water reduce the reliance on groundwater.

5.7.3.1 Actions Related to Identifying and Managing Recharge Areas

CID will:

- Use the recharge potential maps to help evaluate potential sites for additional recharge facilities.
- Seek funding to conduct site specific investigations and hydrogeologic studies to further identify areas that should be protected from urban development or that could be used to expand the conjunctive use and groundwater banking program.
- Continue to participate in the land use planning process to seek mitigation of the effects of new development on the water budget.
- Work with CID Cities to protect recharge areas, including CID canal facilities, which provide recharge benefits. CID will provide information or encourage the cities to use existing information during the development review process and work to protect and manage recharge areas.

5.7.4 Identification and Management of Wellhead Protection Area

The purpose of wellhead protection is to protect the groundwater used as a public supply, thereby reducing the costly treatment otherwise needed to meet relevant drinking water quality standards. A Wellhead Protection Area (WHPA), as defined by the Federal Wellhead Protection Program established by Section 1428 of the Safe Drinking Water Act Amendment of 1986, is "…the surface and subsurface area surrounding a water well or wellfield supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield." The WHPA may also be the recharge area that provides the water to a well or wellfield. Unlike surface watersheds that can be easily determined from topography, WHPAs can vary in size and shape depending on subsurface geologic conditions, the direction of groundwater flow, pumping rates, and aquifer characteristics. Identification of WHPAs is a component of the Drinking Water Source Assessment and Protection (DWSAP) Program administered by California Department of Health Services (DHS). DHS set a goal for all water systems statewide to complete Drinking Water Source Assessments by December 31, 2002. The Cities have completed their required assessments by performing the three major components required by DHS.

CID has not been an active participant in the process, but supports actions by municipal water purveyors and the state to protect water quality for municipal uses.

5.7.4.1 Actions Related to Regulating the Migration of Contaminated and Poor Quality Groundwater

CID is not a regulatory agency, but will continue to track and participate in the efforts of the county and state related to protection of water quality. CID has a vested interest in ensuring preservation and protection of water quality for agricultural and municipal beneficial uses. CID will:

- Continue to track RWQCB, the Department of Health Services, and other local regulatory efforts to identify impacts or benefits to CID programs.
- Consider water quality conditions and any potential effects to water quality when designing and evaluating recharge facilities and during the final environmental review of the proposed land acquisition program.
- Participate in regional monitoring and data sharing as part of the Upper Kings IRWMP.

5.7.5 Well Construction, Abandonment and Destruction Programs

The well construction and destruction program for the majority of CID is managed primarily by Fresno County. One of the primary concerns of local agencies is the groundwater contamination risk posed by unused wells that have not been properly destroyed.

The Fresno County Environmental Health Division (Fresno County EHD) administers the well permitting program within CID. The well construction standards implemented by EHD are consistent with those recommended in State Water Code Section 13801. This section of State Water Code requires counties, cities, and water agencies to adopt the State Model Well Ordinance as a minimum standard for well construction or a more rigorous standard if desired. These standards are delineated in *California Well Standards, Bulletin 74-81*, and all supplements for areas of the county. The Fresno County EHD staff also issue applications and review construction plans and specifications for wells drilled in the county. The EHD requires and maintains well logs and water well driller reports for constructed wells.

Operating permits for wells utilized for public drinking water are provided through either DHS or Fresno County EHD, depending on the number of service connections. The DHS has jurisdiction over public water system wells with over 200 service connections.

Well abandonment and destruction is part of Fresno County EHD's regulatory responsibility. It is believed that there are unknown, obsolete, or abandoned water supply wells within CID. These wells may provide potential locations as a source of contamination between aquifers or from saline water sources at depth. Section 21 of DWR Bulletin 74-81 and revisions contained in Part II of Bulletin 74-90 allow classification of unused wells into two types: abandoned and inactive. An abandoned well is defined as one that has not been used for a period of one year and whose owner has declared the well will not be used again. If the well has not been used during the past year but the owner demonstrates his/her intention to use the well again for supplying water, the well is considered inactive. Four criteria must be met in order for a well to maintain an inactive rather than abandoned classification. These criteria include: the well has no defects; the well is securely covered; the well is clearly marked; and the surrounding area is kept clear of brush and debris.

Failure to meet these criteria could result in the well being classified as abandoned under current regulations. All abandoned wells, exploration or test holes, and monitoring wells must be destroyed as stated in Section 22 of Bulletin 74-81 and revisions contained in Bulletin 74-90.

An abandonment program should focus on those wells that pose the greatest threat to groundwater; however, numerous factors make the abandonment and destruction of wells difficult. These factors include lack of consistency in records regarding well construction, location, and use; cost of well destruction; and the defined classification for abandonment of wells. Recent records pertinent to construction and location of new wells are more complete than earlier records that are often inconsistent. The lack of financial incentive for well owners to declare a well as abandoned also reduces the effectiveness of the well abandonment program.

5.7.5.1 Actions for CID Participation in Well Abandonment and Destruction Programs

CID has an interest in protecting water quality and supports construction and destruction of wells in accordance with local laws and regulations. CID currently does not operate wells and has no role in regulating well construction.

CID will continue to monitor and track the actions of Fresno County EHD, State DHS and DWR for any changes to the existing local ordinances, state code, or well standards that could influence CID operations or which could adversely affect groundwater in the CID area.

5.7.6 Control of Saline Water Intrusion

Saline water intrusion is not an issue within CID. CID will continue monitoring groundwater conditions and will note changes in water quality. This management measure is not applicable to CID, and no further actions are anticipated or planned.

5.7.7 Regulate the Migration of Contaminated and Poor Quality Groundwater

Groundwater in CID is considered to be good quality. CID is committed to protecting the ambient water quality. The Regional Water Quality Control Board (Region 5, Central Valley Region), is primarily responsible for the regulation, management, and protection of water quality in the Kings Basin. Contamination issues are typically localized and relatively manageable.

5.7.8 Develop and Operate Groundwater Contamination Cleanup

CID is not actively engaged in any groundwater contamination or cleanup projects and defers to the RWQCB to hold responsible parties accountable for contamination incidents.

6 Stakeholder Involvement

Creating public awareness of the groundwater issues and opportunities in the Kings Basin and CID portion of the basin is for creating a consensus on a course of action. The Stakeholder involvement and effort has been a combination of activities conducted specifically within CID, but also as part of the larger effort to develop and adopt the Upper Kings IRWMP. Both of the outreach and stakeholder efforts have been an important part of the efforts to create a collaborative working environment to address overdraft compliance with provisions of the Groundwater Management Planning Act of 2002.

6.1 CID GWMP

CID has sought to engage the public, CID Cities, and other stakeholders in the area. Throughout the GWMP planning process, other interested agencies and entities were encouraged and invited to participate in developing the GWMP. The following outreach and stakeholder actions have occurred.

The CID Board held a publically noticed discussion of the GWMP during its regularly scheduled Board meeting on February 13, 2008. A copy of the PowerPoint for the public presentation used at the kick-off meeting for the GWMP is in Appendix B.

To increase participation and generate awareness regarding the GWMP, the CID Board hosted a "Groundwater Summit" on April 12, 2008, at the Spike and Rail conference facility in Selma. CID sent out invitations to members of the city council, city planning, and public works staff; developers; and business interests to inform the community regarding the planning process, schedule, GWMP content, and how the public could participate and provide comments. The purpose of the meeting was to obtain input from the community and to provide the CID Board an opportunity to inform the community on the conditions of the Kings Groundwater Basin, and the purpose and need for the CID GWMP. The meeting allowed various stakeholders to share their perspectives and expectations related to groundwater management within the CID planning area. The meeting notice and PowerPoint presentation of the staff, Board members, and CID consultant are presented in Appendix C. During this meeting persons were informed how the regular Board meetings would be used to provide additional opportunities to discuss the plan, and for staff and the consultant to appraise the Board of progress.

CID Board members and the public were then briefed at their regularly scheduled public board meetings to keep them informed of the progress of the GWMP.

CID board scheduled a hearing to discuss the draft GWMP to provide information to the public as to the content of the draft plan, and to receive comments. Instructions were provided to the public for the submission of written comments. CID obtained the name, phone number, and the address of any contact person who provided written comments. The CID then proceeded to prepare a final plan.

Upon the completion of the GWMP, a notice of intent was published in anticipation of the adoption of the plan. The notice included a summary of the plan and stated the means by which copies of the GWMP could be obtained, and a public hearing was conducted to receive comments. All necessary noticing, Board agendas, and documentation of Board actions are provided in Appendix D.

6.2 Upper Kings IRWMP and GWMP Public Process

The public process of the IRWMP and GWMP were closely interrelated by design, and the IRWMP efforts were fully intended to support groundwater management planning by the Districts.

The Water Forum was open to all stakeholders of the Kings Basin during the development of the IRWMP, and stakeholder involvement has been an important component of the success of the IRWMP and the subsequent updates to the more localized GWMPs. The Water Forum process started in 2004 and included sending open invitations to local water and land use agencies, regional agencies, cities, counties, and environmental groups to join the Water Forum. Throughout the planning process, the local, state, and federal resource and regulatory agencies; landowners; and the public were invited to Water Forum meetings in order to be inclusive and obtain a wide range of perspectives. The agencies and public have been provided the opportunity to review, address, comment upon, and provide input to the process.

Upper Kings Water Forum

- Kings River Conservation District
- Alta Irrigation District
- Consolidated Irrigation District
- Fresno Irrigation District
- Raisin City Water District
- County of Fresno
- County of Kings
- County of Tulare
- City of Clovis
- City of Dinuba
- City of Fresno
- City of Fowler
- City of Kerman
- City of Kingsburg
- City of Parlier
- City of Reedley
- City of Sanger
- City of Selma
- Fresno Audubon Society
- California Native Plant Society, Sequoia Chapter
- Kings River Fisheries Management Program Public Advisory Group
- El Rio Reyes Conservation Trust
- California Water Institute
- California Department of Water Resources
- California Department of Fish & Game
- Regional Water Quality Control Board
- Kings River Water Association
- Sierra Club

A Water Forum Technical Advisory Committee has been formed to oversee technical studies, provide peer review, support exchange of data, and inform the decision-makers at the Water Forum and policy level. The Technical Advisory Committee would be used to provide review of CID GWMP, LGWA grant-funded projects and CID project related work products.

In 2005, with the support of the Education and Community Affairs Work Group, the Public Outreach and Community Affairs Strategy (KRCD, 2005b) was prepared to outline the stakeholder coordination process. The Upper Kings IRWMP, along with the Public Outreach and Community Affairs Strategy, are living documents to be coordinated by the Water Forum with support to be provided by KRCD.

The strategic objectives for public outreach were transformed into messages that were conveyed through appropriate tools and media. It was planned that the Water Forum's public outreach effort would utilize a combined approach of community relations and mixed media to reach the target audiences. The tools identified and applied included:

- Stakeholder meetings
- Speakers' bureau
- Community relations
- Editorial and media relations
- Long format video
- Website
- Printed materials

Most of the efforts made were geared toward decision-making audiences to assist the Water Forum with the adoption of resolutions and to provide support for funding requests.

In total, the Water Forum met 14 times with attendance ranging from 16 to 25 persons. Forum members informed the respective elected bodies at regularly noticed public meetings as incremental progress was made during development of the IRWMP. Special efforts were made in working to adopt the Principles-of-Agreement in support of the IRWMP. The general managers of each of the water districts attended meetings of the other stakeholder decision-making bodies to explain the need and purpose for the IRWMP and Principles-of-Agreement.

In accordance with the Outreach and Community Affairs Plan, numerous special meetings or workshops were conducted, and a host of work group or subcommittee meetings were used to address specific topics.

Numerous stakeholder meetings were conducted with elected and governmental officials along with group meetings with representatives from agricultural, urban, and environmental representatives. The following is a summary of other stakeholder and community affairs activities conducted.

- Subcommittees (total of 46 meetings, average number of attendees ranged from 4-30):
    - Planning and Steering Committee (15 meetings)
    - Technical Analysis and Data Work Group (9 meetings)
    - Water District General Managers Committee (10 meetings)
    - Environmental Stakeholders Work Group (3 meetings)
    - Land Use and Water Supply Committee (5 meetings)
    - Education Committee (4 meetings)
    - Workshops (total of 5 workshops with approximately 100 attendees):
    - Public Works Workshop on Water Quality and Infrastructure
    - Planners Workshop to Review General Plans and Integrate Land Use and Water Supply Planning
    - Public Meetings (one each in AID, CID, and FID service areas to orient the public and local decision-makers)

Presentations were made to governing boards, environmental groups, and rotaries as a total of 25 presentations were made.

Local newsletters were utilized to inform and educate residents, businesses, and elected officials about Water Forum activities. The following is a summary of those articles:

- KRCD News, Winter 2006/2007 Issue – "Water Forum Looking For Grant Funding"
- KRCD News, Fall 2006 Issue – "Upper Kings Basin Water Forum Progresses With regional Planning For Projects"
- KRCD Newsletter – mailed to over 8,500 residents within KRCD's service area

Key reporters for local papers were periodically updated about Water Forum activities resulting in several stories in the Fresno Bee.

- The Fresno Bee, Local and State section, "Group touts four water projects"
- The Fresno Bee, Local and State section, "Fresno Co. may catalog water supply" (Benjamin, 2005b)
- The Fresno Bee, Local and State section, "Agencies to tap sources for water" (Benjamin, 2005a)
- The Fresno Bee: Local and State section, "Group takes regional course" (Upper Kings Water Forum is formed) (Pollock, 2004)

Printed materials were developed to support educational efforts. Approximately 1,000 copies of the educational materials were distributed during speakers' bureaus, workshops, and other events.

- November 2005 – Hydrologic Modeling of the Kings Groundwater Basin /A White Paper (14-page book)
- August 2006 – Upper Kings Basin Water Forum and the Upper Kings Integrated Water Management Plan (2-page overview)
- October 2006 – Position Statement/Principles: Integrated Water Quality and Sustainable Infrastructure Program for Clean and Safe Water (6-page document)
- November 2006 – Upper Kings Basin Water Forum – Briefing Booklet (40-page book)

There is a commitment by CID and the Water Forum for ongoing public involvement in the implementation of the IRWMP, and the implementation plan recommends that KRCD revise the existing community affairs plan to continue the process and promote the IRWMP and GWMP efforts.

6.3 Developing Relationship with State and Federal Agencies

CID is currently working with KRWA, KRCD, a range of state and federal resources agencies, local fishery groups, and the other water districts on the Kings River Fishery Management Program. CID will continue to work cooperatively to avoid, minimize, and mitigate impacts to biological resources.

CID will seek to consult with state and federal regulatory agencies as needed early in the project development and planning process to seek input and guidance and avoid issues before they become problematic. This includes active engagement and early involvement in environmental review.

For the last several years, the water interests in CID have been working cooperatively with the USGS to study the geology and aquifers of the subbasin. CID and the USGS should consider entering into an agreement under the National Water-Quality Assessment Program to map the subsurface geology of the basin, and develop a data network.

6.4 Dispute Resolution Process

CID board meetings were used to identify and address water management issues in the basin. Discussion of issues in CID board meetings, in an open and transparent process, resulted in a cooperative relationship between water users of the basin. CID will continue to provide a forum for identification and discussion of groundwater issues in the basin.

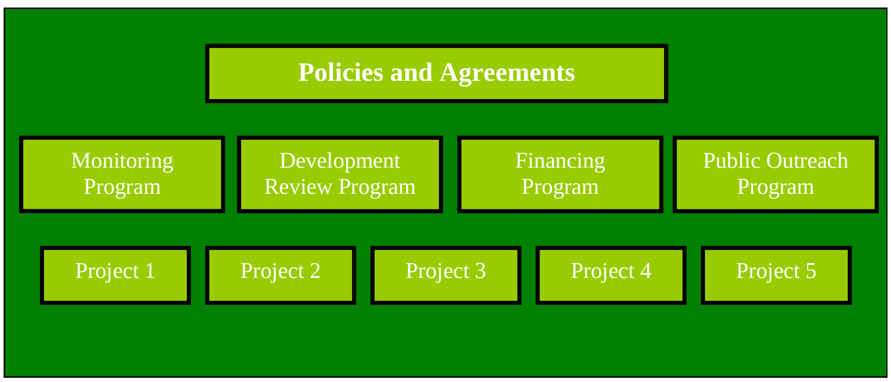
The Fresno County LAFCO has initiated a mediation process with CID and CID Cities related to how they may better integrate land use and water supply plans and the planning process, and cooperatively develop funding and projects to resolve groundwater and storm water management issues. It is likely that this process will result in a standing group of CID and City representatives that will be tasked with further developing projects, policies, and programs.

7 Program Description and Plan Implementation

7.1 Introduction

The Groundwater Mitigation and Banking Program (CID Program) is comprised of specific proposed projects and management actions (Figure 7.1). The management actions include the programs, policies, and agreements that are needed to be funded and implemented. CID is working with the community to finalize the projects, programs, policies, and agreements based on the findings and actions related to the overall Groundwater Mitigation Banking Program that were presented in Chapter 6.

Figure 7.1 Groundwater Mitigation and Banking Program



CID proposes to develop, own, operate, and maintain the groundwater banking facilities and manage the banked groundwater on behalf of overlying land owners in the district and participants in the bank.

7.1.1 Consistency with Basin Management Objectives

CID projects will meet the overall GWMP and Upper Kings IRWMP Basin Management Objectives (BMO). Consistent with near-term (1 to 3 years) BMOs, the CID Program is to design and develop up to 10,000 acre-feet per year of recharge project capacity on 100-200 acres with an instantaneous recharge rate of between 150-300 cfs. This will be accomplished throughout the CID system. These BMO quantities are the result of the engineering feasibility studies and preliminary designs; historical operations at the existing 1,300 acres of recharge ponds; and best engineering judgments.

7.1.2 Near Term Priorities, Synergies, and Linkages between Projects

The Upper Kings IRWMP defined the Regional Conjunctive Use Program (RCUP) for the Upper Kings Region (Region). The RCUP includes a range of projects concepts that are to be implemented by the members in the Upper Kings Water Forum (Water Forum). The CID Program is part of the RCUP Conjunctive Use Element.

A priority for CID is to develop recharge projects along the C&K Canal, but this does not exclude development of projects on viable recharge sites that may be located throughout CID's jurisdictional area. A number of sites have preliminary designs and CID is actively seeking to acquire controlling interest in potential project properties consistent with the intent of the GWMP.

CID has historically reduced the amount of overdraft by diverting Kings River water into the District's system of canals and recharge ponds for the purpose of irrigation and for direct groundwater recharge. CID's canal system has two main arterials, the Fowler Switch and C&K Canals.

Most of the District's recharge ponds are located along the Fowler Switch Canal and its laterals and therefore these ponds can only receive water deliveries through the Fowler Switch. When flood water is available from the Kings River, the Fowler Switch is typically operated near its capacity to deliver recharge water. There are much fewer and smaller recharge ponds located along the C&K Canal. Typically there is capacity available in the C&K when flood water is available from the Kings River, but there are not enough recharge ponds to optimize the available flood water with the ponds capacity of the C&K.

The addition of new recharge ponds on the C&K or Lone Tree systems would increase the overall capacity for delivering recharge water and put more water into storage in the area of proposed municipal development, thus increasing supply reliability, maintaining economic activity, and reducing overdraft. In addition, recharge facilities on the C&K would provide multiple benefits. In response to the agricultural waivers program, CID has closed off the canal connections to the Kings River to reduce spills. This closure resulted in less flexibility when delivering irrigation water down these canals. The recharge ponds on the C&K would be dual purpose and provide storage, thus increasing operational flexibility and delivery system efficiency, and recharge. The facilities would also help CID re-capture water that is released as part of the Kings River Fisheries' management program.

CID will also work to further identify canal improvements and pond facilities that would increase operational flexibility and increased recharge system-wide. Improvements to existing ponds, including changes to the maintenance routines, will be investigated to increase recharge, and determine if the ponds performance could be improved and how they may provide multiple benefits for both groundwater recharge and storm water management.

7.2 Description and Common Groundwater Mitigation and Banking Program Elements

7.2.1 Land Acquisition, Purchase, Easements

CID needs an ongoing land acquisition program to gain access to viable recharge properties. It is recommended that this should be a priority since all other activities are reliant on defining the specific project sites. The purpose of this activity is to acquire the necessary land, including identification of candidate properties, negotiations with the owners, development of purchase options or agreements, escrow, and closing. This includes support of a real estate consultant, all property acquisition costs, and fees. Consultant and engineering costs are also to be incurred for each project related to finalization of easements and rights-of-way for locating any conveyance from CID canals to proposed recharge pond sites.

Purchasing land for purposes of developing recharge projects, to the exclusion of other uses, would be a discretionary action by the CID Board that is a project subject to CEQA. CID could develop a stand-alone land acquisition program that defines and documents how such lands would be cleared pursuant to CEQA. This program description would include the description of the specific types of lands to be acquired, the evaluations process and review criteria used for environmental clearance, and review checklist to define how CID will pre-clear land for purposes of the groundwater mitigation and banking program. This would be reviewed pursuant to CEQA. It is possible that an initial study would determine that a negative declaration or mitigated negative declaration could be used to adopt and implement a land acquisition program.

7.2.2 Surface Water Sources

Surface water for purposes of recharge would come from (1) CID water entitlements; (2) CID diversion of unregulated Pine Flat flood releases; (3) CID diversion of fish flow releases from Pine Flat Reservoir; (4) Central Valley Project (CVP) 215 flood releases; or (5) other Kings River water rights of Kings River Water Association members. Floodwater would be diverted and recharged primarily in wet years. Yield estimates are based on the average annual amount of water that could be recharged above the existing conditions and the number and size of ponds. To be conservative, current recharge rates and project yields are based on analysis of historical operations.[4] Yields for the proposed projects could be significantly

[4] Technical Attachment B, *Technical Memorandum on Floodwater Availability for the CID from the Kings River*, WRIME 2007.

higher should others subscribe to the bank and all potential sources of recharge water are utilized. The IRWMP summarized the evaluation of the sources of supply to the Region.[5] Funding would be used to purchase 215 flood water or water from other sources that could be imported to the basin.

7.2.3 Project Sizing and Phasing

The proposed projects will be developed over the next five to ten years based primarily on the availability of funding, number of sponsors or participants, and a project contribution to meeting measurable basin management objectives. Each of the individual projects will be developed in context of the overall Program and will need to go through a development process. An example of project task relationships and a conceptual recharge project development schedule is shown in Figure 7.2.

If CID is to seek state or federal grant funding or low interest loans to build the projects, the level of project analysis and documentation is relatively rigorous. The feasibility, cost effectiveness, design, and environmental clearances for individual projects needs to be demonstrated in order to produce competitive grant project applications. This implies substantial investment on the front end of a project. CID could seek and obtain grants to help fund the up-front cost, but this could slow down the project development efforts and delay preparation of project grant applications.

