COVER REPORT

The Basin Management Objective, or BMO, concept was developed to overcome many of the usual problems of defining safe yield and overdraft in the Sacramento Valley. The California State Department of Water Resources (DWR), Northern District Groundwater Section formulated the concept while assisting Glenn County in developing their groundwater management ordinance. This concept was utilized in Butte County as well. The BMO concept defines acceptable groundwater levels, groundwater quality, and land subsidence conditions required to meet management objectives. For a more detailed explanation see the BMO concept paper prepared by DWR and included here under Appendix A, Supporting Technical Documents.

Since its inception, the BMO concept has been incorporated into California Water Code §10750 et. seq., which allows local development of an AB 3030 Groundwater Management Plan. Effective January 1, 2003 BMOs are one of the mandatory components in an overall groundwater management plan required to receive grant funding from DWR for groundwater related studies, construction of groundwater projects, or groundwater quality projects.

The objective of these BMOs is to maintain the groundwater surface elevation at a level that will ensure an adequate and affordable water supply. It is the intent of the Butte County BMOs to better manage water supplies for both irrigation and domestic use. For irrigation, the objective is to maintain the groundwater surface elevation during the peak summer irrigation season (July and August) in all aquifer systems at a level that will guarantee an adequate and affordable irrigation groundwater supply. For domestic use, the goal is to ensure an adequate and affordable water supply of adequate quality for domestic consumption, including periods of extended drought and to assure that groundwater in storage is not depleted over time. The management objective is also designed to make certain the water supply can be utilized without injuring groundwater quality or inducing land subsidence. Key BMO Wells are comprised of selected wells from water district and municipal independently monitored wells and DWR's groundwater level monitoring network. This summary document describes the BMOs for groundwater surface elevations at these BMO Key Wells.

The following table summarizes the sub-areas and the method used to determine their respective groundwater level BMO. Each sub-area's groundwater level BMO is presented in standard format in the following sections. Please refer to the map of the Butte County sub-area boundaries and the locations of DWR monitoring wells on pages v through vii.

Sub-area Name	Method for calculating BMO
Butte	Average minus Specific Depth
Llano Seco	Average minus Specific Depth
North Yuba	Average minus Specific Depth
Western Canal	Average minus Specific Depth
Angel Slough	Average of Measurements
Esquon	Average of Measurements
Richvale	Average of Measurements
Cherokee	Historical Expertise
M & T	Historical Expertise
Biggs	n/a
Butte Sink	n/a
Gridley	n/a
Pentz	n/a
Thermalito	n/a
Chico Urban Area	Standard Deviation
Durham/Dayton	Standard Deviation
Vina	Standard Deviation
Biggs/West Gridley	Standard Deviation/Historic Low

n/a – No BMO has been established at this time.

METHODS FOR DETERMINING BMOs in Butte County

There are various methods for determining the BMO for groundwater levels. There is no definitive method that should take precedence over the others because of the uncertainty in the data. However, some methods may be preferable based on variability of the data, simplicity, operating procedures and historical knowledge, or availability of data. Groundwater level monitoring wells within each of the BMO sub areas were identified. For each of the wells identified, historic groundwater measurement levels were obtained using the Department of Water Resources' groundwater level website (http://wdl.water.ca.gov/gw/). The respective methodologies used to calculate alert levels for Butte County sub-areas are described below.

Method 1 – Average minus Specific Depth (Butte, Llano Seco, North Yuba, Western Canal Water District)
The historic annual spring groundwater surface elevation measurements were used to determine an average. The Stage 1 & 2 alerts were determined to be the average of the Spring data minus five feet. The State 3 alert was the average of the Spring data minus ten feet.

Method 2 – Average of Measurements (Angel Slough, Rancho Esquon, Richvale)
The historic annual spring groundwater surface elevation measurements were used to determine an average. The Stage 1 & 2 alerts were determined to be the average of the Spring data. The State 3 alert was the lowest Spring measurement on record.

Method 3 – Historical Expertise (Cherokee, M&T)
The historic annual spring groundwater surface elevation measurements were used to determine an average. Alert levels were established according to historical expertise and knowledge of levels to be problematic within the sub area.

