3.0 WATER SUPPLY

10631(b). Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a)… Provide:

(1) A copy of any groundwater management plan adopted by the urban water supplier.

(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater…information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become over drafted…and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years.

(4) A detailed description and analysis of the amount and location of groundwater that is protected to be pumped by the urban water supplier.

3.1 Water Supply Facilities

The City currently utilizes groundwater as its only source of potable water. The City's municipal water system extracts its water from underground aquifers via groundwater wells located in a well field east of the City (Figure 3-1, attached). The yearly productions of the City's wells are shown on Table 3.1-1.

Table 3.1-1
City Booster Pump Information

City Well No.	Yearly Well Production in Gallons
1A	292,930,029
2A	452,214,968
3A	540,752,676
4A	342,934,590
10A	0
6A	422,758,927
7A	161,430,620
8A	New
9A	New

The City has six active, above ground storage tanks located at two separate booster stations, three variable frequency drive (VFD) Booster Pumps, five fixed drive booster pumps, and an

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estimated 55 miles of distribution system. Each City well is listed by number with its pump horsepower and rated flow in the Table 3.1-2 below.

Table 3.1-2
City Well Information

Well No.	Rated (GPM)	Capacity (GPM)	Capacity (MGD)	Notes
1A	2000	1530	2.2	
2A	2600	1200	1.73	
3A	2000	1450	2.09	
4A	2200	1100	1.58	
6A		1400	2.02	Prison Well
7A		2400	3.46	Prison Well
8A	1800	1800	2.59	Constructed in 2006
9A	1800	1800	2.59	Constructed in 2006
10		1350	1.94	Standby Well

The City of Corcoran has three independent well systems and two booster stations each with its own transmission main. The City's primary system is composed of six groundwater wells each with an emergency diesel power unit attached via a right-angled drive. The second or Prison system has two deep-water wells with right-angle drives configured for emergency power take-off (PTO) drives. Each of these systems is treated with Sodium Hypo-Chloride using independent injector pumps and monitoring equipment. Both of these systems are monitored by a computer based SCADA (*Supervisory Control and Data Acquisition)* system using radio telemetry and program logic control units capable of standalone operation should that become necessary.

All of the water storage facilities are located within the corporate City limits at two separate locations on the City system. The total storage capacity available to the City of Corcoran is over 4.5 million gallons (MG).

The primary station known as Station 2 is located at the corner of California State Highway 43 and Pickerel Avenue. This station has five above ground water storage tanks including a one-million gallon welded steel storage tank. Station 2 has a total of five booster pumps rated at 100 hp each and capable of flowing 2,500 gallons per minute (gpm) at 50 psi. Two of these units are VFD controlled and supervised by the City SCADA system to maintain the desired pressure set point. This station has a back-up generator capable of supplying full operational power.

The City's second booster station, Station 3, is located at the corner of King and Plymouth and is supplied by the prison water wells and transmission system. This station has one 500,000 gallon above ground water storage tank and two booster pumps. The primary pump is a 75 hp VFD pump capable of flowing 1,500 gpm at 50 psi pressure and controlled by the City SCADA system to maintain the desired pressure set point. There is also a 75 hp fixed speed pump capable of flowing 2,000 gpm at 50 psi pressure.

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3.2 Groundwater Basin

The groundwater subbasin underlying the City is the Tulare Lake Subbasin, which is a subbasin of the San Joaquin Valley Groundwater Basin within the Tulare Lake Hydrologic Region (Figure 3-2). The San Joaquin Valley Basin contains multiple interconnected subbasins that transmit, filter, and store water: the Kings, Kern County, Kaweah, Tulare Lake, Tule, Westside, and Pleasant Valley subbasins.

The Tulare Lake Subbasin is not an adjudicated groundwater basin, as defined by the California Water Plan Update, Bulletin 160-98, Figure 3-28 on page 3-54 and Table 3-16 page 3-55.