7.2.4 Diversion, Conveyance Facilities, and Wheeling

CID uses gravity to feed water through the existing canal network and current conveyance capacities to wheel water from the point of diversion at Fresno Weir. Other project sites would be served by existing or improved canals located nearest to the lands that are acquired for purposes of developing the other proposed recharge facilities. Existing rights-of-way and easements will be used when available. Secondary canals may need minor improvement to convey the water at the flow rates desired to maximize yields. If developers or cities were to acquire alternative sources of water through transfer, CID would charge a wheeling and recharge fee to provide for use of the canal and recharge facilities.

[5] Technical Attachment C, *Analysis of Water Supplies in the Kings Basin, Technical Memorandum, Phase 1, Task 4.*

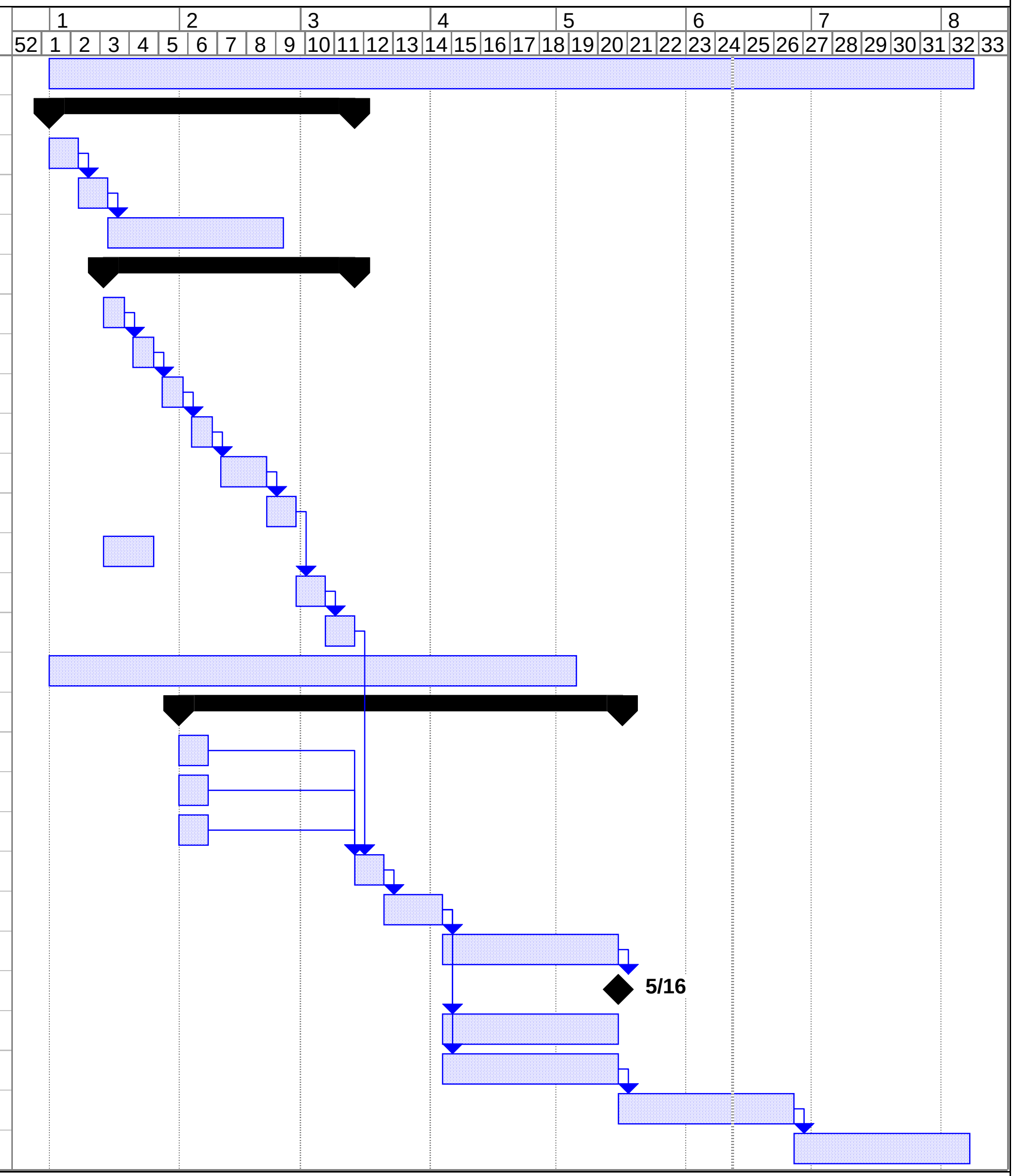
7.2.5 Pond Construction and Maintenance

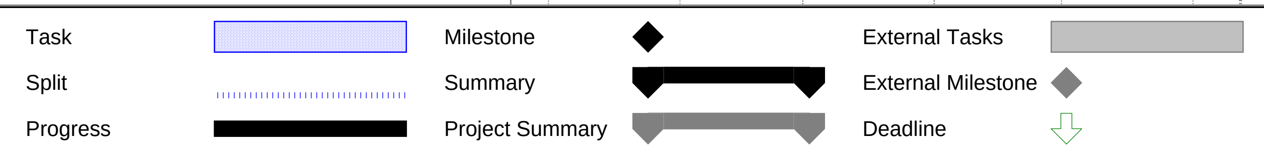
Ponds would be constructed through grading, scraping, and excavation to remove materials. Ponds will be connected to existing canals by pipeline or canal. Existing easements and rights-of-way will be used or acquired where necessary. Ponds would be configured into separate cells to allow alternate uses of the property for recharge, retention, and potentially for recreation purposes; to allow for alternative wetting and drying cycles; and allow for maintenance as needed. The District will be developing a maintenance plan. Such activity is likely to occur on a 5- to 10-year cycle and only if percolation rates are observed to decrease. Ponds would also be designed to include environmental features where feasible.

Project: Fig 7.2 Example Project Sched
Date: Thu 6/12/08

Figure 7.2 - Example of Task Relationships and Conceptual Recharge Project Schedule1

ID	Task Name
1	Project Management
2	**Preliminary Characterization and Design**
3	Gain access to the site
4	Survey and Site Mapping
5	Develop Project Description and Preliminary Design
6	**Site Characterization/ Hydrogeology Review**
7	Collect Soils, Geologic, and Hydrogeologic Data
8	Review Well Logs/Develop Site Specific Cross Section
9	Develop Exploratory Program/Geotechnical Investigation
10	Develop Drilling Plans, Specifications, and Bid Documents
11	Supervise Drilling, Collect Cores, Direct Well Construction
12	Water Quality Sampling and Lab Analysis
13	Phase I Site Assessments
14	Evaluate Recharge Effects
15	Prepare Site Characterization and Geotechnical Report
16	**Land Purchase, Option, Easement**
17	**Environmental Clearance CEQA documentation.**
18	Biological Survey or Evaluation
19	Cultural Resources Survey or Evaluation
20	Evaluate Other Resources
21	Develop Project Specific Monitoring Plan
22	Prepare Environmental Review Document
23	Public Review
24	Certification
25	**Engineering and 60 % Project Design**
26	**Permitting**
27	**Final Design, Prepare Plans and Specification**
28	**Bidding/Contracting**





7.2.6 Extraction of Stored Water

The banked water is intended for local use by the project sponsors/participants to help alleviate the problems of the overdraft. The extraction of the banked water will be through wells by overlying landowners within CID, and potentially other entities that are subscribers to the bank and are participating directly in funding the Program. The recharged water will be used: (1) to reduce overdraft, and (2) for planned development and future growth that is consistent with existing general plans or has undergone complete environmental review, and where agreements have been entered into with CID. CID will account for the recharged water and any assignment of the water to specific subscribers or for general groundwater recharge operations.

Proposed development and cities will need to have specific agreements with CID to rely on the water for projects, or when making findings pursuant to CEQA and SB 610 or SB 221. Such agreements would also allow for updating an Urban Water Management Plan (UWMP) or General Plan where these documents need to ensure there is a long-term, sustainable, and reliable water supply.

CID would reserve the right to manage the groundwater and existing surface water rights for the benefit of CID ratepayers and jurisdictional area and could transfer or exchange water captured through the proposed projects within or outside of the Kings River Water Association area, consistent with local laws and regulations. In no case would native or resident groundwater be transferred out of the Kings River service area, and transfer of banked water would never exceed the volume of groundwater previously recharged.

7.2.7 Environmental Features

The proposed projects may allow CID to recapture water released for the Kings River Fishery Management Program. This provides multiple benefits of these releases. As part of the IRWMP, an environmental stakeholders group was convened to develop environmental design criteria for incorporation of environmental features into recharge pond designs and to develop an approach to incorporating ecosystem values into the recharge pond design. When consistent with the primary purpose of recharge, and where economically and technically feasible, the work of the environmental stakeholders work group will be used to guide the design and operation of recharge projects.

7.2.8 Project Specific Monitoring

The work plans for each project would include monitoring to measure project outcomes and indicators. A project specific monitoring plan and Quality Assurance Project Plan will be prepared. Project specific monitoring may include:

- Monitoring wells may be installed up gradient and down gradient to measure water levels (feet above mean sea level; depth to water) and quality (Title 22 constituents concentrations)
- Measurement of flow into and out of the recharge ponds (flow in cfs; annual recharge in acre-feet)
- Stage measurements in the pond
- Wildlife use of ponds - The site may be proposed for inclusion in the annual Christmas bird survey

The sites and measurements are also to be included in the mitigation, monitoring, and reporting program to ensure CEQA compliance as required once the final environmental documents are circulated and certified by CID acting as the lead agency. It is anticipated that daily recordings will be made during pond operations to verify that the anticipated benefits are being realized. The information generated will be included in CID's annual report to the Board. Water Quality will be monitored for the first three years before and after the recharge operations have been initiated.

Project specific monitoring will be integrated into the IRWMP efforts for regional monitoring, data management, and will be compatible with Groundwater Ambient Monitoring and Assessment (GAMA) and Surface Water Ambient Monitoring Program (SWAMP) where required.

7.3 Program Implementation

Program implementation also includes the following CID activities.

7.3.1 Project Sponsor and Role, Participants, and Funding

7.3.1.1 Project Sponsor and Role

The up-front, first phase program costs are related to planning, feasibility study, engineering design, grant writing, and environmental compliance. The second phase costs are related to project construction. Finally, the final phase is for long-term maintenance and operations of CID facilities. CID could provide funding for the initial phases of the Program with state and/or federal grants and existing sources of revenue that include water standby and availability charges and water sales, but is seeking to identify cost-sharing partners to participate in all implementation phases. CID proposes to construct, maintain, and operate projects; administer the Groundwater Mitigation and Banking Program and related capital projects; provide administrative services; and account for water that is stored on behalf of the cosponsors or project participants. CID will wheel water through its existing or improved facilities for subscribers to the Groundwater Mitigation and Banking Program. This includes developing systems for monitoring and measuring the banked water and tracking project performance. There are a number of potential subscribers and a number of funding approaches that are being developed.

7.3.1.2 Project Participant

The first priority is to recharge the groundwater basin on behalf of overlying landowners and rate payers within the District boundaries to reduce existing levels of overdraft. The second priority is to provide groundwater mitigation and banking services and benefits to entities that choose to enter into agreements with CID. Such agreements are intended to provide mitigations to those entities that are proposing projects that would increase the consumptive use of groundwater, and therefore contribute to the overdraft of the groundwater basin. A percentage or specific amount of the project yields would be assigned to meet the water needs of planned development. Funding obtained by project participants under agreement with CID will be used to: (1) cover up-front planning, grant writing, environmental compliance, and design costs; (2) construct recharge projects and physical facilities; (3) retire capital facility debt; (4) purchase additional water; and (5) maintain and operate the project facilities.

Potential participants include:

- Kings River Water Association members
- Kings River Conservation District
- Cities that may subscribe to the bank, including Sanger, Parlier, Fowler, Selma (California Water Service), Kingsburg, Fresno, and Clovis
- Fresno County and unincorporated communities
- Developers of residential, commercial, or industrial projects which would consume groundwater

7.3.1.3 Funding and Financing

The benefits of the proposed projects would accrue to the overlying landowners within CID boundaries, or to participants that enter into agreements and provide funding for proposed projects. CID is also working to identify participants to support up-front planning, and are willing to work with CID to procure grant funding from the State of California. It is believed that the probability of obtaining grant funding, either for planning or construction costs, would greatly increase if there are agreements between CID and project participants that define long-term funding mechanisms.

CID is evaluating and finalizing the mechanisms to fund additional planning, engineering, capital facilities costs, and ongoing maintenance and operations (M&O) costs of a new project. Preliminary capital project costs have been generated to provide a basis for equitably apportioning capital and M&O costs. Financing and revenue strategies will continue to be evaluated, including discussions with private entities that could provide financing through public bonds. Final funding requirements are contingent on the amount of grants that may be available. CID funding mechanisms to be further developed as part of the GWP development include:

- State or federal grants
- Impact fees on new development
- Benefits assessments or water standby and availability charges
- Fees on municipal pumping
- Fees for wheeling water through CID facilities for purposes of recharge

Agreements between CID and other sponsors or subscribers will be developed. Participants could subscribe to the bank based on a number of models that may include, but are not limited to, one or more of the following:

- **Sponsorship** - buying pro-rated shares up front to help fund up-front planning and to capitalize the project; followed by payment of annual fees based on percentage of yield.
- **Participation** - buying credits in the bank, once constructed, but at a higher cost than initial subscribers.

Capital costs are primarily related to land acquisition for the percolation ponds and construction of necessary infrastructure improvements (canal improvements, pipelines, turnouts, etc.). M&O costs are related to measurement and data collection, pond cleaning, administration, and operation of the groundwater mitigation bank. Different funding mechanisms may be appropriate capital versus M&O costs.

Groundwater impact fees on new development have been considered and have been used in other geographic areas to develop new water supplies. These "impact" fees are collected on a one-time basis as a condition of an approval being granted by the local agency.[6] Such a fee must be directly related to mitigating a defined impact and would be based on the capital program costs for the planned groundwater mitigation bank and do not require voter approval. Impact fees are not used for M&O costs. CID or the city could be the "local agency" to collect the groundwater impact fee from development as a condition of project approval. A CID capital facilities and water acquisition fund would be established to acquire land, construct capital facilities, purchase water, and/or retire debt.

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[6] Technical Attachment G, Engineers *Report, Urban Impacts Study*, Summers Engineering, 2007

CID benefits assessments or water standby and availability charges would require a Proposition 218 election. Such assessments may reflect the distinctions between urban and agricultural uses. Benefits assessments or water standby and availability charges are appropriate for debt service and for ongoing M&O costs. Annual assessments could also be accumulated for purposes of acquiring land or for purchasing CVP 215 water or water from other sources.

Lands that annex to the cities detach from the District and are therefore not currently subject to CID standby or availability charges. The cities have their own funding mechanisms and each city may use different strategies to generate capital or pay for ongoing M&O. This could include a combination of connection fees or urban water rates.

7.3.2 Reporting and Measuring Progress

An annual report will be used to track and measure progress in implementing the GWMP. The GWMP provides for periodic report(s) summarizing groundwater basin conditions and groundwater management activities. The report will be prepared annually and include:

- Summary of monitoring results, including a discussion of historical trends.
- Aggregated project specific monitoring plans used to document that each project is performing as designed and mitigations are effective.
- 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 proposed management actions for the future.
- Summary of any plan component changes, including addition or modification of BMOs, during the period covered by the report.
- Summary of actions taken to coordinate with other water management and land use agencies, and other government agencies.

The BMOs provide the mechanism for measurement and evaluation of project performance.[7] The BMOs are intended to:

- Provide a framework for assessment and evaluation of project performance.
- Identify measures that can be used to monitor progress toward achieving goals.
- Provide tools for grant recipients and the state to monitor and measure project progress and fulfill grant requirements.

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[7] See Upper Kings IRWMP Section 9.4.1 RCUP Basin Management Objectives And Performance Measures.

- Provide information to help improve current and future projects.
- Maximize the return on public investments.

Other output indicators (measures to effectively track output) and outcome indicators (measures to evaluate change that is a direct result of the work) that will be used, and which are consistent with the IRWMP include:

- Conveyance capacity improvements (linear feet of improvements; flow improvements in cubic feet per second (cfs))
- Recharge area developed
- Direct recharge volumes from the source of surface water used for recharge (acre-feet by source)
- Water levels up- and down-gradient of the ponds
- Changes in water surface elevation and gradient
- Annual water quality
- Recovery of stored water (acre-feet)

7.3.3 Community Affairs and Public Outreach

The purpose of this implementation activity is to coordinate with local stakeholders, including city staff, city councils, other nongovernmental organizations, and the media to increase awareness and understanding regarding groundwater issues and the GWMP. To be successful, CID needs to continue to engage the community to gain political support for the GWMP.

7.3.4 Integration with Land Use Plans and GWMP

CID, acting as a responsible agency, will continue to review and comment on project development proposals in the unincorporated part of CID jurisdictional area and on projects proposed by CID Cities. CID will also review and comment on any general plan updates or UWMPs of CID Cities. The purpose of the reviews will be to ensure that all impacts to groundwater are appropriately mitigated, that there are no impacts to CID facilities, and that overlying water rights and groundwater are protected.

CID proposed projects could be available to support planned development as defined in the general plans for the cities of Selma, Kingsburg, Fowler, Parlier, and Sanger should the cities have agreements with CID. Chapter 4 and the Upper Kings IRWMP provides a summary of the detailed analysis of future water demands.[8] The analysis was based on adopted general plans, planned land uses, and the local Urban Water Management Plans. If the cities adopt the CID GWMP and participate directly in the proposed projects, they would likely be able to make defensible findings regarding the availability of a reliable water supply, and determinations that groundwater impacts would be mitigated. The analysis of future build-out conditions indicates that new development will increase groundwater pumping and decrease groundwater levels. These impacts need to be mitigated.

CID projects would provide the cities in CID's area with a source of supply and ensure that there is a long-term, sustainable water supply and that there are no impacts to other existing overlying groundwater users. The GWMP can also be factored into the city's Urban Water Management Plan and allow the cities to make necessary findings when adopting annexations to the city or in approving new development consistent with the requirements of the CEQA and the California Water Code.

7.3.5 Environmental Compliance for the GWMP

The GWMP, as a planning document, is not subject to the California Environmental Quality Act, although the Board could commit itself to an overall course of action and decide to review the document pursuant to CEQA in order to expedite and streamline project approvals and decision making. Numerous actions of the Board to implement the Groundwater Mitigation and Banking Program are discretionary and are therefore subject to environmental review using a negative declaration, mitigated negative declaration or environmental impact report. For example, purchase of land exclusively for purposes of development of recharge facilities could be construed as a project pursuant to CEQA. Constructing and operating a recharge pond would be a project requiring an environmental document and determination by the Board. State grant funding is contingent on the applicant completing appropriate CEQA evaluations and determinations for the proposed projects. There is a wide array of alternative approaches and strategic considerations that must be considered prior to adopting a final environmental compliance strategy.

7.4 Recharge Project Sites and Descriptions

The preliminary list of potential projects is provided in Appendix E. The list is not inclusive of all the project concepts being considered and the program is not limited to these specific

[8] Technical Attachment F, Technical Memorandum, *Analysis of Water Demand in the Kings Basin. Technical Memorandum, Phase 1, Task 3*, WRIME, 2006.

sites. The feasibility of other sites is to be evaluated as they come onto the market or as CID can make contact and negotiate agreements with land owners that are willing sellers. To allow for flexibility in implementing projects, all CID facilities can be developed and operated as stand-alone projects. There are no critical dependencies between the individual projects, and all proposed recharge projects are moving forward and/or are at various stages in the design process.

Table 7-1 contains a preliminary listing of potential projects and the general project locations are shown in Figure 7.3. The overall cost breakdown is presented in Table 7-2, and the budgets for the individual projects are presented in Appendix E.

Conceptual designs for the projects have been developed,[9] and preliminary cost estimates include acquisition of land; easements and rights-of-way; connecting canals, pipelines, and appurtenances; or an inlet and outlet structure back to canals may be included to allow for both recharge and regulation purposes.