Method 4 – Standard Deviation (Chico Urban Area, Durham, Vina,
The Spring (and Fall for Chico and Durham) data for groundwater surface elevation (WSE) was further analyzed. The average and standard deviation were then calculated for these data. The Stage 1 & 2 alerts were determined to be the average of the Spring data minus one standard deviation. The State 3 alert was the determined to be the average of the data minus two standard deviations.

Method 5 – Standard Deviation/Historic Low (Used by Biggs-West Gridley)
The historic annual spring groundwater surface elevation measurements were used to determine an average. The annual measurements were also used to calculate the standard deviation. The Stage 1 & 2 alerts were determined to be the average of the spring data minus one standard deviation. The State 3 alert was established at the historic low level.

WELL NUMBERING SYSTEMS

To develop the groundwater level BMOs all existing monitoring wells were identified for each BMO sub-area. These wells are currently monitored either by public or private entities within a given sub-area, or they are monitored as part of the DWR, Northern District groundwater levels monitoring program. To distinguish and locate these monitored wells an alphanumeric name, or ID, is used. All BMO Key Wells identified for each sub-area are referenced by these unique ID's. Wells that are not part of the DWR monitoring network are typically assigned a local ID. Wells that are part of the DWR monitoring network are identified by the State Well Numbering System. This system is very useful in locating points on the ground, such as groundwater wells in areas with few identifying landmarks. Under this system, each well is assigned a unique number referred to as the State Well Number. This system is described further below.

State Well Numbering System
(Reference: Water Facts: Numbering Water Wells in California, No. 7, June 2000)

The State's well-numbering system is based on a rectangular system called the "United States System of Surveying in the Public Lands," commonly referred to as the "Public Lands Survey," established by the Continental Congress in 1784. The Public Lands Survey system has been employed by DWR, USGS, and other agencies for over 50 years. This system allows for a unique ID to be assigned to each well. These unique ID's are made up of several components, each of which is described below.

Initial Point, and Corresponding Base & Meridian Pair. Under this system all tracts of land are referenced to an Initial Point. This Initial Point is defined by the intersection of a north-south line called the Meridian and an east-west line called the Base. In California there are three Initial Points each with a corresponding Base and Meridian Pair. These three Initial Points are Mount Diablo Base and Meridian, San Bernardino Base and Meridian, and Humboldt Base and Meridian, and are identified by the letters M, S, and H, respectively. All of the BMO Key Wells are referenced to the Mt. Diablo Base and Meridian.

Range and Township Lines. Longitudinal lines are established at six-mile increments from the Initial Point and are east or west of the Meridian. These longitudinal lines are called Range Lines. Latitudinal lines also set at six-mile increments from the Initial Point are parallel to, and north or south of the Base. These latitudinal lines are known as Township Lines. This pattern of longitudinal and latitudinal lines defines a grid pattern consisting of 36-square-mile parcels of land. These 36-square-mile parcels are referred to as Townships. Each Township is referenced to an Initial Point by the number of 36-square-mile parcels and direction from that Initial Point. For example, Figure A-1 shows a Township that is three 36-square-mile parcels south of the San Bernardino Base and four 36-square-mile parcels east of the San Bernardino Meridian. This Township would be labeled as Township 03 South, Range 04 East, or in abbreviated form T3S/R4E.

Sections. Every Township is further divided in to 36 parts called Sections. A Section is a square parcel of land one-mile on a side, containing 640 acres. Numbering of these Sections is illustrated in Figure B-1.

Tract. Each Section is further divided into sixteen 40-acre parcels called Tracts. Each Tract is labeled with a letter as shown in Figure A-1. Once the well's location is established in the 40-acre Tract it is assigned a Sequence Number. These Sequence Numbers are assigned in chronological order (see Figure A-1).

State Well Number. The State Well Number is composed of the various components described above, including Township, Range, Section, Tract, Sequence Number, and Base & Meridian Pair. An example of the complete State Well Number is displayed in Figure A-2.