The California Water Plan Update, Bulletin 160-98 page 3-50, Table 3-15, lists the 1995 overdraft for the Tulare Lake Hydrologic Region at 820 thousand acre feet (taf). As shown in Table 3-15, groundwater overdraft is expected to decline to 670 taf by 2020.

During drought periods, water levels in these subbasins may decline. However, during wet periods, most of them recover, thus making application of overdraft or perennial yield models impractical.

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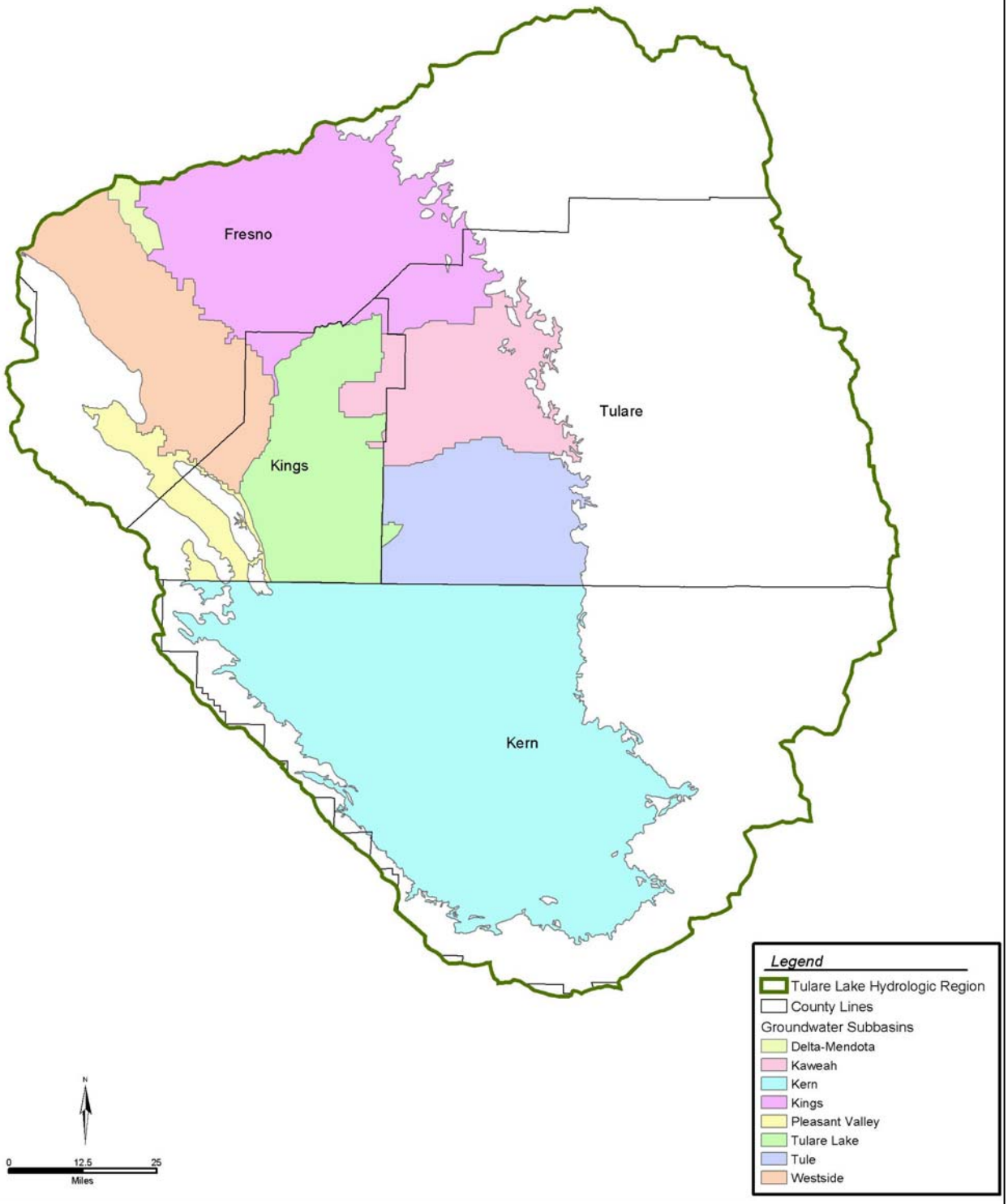