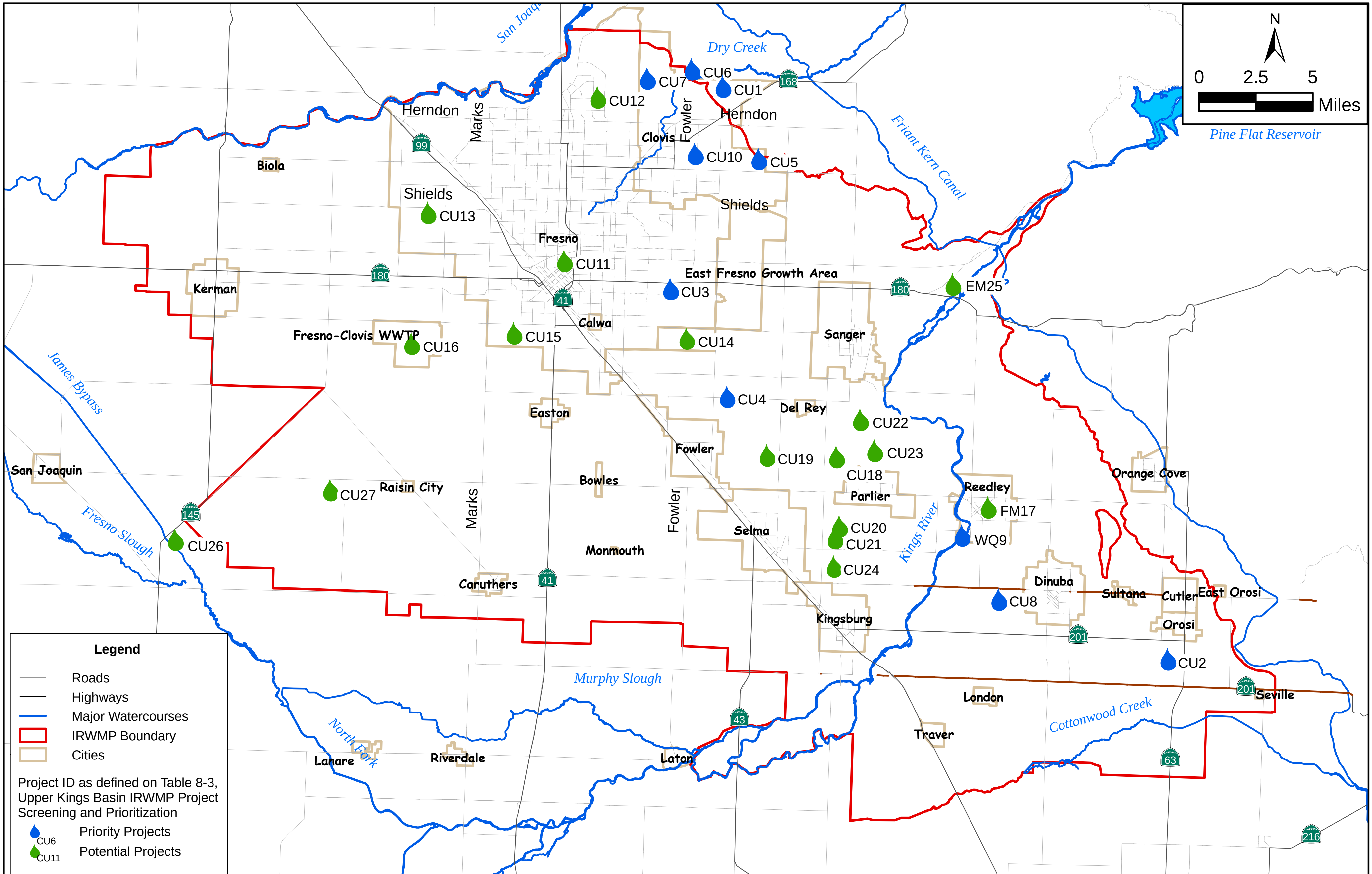
[9] Technical Attachment G, Engineers *Report, Urban Impacts Study*, Summers Engineering, 2007

Table 7-1. Site Locations, Size, and Costs for Development

IRWMP Reference No./CID Ref No.	Location	Size (acres)	Preliminary Cost Estimate
CU3D/CID No. 13	Wards Drain Pond North of Floral	60	$2,257,675
CU3A/CID No. 10	Kingsburg/Selma Branch Divide	150	$6,156,000
CU3B/CID No. 14	Fowler Switch between Summer and South	40	$1,852,500
CU3C/CID No. 11	Kingsburg Branch North of Huntsman	10	$584,250
CU3E/CID No. 8	Cole Slough between Jefferson & Lincoln	30	$1,774,125
CU3F/CID No. 9	Santa Fe Pond Enlargement	60	$2,636,250
CU3G/CID No. 12	Wards Drain Canal Works	4	$235,125
	Total	354	$15,495,925

Table 7-2. Groundwater Mitigation and Banking Program Preliminary Project Total Costs

	Proposal Title	Upper Kings IRWMP				
	Project Title	CID Groundwater Mitigation and Banking Program				
	Budget Category	Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs	$0	$486,600	$348,375	$834,975	
(b)	Land Purchase/Easement	$0	$0	$8,540,000	$8,540,000	
(c)	Planning/Design/Engineering/ Environmental Documentation	$0	$559,500	$574,500	$1,134,000	
(d)	Construction/Implementation	$0	$0	$2,453,000	$2,453,000	
(e)	Environmental Compliance/ Mitigation/Enhancement	$0	$324,400	$232,250	$556,650	
(f)	Construction Administration	$0	$348,375	$378,375	$726,750	
(g)	Other Costs	$0	$0	$0	$0	
(h)	Construction/Implementation Contingency	$0		$1,345,550	$1,345,550	
(i)	Grand Total (Sum rows (a) though (h) for each column)	$0	$1,718,875	$13,872,050	$15,590,925	
(j)	Calculation of Funding Match %			$13,872,050	$15,590,925	11.0%
Local match met through local District revenues and fees						
CID project will support and provide benefits to DACs which include Selma, Fowler, Parlier, Sanger, Kingsburg						



RIME

Upper Kings IRWMP Proposed Project Locations

Upper Kings Basin IRWMP

June 2007

Figure 7.3

7.5 Economic Benefits and Analysis

The Groundwater Mitigation and Banking Program presents significant water quality and economic benefits to the region and to the state. The Program provides new water that would be available either to support local needs or for transfer to users within or outside the boundaries of the Upper Kings IRWMP. In instances where the water was used locally, the Program would relieve pressure to: (1) import water into the region, (2) construct alternative surface water supply projects, or (3) continue to overdraft the local aquifer.

As described in Chapter 4, the ongoing conversion of agricultural land uses to urban uses together with ongoing improvements in the efficiency of irrigation practices is shifting the regional balance of water usage from surface water to groundwater. This shift is occurring primarily because agricultural land uses, which are primarily served by surface water, are being replaced by municipal uses that are almost exclusively reliant on groundwater. The shift in demand is exacerbated by the loss of groundwater recharge that occurs as agricultural land is taken out of production and as more efficient irrigation techniques are introduced on remaining irrigated lands.

Implementation of this Program will provide a mechanism for recharge of floodwater to offset impacts due to increased groundwater demand.

Water Quality Benefits

Baseline water quality and the potential impacts and benefits of conjunctive use operations were evaluated during the development of the Upper Kings IRWMP in the *Technical Memorandum, Water Quality Standards, Conditions, and Constraints*. The data show that recharge of San Joaquin and Kings River water would result in a net benefit to groundwater quality as compared to current conditions. The high quality of source water will result in dilution of minerals and other constituents in the native groundwater, and, as a consequence, any recovered water would generally be of better quality than the native groundwater. The available data also indicate that groundwater is currently meeting standards in most cases and has historically sustained municipal and agricultural beneficial uses. Maintaining or improving groundwater quality could result in avoided costs for treatment of drinking water at the point of extraction in the down gradient cities. In addition to avoiding the capital and operational costs associated with water treatment, protection of groundwater quality to enable compliance with drinking water standards would also be likely to reduce regulatory and permitting burdens.

Although the benefits of preserving the ability to rely on groundwater for drinking water supply are relatively certain, these benefits are difficult to confidently quantify without additional groundwater modeling and economic analysis.

Environmental Benefits

Consistent with the environmental strategy documented in the Upper Kings IRWMP, specific environmental and habitat features could be included into the site designs when consistent with the primary purpose of recharge, and where economically and technically feasible; and the work of the environmental stakeholders work group will be used to guide the design and operation of recharge projects..

Measurement of Water Quality Improvements

Project monitoring plans will be prepared for individual projects within the Program to guide collection and analysis of water quality data. The broad impact of Program implementation on water quality within the Upper Kings IRWMP area is likely to be detected by established flow and water quality measurement programs.

Water Supply Benefits

The central purpose of the Program with respect to water supply is to capture flood water that is now conveyed by CID canals and to route this water to recharge basins for percolation to groundwater. The Program will convert flood water, which is available without cost but is of little regional benefit because of its infrequent, unpredictable occurrence, into a reliable groundwater asset that can be used to meet growing municipal and agricultural demands. Recharge from the Program will be a component in the IRWMP's strategy to respond to the chronic and worsening overdraft of aquifers in the planning area.

The water supply benefits of Program implementation have been estimated for the Upper Kings IRWMP Step 2, Project Implementation grant application based on a feasibility study performed for the Recharge Pond off Ward Drainage Canal Project. This project is representative of the array of projects included within the Program, and, as such, provides a useful yardstick for estimating the water supply benefits for the full Program. A feasibility study for the Recharge Pond off Water Drainage Canal Project demonstrates the technical viability of this project and illustrates the capacity of the CID conveyance system to convey flood water sufficient to meet the percolation capacity of the project during years when flood water enters the system (approximately 40 percent of years). The operational capacity to convey and recharge flood water is available throughout the year including during the irrigation season. Although the economic analysis of this project is based exclusively upon recharge of flood water, pond operation may be expanded at many of the Program's recharge facilities to reduce operational spillage by storing and recharging rejected irrigation deliveries or surface water from other sources that exceed immediate irrigation demands.

While importation of surface water or construction of a new reservoir would provide water sources that are more predictable than flood water, aquifer recharge using flood water offers a mechanism that effectively utilizes existing CID infrastructure to convey water to proposed recharge ponds, an approach that contributes greatly to controlling Program costs. Because storm water is conveyed by gravity to the Program's recharge sites, there is no energy costs associated with the recharge component of the Program.

Avoided Cost Analysis

The unit values used to derive water supply benefits were estimated using data from the Environmental Water Account (EWA) water acquisitions program and prices paid for EWA water since its inception in 2001 through 2004. These prices were used because they provide a firm foundation for estimating the value of transferred water over a span of years. While pumping restrictions at the Delta and other actions that have occurred since 2004 have substantially increased the costs associated with long-term water purchases, the water prices associated with EWA activity constitute a conservative basis for estimating the price of water imported into the Kings River IRWMP area.

The EWA water acquisition program separates acquisitions by region (upstream or north of the Delta and south of the Delta). Table 7-3 shows the EWA water acquisitions and the calculated average price per acre-foot for four years of program operation. As noted above, these values provide a conservative basis for estimating the cost of importing water to the Upper Kings IRWMP area and, therefore, the avoided cost associated with use of flood water for recharge.

The FY 2000-01 prices were higher than any of the following three years due to (1) higher percentage of water bought from sellers south of the Delta where prices paid for water are generally higher and, (2) 2000-01 being a dry year. Because all of the prices shown in this table result from transactions completed before establishment of current restrictions on Delta Pumping, the FY 2000-2001 values may be representative of near term conditions. However, because of the long-term character of this project, the average value presented in Table 7-3 of $145 will be applied for analysis.

Table 7-3. EWA Water Acquisitions, 2001 to 2004, AF, and Average Price Paid, $/AF

	FY 2000-01	FY 2001-02	FY 2002-03	FY 2003-04	Mid-point[1]
EWA Acquisitions (Total)					
Water purchased (AF)	336,034	239,543	214,914	155,000	
Total paid	$60,173,008	$28,333,455	$30,383,550	$17,111,000	
Average price/AF	$179	$118	$141	$110	$145

Source: Environment Water Account Acquisitions CDWR 2001 to 2004

[1] Mid-point value is the value half-way between the highest and the lowest average price

When adjusted to 2007 dollars using the Consumer Price Index (CPI), the mid-point value shown in Table 7-3 converts to an average price per acre foot of $159. This average annual price for an acre-foot of water yields a present value of an annual delivery of one acre-foot over the 30-year life of the project of $2,065. This equates to a total present value for the 10,000 acre-feet of captured storm water avoided on an average annual basis by the Program of $21,886,000.

An alternative estimate for the cost of imported water is presented in the draft engineer's report *Urban Impacts Study* prepared for CID by Summer's Engineering in July 2007.[10] This report notes that SWP water that is delivered through the California Aqueduct in the San Joaquin Valley and Central Valley Project water from the Friant-Kern Canal on the east side is frequently purchased or exchanged among eligible contractors. The cost to purchase a permanent supply in this market typically includes a one-time charge of $3,000 per acre-foot plus an annual charge of approximately $90 per acre-foot. The present value of an annual delivery of an acre-foot of water from this source over the 30-year life of the Program is $3,984. As the present value of this avoided cost stream is higher than that estimated based on the EWA, the EWA values will be applied as they lead to a more conservative economic analysis.

The per-acre-foot value of water developed from the preceding analysis was used to estimate the cost of water that would be imported into the Upper Kings IRWMP area absent implementation of the project. Water supply benefits are then based on the assumption that Program implementation would produce an average annual yield of 10,000 acre-feet that would reduce the need to import water for groundwater recharge. The basis for computation of the average annual yield is described in the feasibility report for the Recharge Pond off Ward Drainage Canal project.

Direct Water Supply Benefit Analysis

An alternative to the avoided cost analysis is analysis of the direct water supply benefits of the Program. These benefits represent the value of recharged water in reducing overdraft and compare the cost of constructing the Program with those of the no action alternative, continued overdraft of local aquifers. A report prepared for the KRCD directly addresses the economic value of recharged water in the project area and was used as a source for

[10] Summers Engineering, *Engineers Report-Consolidated Irrigation District Urban Impacts Study, July 2007*

estimating this value.[11] In its conclusion, the report states that, "The cost of overdraft can be used directly as the value of an acre-foot of recharge project yield. In other words, if water were to be recharged to the area, it would be worth $62/AF in avoided costs." Because the benefits associated with reduction of overdraft are largely associated with energy prices, the CPI index for Fuels and Utilities was applied when adjusting the 1999 costs to 2007 dollars. This adjustment resulted in an adjusted pumping cost of $97/acre-foot. Applying this adjustment leads to an estimated present worth for reducing overdraft by 10,000 acre-feet of $13,292,700.

Program Capital Costs

Capital costs for Program implementation are estimated to total $10,517,925. This total provides for construction of 240 acres of recharge ponds (Wards Drain Pond North, Kingsburg/Selma Branch Divide; and Cole Slough between Jefferson and Lincoln). This area is believed to be sufficient to generate the target average annual recharge of 10,000 acre feet and would be supplemented by improvements to the Wards Drain Canal Works and updating the GWMP. For simplicity, the conservative assumption is made that these funds would be committed to the Program at the beginning of the implementation period.

Program Operations Costs

Annual Program operations costs were drawn from the draft *Urban Impact Study*. Table 7-4 presents how this report detailed operational and maintenance costs for the recharge pond Program and prorates costs computed for the 1,300 acres of recharge ponds now in place to estimate costs for the 240-acre Program area. Because the report presents costs from CID's 2005-2006 budget, for the purposes of this economic analysis, the costs shown in Table 7-4 have been adjusted to 2007 dollars.

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[11] S.R. Haugen and R.W. Andrus, *The Economic Value of Recharged Water as it Relates to the Cost of Overdraft, KRCD, April 2000*

Table 7-4. CID Budget Expenses FY 2005-2006 for Recharge Facilities

	Full CID System	Program Area (240 Acres)
Administration		
Administration	$105,862	$1,368[1]
Administration – salaries	$357,519	$4,620[1]
Operation		
Operation for recharge ponds	$38,690	$7,143
Maintenance		
Class A maintenance	$141,746	$1,832[1]
Class B maintenance	$462,293	$5,974[1]
Replacement		
Capital cost for storage ponds	$2,324	$429

[1] CID budget presents combined costs for Class A and Class B maintenance of irrigation and recharge facilities. Because seven percent of irrigation, recharged, and storm water management costs are assigned to recharge, this allocation was used as a basis for assigning seven percent of the Administration, Class A, and Class B maintenance costs to recharge facilities.

Costs from Table 7-4 have been used in the economic analysis and, together with the project's capital costs, yield a total present value of discounted Program costs of $10,793,225.

Summary of Project Water Supply Benefits

The preceding analyses demonstrate that at the average annual project yield anticipated for the Program of 10,000 acre-feet per year, over the 30-year Program life benefits can be computed using two approaches:

- The net present value of controlling overdraft is computed to be $13,292,700.
- The net present value of avoiding the requirement to import water is computed as $21,886,000.

The total present value of the costs of Program implementation and operation ($10,793,225) compares favorably with the benefits estimated based either on control of overdraft or avoidance of water importation.

The result of this analysis is that the economic feasibility of the Program can be broadly justified based upon quantifiable water supply benefits. Should energy prices continue to escalate, the water supply benefits of controlling overdraft will increase. This evaluation of water supply benefits gives no consideration to the non-quantifiable benefits discussed earlier in this section.

Detailed designs and complete feasibility studies for other sites will be developed once access or control of the specific property is obtained. The priority is to acquire lands from willing sellers. CID will seek to option properties when pursuing grant funding to demonstrate control of the proposed project site. CID could use eminent domain to acquire properties but only as a last resort. Under such circumstances, CID would select and appraise the property and extend to the owner an offer to purchase it at the appraised value. If that offer were refused, the District could adopt a Resolution of Public Necessity finding that (1) public interest and necessity require the project, (2) the proposed project is planned or located in a manner that will be most compatible with the greatest public good and the least private injury, (3) the property described in the resolution is necessary for the proposed project, and (4) an offer to acquire the property has been made.

8 Annotated References – Scientific and Technical Studies

This section describes the wide array of data that has been collected, analyzed, and used to design the proposed CID Program and specific recharge projects. It documents technical studies and engineering and scientific investigations that supported definition and feasibility evaluation for CID Groundwater Mitigation and Banking Program. The reader is referred to the enclosed disk for copies of the studies that are referenced in this document, or to the Upper Kings Water Forum website located at http://project.wrime.com/krcd/ for copies of many of the reports cited in this section.

8.1.1 Project Development and other Technical Investigation

KRCD, 1979. Groundwater Recharge Study. Fresno, CA.

KRCD, 1991. Alta Irrigation District Surface Water Study. Fresno, CA.

KRCD, 1999a. Artificial Groundwater Recharge in the Kings Service Area. Fresno, CA.

KRCD, 1999b. Artificial Recharge in the Kings River Service Area. Fresno, CA.

KRCD, 2000. Feasibility Study Report. Preliminary Design and Estimate of Costs for Two Potential Groundwater Recharge Sites Within the McMullin Recharge Project Area. Fresno, CA.

Provost and Pritchard, 1995. Feasibility of Utilizing the City of Fresno's Wastewater for Raisin City Water District. Fresno, CA.

Provost and Pritchard, 2005. Unpublished Canal Characteristic Data. Fresno, CA.

Provost and Pritchard, 2005. Unpublished Water Delivery and Water Entitlement Data in Lower Kings Basin. Fresno, CA.

Summers Engineering, 2007, Engineer's Report, Urban Impacts Study. (Attachment H) This report evaluated financing and funding opportunities and evaluates the connection between urban development and impacts to flood and recharge in CID; it documents the preliminary project design and canal improvements needed for recharge and flood management.

WRIME, 2002a. Upper Kings River Basin Phase in Basin Assessment Report. Prepared for Upper Kings River Basin ISI Participants in Coordination with California Department of Water Resources, Division of Planning and Local Assistance, Conjunctive Water

Management Branch. Sacramento, CA. This study reviewed historical data, documented current conditions, provided feasibility/suitability study for recharge project, and included site characterization for a range of locations in Fresno Irrigation District (FID), Alta Irrigation District (AID), and CID. The study documented soil and aquifer parameters (transmissivity and hydraulic conductivity, infiltration rates), described the lithology and stratigraphy of the basin, and presented a range of groundwater level contours.

WRIME, 2006f. Kings Basin Conjunctive Use Feasibility Analysis Memorandum. (Attachment EE) Prepared for the Upper Kings River Water Forum Planning and Steering Committee. Sacramento, CA. The report evaluated regional and more localized hydrogeology to support locating direct and in-lieu recharge facilities. Evaluated canal/conveyance constraints, identified surface water availability for the proposed projects, and quantified the recharge capacities of the Region using GIS and specific site selection criteria.

WRIME, June, 2007. Technical Memorandum on Floodwater Availability for the CID from the Kings River, File: 304.T06.00. (Attachment C) As part of the feasibility investigations of the proposed CID Groundwater Mitigation Bank, WRIME analyzed the historical unregulated flood releases in the Kings River to quantify the additional diversions that could be made for purposes of groundwater recharge. Four different diversion scenarios, 50, 100, 150 and 200 cfs, were tested against two different canal capacity constraints; an operational constraint of 2,100 cfs, and a design constraint of 2,700 cfs.

8.1.2 Demand, Supply, and Water Budget Analysis

The development of the Upper Kings Basin IGSM (WRIME, 2007) allows for extensive analysis of the water budget; supports planning of proposed capital facilities; and provides for evaluation of impacts and benefits of proposed projects. There were a number of separate technical studies conducted to support model development that also helped demonstrate the need and feasibility of the proposed projects.

DWR, 1975. Vegetative Water Use in California. DWR Bulletin 113-3, Department of Water Resources, California.

DWR, 1989. Effective Precipitation: A Field Study to Assess Consumptive Use of Winter Rains by Spring and Summer Crops. Department of Water Resources, San Joaquin District, California.

DWR, 1999. Tulare County Land Use Survey.

DWR, 2000. Fresno County Land Use Survey.

DWR, 2004. Kings County Land Use Survey.

KRCD, 1993. Consolidated Irrigation District Surface Water Study. Fresno, CA.

KRWA, 2001. Summary of Flood Releases from Pine Flat Reservoir 1954-2000. Revised August 3. Fresno, CA.

KRWA, 2005. Unpublished Kings River Flow Data Measured Below Weirs Data. Fresno, CA.

USBR, 2005. Mid-Pacific Region 2005 Conservation and Efficiency Criteria. Sacramento, CA.

WRIME, 2002b. Upper Kings Basin Phase IB Basin Assessment Report. Sacramento, CA. This study evaluated the basin conditions in greater detail and supported formation of the Water Forum.

WRIME, 2003a. Upper Kings Basin Conjunctive Use Project Assessment. Prepared for Upper Kings River Basin ISI Participants in Coordination with California Department of Water Resources, Division of Planning and Local Assistance, Conjunctive Water Management Branch. Sacramento, CA. This report helped define conjunctive use project opportunities and the feasibility of projects subsequently constructed including Waldron Ponds in the FID area and Harder ponds in the AID area.

WRIME, 2004. White Paper No. 1, Summary of Land Use and Water Use. Prepared for the Upper Kings River Basin Water Forum and The California Department of Water Resources. Sacramento, CA. This was a non-technical presentation of the range of urban and agricultural water demands in the basin and was used by the Forum to define issues.

WRIME, 2005a. Lower Kings Basin Groundwater Management Plan Update. Prepared for the Kings River Conservation District. Sacramento, CA. Provided review of historical water levels, quality, and hydrogeology in the western part of the basin; defined project opportunities and management actions.

WRIME, 2005b. Hydrologic Modeling in Kings Basin, A White Paper. Prepared for the Upper Kings Water Forum. Sacramento, CA. A non-technical publication to support the Forum in defining the purpose, need, and approach to developing modeling tools.

WRIME, October 2006. Existing Conditions and 2030 Baseline Conditions and Assumptions. This draft memorandum was used by the Technical Advisory Committee and Water Forum to finalize the assumptions for the without project future conditions.

WRIME, 2006a. Analysis of Water Demand in the Kings Basin. Technical Memorandum, Phase 1, Task 3. (Attachment G) Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of

Water Resources. Sacramento, CA. Presents an evaluation of historical agricultural and urban demands and forecast of future water needs. Used to develop model input files.

WRIME, 2006b. Analysis of Water Supplies in the Kings Basin. Technical Memorandum, Phase 1, Task 4. (Attachment D) Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA. Presents an evaluation of historical supplies and diversions and provides discussion on potential future water supply opportunities. Used to develop model input files.

WRIME, 2007. Kings IGSM Model Development and Calibration Report. (Attachment A) Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA.

WRIME, 2007b. Kings IGSM Model Development and Calibration Report, (Work in progress). Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA.

8.1.3 Planning

City of Sanger, 2000. Urban Water Management Plan. Sanger, CA.

City of Sanger, 2006. Wastewater Treatment Plan 2006. Sanger, CA.

Department of Health Services, 2006. Groundwater Recharge Reuse DRAFT Regulations 12-01-04. Sacramento, CA.