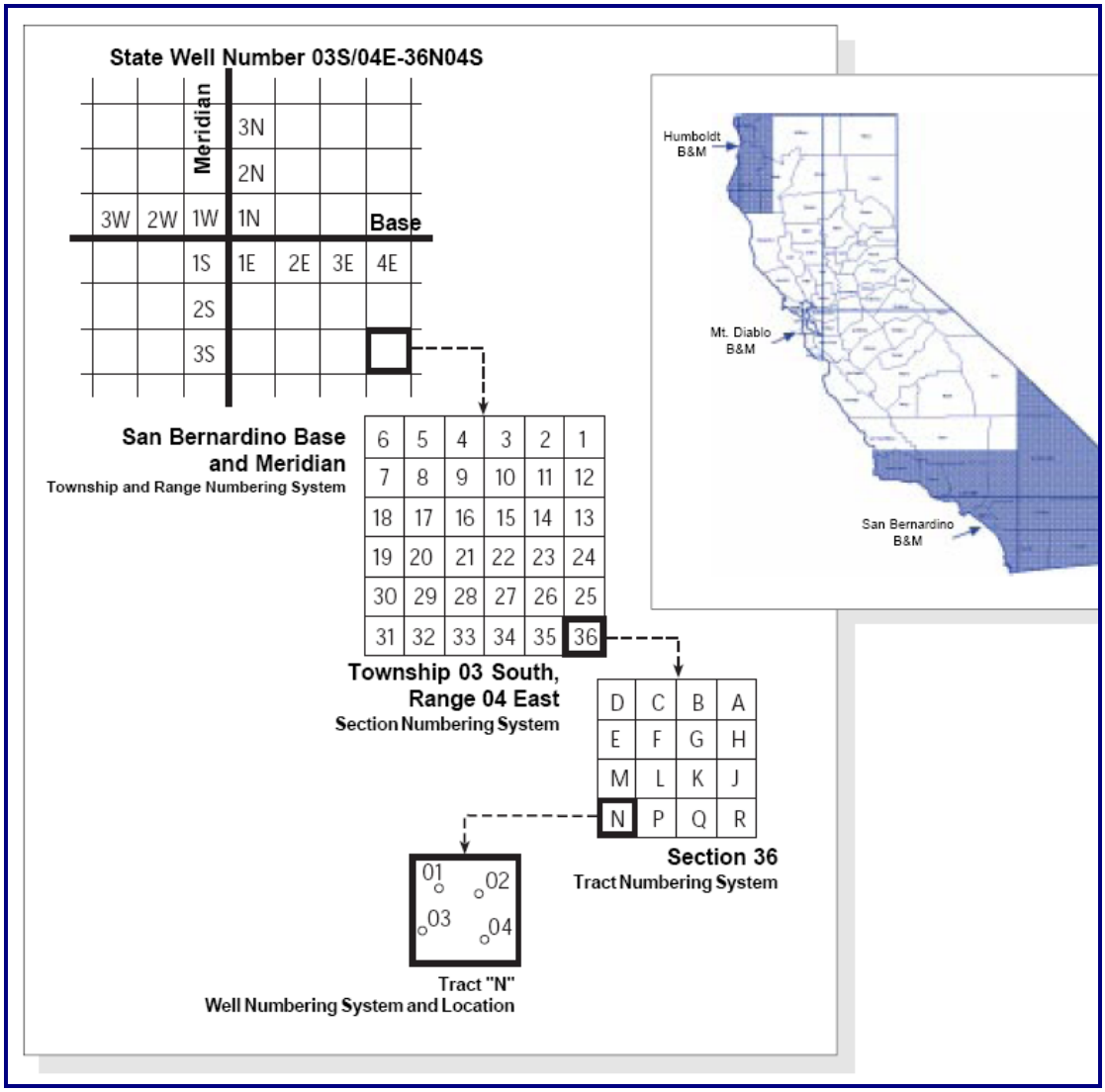

Figure A – 1 State Well Number System Schematic

Nomenclature and Notation Examples

Example of a State Well Number: T3S/R4E/36N04S

Ignoring the slash and the hyphen, the well number's components are:

State Well Number	T3S	R4E	36	N	04	S
Township	/	/	/	/	/	/
Range	/	/	/	/	/	/
Section	/	/	/	/	/	/
40-Acre Tract	/	/	/	/	/	/
Sequence Number	/	/	/	/	/	/
Base & Meridian	/	/	/	/	/	/

- Township is the third 36-square-mile parcel of land (township) south of the initial point (T3S).
- Range is the fourth 36-square-mile parcel of land (township) east of the initial point (R4E).
- Section is that parcel of land one mile square numbered 36 in T3S/R4E.
- Tract is that 40-acre parcel of land in section 36 lettered "N".
- Sequence number 4 is the number assigned to this particular well in tract N of section 36 and it indicates that three other wells in this tract have been assigned numbers in the past.
- Base & Meridian is that particular initial point, baseline and principal meridian to which this well is referenced, in this case S, the San Bernardino Base and Meridian.