Quad Knopf	SUBBASINS, TULARE LAKE HYDROLOGIC REGION	Figure 3 - 2

3.2.1 BASIN BOUNDARIES AND CHARACTERISTICS

The Tulare Lake Subbasin is bounded on the south by the Kings-Kern county line, on the west by the California Aqueduct, the easterly boundary of Westside Groundwater Subbasin, and by the Tertiary marine sediments of the Kettleman Hills. It is bounded on the north by the southern boundary of the Kings Groundwater Subbasin, and on the east by the westerly boundaries of the Kaweah and Tule Groundwater Subbasins. The southern half of the Tulare Lake Subbasin consists of lands in the former Tulare Lakebed in Kings County

According to DWR, the estimated total storage capacity of the Tulare Lake Subbasin and the amount of water storage as of 1995 were calculated using an estimated specific yield of 8.5 percent and water levels collected by DWR and cooperators. According to these calculations, the total storage capacity of the Tulare Lake Subbasin is estimated to be 17,100,000 acre feet to a depth of 300 feet and 82,500,000 acre feet to the base of fresh groundwater. These same calculations give an estimate of 12,100,000 acre feet of groundwater to a depth of 300 feet stored in this subbasin as of 1995.

While several strata of groundwater can be found beneath both the City's wellfield and the City itself, only certain strata have proven to be useful for domestic water supply. These strata are below the "A" Clay and below the "E" Clay as known as Corcoran Clay. The "A" Clay is at a depth below the ground surface of approximately 70 feet at the wellfield and approximately 400 feet within the City. The "E" Clay is at a depth below the ground surface of approximately 500 feet at the City's wellfield and approximately 800 feet within the City. The aquifers below the "A" Clay have been described in hydrogeological reports as "semi-confined," and the aquifer below the "E" Clay has been described as "confined". These aquifers are fed by percolating surface water along the east side of the San Joaquin Valley, west of the Sierra Nevada watershed. That water then migrates south and west under much of the San Joaquin Valley, forming a groundwater pool over 2 million acres in area.

The City of Corcoran is geographically located within the Kings River service area in which groundwater management activities are conducted and coordinated by a number of agencies. A recent publication of the Kings River Water Association describing these activities is included in Appendix E of this report.

The Corcoran Canal and Irrigation Company, although not a "District" or public agency, owns, maintains and operates surface water canals near and within the City of Corcoran. The activities of this Company affect groundwater levels and usage in the Corcoran area; the City of Corcoran discharges storm water to the Company's canals for transport to a City-owned wetlands facility and to other agricultural areas. The City has a close and cooperative relationship with the Company.

As a water district immediately up-gradient from the City of Corcoran, the groundwater management program of the Kings County Water District (KCWD) is of importance to the City of Corcoran.

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3.2.2 GROUNDWATER MANAGEMENT PLANS

KCWD was formed in 1954 under the County Water District Act (District Act) to provide a legal entity for water management in the Northeast portion of Kings County. KCWD has prepared a Groundwater Management Program (GMP), which provides an understanding of KCWD groundwater management role within the County. It also documents the existing activities of KCWD and formalizes other proposed programs in a plan that will be used in implementing a monitoring and management program for conjunctive use, replenishment and preservation of groundwater of the basin. The following are excerpts from the GMP.

Since its creation, KCWD has worked to minimize subsidence and protect the groundwater resources of the County under the direction of the District Act. KCWDs objectives related to groundwater management are to recharge the groundwater basins, conserve water, increase water supply, and to prevent waste or diminution of KCWD's water supply.

KCWD has effectively managed the groundwater basins to fulfill the objectives of the District Act and its mission. The goal of these groundwater management efforts have been, and continues to be, to ensure that groundwater resources are sustained and protected.