DWR, 2005c. The California Water Plan Update 2005. Sacramento, CA

DWR, 2005. Guidebook to Assist Water Suppliers in the Preparation of a 2005 Urban Water Management Plan. January 18, 2005.

FID, 2000. Water Conservation Plan, 5 Year Update. Fresno, CA.

FID, 2005. Groundwater Management Plan (Draft). Fresno, CA.

Fresno County, 2000. Fresno County General Plan Policy Document, October 3, 2000. Fresno, CA.

Fresno County, 2000. The Fresno County General Plan Background Report. October 2000. Fresno, CA.

Fresno County, 2004. The Fresno County General Plan. Fresno, CA.

Fresno County, 2004. The Fresno County General Plan. Fresno, CA.

Hauge, Carl J. 1992. The Impact of Groundwater in California. In: Changing Practices in Groundwater Management –The Pros and Cons of Regulation. Proceedings of the Eighteenth Biennial Conference on Groundwater, Sacramento, California.

Ireland, R. L., Poland, J. F., and Riley, F. S. 1984. Land Subsidence in the San Joaquin Valley, as of 1980, U. S. Geological Survey Professional Paper 437-I, 93 p.

Ireland, R.L., et al., 1984. Land Subsidence in the San Joaquin Valley, as of 1980. USGS Professional Paper 437-1.

KRCD, 1974. Master Plan. Fresno, CA.

KRCD, 1999c. Consolidated Irrigation District Ponding Basin Volume. Fresno, CA.

KRCD, 2006b. Environmental Baseline Conditions. Fresno, CA. Report aggregates environmental data for the Region and documents studies, data sources, and maps; describes current conditions.

State of California, 2006. Water Code. Sacramento, CA.

State of California, 2000. Cortese-Knox-Hertzberg Local Government Reorganization Act of 2000. Sacramento, CA.

SWRCB, 2002. Water Transfer Issues in California, Final Report to the California State Water Resources Control Board by the Water Transfer Workgroup. Sacramento, CA.

WRIME, 2006c. Baseline Conditions. Technical Memorandum. Phase 1, Task 5. Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA. Documents historical and existing baseline conditions in the Region, evaluated physical and as-built facilities and policy/institutional settings. .

WRIME, 2006d. Planning Framework, Integration Strategy, and Assumptions. Technical Memorandum. Phase 1, Task 12. Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA. Defines the approach to configuring alternatives and evaluating water management strategies.

WRIME, 2006e. Water Management Strategies, Opportunities, and Constraints. Technical Memorandum. Phase 1, Task 13. Prepared for the Upper Kings Basin Water Forum and the Kings River Conservation District with support from the California Department of Water Resources. Sacramento, CA. Detailed evaluation of the water management strategies required for consideration in an IRWMP; defines approaches and applicability to the Region.

WRIME, 2007a. (Attachment F) Draft Technical Memorandum- Review of City and County General Plans. Prepared for the Upper Kings River Water Forum Planning and Steering Committee Land Use and Water Supply Work Group. Sacramento, CA. Evaluates city and county general plan goals, objectives, and policies to define plan integration opportunities and to better integrate land use and water supply plans and the planning process.

8.1.4 Hydrogeology/Geology

The geology and hydrogeology of the Kings River Basin and San Joaquin Valley has been extensively investigated. The major reports listed below, and other publications, were used to characterize the hydrogeology and develop the Upper Kings Basin IGSM (WRIME, 2007b, 2006f) and to conduct the regional recharge feasibility study (WRIME, 2006f), which defined recharge areas. The major geological studies that were examined include the following:

Brown and Caldwell, 2006. Technical Memorandum, Kings Basin Integrated Hydrologic Modeling, Hydrogeoligic Investigation. This report documents the collection and review of over 2,000 drillers logs, contains cross sections, and developed the conceptual hydrogeologic model.

Cehrs, David, Stephen Soenke, and William C. Bianchi, 1980. A Geologic Approach to Artificial Recharge Site Selection in the Fresno-Clovis Area, California. This study discusses site selection criteria for potential artificial recharge including how the geology influences recharge.

Croft, M.G., 1969. Subsurface Geology of the Late Tertiary and Quaternary Water-Bearing Deposits of the Southern Part of the San Joaquin Valley, California. This report describes the occurrence of groundwater and aquicludes and aquifers in the area including their thickness, lithology, and stratigraphic relations.

Davis, G. H., J. H. Green, S. H. Olmstead, and D. W. Brown, 1959. Ground Water Conditions and Storage Capacity in the San Joaquin Valley, California. U.S. Geological Survey. Water Supply Paper No. 1469. 287p.

Davis, S. N. and R. J. M. DeWiest, 1966. Hydrogeology. NewYork, John Wiley.

DWR, 1980. Groundwater Basins in California. DWR Bulletin 118-80, Department of Water Resources, California.

KRCD, 2001. Kings River Service Area, Annual Groundwater Report 2000. Fresno, CA.

Muir, K.S., 1977. Ground Water in the Fresno Area, California. This report documents the water-bearing deposits, direction of movement, recharge, and discharge characteristics, fluctuations of water levels, and chemical quality of the aquifers. • A series of papers between 1997 through 2005 by Gary S. Weissmann and others on the area's glacial history, stratigraphic sequences, groundwater, and modeling of aquifers.

Page R.W. and R.A. LeBlanc, 1969. Geology, Hydrology, and Water Quality in the Fresno Area, California. Geologic and hydrologic conditions of the San Joaquin Valley were investigated during this study to utilize the area for groundwater storage and relate the study area to adjacent areas and the valley as a whole.

U.S. Geological Survey. 1959. Ground-water Conditions and Storage Capacity in the San Joaquin Valley California, Water Supply Paper 1469.

Williamson, A. K., D. E. Prudic, and L. A. Swain. 1989. Ground-Water Flow in the Central Valley, California. USGS. Professional Paper 1401-D. 127p.

8.1.5 Water Quality

RWQCB, 1998. The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region, Fourth Edition. Fresno, CA.

RWQCB, 2004. Water Quality Control Plan for the Tulare Lake Basin (Basin Plan). Fresno, CA.

RWQCB, 2006. 2006 CWA Section 303(d) List of Water Quality Limited Segment. Fresno, CA.

SWRCB, 1988. Resolution 88-63: Sources of Drinking Water. Sacramento, CA.

SWRCB, 1995. Water Quality Control Plan for the Delta. Sacramento, CA.

SWRCB, 2000. Plan for California's Nonpoint Pollution Control Program. Sacramento, CA.

Upper Kings Water Forum, 2006. Position Statement/Principles: Integrated Water Quality and Sustainable Infrastructure Program for Clean and Safe Water. Fresno, CA.

WRIME, 2006. Water Quality Standards, Conditions, and Constraints. Prepared for: Upper Kings Basin Water Forum and Kings River Conservation District In Coordination with California Department of Water Resources. (Attachment J) Report documents groundwater and surface water quality conditions; evaluates current regulatory and planning environment; and contains and analysis of the water quality benefits and impacts of proposed recharge operations.

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Appendix A Land Use-Water Supply Briefing

GEI Consultants
Bookman-Edmonston Division

March 6, 2009

Memo

To: Phil Desaloff, General Manager, CID

From: Matt Zidar

Date: March 14, 2008

Re: Briefing on Integrating Water Supply and Land Use Planning in CID

Summary

- The Kings Groundwater Basin, including the area of the Consolidated Irrigation District (CID), is in a state of overdraft. This means that more water is removed than is recharged on an average annual basis. Over the long-term, overdraft is not sustainable.

- Future municipal and industrial uses that are reliant on groundwater will increase overdraft and have a negative impact on the groundwater basin and current overlying water users.

- A physical solution consisting of projects and funding is needed to reduce overdraft that results from current water demands, and for mitigating the impacts of new development on groundwater overdraft.

- The cities within CID include Selma, Fowler, Kingsburg, Parlier, and Sanger (CID Cities), which have authority over land use, adopt General Plans to guide land use, prepare Urban Water Management Plans (UWMP) to guide use of their available water supplies, and act as lead agency pursuant to the California Environmental Quality Act (CEQA).

- CID is a regional water management agency with appropriate powers and authorities, infrastructure, water rights, and experience needed to develop physical solutions to the water supply problems, and to provide solutions that increase the reliability of the water supply.

- CID is updating the 1995 Groundwater Management Plan (GMP), which includes identifying projects, programs, and policies that will define the proposed Groundwater Mitigations and Banking program. This program will ensure that a long-term, sustainable water supply is available to meet both current and future demands.

- The intended uses of the GMP are to:

  - Define projects (physical solutions) to manage overdraft.
  - Streamline the development review process for CID cities, water suppliers, and CID.[1]

- Document regional water demand and supply sources to a level of detail such that the GMP would serve as a regional water supply assessment for CID Cities when considering new development.[2]
- Define the financial mechanism to implement, operate, and maintain projects.
- Provide mitigation for groundwater impacts pursuant to CEQA.
- Provide a mechanism for CID Cities to verify water supply availability and adopt legally defensible findings of sufficiency.

Problem Statement

There is substantial evidence of historical overdraft in the Upper Kings Groundwater Basin, including the portions of the groundwater basin that underlie CID and the cities within the CID boundaries, including Selma, Fowler, Kingsburg, Parlier, and Sanger. The Kings Basin area has been defined as being in a critical state of overdraft by the California Department of Water Resources. The Kings Basin Integrated Groundwater and Surface Water Model (Kings IGSM) was developed as part of the Upper Kings Integrated Water Resources Management Plan (Kings IRWMP).[3] The model was used to simulate the historical conditions and quantify overdraft. The Kings IGSM was also used to evaluate baseline and future build out conditions. The results indicate that future land use and growth will contribute to the overdraft problem.[4]

Urban and industrial demands are different than the historical overlying agricultural uses in both the source of water and the type of water use. Urban and industrial uses rely 100% on groundwater, whereas agricultural uses within CID may rely on both delivered surface water and/or groundwater sources. Urban uses require greater reliability, higher quality, and represent a year-round, rather than seasonal, demand for water.

New development or other projects that increase consumptive use of groundwater, also increase groundwater overdraft and impact current overlying groundwater users. The negative impacts should be mitigated.[5] In addition, increased contributions to overdraft have a negative effect on the existing, overlying groundwater rights.

Changes in State legislation over the past ten years have created informational and procedural requirements that mandate that land use agencies and water supply agencies communicate and coordinate during the planning process. CID and the CID Cities need to review the information requirements, current land and water management plan and candidly define the issues and opportunities to streamline the development review process, while also ensuring there is reliable water for current and proposed agricultural, municipal, and industrial water users.

Planning Issues and Policy Environment

Roles and Responsibilities for Land Use and Water Management

CID and the CID Cities participated in the development of the Kings IRWMP. The Kings IRWMP identified the need for integration of land use and water supply plans, and the related planning and decision making process.

CID Cities and County of Fresno have the powers and authorities to develop general plans, make land use decisions, and approve new development. They are the lead agencies to comply with the California Environmental Quality Act (CEQA) when making land use decisions. CID Cities and Fresno County are responsible for ensuring that impacts from projects are mitigated or avoided. When CID Cities annex land, they detach the land from the County and CID.

The Fresno County General Plan has clear regional water management goals and objectives and has well-defined requirements for groundwater management. The Fresno County General Plan takes a regional perspective for addressing groundwater overdraft. The general plans for cities within CID generally do not recognize the regional problems of overdraft.[6]

CID is a regional water agency that has conducted conjunctive-use operations and worked to manage groundwater in its jurisdictional area since 1921. It holds the rights to the surface water from the Kings River, which it manages and distributes to overlying land owners for agricultural purposes and groundwater recharge, and has a 1995 GMP that is being updated.

CID is a responsible agency with jurisdiction for reviewing city development that may affect groundwater supplies by law pursuant to CEQA. CID has a compelling interest in the protection of groundwater rights of the overlying land owners within the jurisdictional area. The Cities' rights to groundwater are prescriptive and potentially adverse and subordinate to the right of existing overlying agricultural groundwater rights. The Cities, through their municipal utilities or as part of a franchise agreement with a private water company, are acting as an appropriator of groundwater and can only legally pump surplus groundwater. Their use and commitment of groundwater to new development could significantly affect existing overlying groundwater users in the CID area. The Cities' commitment of groundwater to new development is a prescriptive use of the groundwater in the Kings Basin.[7]

Local Agency Formation Commission (LAFCO) also has an affirmative responsibility to ensure that water supplies are available prior to granting an annexation. The CID Cities water supply assessments are needed by LAFCO to make appropriate findings prior to annexation to the city and de-annexing from CID. Important changes to the governing statutes[8] and added responsibility include requirements to determine timely and available water supplies; prepare comprehensive water services reviews; and assess firm yield water supply availability, reliability, and quality for annexations and extension of services. The legislature also tasked LAFCO with considering water and wastewater management regionally, including evaluating the ability of public facilities to meet current and future service needs, or to extend services outside of existing boundaries.

Urban Water Management Plans

The CID Cities with 3,000 service connections are "urban water suppliers" and are required to adopt UWMPs. Selma is serviced by California Water Service, which has prepared the UWMP. UWMPs define how cities and/or water service providers will meet current and future demands over a 20-year planning horizon for different hydrologic conditions.[9] They generally describe water supply and demand (existing and projected) and water conservation measures, as well as water supply reliability and shortage contingency plans.

The planning functions of the UWMPs were significantly elevated by the enactment of laws creating water supply assessment and verifications.[10] UWMPs must describe the plans to supplement or replace a water supply source with alternate sources or water demand management measures if it is shown that current sources cannot meet all anticipated demands.[11] The cities must identify specific projects and include a description of the increase in a water supply that is expected to be available from each water supply project or source.[12] If groundwater is a water supply source, the UWMP must provide detailed information regarding the limitations of that source and, to the extent available, the historical uses of groundwater within the basin. Most of the CID Cities' UWMPs were prepared prior to the Kings IGSM analysis of the water budget and documentation of overdraft and do not contain specific projects or plans to reduce or mitigate overdraft. As a result, the currently adopted UWMP may not help CID Cities meet the state requirements related to use of the UWMP during evaluation of new development or proposed projects and when making environmental determinations.[13]

Water Supply Assessments and Verification - Information and Procedural Requirements

Water supply planning has received increased attention from both the State Legislature and the California Courts. Recent legislation and judicial rulings[14] have increased the need for CID, the CID Cities, and County of Fresno to adhere to more rigorous planning standards. Both the legislature and the courts have created substantive informational and procedural requirements for water suppliers, the CID Cities, and the County,[15] and revisions to the water code define how these land use agencies must prepare water supply assessments when considering projects and conducting the environmental review. Cities are also now required to verify a supply prior to final approval of the final subdivision map.

The purpose of the water supply assessment and verification requirements is to determine whether the total projected water supplies available will meet the projected water demand associated with the proposed project during normal, single-dry, and multiple-dry water years during a 20-year projection, in addition to the public water system's existing and planned future uses which include agriculture and manufacturing.[16]

City or County approval of new development projects is subject to CEQA review. The city's UWMP or a water supply assessment prepared for the specific project must document that the water supply sources are available for both existing and planned uses.[17] Water supply assessments should be prepared at the time of environmental review and are to be used to document water availability or provide evidence of how water will be obtained.[18] CEQA also requires evaluation of the environmental impacts of obtaining water from proposed sources. CID believes that overdraft is a significant impact that requires mitigation.

The Cities' general plans and UWMP identify groundwater as the source of supply, and this triggers additional information requirements.[19] Most of the UWMPs do not identify new water supply projects or provide substantial evidence to document the availability of, or plan for, a long-term, sustainable water supply, nor do they define specific mitigations for increased consumptive use of groundwater.

This means that the developer and/or the CID Cities need to find project-specific mitigations to overdraft conditions and document that there is a sufficient water supply available for the proposed project.

If a city (public agency) proposes to pump groundwater to meet the needs of new development, then the city must show under CEQA that its pumping will not significantly affect the environment nor interfere with existing overlying agricultural uses of groundwater. CID Cities and Fresno County need to ensure that the increased water demands that contribute to overdraft are mitigated and that such mitigations are conditions of approval imposed during the development review process.

In developing a water supply assessment, the cities, county, or water supplier must disclose and document the quantity of water received from the various sources using the following:

- Written contracts or other proof of entitlements.
- Copies of a capital outlay program for financing the delivery of a water supply.
- Federal, state, and local permits for construction of infrastructure associated with delivery of the water supply.
- Any necessary regulatory approvals that are required to be able to convey or deliver the water supply.[20]

The water supply assessment is intended as a communication mechanism between the land use planning agencies and water supply planning agencies.

The water supply verification requirements are intended as a 'backstop' and require cities to make a finding that there is a sufficient water supply available prior to final approvals. Prior to finalizing a tentative map, cities must verify that the supplies identified in the water supply assessment are prepared pursuant to state code for a project, documenting what waters are actually available and what are committed.[21]

The city, in verifying a water supply, must also include a description of the reasonably foreseeable impacts of the proposed project on the availability of water resources for agricultural and industrial uses within the public water system's service area that are not currently receiving water from the water system but are utilizing the same source.[22] Verification of a water supply must be supported by substantial evidence, which may consist of the supplier's or cities' UWMP, a water assessment, or other information similar to the assessment of water supplies and demand in an UWMP.[23]

None of the available information currently provided by the CID Cities include substantial evidence to document a verifiable water supply and make substantive findings of sufficiency.

LAFCO AND THE CORTESE-HETZBERG-KNOX ACT

Local Agency Formation Commissions (LAFCOs) are tasked with ensuring water supplies are available at the time when city or special district boundaries are to be amended. The Cortese- Hetzberg-Knox (CHK) Act passed in 2000 amended the Government Code and requires all spheres of influence to be updated every five years. Prior to updating a sphere, the LAFCO is required to approve a Municipal Service Review (MSR) for public services provided within the sphere. Proposals for reorganization are subject to the CHK and to review by the LAFCO. The LAFCO is required by state law to review and make a determination of approval or denial of all annexations or other changes of organization to cities and special districts.

LAFCOs serve as the legislature's watchdog, operating at the intersection of land use, services (including water), finance, and governance. LAFCOs are tasked with balancing competing stakeholder interests of: 1) discouraging sprawl; 2) preserving open space and prime agricultural lands; and 3) efficiently providing government services.

Important changes and added responsibility include requirements to determine that there are timely and availability water supplies; prepare comprehensive water services reviews; and assess firm yield water supply availability, reliability and quality for annexations and extension of services. The legislature also tasked LAFCO's with considering water and wastewater management regionally, including evaluating the ability of public facilities to meet current and future service needs, or to extend services outside of existing boundaries.

The CHK defines the factors to be considered in the review of a proposal. This includes whether the city annexing land is able to provide the services needed, including the sufficiency of revenues for those services following the proposed boundary change24, and the timely availability of water supplies adequate for projected needs[25.] As such, the CID cities need to not only evaluate the water supplies available, but the source of supply to a project and how such new supplies will be financed. This is challenging given overdraft in the Kings Basin and the complete on groundwater by the cities.

The CHK further clarifies the legislative intent for ensuring that there be close coordination and consultation between water supply agencies and land use approval agencies to ensure that proper water supply planning occurs Section in order to accommodate projects that will result in increased demands on water supplies through a standardized process for determining the adequacy of existing and planned future water supplies to meet existing and planned future demands on these water supplies[26].

The informational requirements are similar to the information requirements that the cities must consider in making their determinations pursuant to CEQA and the Water Code. As such, this further makes the case for having the GMP serve as a water supply assessment for the cities and LAFCO to use in making determinations, as well as for defining projects and funding sources to implement such projects so that both LAFCO and the cities may verify a sustainable water supply.

Plans for providing services need to be submitted with resolution of application to LAFCO[27]. The plan for providing water services is to include along with discussion of other conditions the local agency would impose or require within the affected territory if the change of organization or reorganization is completed. This includes information with respect to how those services will be financed. Within the CID Cities, this typically included plans for wells, pumps, water storage and distribution infrastructure for use of groundwater, but did not include actions that that Cities would take to work regionally to resolve overdraft, fund development of new water supplies to meet their increasing demand, or to support conjunctive use and construction recharge facilities to increase supplies and reduce overdraft.

Prior applications to LAFCO did not acknowledge the overdraft issue nor seek to resolve the effects of new municipal development on overdraft. MSR also did not seek to include facilities or financing to resolve overdraft and effects of new development on the water budget. LAFCO has not historically conditioned annexation of resolution of overdraft issues. This lack of recognition of the regional overdraft, and of projects and financing intended to reduce overdraft, are issues for both LAFCO and the Cities to resolve prior to approval of new projects.

Findings and Conclusion

City general plans and the UWMP do not recognize overdraft or the limitation of the groundwater source, nor do they define how cities will mitigate water supply impacts of new development[28] by providing a sustainable water supply[29] and defining what projects are planned to meet the total projects' water use.[30]

Without firm plans for developing and funding water supply projects and ensuring that water supplies are available to meet current and future water demands, the Cities will have trouble making sufficiency determinations and complying with statutory requirements; land use decisions may be subject to legal challenge; and economic development could be affected.

The CID Cities need to mitigate for the groundwater impacts of new development as part of the development review process. This can be done through demonstrating that the city is not contributing to overdraft (e.g., requiring the developer to procure a new water supply in lieu of using groundwater), or through some other appropriate project or agreements to mitigate for the increased groundwater consumption.

It is not likely that in matters where the city would be committing water through prescription and where there are significant effects related to overdraft, the city use of a statement of overriding consideration would withstand legal challenge.

Opportunities

Opportunities exist for CID and the land use agencies to integrate General Plan, UWMPs, and GMP requirements to streamline the decision process; avoid conflicts; meet current and future demands; and sustain the local economy.

CID is the regional water agency with appropriate powers and authorities to develop the GMP[31] for the region. CID intends to use the GMP to define projects that ensure a reliable water supply is available. It is anticipated that the GMP will define a Groundwater Mitigation and Banking Program that consists of capital projects, policies, and programs that will document how CID and the CID Cities will work together to develop additional water supplies, reduce overdraft, and avoid significant impacts.

The GMP will define the process to integrate information and meet the procedural requirements for both the CID Cities and CID. One of the GMP objectives is to implement cost-effective mitigations to overdraft that the CID Cities and development community can use to ensure that a long-term, sustainable water supply is available, that appropriate findings can be made, and that decisions are technically supported and able to withstand challenge. The intended uses of the GMP are as follows:

- Streamline development review process for CID cities, water suppliers, and CID.[1]
- Document regional water demand and supply sources to a level of detail such that the GMP would serve as a regional water supply assessments for CID Cities when considering new development.[2]
- Define projects (physical solutions) to overdraft, including the financial mechanism, which ensures implementation, operations, and maintenance, that would provide mitigations for groundwater impacts pursuant to CEQA, and provide the mechanism for CID Cities to verify water supply availability and adopt legally defensible findings of sufficiency.
- Define project funding requirements and financing mechanism.