Figure A – 2 Definition of State Well Number Components

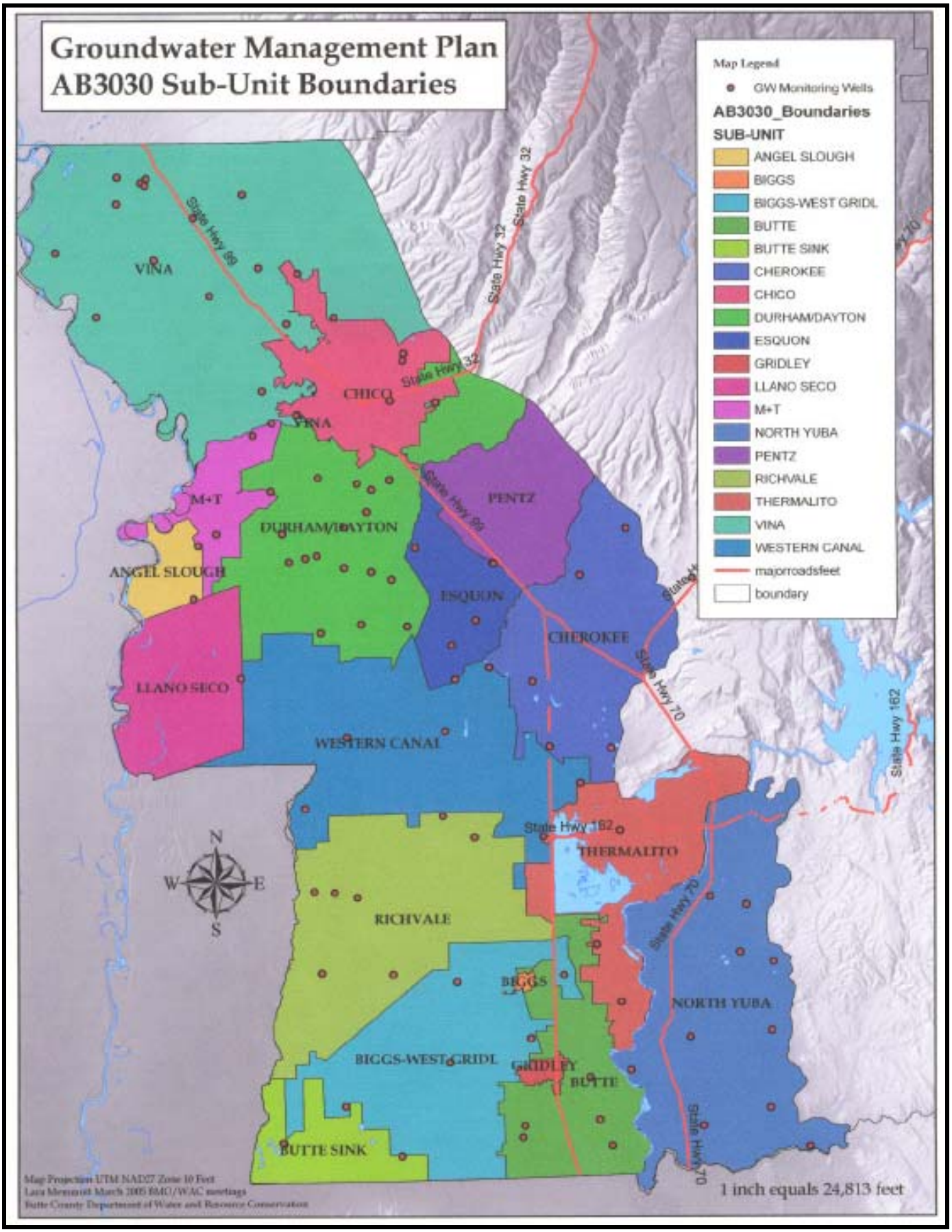

Figure B – Map of