The Groundwater Management Program formally documents KCWD's groundwater management goals and describes programs in place that are designed to meet those goals. The following programs are documented in the plan:

- *Conjunctive use of surface water and groundwater has been practiced within the KCWD since its formation in 1954. Through the purchase of slough channels and other appropriate sites for the as recharge basins, and by the purchase and importation of available surplus water and flood release water, the KCWD has reduced the decline of groundwater levels within the District.*

- *Since 1963, the KCWD has engaged in a cooperative program with the State Department of Water Resources for the monitoring and sampling of groundwater in the District. Water level measurements are annually obtained from approximately 200 wells in both the spring and the fall. The data obtained in the spring (normally the last of January) reflects the "seasonal high" water table, as the measurements are made prior to pumping for pre-irrigation. The fall measurements (normally obtained in the first part of October) are taken after the season of crop irrigation pumping.*

- *The cooperative program between DWR and the KCWD has been expanded to include monitoring of groundwater quality. Water samples from selected wells were collected in those years and delivered to the DWR and private laboratories for analysis.*

The City region is recharged with pumped water from the Sweet Canal, the Bean Ditch, Boswell Levee, and the West Corcoran Ditch. In addition to the pumped water, the Corcoran vicinity receives waters from the California Aqueduct and the Kaweah River through water exchanges with the Friant-Kern Canal contractors. The groundwater is naturally recharged primarily through run-off from the Sierra-Nevada Mountains and agricultural irrigation with reclaimed wastewater.

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Rainfall has little influence on the groundwater level since the City of Corcoran's average annual rainfall is 7.63 inches.

3.2.3 ANNUAL WATER USE AND RELIABILITY

The City of Corcoran's water system serves the incorporated areas of the City, several County tracts, the California State Prison at Corcoran, and the California Substance Abuse Treatment Facility. The estimated population served by the water system is approximately 22,000, Which includes approximately 10,500 inmates and workers at the two California State Prisons. The Census Data for 2005 from the California Department of Finance indicated that the total population of the City of Corcoran was 20,640.

There are 3,055 active service connections within the City's service area; the breakdown of these service connections is as follows:

- 1,387 metered services (includes residential, commercial and industrial)
- 1,668 flat rate services (includes residential, commercial and industrial)

The water production total for the end of the 2005-2006 fiscal year was 1,598.83 million gallons (MG). The month of maximum production was July with a total production of 246.57 MG. The maximum day water production was 9.47 MG in the month of May and an average daily production of 6.08 million gallons of water per day (MGD).

The climate of the Central San Joaquin Valley is the main contributing factor to water usage. As mentioned previously, in Section 2-Service Area, the City of Corcoran is dry and warm in the summer and cool in the winter. This makes water usage seasonal, and therefore, in greater demand during the summer season. Landscape irrigation coupled with water used for car washes, construction sites, and evaporative coolers tends to boost water demands during the summer months. The City's water production totals for 1999-2005 are shown in Table 3.2-1:

Table 3.2-1
Monthly Water Production (Gallons)

Month	1995	2000	2002	2004	2005
January	67,600,000	73,090,000	84,097,000	126,821,976	142,058,957
February	60,080,000	66,950,000	81,800,000	117,076,498	118,414,581
March	67,230,000	91,210,000	110,310,000	168,979,009	154,930,450
April	91,630,000	127,460,000	147,485,000	222,845,287	197,168,541
May	111,820,000	168,250,000	182,606,000	226,366,266	204,230,910
June	141,970,000	199,730,000	227,544,000	292,062,912	236,876,582
July	158,050,000	217,240,000	253,296,600	286,990,572	246,567,119
August	162,780,000	231,300,000	237,580,200	274,056,811	244,316,803
September	143,850,000	172,730,000	201,476,400	283,237,715	202,584,335
October	125,250,000	123,100,000	168,600,000	N/A	166,845,283
November	94,170,000	85,120,000	121,829,400	N/A	134,355,067
December	77,730,000	74,460,000	101,346,000	N/A	113,909,556
Total	1,302,160,000	1,630,640,000	1,917,970,600	2,463,593,931	2,162,258,184

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The City of Corcoran does not breakdown for usage volumes among residential, commercial, and industrial users. The per capita production figure therefore includes all usage plus system losses and fire hydrant flushing, etc.