Endnotes

1 Most CID Cities are the municipal supplier, with the exception of Selma, which is served by California Water Service.

2 CEQA statutes and guidelines; the Water Code (CWC § 10910 (c) (2), (h)); and the Govt. Code (§ 6647.3.7 (c) (1) allow incorporation by reference and support streamlining.

3 California's Groundwater - Bulletin 118. DWR, Update 2003. *Kings IGSM Model Development and Calibration Report*, WRIME, 2007.

[4] See Chapter 4 of the Upper Kings IRWMP, which presents the water budgets for the 2005 baseline and the 2030 build out conditions. Forecasts of future growth and water demand were based on review of the adopted UWMP, General Plan land use diagrams, and the accepted sphere of influence.

[5] *Engineer's Report, Urban Impacts Study*. Summers Engineers July 2007; Groundwater *Impact Analysis* WRIME, July 2007.

[6] Technical Memorandum- Review of City and County General Plans. WRIME, February 2007.

[7] CID views the increase in municipal uses of groundwater to be open, adverse, and hostile pursuant to the Water Code.

[8] Govt. Code § 56000 *et seq.* Cortese-Knox-Hertzberg Local Government Reorganization Act Of 2000

[9] California Water Code (CWC) § 10610 *et seq*)

[10] CWC § 10910-10915

[11] CWC § 10631(c)

[12] CWC § 10631 (h)

[13] Senate Bills 610 and 221 significantly elevated the planning function of UWMPs by creating water supply assessments and verification requirements (CWC § 10910 *et seq*). A supplier relying on groundwater to meet its customers' demands must provide detailed information regarding the limitations of that source, and to the extent available, the historical uses of the basin. Requirements to address groundwater sources were added in 2001 and the Kings IGSM results were published in 2007 and may not be reflected in the most recent UWMPs.

[14] Several major court decisions have interpreted CEQA in ways that place more requirements on land use and water planners. See Planning and Conservation League v Dep't of Water Resources, 83 Cal.App. 4th 892 (2000) (disapproving contract reformation between DWR and State Water Project (SWP) contractors; Santa Clarita Org for Planning and the Environment (SCOPE) v Count of Los Angeles, 106 Cal. App. 4th 715 (2003) (finding that CEQA prohibits reliance on "paper water," specifically water from the SWP; recent California Supreme Court ruling, Vineyard Area Citizens For Responsible Growth, Inc. V City Of Rancho Cordova, Sunrise Douglas Property Owner Assn., Super. Ct. No. 02CS01214., Cal. App. 3rd C044653 (2007).

[15] CWC § 10910-10915

[16] CWC § 10910 (c)(3) and (4). Also Govt. Code § 66473.7 (a)(2). Water supply assessments may be required for any project that is subject to CEQA, while verifications are not required until the tentative or parcel map stage. The laws requiring verification were added in part because of pervasive non-compliance with the earlier laws requiring assessments.

[17] CWC § 10631(b), (h) and (i); 10910 (c)(2), (c)(3), (c)(4)

[18] CWC § 10911(b). Assessments should be included in negative declarations, mitigated negative declarations, or EIRs.

[19] CWC § 10910 (f); Govt. Code § 66473.7(h)

[20] CWC § 10910 (d)(2)

[21] Govt. Code § 66473.7

[22] Govt. Code § 66473.7 (g)

[23] Govt. Code § 66473.7(c)

[24] *ibid* §56668(f)

[25] *ibid* §56668(f)

[26] *ibid* §65352.5

[27] *ibid* §56653

[28] *Technical Memorandum- Review of City and County General Plans.* WRIME, February 2007. Prepared for the Upper Kings Water Forum.

[29] CWC § 10631(b) requires UWMPs to include a copy of the most recent General Plan, description of the groundwater basin, detailed description and analysis of the location amount, and sufficiency of groundwater.

[30] CWC § 10631(h)

[31] CWC § 10750- 10755

Appendix B Kick-Off Meeting Presentation

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CID Board Meeting

Agenda Items

1. **Groundwater Management Plan**
2. **Geringer Property Site Evaluation**

Consolidated Irrigation District Groundwater Management Plan

- **Why do the plan?**
- **What are the anticipated outcomes and benefits?**
- **How to do the plan?**

Everything should be made as simple as possible, but not one bit simpler….. Albert Einstein

Why Do the GWMP? Purpose and Need

- **Reduce or eliminate overdraft**
- **Protect overlying ground water rights**
- **Define "physical solution" solutions**
- **Engage cities & stakeholders**
- **Meet SB 1938 requirements and qualify for state funding**
- **Provide CID with a strategic roadmap**

In preparing for battle I have always found that plans are useless, but planning is indispensable. Dwight D. Eisenhower

Why Do the GWMP? Relationship to Other Plans

Existing Plans

- County and City General Plans
- AWMPs
- UWMPs
- Capital Improvements
- GWMPs
- RWQCB Basin Plan
- Other Plans

IRWMP

Integration of existing plans

Comprehensive management at the regional scale

Future Plans

- County or City General Plan Updates
- Amendments to AWMPs, UWMPs, GWMPs
- Long Range Visions and Plans

What is the Anticipated Outcome and Benefits?

- **Groundwater and Mitigation Banking Program**
  - **Projects**
  - **Programs**
  - **Policies**
- **State grants awarded**
- **Equitable distribution of costs**
- **Preservation of local control**
- **Increased supply reliability in all years**

What is the Anticipated Outcome and Benefits? (cont.)

- **Solve problems without litigation**
- **Consensus with Cities and developers**
  - **Opportunity for local land use agencies to comply with state laws**
  - **Mitigations for impacts of new development**
- **CEQA clearance for defined set of actions**

How do the Plan?

- Required Elements - SB 1938/CWC § 10750
- Stakeholder/Public Involvement
- Schedule/Budget

Stakeholder/Public Involvement

- Board Meetings
  - Workshop
  - Action Items
- Groundwater "Summit"
- Policy Advisory Committee

Men often oppose a thing merely because they have had no agency in planning it, or because it may have been planned by those whom they dislike. Alexander Hamilton (1755 - 1804)

Components of GWMP

	Recommended by AB 3030	Required by SB 1938
The control of saline water intrusion	●	
Identification and management of wellhead protection areas and recharge areas	●	
Regulation of the migration of contaminated groundwater	●	
The administration of a well abandonment and well destruction program	●	
Mitigation of conditions of overdraft	●	
Replenishment of groundwater extracted by water producers	●	
Monitoring of groundwater levels and storage	●	
Facilitating conjunctive use operations	●	●
Identification of well construction policies	●	
The construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling and extraction projects	●	
The development of relationships with state and federal regulatory agencies	●	
The review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.	●	
Description of participation by interest parties		●
Plan to involve agencies overlying the basin		●
Basin management objectives		●
Basin management entity and area map		●

Schedule

Feb	March	April	May	June	July
2/13 Workshop	3/5 Water Summit 3/12 Workshop	4/9 Workshop	5/14 Workshop	6/11 Workshop	7/9 Draft GMP
Action Items: Goals/BMOs	Action Items: - Project Desc. -Water Management Strategies	Action Items: Decisions in project approaches	Action Items: Decisions in project approaches	Action Items: Financing and economics	

Discussion Points

- Issues and concerns
- Anticipated benefits
- Who should be participating in the process
- Who need to be part of the solution
- Sticking points for implementing a solution
- Items on or off the table
- Alternative views of the problem

Next Steps

- Provide Board with an updated groundwater mitigation and banking program description
- Schedule Board Workshop to review program description
- Schedule Groundwater "Summit" for local stakeholders
- Finalize schedule

The significant problems we have cannot be solved at the same level of thinking with which we created them.
Albert Einstein

Geringer Property Site Evaluation

Scope of Work

- **Phase 1 Tasks**
  1. Regional Review
  2. Drilling
  3. Phase I Site Assessment
- **Phase 2 Tasks (Optional)**
  1. Mounding Analysis
  2. Preliminary Grading Grading & Design
  3. CEQA Review

Budget

- **GANTT CHART**

BACKUP

Conjunctive Use Project Concepts CID Draft List

- 16 Potential Projects for approximately $16 Million to yield 12 to 20 K AF/yr.
- Prioritize land acquisitions
- Recharge ponds up gradient of the cities
  - Potentially seek to combine recharge and detention ponds below the cities
  - Regulation, recharge, habitat ponds
- Need to evaluate all funding mechanisms

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Appendix C Groundwater Summit Meeting Materials

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Meeting Purpose and Goals

The Consolidated Irrigation District (CID) Board of Directors is updating the 1995 Groundwater Management Plan (GMP). The purpose of the meeting is for the CID Board to provide information to the community on the State of the Kings Groundwater Basin and need for a GMP, and to obtain input from the community. The meeting will allow various stakeholders to share their perspectives and expectations related to groundwater management with the planning area. The CID GMP will:

» Establish groundwater management goals and basin management objectives

» Define project and program priorities for addressing groundwater overdraft

» Meet state requirements and allow CID to qualify for State grant funding

» Support development of a consensus on how to implement water supply facilities and better manage available water supplies

» Engage stakeholders in the area and gain consensus on problems and solutions

DATE
April 2, 2008 | 8:00 a.m. – 12:30 p.m.

LOCATION
Spike and Rail
2910 Pea Soup Anderson Blvd., Selma, CA 93662
(559) 891-7000

RSVP
Stephanie Sherrell
stephanie@cidwater.com, or (559) 896-1660

The anticipated outcome of the GMP is a CID Groundwater Mitigation and Banking Program that would define management actions and capital facilities that would help CID meet agricultural and municipal demands, both now and in the future.

Who Should Attend

Growers and agricultural interests; members of the city council, city planning and public works staff; developers; business interests; and representatives of other non-governmental organizations that have an interest in groundwater management.

CID Groundwater Summit

CID Groundwater Summit Agenda

Item	Person/Subjects	Time	
Introduction and welcome	**Robert Nielsen, Larry Cruff** *CID Board Members*	8:00 am	8:15
State of the basin, water budget, purpose and need for GMP	**Matt Zidar** GEI Consultants	8:15	8:45
Upper Kings IRWMP	**David Orth** Manager, KRCD	8:45	9:15
State Perspectives on groundwater management and GMP requirements	**Mary Scruggs** *DWR Dept. of Planning and Local Assistance*	9:15	9:45
Break		9:45	10:00
Requirements and opportunities to integrate land use and water supply planning	**Doug Jensen** *BMJ/CID Counsel*	10:00	10:30
County perspective	**Judy Case** *County Supervisor*	10:30	11:00
City perspective	**Don Pauley** *City Manager and City Representative to LAFCO Mediation Team*	11:00	11:30
Developer perspective	**Glenn Pace** *Wellington Business Group*	11:30	Noon
Wrap-up & discussion		Noon	12:30 pm

Agenda for CID Water Summit

Introduction	Robert Nielsen, Larry Cruff
State of the Basin, Water Budget, Purpose and Need for GWMP	Matt Zidar, GEI
Upper Kings IRWMP	David Orth, KRCD
State Perspectives, GWMP	Tom Lutterman, DWR
Requirements for Integration of Land Use and Water Supply	Doug Jensen, BMJ
County Perspective	Judy Case, County Supervisor
City Perspective	Don Pauley
Development Perspective	Glen Pace, Wellington Corporation

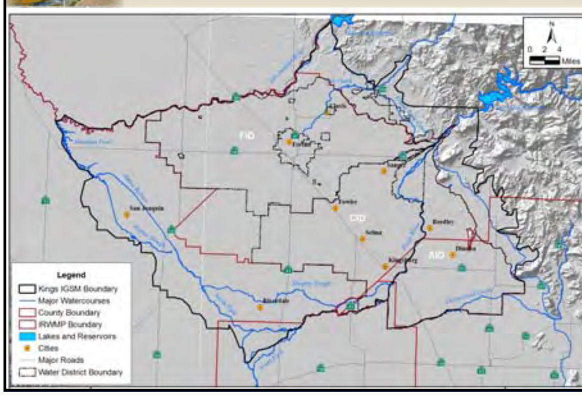
Purpose of the Meeting

- Allow CID to present information on the Groundwater Management Plan (GMP)
- Allow the Board to obtain input and hear from multiple perspectives and stakeholders
- Open up a dialog with the community on how to better manage groundwater

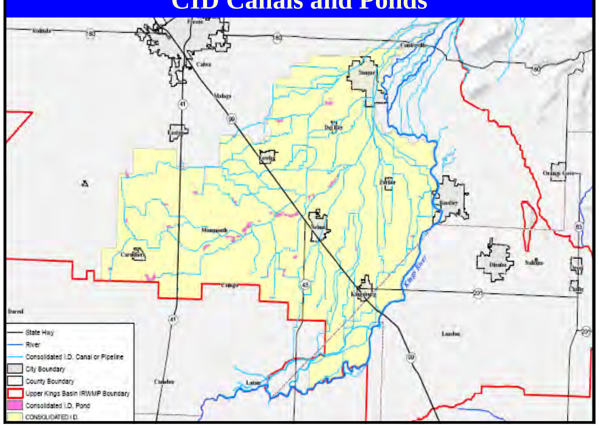
Background and History of CID

- Formed in 1921
- Senior water rights to the Kings River and
- Member of the Kings River Water Association
- Long history of conjunctive use
- Funded through annual acreage assessments

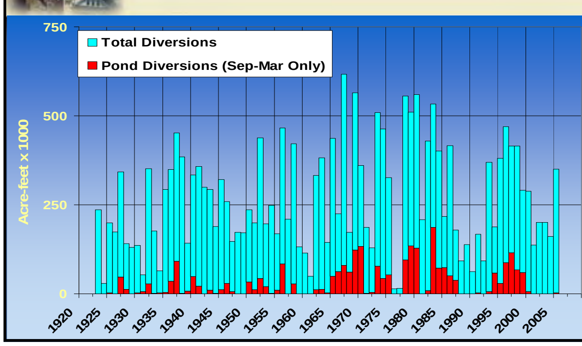
CID and the Kings Groundwater Basin



CID Canals and Ponds



Historical Water Delivery and Recharge



Why Do the GWMP? Purpose and Need

- Respond to groundwater overdraft
- Retain local control and protect overlying ground water rights
- Define "physical solution" solutions
- Engage cities & stakeholders and reduce the potential for conflicts
- Qualify for state funding and meet SB 1938 (Water Code § 10750) requirements
- Provide CID and local cities with a strategic roadmap
- Respond to changes to state laws and integrate land use and water supply planning
- Implement the Upper Kings Basin Integrated Regional Water Management Plan within CID

CID GMP Embraces the Upper Kings IRWMP Goals

- Halt and reverse overdraft and
- Provide sustainable water management
- Increase the water supply reliability, enhance operational flexibility, and reduce system constraints
- Improve and protect water quality

Objective of IRWMP & GMP

- Develop conjunctive use projects and artificial recharge facilities to:
  - Enhance operational flexibility of existing water facilities
  - Store surface water in the groundwater basin
  - Capture storm water and floodwater currently lost in the region
  - Develop multipurpose groundwater recharge facilities
  - Support the fishery management plan

Objectives of GMP – Develop Standard Practices

- Improve coordination between CID and the Cities and County during development review
- Develop equitable funding strategies to purchase water and land and to build project
- Evaluating land for its recharge potential
- Groundwater data sharing, monitoring and reporting

Anticipated Outcome = Groundwater Mitigation and Banking Program

- Projects
- Programs
- Policies

Intended Uses of GMP

- Streamline development review process
  - Provide a regional water supply assessment (WSA)
  - Provide a mechanism for verifications of a water supply availability and adoption of legally defensible findings of sufficiency
  - Define mitigations to groundwater impacts pursuant to CEQA
- Support updates of City's Urban Water Management Plans
- Support grant applications

Regional Problems and Issues
Matt Zidar, GEI

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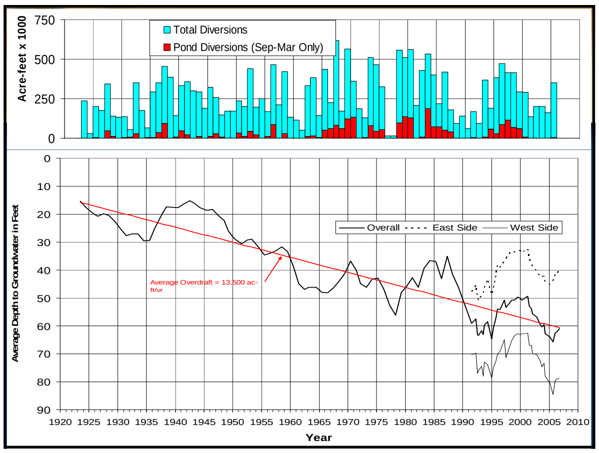
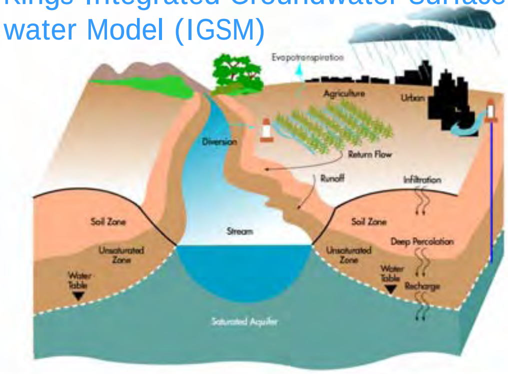
Regional Problems and Issues

- Overdraft
- Water Supply Reliability
- Urban Development
- Sustainability of Agricultural Economy



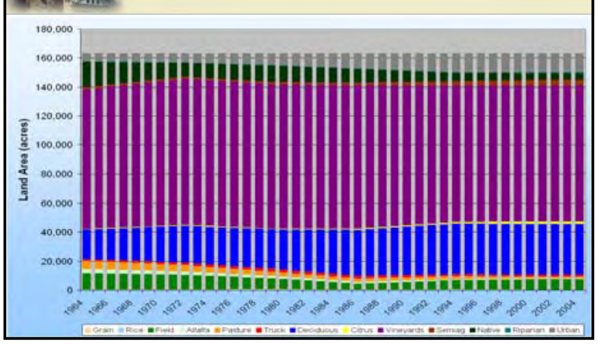
Kings Integrated Groundwater Surface water Model (IGSM)

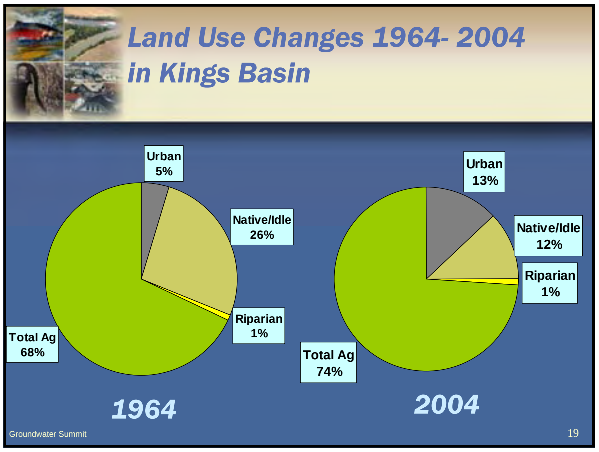


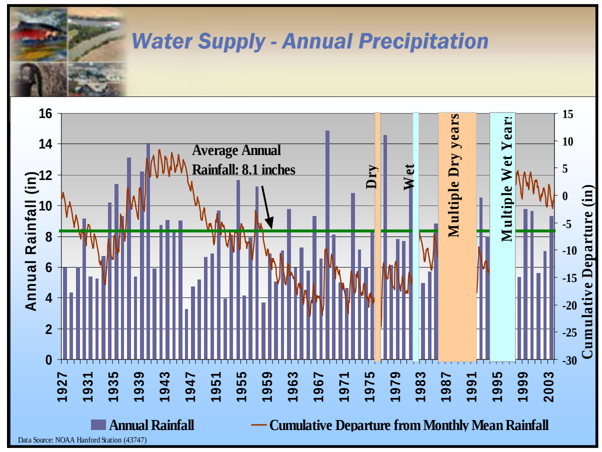
Water Budget Analysis Planning and the Kings IGSM

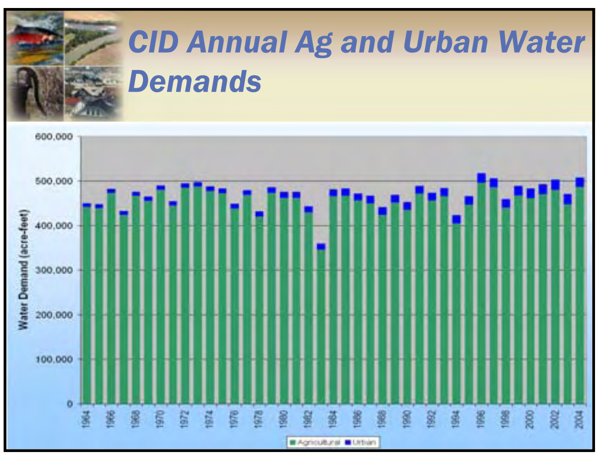
Planning Purpose	Describe Water Budget, Historical Conditions & the Problem	Evaluate Future Conditions Prescribe - Develop Management Actions
	1964-2004	Years 1 to 41
Model Use	Calibration with Observed Data	No Project Conditions 2005 Existing & 2030 Baseline Conditions