Butte County Sub-Unit Boundaries

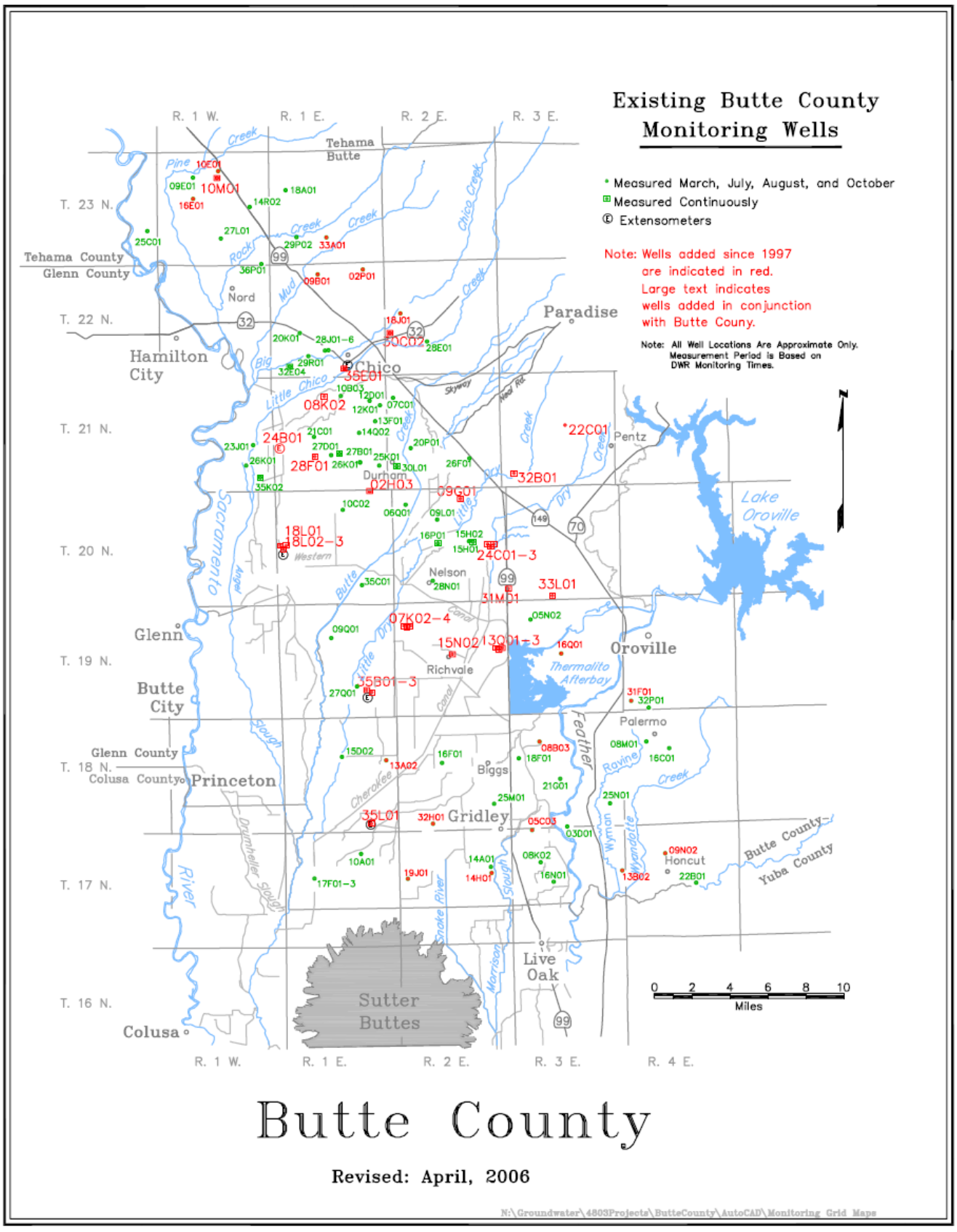

Figure C – Map of Butte County Monitoring Wells