3.2.4 CITY SUPPLY WELLS

Currently the City of Corcoran has two Pump Stations. Station 1 is located northeast of the City Limits between Waukena Avenue and Orange Avenue. There are 4 active and 4 inactive wells located there. Currently these active wells are running, on average, at 51.25 % or 12 hours and 18 minutes each day.

Pump Station 2 is located at the intersection of Waukena Avenue and Highway 43. At this site, one booster station was abandoned and replaced with five. No wells located at this site.

The previous Pump Station 3 is located on the property between Otis Avenue, Park Avenue and Ross Avenue. That station has been abandoned and relocated to its new location on King Avenue, south of the Tulare Irrigation District Canal, and near the California State Prison Facility, within the southern City limits. This station operates 2 pumps and no wells on site.

3.2.5 GROUNDWATER LEVELS

Water levels within the basin area during the 1992 summer averaged approximately 170 feet. Figures 3-3 and 3-4 show the groundwater elevation contours in spring of 1970 and 2004 respectively.

3.3 Water Supply Projections

3.3.1 NORMAL PRODUCTION CAPACITY

"Normal Production capacity" is determined using historic data. DWR Public Water Systems Statistic Forms have identified the City's population between 1998 and 2005. During this time period, the City's population has only fluctuated by a few thousand. The latest count in 2005 has the population at 22,456.

The City has pumped 2,079 MG per year on an average over the past 5 years and 1,531 MG for the previous 5 years. With upgrades and additional wells the City has been able to raise their normal production capacity to over 500 MG per year in the past five years. Two new wells, 8A and 9A, will be incorporated to the existing infrastructure and will help with the growth demands of the City.

3.3.2 STANDBY PRODUCTION CAPACITY

For the year 2005 the City operated its main pumps on an average time of 51.25% of a day, a

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little over 12 hours in a day. The wells that directly supply the California State Prison Corcoran were operated an average time of 43.85% of the day. The reality is that no one should run the wells twenty-four hours a day, thereby causing the pump's life span to diminish, but should pace the pumps so that they'll last the full projected life expectancy. Therefore, the City technically has a standby production capacity of an average 48% of what they are currently producing. The City has recently drilled two new wells that will help with production with well 10A that was on standby for the entire year. With minimal growth, the standby production seems to be at a level in which the City will be able to meet peak demands for several years to come.

3.3.3 FUTURE GROUNDWATER SUPPLY CAPACITY

It is anticipated that the groundwater overdraft will continue unless a significant change occurs. The City of Corcoran has implemented a subdivision ordinance as follows:

> 12-1-13: SUBDIVISION STANDARDS AND REQUIREMENTS:
> *J. Watercourses: The subdivider shall dedicate a right of way for storm drainage conforming substantially with the liens of any natural watercourse or channel, stream or creek that traverses the subdivision, or at the option of the City Council the subdivider shall provide by dedication further and sufficient easements or construction, or both, to dispose of such surface and storm water.*
> *12-1-31: DRAINAGE AREA:*
> *A. Adoption: Pursuant to section 66483(b) of the Subdivision Map Act, the City Council does adopt as one complete drainage area that area within the urban improvement boundary as delineated on the Land Use Element of the General Plan.*

With this ordinance in place all new subdivision within the City limits will now have to create a retaining area for their storm runoff. The groundwater supply would be benefit from the percolating water it will receive from the ponds.

3.3.4 FUTURE SURFACE WATER SUPPLY CAPACITY

It is understood that the local irrigation districts will continue operations to import water into the area from the Friant Dam and Terminous Dam. It has been recommended that the City of Corcoran consider long-term partnerships to import water for groundwater recharge in wet years or other years of opportunity.