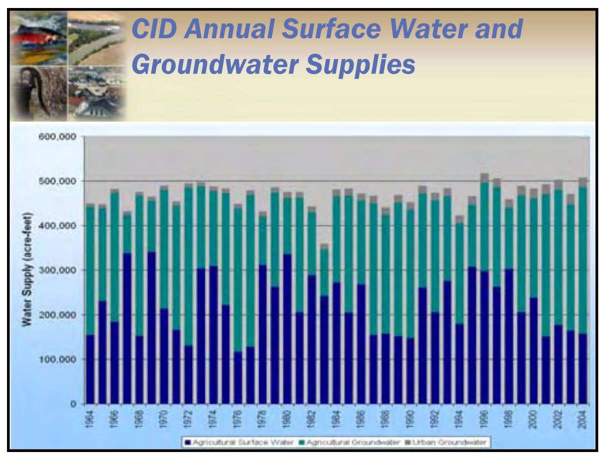
Land Use in CID

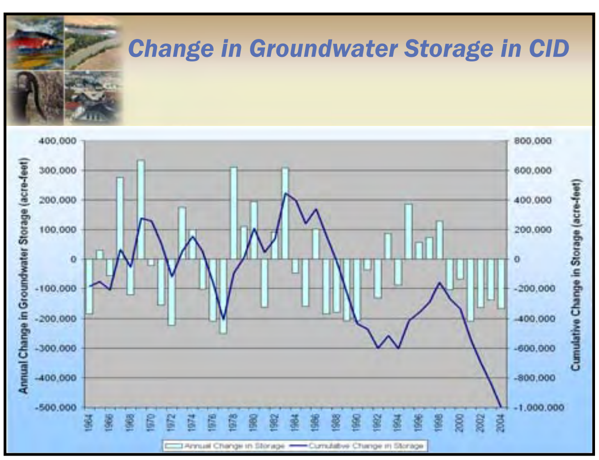


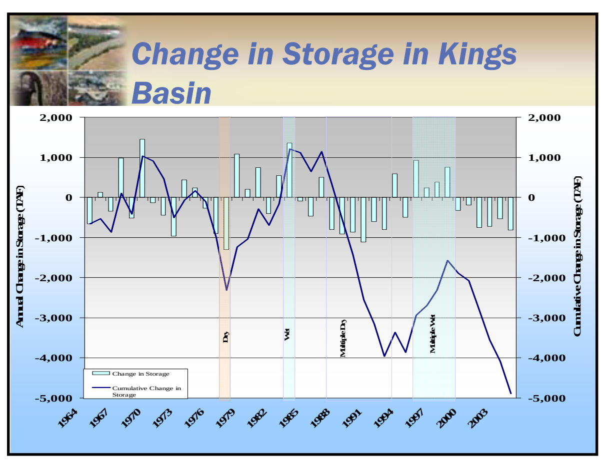

Land Use Changes 1964- 2004 in Kings Basin
Urban 5%
Native/Idle 26%
Riparian 1%
Total Ag 68%
1964
Urban 13%
Native/Idle 12%
Riparian 1%
Total Ag 74%
2004
Groundwater Summit
19


Water Supply - Annual Precipitation
Annual Rainfall (in)
Cumulative Departure (in)
Average Annual Rainfall: 8.1 inches
Dry
Wet
Multiple Dry years
Multiple Wet Years
Annual Rainfall
Cumulative Departure from Monthly Mean Rainfall
Data Source: NOAA Hanford Station (43747)


CID Annual Ag and Urban Water Demands
Water Demand (acre-feet)
Agricultural
Urban


CID Annual Surface Water and Groundwater Supplies
Water Supply (acre-feet)
Agricultural Surface Water
Agricultural Groundwater
Urban Groundwater


Change in Groundwater Storage in CID
Annual Change in Groundwater Storage (acre-feet)
Cumulative Change in Storage (acre-feet)
Annual Change in Storage
Cumulative Change in Storage


Change in Storage in Kings Basin
Annual Change in Storage (TAF)
Cumulative Change in Storage (TAF)
Change in Storage
Cumulative Change in Storage

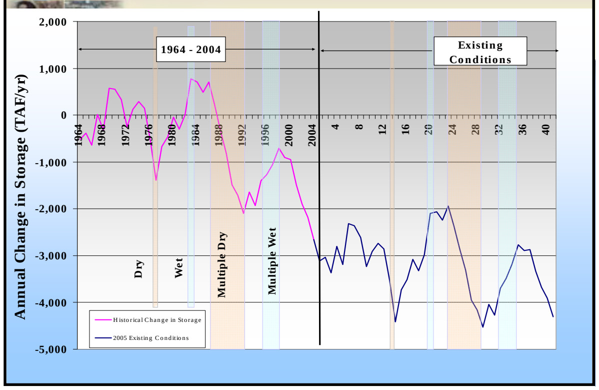
Groundwater Budget from 1964 to 2004 for CID

Budget Component	Recharge (TAF)	Discharge (TAF)
Percolation from Rainfall and Irrigation	187	
Recharge from Streams and Canals	25	
Recharge from Ponds	90	
Pumping		246
Groundwater flow out of CID		80
Overdraft	24	

Cumulative Overdraft Summary

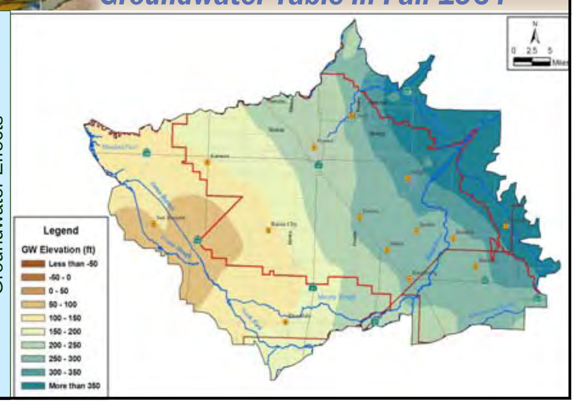
Area	Cumulative Overdraft (TAF)	Average Overdraft (TAF)
Kings Basin	6,637	162
IRWMP Area	3,313	81
CID	1,004	24

Change in Storage in IRWMP Area



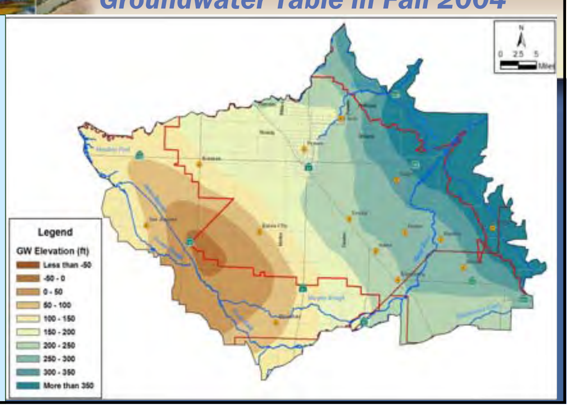
Groundwater Table in Fall 1964

Groundwater Effects



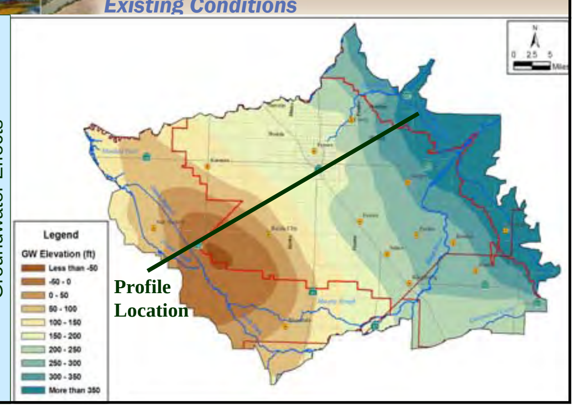
Groundwater Table in Fall 2004

Groundwater Effects

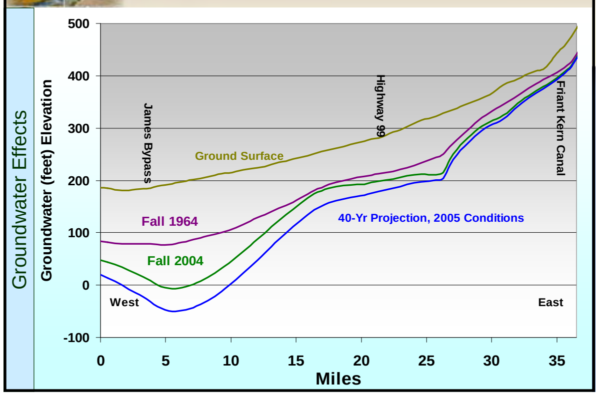


Groundwater Table, 40-Year Projection Under Existing Conditions

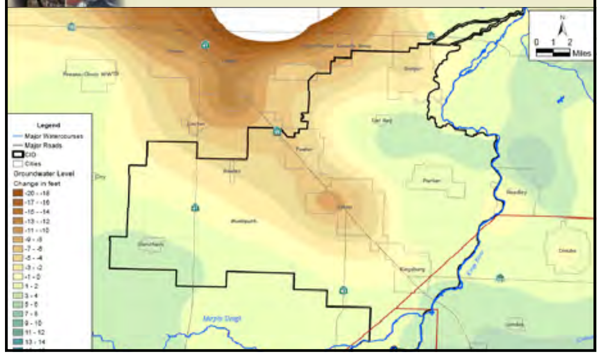
Groundwater Effects



Groundwater Elevation Profile



Expected Changes in Groundwater Levels at Build-Out



Primary Drivers
Land and Water Use System

- **Land**
  - **Total agricultural and urban acres have increased, replacing vacant and native lands**
  - **Urban areas increased from 49K to 129K acres, More permanent and water intensive crops**
- **Water**
  - **Shift from agricultural applied surface water to municipal groundwater pumping**
  - **"Hardened" year round urban demand**
  - **Municipal water quality requirements**

Groundwater System
Primary drivers

- **Groundwater moves east to west, from Upper to Lower Kings**
- **High reliance on groundwater in western portion of Kings Basin effects regional water level**
- **Urban development shift to reliance on groundwater reduces recharge and affects groundwater budget**

Potential Consequences of Inaction
"No Project" Baseline

- **Subsidence, increased pumping costs, migration of poor quality water**
- **Reduced economic activity in both agricultural and urban sectors**
- **Increased competition for available supplies and potential for conflicts over water rights**
- **Internal competition for reduced state and federal resources**
- **Lack of regional competitiveness for state and federal funding**

GMP as a Solution

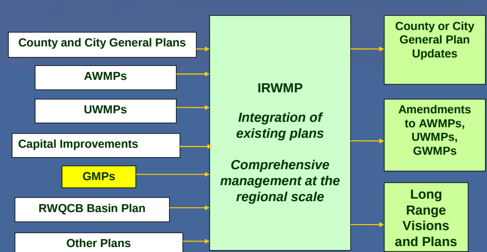
1. **Introduction**
2. **Purpose and Need for Groundwater Management Planning**
3. **Goals, Objectives, and Intended Use of GMP**
4. **Water Resources Settings**
5. **Water Resources Management Conditions, Policy and Institutional Settings**
6. **Program Description**
7. **Stakeholder Involvement**
8. **Plan Implementation**

Upper Kings Basin IRWMP
David Orth, General Manager
Kings River Conservation District

Upper Kings Basin IRWMP
David Orth, General Manager
Kings River Conservation District

Relation to Local Plans

Existing Plans | *Future Plans*



Requirements for Integration of Land Use and Water Supply Planning

Doug Jensen
Backer, Manock & Jensen

Backup

Cid Regional Conjunctive Use Projects Priorities For Prop 50 and 84 Funding

- **17 Projects for a total of $507 Million Dollars**
- **Range of projects at different stages in the project development “life cycle”**
- **Emphasis on immediate-, near-, mid- and long-term priorities**
- **Developing conjunctive use and groundwater banking projects and a longer term view**
- **Define disadvantage community needs**
- **Regional program framework**

CID Regional Conjunctive Use Projects Priorities For Prop 50 and 84 Funding

- 16 Conjunctive Use Projects
- Approximately $16 Million
- Yield 12 to 20 K AF/yr.
- Recharge ponds up gradient of the cities
  - Potentially seek to combine recharge and detention ponds below the cities
  - Regulation, recharge, habitat ponds

IRWMP Potential Benefits to CID

- Help solve CID problems using P50 and P84 funding
- Gives CID needed regional context
- Seeks to keep local water charges at a minimum
- Support local control
- Reduce potential for conflicts
- Ensure long term ag and urban needs are met

Primary Drivers Surface and Groundwater Supply

- Kings surface water supplies are well managed and little unmanaged water leaves the region
- Kings flood water is available
- San Joaquin 215 Flood water is available
- History of conjunctive use of surface and groundwater and artificial recharge
- Parts of the lower and western Kings Basin rely exclusively on groundwater and lack infrastructure to move water

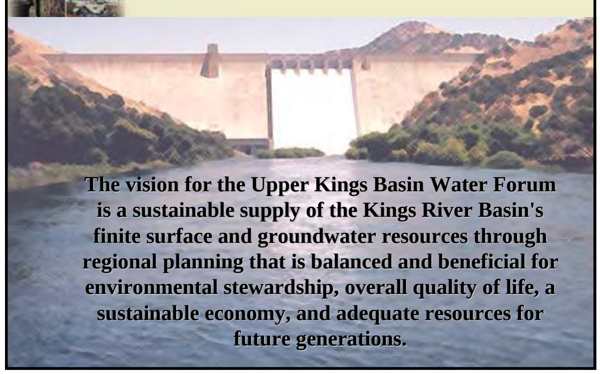
IRWMP is Consistent with CID Groundwater Management Plan

- Monitor and analyze groundwater use and trends
- Develop, manage, and monitor groundwater locally
- Recommend actions for the wise use of groundwater
- Address agricultural water supply concerns and issues
- Address water quality and supply issues of cities and rural communities
- Coordinate groundwater management plan with local agencies in the region
- Did not authorize the District to levy any fees to fund the implementation of the plan

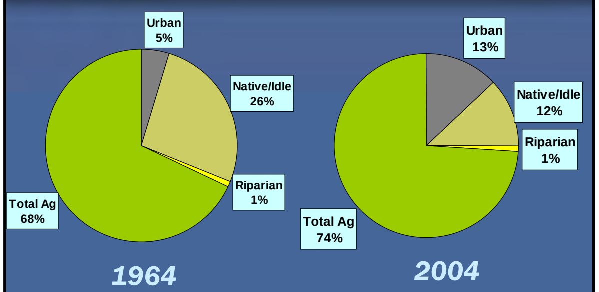
How make it happen?

- Match your priorities to the available funding sources
- Define near term project
- Develop CID program approach
  - Land acquisition program
  - Get CEQA clearances
  - Identify funding mechanism
  - Develop design standards and guidelines
  - Work with the land use agencies

Upper Kings Basin IRWMP Vision



Land Use Changes 1964- 2004



RCUP integrates existing or proposed programs and projects

- The Planning Framework
- Project Timing
- Readiness to Proceed-Status in Project Life Cycle
- Geographic Scale
- Relationship to Existing Plans; and
- Institutional and Political Integration

Geographic Scale

- Sub regional (Within the jurisdiction of Water Agencies)
- IRWMP Region
  - Kings Region
  - KRWA Area
- Inter- regional

Regional Conjunctive Use Program (RCUP)

- Direct Recharge - Ponds, injection wells, spreading
  - FID
  - CID
- Indirect or In- lieu Recharge - Reduce groundwater use by providing treated surface water or reclaimed water
  - AID
  - Clovis
  - Dinuba

Project Timing

- Immediate (Proposition 50 and Prop 84 Implementation Grant application in 2007)
- Near term (1-3 years)
- Mid- term (3-6 years), and
- Long term (greater than six years)

Water Budget under No Project Conditions

	2005		2030	
Area	Cumulative Overdraft (TAF)	Average Overdraft (TAF)	Cumulative Overdraft (TAF)	Average Overdraft (TAF)
Kings Basin	3,663	89	3,919	96
IRWMP Area	1,905	46	2,219	54
CID	463	11	498	12

Evaluating Future Conditions

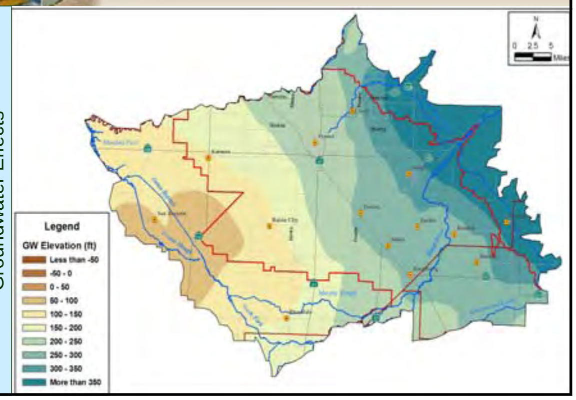
Evaluate potential scenarios

← Year 1 to 41 →

No IRWMP
2005 Existing Conditions
2030 Baseline Conditions

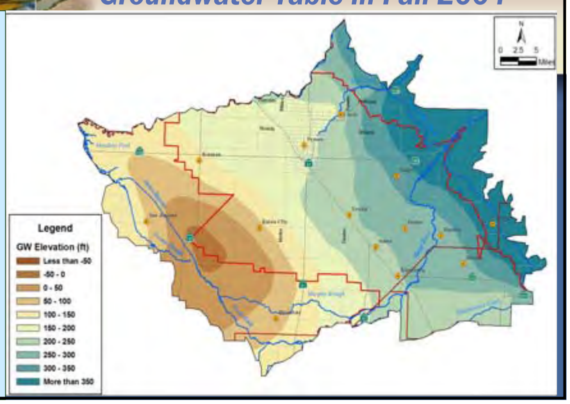
Groundwater Table in Fall 1964

Groundwater Effects

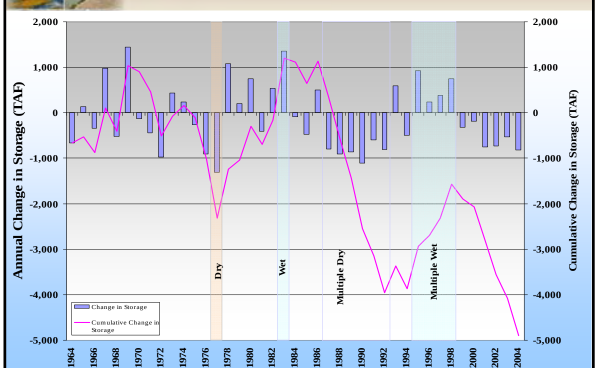


Groundwater Table in Fall 2004

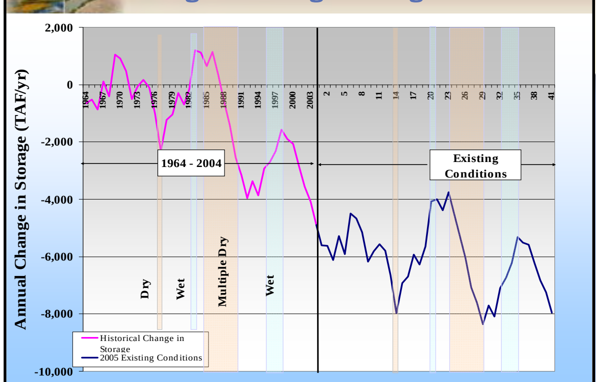
Groundwater Effects



Change in Storage in Kings Basin



Change in Storage in Kings Basin



IRWMP will identify, evaluate and integrate Water Management Strategies

- Water Supply Reliability
- Flood management
- Groundwater management
- Storm water capture and management
- Water recycling
- Ecosystem Restoration
- Environmental and habitat protection and improvement
- Recreation and public access
- Water conservation
- Water quality protection and improvement
- Wetlands enhancement and creation
- Conjunctive use
- Desalination
- Imported water
- Land use planning
- NPS pollution control
- Surface storage
- Watershed planning
- Water and wastewater treatment
- Water transfers

Blue text indicates must be considered

The CID GMP will.....

- Define project priorities to address overdraft of the groundwater basin,
- Meet state requirements and allow CID to qualify for State grant funding,
- Support development of a consensus on how to implement water supply facilities,
- Engage stakeholders in the area and gain consensus on problems and solutions

Objectives of the IRWMP & GMP

- Define local and regional opportunities for groundwater recharge
- Develop institutional arrangements for water banking
- Develop standard practices
- Provide necessary environmental documentation that would support the recharge programs

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Appendix D Board Actions

Appendix D will be populated in the final report pending board resolutions.

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Appendix E Preliminary Project Concepts

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Project CU3D/ CID No. 13 - Recharge Pond off Ward Drainage Canal north of Floral Avenue Alignment

Status - This project and an adjoining property were the subject of a more detailed hydrogeologic investigation and feasibility study, including conduct of a Phase I site assessment. The thirty percent design and preliminary hydrogeologic site characterization are complete. Property acquisition is on hold pending review of other viable sites.

Facilities - The 60-acre site is located at the head works of the Ward Drainage Canal, along the south side of Huntsman Avenue. The property is currently fallow and was once part of a winery. Two inlets to approximately 50 acres of ponding basins would be provided off of the Selma Colony Ditch and Kingsburg Branch Canal, respectively. Water will be diverted from either canal. New recharge ponds at this location would provide recharge benefits upslope of the cities of Fowler, Selma, and Kingsburg. The first 650 feet of the drain will be piped to allow the drain to flow into the new ponds to be constructed in series to allow for cleaning, maintenance, and flexibility in operations. Water will enter at the north end and spill into the existing drain at the south end. A check structure at the pond outlet would control spills into the downstream portion of the drain.

Table E-1. Project CU3D/ CID No. 13 - Recharge Pond off Ward Drainage Canal north of Floral Avenue Alignment

Proposal Title		Upper Kings IRWMP				
Project Title		CID Groundwater Mitigation and Banking Program, Project CU3DCID No. 13 Wards Drain Pond at Huntsman				
Budget Category		Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$ 138,225		$ 138,225	
(b)	Land Purchase/Easement			$1,115,000	$ 1,115,000	
(c)	Planning/Design/Engineering/ Environmental Documentation			$110,000	$ 110,000	
(d)	Construction/Implementation			$588,000	$ 588,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$ 92,150		$ 92,150	
(f)	Construction Administration			$30,000	$ 30,000	
(g)	Other Costs				$ -	
(h)	Construction/Implementation Contingency			$184,300	$ 184,300	
(i)	Grand Total	$	$ 230,375	$2,027,300	$ 2,257,675	
(j)	Calculation of Funding Match %			$2,027,300	$ 2,257,675	10.2%
Local match met through local District revenues and fees Assume 50/50 split of state/non-state for a, c, e, f						

Project CU3A/CID No. 10 - Recharge Pond at Kingsburg / Selma Branch Canal Divide

Status - Conceptual design complete. Pending environmental evaluation, hydrogeologic site characterization and development of 30 percent design.

Facilities - A new recharge pond at the divide of the Kingsburg and Selma Branch Canals, between Adams and Sumner Avenues, would provide recharge benefits upslope of Selma, Parlier, and Kingsburg. The area of the proposed site is approximately 150 acres. To implement the project, CID would need to purchase the property and construct levees and a turnout structure. The pond would provide a secondary benefit of capturing spills during irrigation operations. This would be particularly helpful to the operations of the Kingsburg Branch Canal, which currently has no available spills, and would reduce the risk of canal breaches in Kingsburg.

Table E-2. Project CU3A/CID No. 10 - Recharge Pond at Kingsburg/Selma Branch Canal Divide

	Proposal Title	Upper Kings IRWMP				
	Project Title	CID Groundwater Mitigation and Banking Program, Project CU3A/CID No. 10- Recharge Pond at Kingsburg / Selma Branch Canal Divide				
	Budget Category	Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		162,000	162,000	324,000	
(b)	Land Purchase/Easement			3,750,000	3,750,000	
(c)	Planning/Design/Engineering/ Environmental Documentation		216,000	216,000	432,000	
(d)	Construction/Implementation			570,000	570,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		108,000	108,000	216,000	
(f)	Construction Administration		162,000	162,000	324,000	
(g)	Other Costs				0	
(h)	Construction/Implementation Contingency			540,000	540,000	
(i)	Grand Total (Sum rows (a) though (h))	0	648,000	5,508,000	6,156,000	
(j)	Calculation of Funding Match %			5,508,000	6,156,000	10.5%
Local match met through local District revenues and fees Assume 50/50 split of state/non-state for a, c, e, f						

Project CU3B/ CID No. 14 - Recharge Pond off Fowler Switch between Sumner and South Avenues

Status - Conceptual design complete. Pending environmental evaluation; hydrogeologic site characterization and development of 30 percent design.