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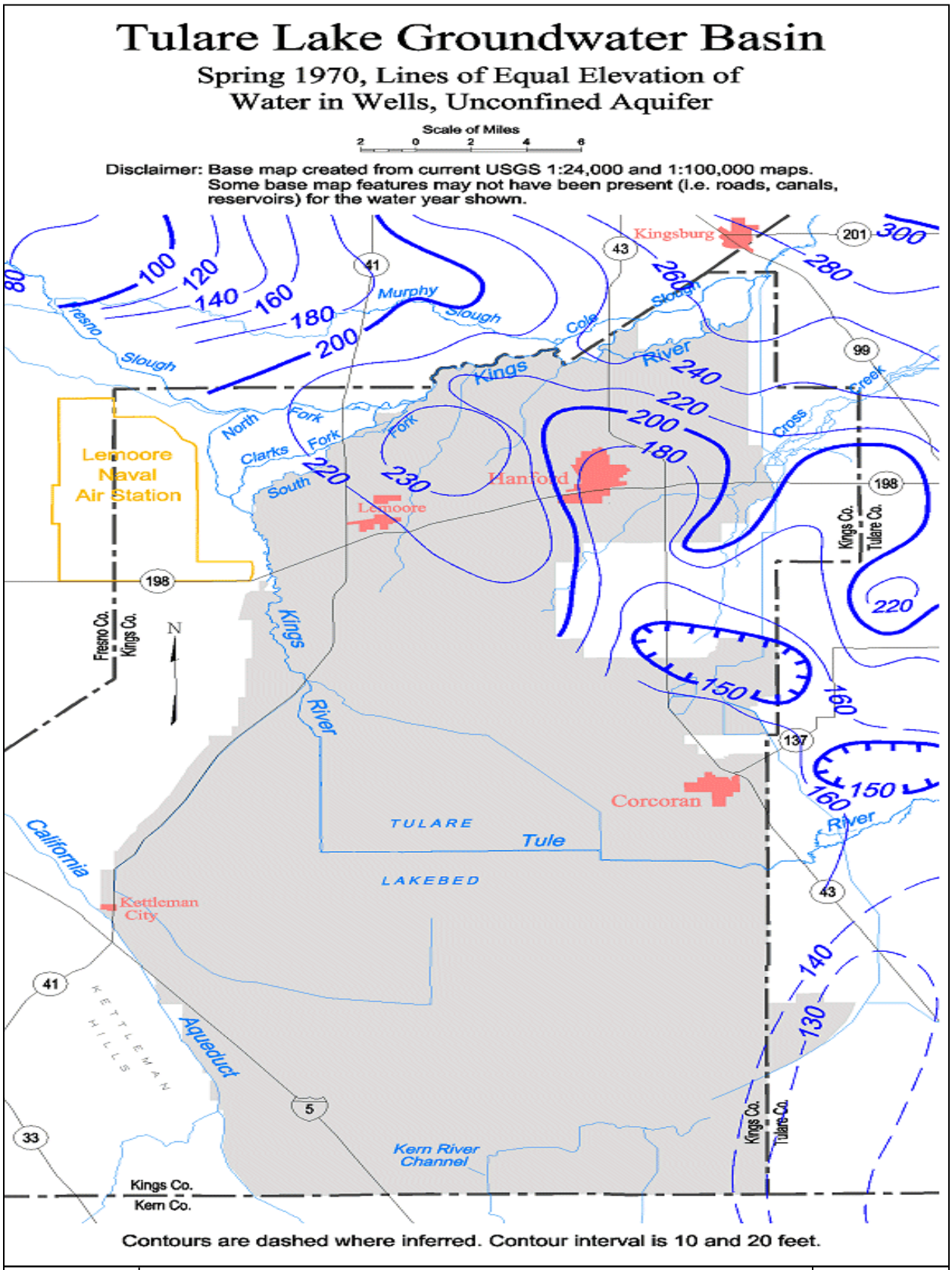
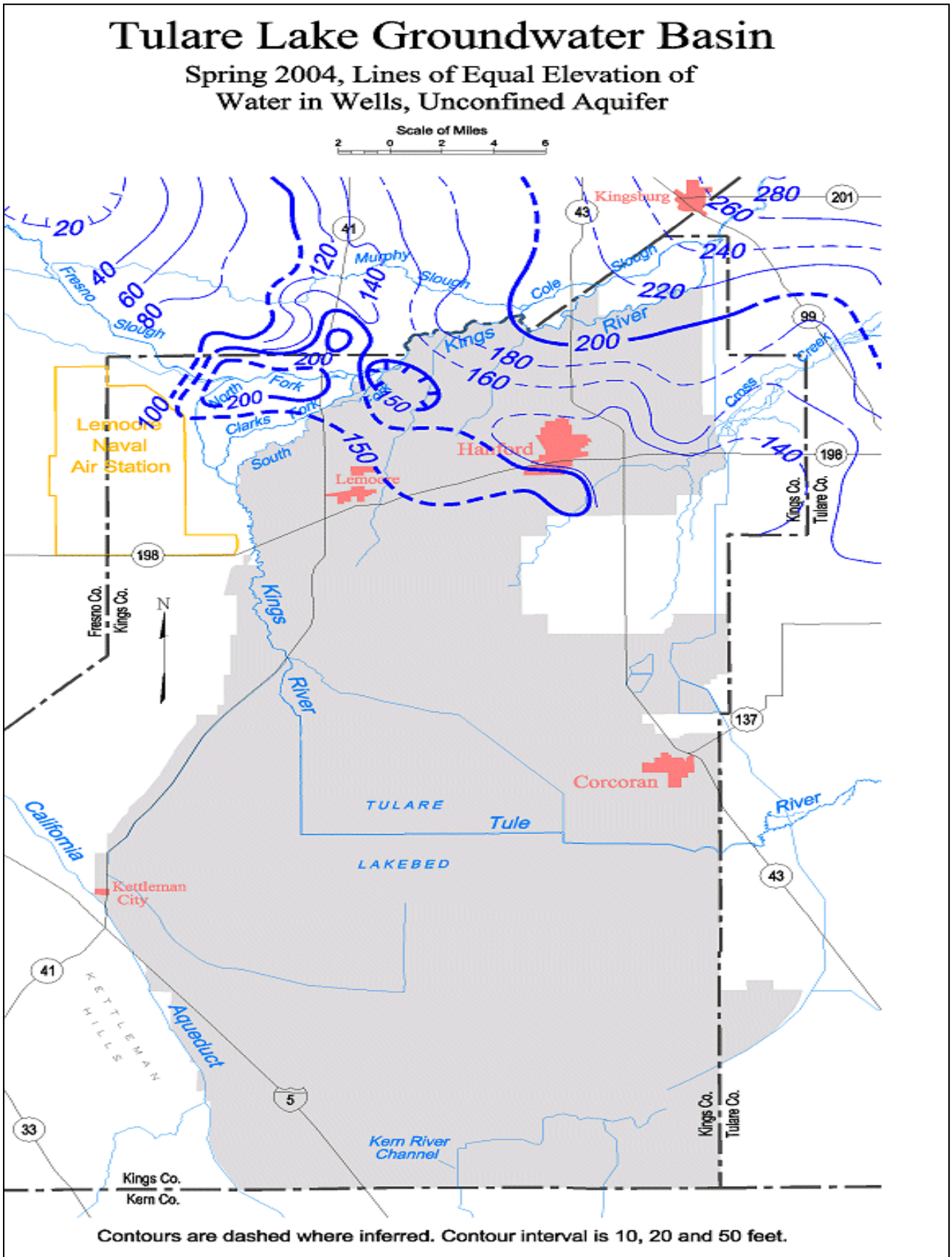


Quad Knopf	GROUNDWATER ELEVATION CONTOURS IN SPRING 1970	Figure 3 - 3



Quad Knopf	GROUNDWATER ELEVATION CONTOURS IN SPRING 2004	Figure 3 - 4