Facilities - A new recharge pond at the right bank of the Fowler Switch Canal, between the Sumner Avenue alignment and South Avenue, would provide recharge benefits upslope of Selma and Fowler. The East Kirby Ditch is diverted from the C&K Canal and spills into the McCall Ditch one and a half miles east of the pond site. The McCall Ditch, which is diverted from the Lone Tree Channel, continues west from the Kirby spill and spills into the Fowler Switch Canal at the south end of the pond site. If Fowler Switch recharge deliveries were diverted into the new pond, it would free additional capacity in the Fowler Switch, downstream of South Avenue. Recharge supplies delivered through the C&K Canal and Lone Tree Channel could be added to the Fowler Switch at South Avenue via the Kirby and McCall spills. The net result would be the creation of up to 50 cfs of additional recharge flow capacity and an additional recharge site upslope of Selma and Fowler. The area of the proposed site is approximately 40 acres. To implement the project, CID would need to purchase the property and construct levees and a turnout structure.

Table E-3. Project CU3B/ CID No. 14 - Recharge Pond off Fowler Switch between Sumner and South Avenues

	Proposal Title	Upper Kings IRWMP				
	Project Title	CID Groundwater Mitigation and Banking Program, Project CU3B/CID No. 14- Recharge Pond off Fowler Switch between Sumner and South Avenues				
	Budget Category	Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$48,750	$48,750	$97,500	
(b)	Land Purchase/Easement			$1,000,000	$1,000,000	
(c)	Planning/Design/Engineering/ Environmental Documentation		$65,000	$65,000	$130,000	
(d)	Construction/Implementation			$300,000	$300,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$32,500	$32,500	$65,000	
(f)	Construction Administration		$48,750	$48,750	$97,500	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency			$162,500	$162,500	
(i)	Grand Total (Sum rows (a) though (h))	$0	$195,000	$1,657,500	$1,852,500	
(j)	Calculation of Funding Match %			$1,657,500	$1,852,500	11%

Project CU3C/ CID No. 11- Recharge Pond off Kingsburg Branch Canal north of Huntsman Avenue

Status - Conceptual design complete. Pending environmental evaluation; hydrogeologic site characterization and development of 30 percent design.

Facilities - A new recharge pond at the right bank of the Kingsburg Branch Canal, north of Huntsman Avenue, would provide recharge benefits upslope of Selma and Kingsburg. The area of the proposed site is 10 acres. There is an existing depression at the site, but development of a pond would still require land acquisition, grading, and levee construction. A pond at this site would also provide a secondary benefit of capturing operational spills from the Kingsburg Branch Canal.

Table E-4. Project CU3C/ CID No. 11- Recharge Pond off Kingsburg Branch Canal North of Huntsman Avenue

	Proposal Title	Upper Kings IRWMP				
	Project Title	CID Groundwater Mitigation and Banking Program, Project CU3C/CID No. 11- Recharge Pond off Kingsburg Branch Canal north of Huntsman Avenue				
	Budget Category	Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$15,375	$15,375	$30,750	
(b)	Land Purchase/Easement			$250,000	$250,000	
(c)	Planning/Design/Engineering/ Environmental Documentation		$20,500	$20,500	$41,000	
(d)	Construction/Implementation			$160,000	$160,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$10,250	$10,250	$20,500	
(f)	Construction Administration		$15,375	$15,375	$30,750	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency			$51,250	$51,250	
(i)	Grand Total	$0	$61,500	$522,750	$584,250	
(j)	Calculation of Funding Match			$522,750	$584,250	11%
Local match met through local District revenues and fees Assume 50/50 split of state/non-state for a, c, e, f						

Project CU3E/CID No. 8 - Recharge Ponds off Cole Slough Canal between Jefferson & Lincoln Avenues

Status - Conceptual design complete. Pending environmental evaluation; hydrogeologic site characterization and development of 30 percent design.

Facilities - New recharge ponds at the left and right banks of the Cole Slough Canal, between Jefferson and Lincoln Avenues, would provide recharge benefits in the region between Sanger and Parlier. The sites are far enough from the bluff of the Kings River that the groundwater gradient does not run toward the river. The area off the right bank is approximately 7 acres, the area off the left bank is approximately 30 acres, and the soils for both sites are very sandy. To implement the project, CID would need to purchase the property and construct levees and turnout structures from the Cole Slough Canal.

Table E-5. Project CU3E/CID No. 8 - Recharge Ponds off Cole Slough Canal between Jefferson & Lincoln Avenues

	Proposal Title	Upper Kings IRWMP				
	Project Title	CID Groundwater Mitigation and Banking Program, Project CU3E/CID No. 8- Recharge Ponds off Cole Slough Canal between Jefferson & Lincoln Avenues				
	Budget Category	Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$46,688	$46,688	$93,375	
(b)	Land Purchase/Easement			$925,000	$925,000	
(c)	Planning/Design/Engineering/ Environmental Documentation		$62,250	$62,250	$124,500	
(d)	Construction/Implementation			$320,000	$320,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$31,125	$31,125	$62,250	
(f)	Construction Administration		$46,688	$46,688	$93,375	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency			$155,625	$155,625	
(i)	Grand Total (Sum rows (a) though (h))	$0	$186,750	$1,587,375	$1,774,125	
(j)	Calculation of Funding Match % .			$1,587,375	$1,774,125	11%
Local match met through local District revenues and fees Assume 50/50 split of state/non-state for a, c, e, f						

Project CU3F/ CID No. 9 - Santa Fe Pond Enlargement

Status - Conceptual design complete. Pending environmental evaluation; hydrogeologic site characterization and development of 30 percent design.

Facilities - The District's Santa Fe Pond is located at the headworks of the Santa Fe Ditch, between Adams and Sumner Avenues. The pond could be expanded to the south by an additional 60 acres. To implement the project, CID would need to purchase the property and construct levees.

Table E-6. Project CU3F/ CID No. 9 - Santa Fe Pond Enlargement

	Proposal Title	Upper Kings IRWMP				
	Project Title	CID Groundwater Mitigation and Banking Program, Project CU3F/CID No. 9- Santa Fe Pond Enlargement				
	Budget Category	Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$69,375	$69,375	$138,750	
(b)	Land Purchase/Easement			$1,500,000	$1,500,000	
(c)	Planning/Design/Engineering/ Environmental Documentation		$92,500	$92,500	$185,000	
(d)	Construction/Implementation			$350,000	$350,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$46,250	$46,250	$92,500	
(f)	Construction Administration		$69,375	$69,375	$138,750	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency			$231,250	$231,250	
(i)	Grand Total (Sum rows (a) though (h))	$0	$277,500	$2,358,750	$2,636,250	
(j)	Calculation of Funding Match %			$2,358,750	$2,636,250	11%

Local match met through local District revenues and fees
Assume 50/50 split of state/non-state for a, c, e, f

Project CU3G/ CID No. 12 CID Ward Drainage Canal Capacity Enlargement

Status - Conceptual design complete. Pending environmental evaluation; hydrogeologic site characterization and development of 30 percent design.

Facilities - The Ward Drainage Canal begins at Huntsman Avenue, east of Selma, and ends near the Cole Slough branch of the Kings River in Kings County. The canal is located within a natural depression that collects surface drainage and it is not utilized for irrigation deliveries. Recharge deliveries can be made to the Ward Drain through the Kingsburg Branch of the C&K Canal. Some portions of the Ward Drain are piped and others are open canal. The portions that are open canal are very sandy and able to rapidly percolate the drainage that is collected. The recharge capacity of the drain is limited by a series of east-west road crossings east of Selma. Enlarging these road crossings and constructing check structures at three specific locations (above and below Nebraska Avenue and above Mt. View Avenue) would increase both the flow capacity and the volume of water that can be diverted to the drain for recharge. It is estimated that an additional four acres of the drain could be wetted with these improvements.

Table E-7. Project CU3G/ CID No. 12 CID Ward Drainage Canal Capacity Enlargement

	Proposal Title	Upper Kings IRWMP				
	Project Title	CID Groundwater Mitigation and Banking Program, Project CU3G/CID No. 12- Ward Drainage Canal Capacity Enlargement				
	Budget Category	Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs		$6,188	$6,188	$12,375	
(b)	Land Purchase/Easement				$0	
(c)	Planning/Design/Engineering/ Environmental Documentation		$8,250	$8,250	$16,500	
(d)	Construction/Implementation			$165,000	$165,000	
(e)	Environmental Compliance/ Mitigation/Enhancement		$4,125	$4,125	$8,250	
(f)	Construction Administration		$6,188	$6,188	$12,375	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency			$20,625	$20,625	
(i)	Grand Total (Sum rows (a) though (h))	$0	$24,750	$210,375	$235,125	
(j)	Calculation of Funding Match %			$210,375	$235,125	11%

Local match met through local District revenues and fees
Assume 50/50 split of state/nonstate for a, c, e, f

Other Project Sites and Other Improvements

CID is actively seeking other properties and tracking the agricultural real estate market. Protocols for site characterization, site design, and environmental clearance have been developed so that CID can rapidly respond to market opportunities and acquire property. In addition, CID is mapping and characterizing existing infrastructure, and has also developed a preliminary plan for rehabilitation and betterment of CID facilities (Engineer's Report, *Urban Impacts Study*, Summers Engineering, 2007) that includes an evaluation of the replacement value of the CID system.

Table E-8. Update the Groundwater Management Plan

Proposal Title		Upper Kings IRWMP				
Project Title		Update of CID GWMP				
Budget Category		Other State (1)	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
(a)	Direct Project Administration Costs				$0	
(b)	Land Purchase/Easement				$0	
(c)	Planning/Design/Engineering/ Environmental Documentation		$95,000		$95,000	
(d)	Construction/Implementation				$0	
(e)	Environmental Compliance/ Mitigation/Enhancement				$0	
(f)	Construction Administration				$0	
(g)	Other Costs				$0	
(h)	Construction/Implementation Contingency				$0	
(i)	Grand Total (Sum rows (a) though (h) for each column)	$0	$95,000	$0	$95,000	
(j)	Calculation of Funding Match %			$0	$95,000	100.0%
Local match met through local District revenues and fees Assume 50/50 split of state/nonstate for a, c, e, f						

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Appendix E Figures

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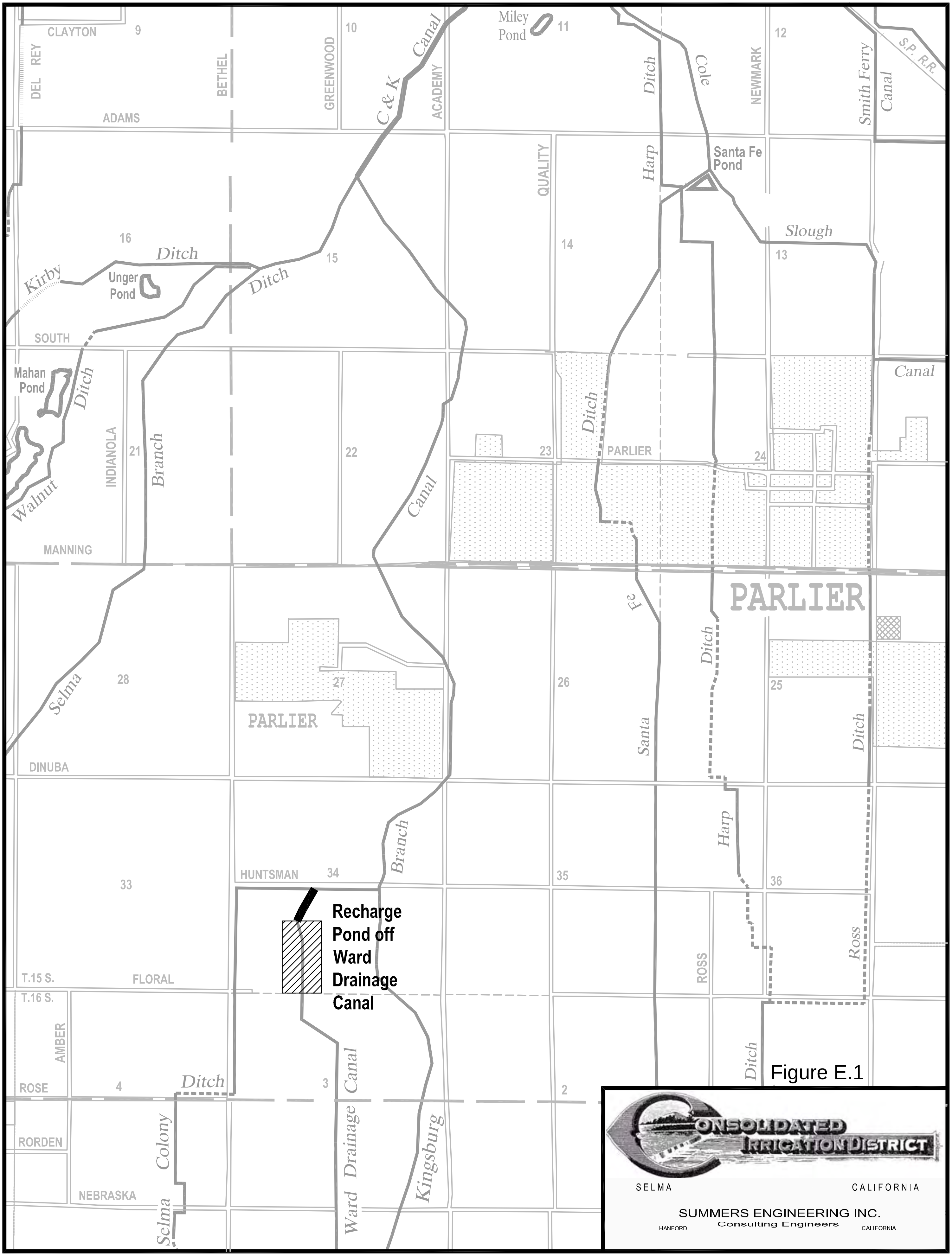

CLAYTON
ADAMS
SOUTH
MANNING
DINUBA
HUNTSMAN
FLORAL
ROSE
RORDEN
NEBRASKA
DEL REY
BETHEL
GREENWOOD
ACADEMY
QUALITY
NEWMARK
INDIANOLA
AMBER
ROSS
PARLIER
T.15 S.
T.16 S.
Miley Pond
Santa Fe Pond
Unger Pond
Mahan Pond
C & K Canal
Harp Ditch
Cole Slough
Smith Ferry Canal
S.P. R.R.
Kirby Ditch
Ditch
Walnut
Branch
Canal
Selma
Santa Fe Ditch
Ross Ditch
Kingsburg Branch
Ward Drainage Canal
Colony Ditch
Selma
PARLIER
PARLIER
9
10
11
12
13
14
15
16
21
22
23
24
25
26
27
28
33
34
35
36
4
3
2
Recharge Pond off Ward Drainage Canal
CONSOLIDATED IRRIGATION DISTRICT
SELMA CALIFORNIA
SUMMERS ENGINEERING INC.
Consulting Engineers
HANFORD CALIFORNIA

Figure E.1

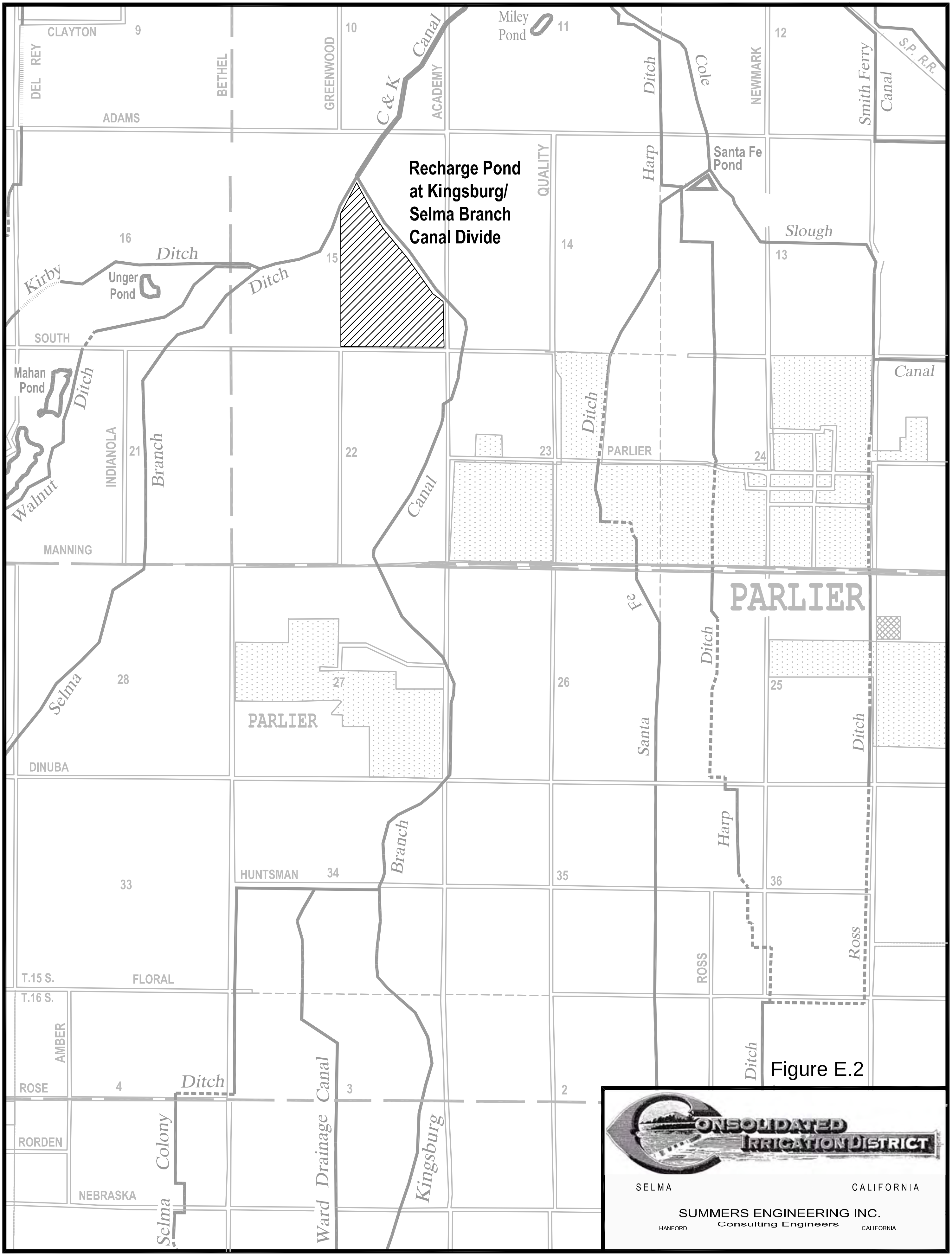
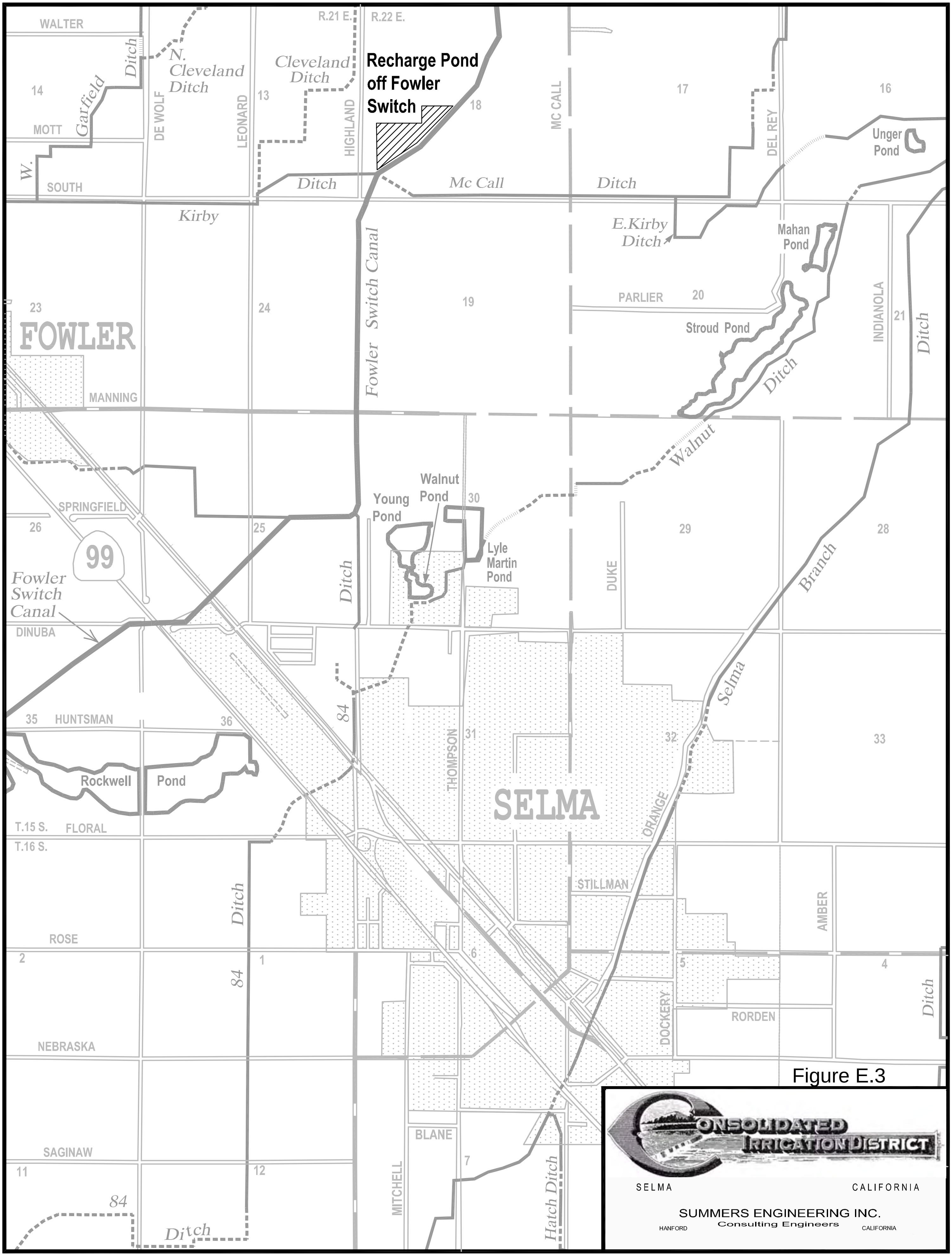

Recharge Pond
at Kingsburg/
Selma Branch
Canal Divide
CLAYTON
DEL REY
BETHEL
GREENWOOD
ACADEMY
ADAMS
QUALITY
NEWMARK
Miley
Pond
C & K Canal
Harp Ditch
Cole
Santa Fe
Pond
Smith Ferry Canal
S.P. R.R.
Slough
Kirby Ditch
Unger
Pond
SOUTH
Mahan
Pond
Walnut Ditch
INDIANOLA
Selma Branch Canal
PARLIER
MANNING
Santa Fe Ditch
Harp Ditch
Ross Ditch
PARLIER
DINUBA
HUNTSMAN
Kingsburg Branch
FLORAL
T.15 S.
T.16 S.
AMBER
ROSS
ROSE
RORDEN
NEBRASKA
Selma Colony Ditch
Ward Drainage Canal
CONSOLIDATED IRRIGATION DISTRICT
SELMA
CALIFORNIA
SUMMERS ENGINEERING INC.
Consulting Engineers
HANFORD
CALIFORNIA

Figure E.2


Recharge Pond
off Fowler
Switch
R.21 E.
R.22 E.
WALTER
MOTT
SOUTH
MANNING
SPRINGFIELD
DINUBA
HUNTSMAN
FLORAL
ROSE
NEBRASKA
SAGINAW
T.15 S.
T.16 S.
DE WOLF
LEONARD
HIGHLAND
MC CALL
DEL REY
PARLIER
INDIANOLA
DUKE
THOMPSON
ORANGE
STILLMAN
AMBER
DOCKERY
RORDEN
BLANE
MITCHELL
W. Garfield Ditch
N. Cleveland Ditch
Cleveland Ditch
Mc Call Ditch
Kirby
E.Kirby Ditch
Fowler Switch Canal
Walnut Ditch
Selma Branch
Hatch Ditch
84 Ditch
Unger Pond
Mahan Pond
Stroud Pond
Walnut Pond
Young Pond
Lyle Martin Pond
Rockwell Pond
FOWLER
SELMA
99
14
13
18
17
16
23
24
19
20
21
26
25
30
29
28
35
36
31
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33
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1
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7
CONSOLIDATED IRRIGATION DISTRICT
SELMA
CALIFORNIA
SUMMERS ENGINEERING INC.
Consulting Engineers
HANFORD
CALIFORNIA
Figure E.3

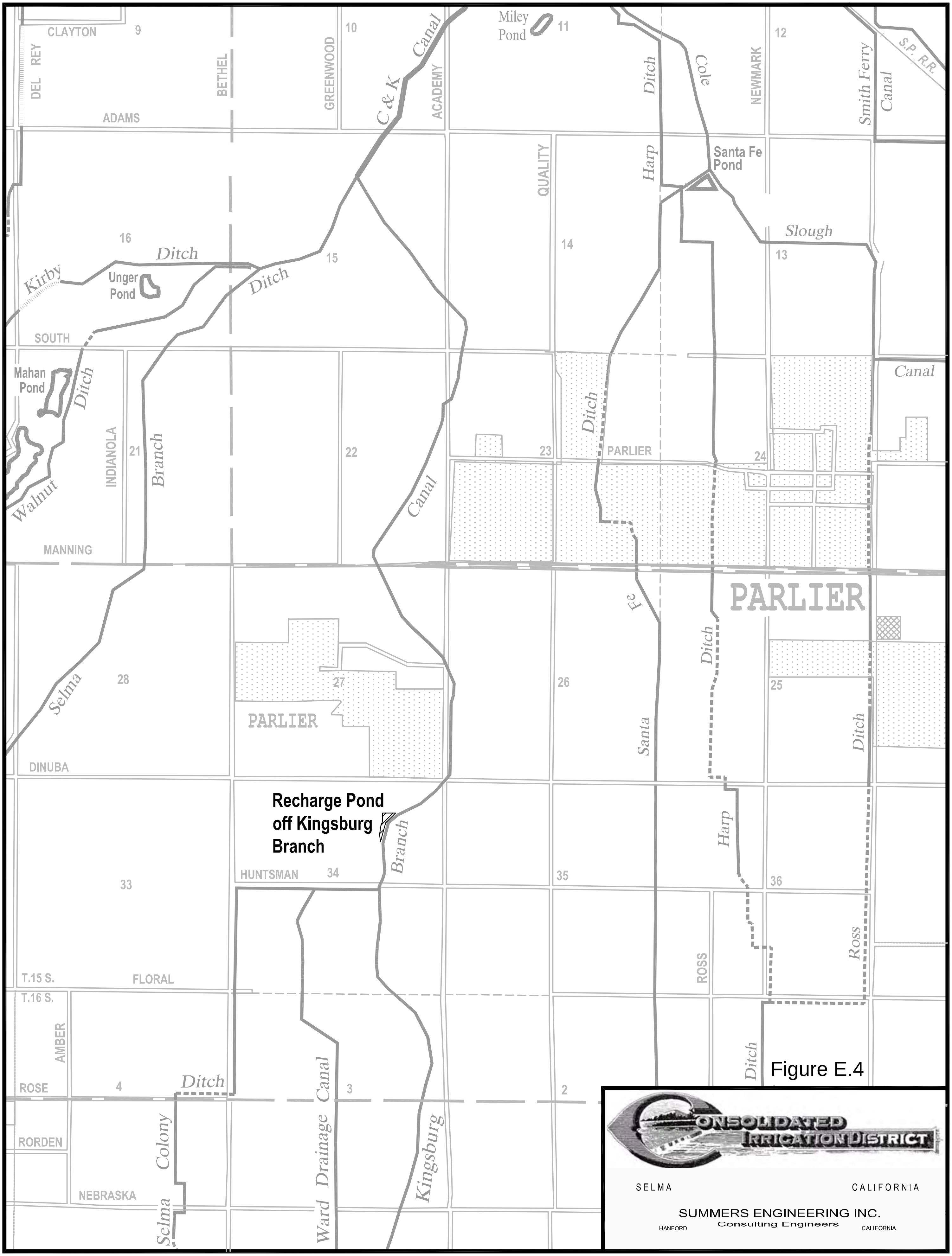
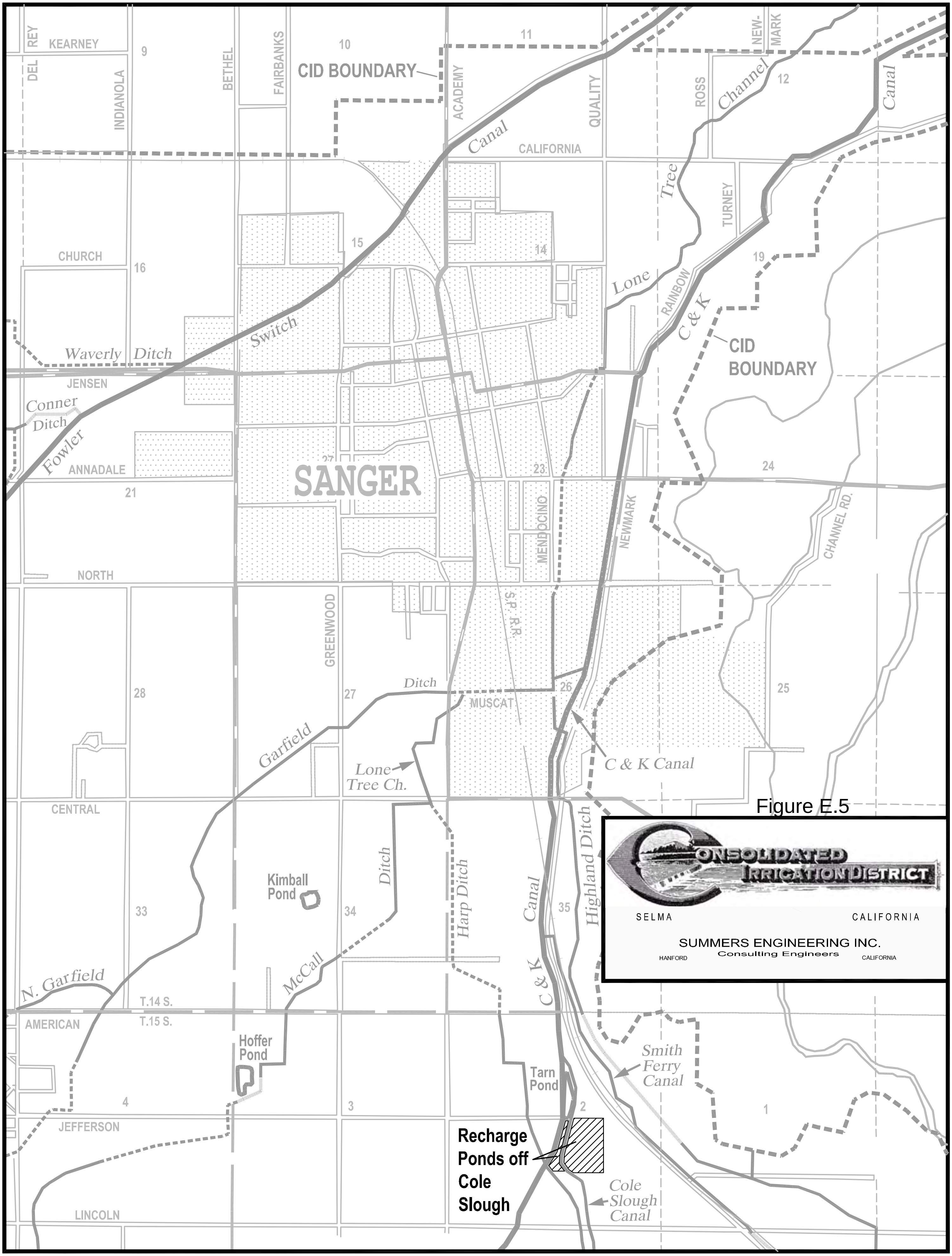
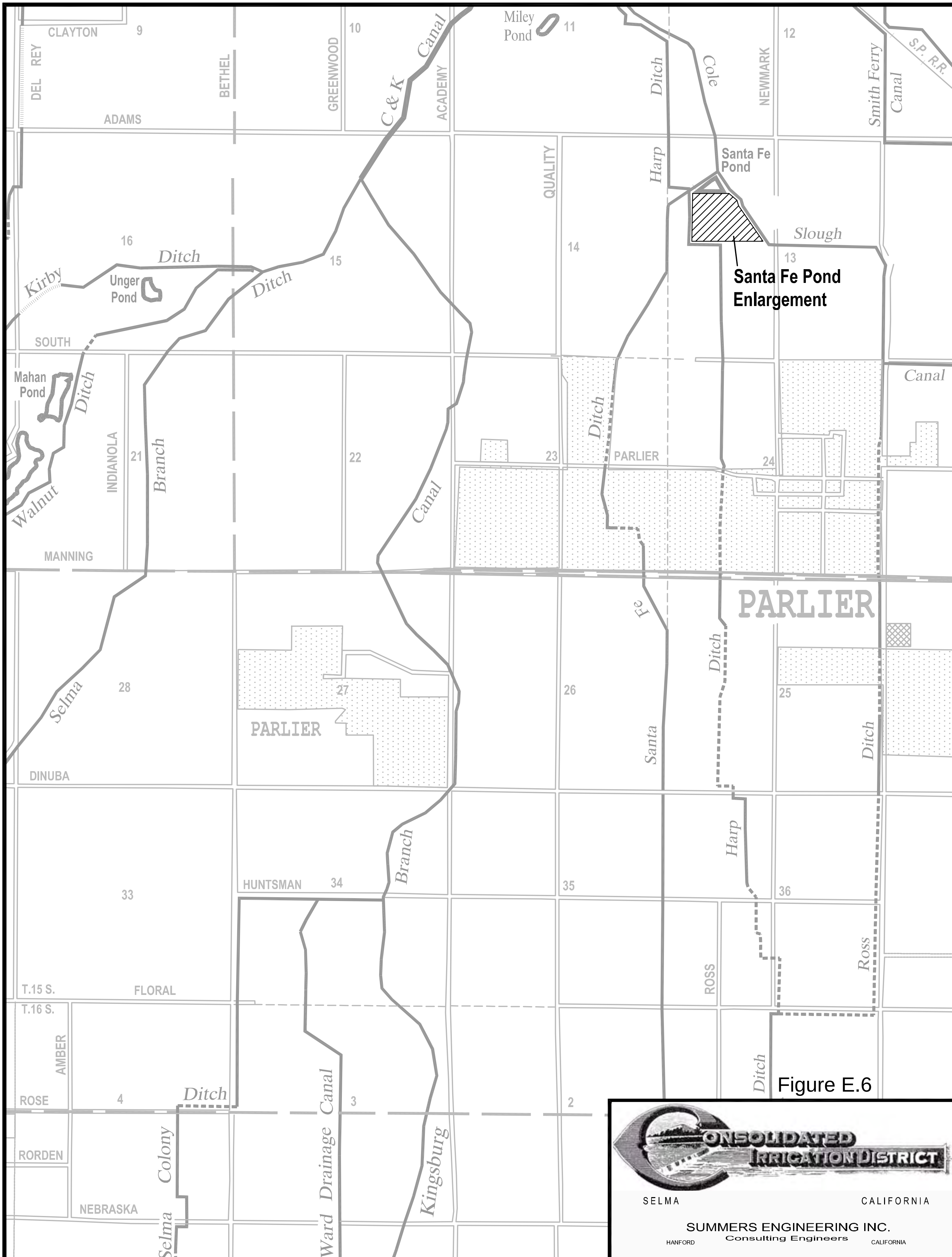

CLAYTON
DEL REY
BETHEL
GREENWOOD
ACADEMY
ADAMS
C & K Canal
Miley Pond
Harp Ditch
Cole
NEWMARK
Smith Ferry Canal
S.P. R.R.
Santa Fe Pond
QUALITY
Slough
Kirby Ditch
Unger Pond
SOUTH
Mahan Pond
Ditch
INDIANOLA
Branch
Walnut
Canal
PARLIER
MANNING
Santa Fe Ditch
Selma
DINUBA
Recharge Pond off Kingsburg Branch
HUNTSMAN
Branch
Harp
Ross Ditch
ROSS
T.15 S.
T.16 S.
FLORAL
AMBER
ROSE
RORDEN
NEBRASKA
Colony
Selma
Ward Drainage Canal
Kingsburg
Figure E.4
CONSOLIDATED IRRIGATION DISTRICT
SELMA CALIFORNIA
SUMMERS ENGINEERING INC.
Consulting Engineers
HANFORD CALIFORNIA

Figure E.5


CID BOUNDARY
SANGER
CONSOLIDATED IRRIGATION DISTRICT
SELMA CALIFORNIA
SUMMERS ENGINEERING INC.
HANFORD Consulting Engineers CALIFORNIA
Fowler Switch Canal
Lone Tree Channel
C & K Canal
Waverly Ditch
Conner Ditch
Garfield Ditch
Lone Tree Ch.
Harp Ditch
McCall Ditch
Highland Ditch
N. Garfield
Smith Ferry Canal
Cole Slough Canal
Kimball Pond
Hoffer Pond
Tarn Pond
Recharge Ponds off Cole Slough
KEARNEY
CHURCH
JENSEN
ANNADALE
NORTH
CENTRAL
AMERICAN
JEFFERSON
LINCOLN
CALIFORNIA
MUSCAT
DEL REY
INDIANOLA
BETHEL
FAIRBANKS
ACADEMY
QUALITY
ROSS
NEWMARK
TURNEY
RAINBOW
GREENWOOD
MENDOCINO
NEWMARK
CHANNEL RD.
S.P. R.R.
T.14 S.
T.15 S.


Santa Fe Pond Enlargement
Santa Fe Pond
Miley Pond
Unger Pond
Mahan Pond
PARLIER
PARLIER
CLAYTON
ADAMS
SOUTH
MANNING
DINUBA
HUNTSMAN
FLORAL
ROSE
RORDEN
NEBRASKA
PARLIER
DEL REY
BETHEL
GREENWOOD
ACADEMY
QUALITY
NEWMARK
INDIANOLA
AMBER
ROSS
T.15 S.
T.16 S.
C & K Canal
Harp Ditch
Cole Slough
Smith Ferry Canal
S.P. R.R.
Kirby Ditch
Mahan Ditch
Walnut Ditch
Selma Branch
Selma Branch Canal
Santa Fe Ditch
Harp Ditch
Ross Ditch
Canal
Selma Colony Ditch
Ward Drainage Canal
Kingsburg Branch
9
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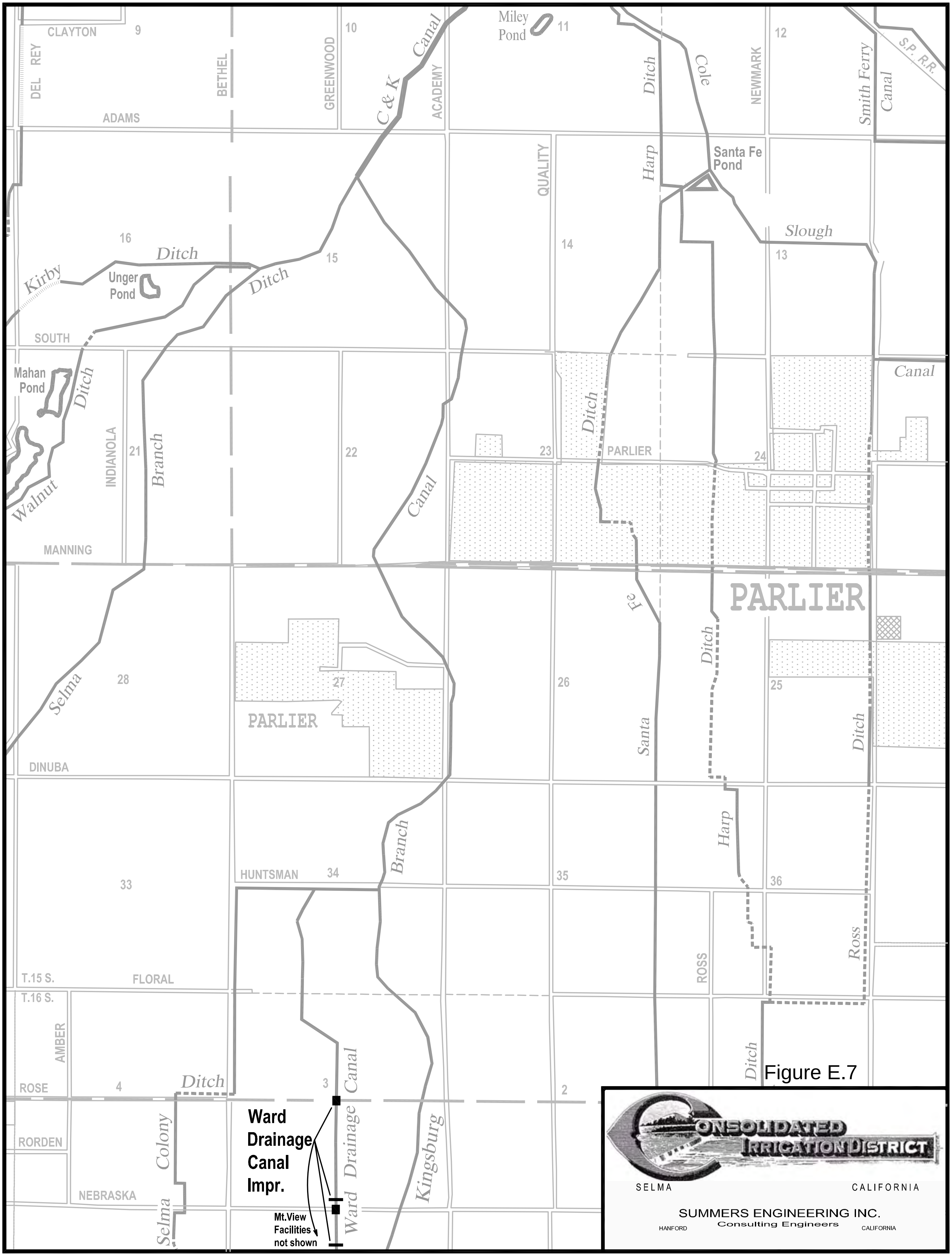
CONSOLIDATED IRRIGATION DISTRICT
SELMA CALIFORNIA
SUMMERS ENGINEERING INC.
Consulting Engineers
HANFORD CALIFORNIA
Figure E.6


CLAYTON
9
10
Miley Pond
11
12
DEL REY
BETHEL
GREENWOOD
C & K Canal
ACADEMY
Ditch
Cole
NEWMARK
Smith Ferry Canal
S.P. R.R.
ADAMS
QUALITY
Harp
Santa Fe Pond
16
Ditch
Kirby
Unger Pond
Ditch
15
14
Slough
13
SOUTH
Mahan Pond
Ditch
Canal
INDIANOLA
21
Branch
22
Canal
23
Ditch
PARLIER
24
Walnut
MANNING
PARLIER
Fe
Ditch
Selma
28
27
PARLIER
26
25
Santa
Ditch
DINUBA
HUNTSMAN
34
Branch
35
Harp
36
33
T.15 S.
FLORAL
T.16 S.
AMBER
ROSS
Ross
ROSE
4
Ditch
3
Canal
2
Ditch
Figure E.7
Ward Drainage Canal Impr.
RORDEN
Colony
Drainage
Kingsburg
NEBRASKA
Selma
Ward
Mt.View Facilities not shown
CONSOLIDATED IRRIGATION DISTRICT
SELMA CALIFORNIA
SUMMERS ENGINEERING INC.
Consulting Engineers
HANFORD CALIFORNIA

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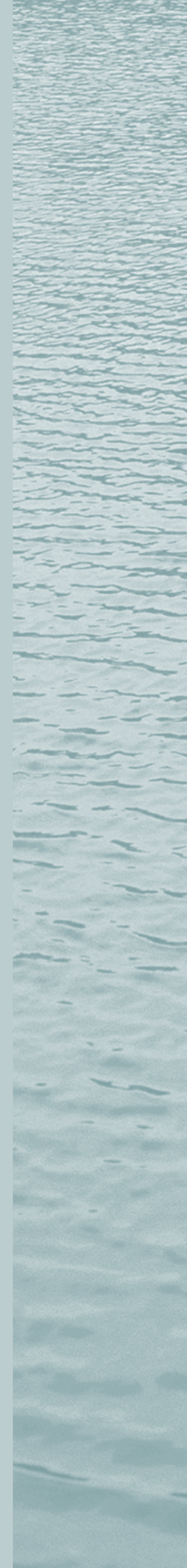

GEI Consultants

Consolidated Irrigation District
Groundwater Management Plan