

County of Madera
Engineering and General Services
Madera, CA

AB3030

Groundwater Management Plan

Madera County

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Prepared by:

Todd Engineers
Emeryville, CA

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1. INTRODUCTION

Highly productive groundwater basins of the San Joaquin Valley underlie the western one-third of Madera County including more than 500,000 acres (Figure 1-1). The County of Madera recognizes the importance of groundwater to the economy and well-being of its residents. More than one-half of the County's water supply for agriculture, municipal, and domestic use is provided by groundwater. In addition, almost 100 percent of the county's drinking water is supplied from groundwater. Because of the reliance on groundwater, water levels beneath the County have been declining for decades, increasing the cost of pumping and jeopardizing the groundwater basin's yield in terms of quantity and quality.

1.1 Purpose

The County has adopted several ordinances for the protection of groundwater including a recent requirement for a permit application and public review process of any activity that results in importing, banking, or exporting groundwater from the County. Cities and other local agencies in the County have also adopted groundwater management practices in their service areas. In this AB3030 plan, the County desires to:

- study the current condition of the groundwater basins
- document current groundwater management practices, and
- explore techniques to cooperatively manage one of the County's most important resources.

1.2 Authority

The law that we generally refer to as AB3030 is contained in the California Water Code beginning with Section 10750. The authority of the County to adopt a groundwater management plan is set forth in Water Code Section 10753 (a) and (b) as follows:

(a) Any local agency, whose service area includes a groundwater basin, or a portion of a groundwater basin, that is not subject to groundwater management pursuant to other provisions of law or a court order, judgment, or decree, may, by ordinance, or by resolution if the local agency is not authorized to act by ordinance, adopt and implement a groundwater management plan pursuant to this part within all or a portion of its service area.

(b) Notwithstanding subdivision (a), a local public agency, other than an agency defined in subdivision (g) of Section 10752, that provides flood control, groundwater management, or groundwater replenishment, or a local agency formed pursuant to this code for the principal purpose of providing water service that has not yet provided that service, may exercise the authority of this part within a groundwater basin that is located within its boundaries within areas that are either of the following: (1) Not served by a local agency, (2) Served by a local agency whose governing body, by a majority vote, declines to exercise the authority of this part and enters into an agreement with the local public agency pursuant to Section 10750.7 to 10750.8.

The County provides water service to its residents and conducts groundwater management, and therefore has authority under both of these provisions to prepare an

AB3030 Groundwater Management Plan (Plan). The County adopted a resolution to prepare a Groundwater Management Plan in accordance with AB3030 (Appendix A).

1.3 Madera County Groundwater Basins

AB3030 plans can be prepared for any groundwater basin in the State as defined by the California Department of Water Resources (DWR). Three groundwater basins as defined by DWR underlie Madera County (Figure 1-2) (DWR, 1975; 1980; 1995c). These basins, Chowchilla Groundwater Basin, Madera Groundwater Basin, and Delta-Mendota Groundwater Basin, are subbasins of the larger San Joaquin Basin and are hydraulically connected. Basin boundaries were originally defined by DWR in Bulletin 118 and based predominantly on natural geologic and hydrogeologic boundaries such as the edge of alluvial sediments or natural groundwater divides. Some basin boundaries were also defined by institutional conditions such as a water district service area boundary (personal communication, A. Steele, July 13, 2001). Even though conditions such as natural groundwater divides have changed over time, historical basin boundaries are maintained for consistency. This Plan uses updated boundaries from recently-available basin maps published on the Internet by DWR (DWR, 1995c) (Figure 1-2).

During the 1980 update of Bulletin 118, DWR conducted an assessment of overdraft conditions in California's groundwater basins. (Overdraft refers to the condition where more water is being removed from a groundwater basin than is being replenished). Although all of the Madera County groundwater basins were determined to be in an overdraft condition, two of the basins were designated as being in a state of "critical overdraft," a loosely defined term that has been abandoned in recent versions of Bulletin 118 (Kenneth Fransen, personal communication, September 18, 2001). Because AB3030 uses the "critically overdrafted" designation as a criterion for the type of agency that can prepare an AB3030 plan, the 1980 designations are retained in this document. The following table summarizes the size and overdraft designation of Madera County groundwater basins.

<i>Groundwater Basin</i>	<i>Area in Madera County¹</i>	<i>Overdraft Designation²</i>
<i>Madera Basin</i>	372,000 acres	Critically Overdrafted
<i>Chowchilla Basin</i>	120,000 acres	Critically Overdrafted
<i>Delta-Mendota Basin</i>	15,746 acres	Not Critically Overdrafted
<i>TOTAL</i>	<i>507,746 acres</i>	

¹ All acres in this Plan are approximate

² DWR, 1980

As shown above, the portion of the County that overlies groundwater basins covers approximately 507,746 acres and is referred to as the Study Area in this report.

1.4 Plan Area

Seven AB3030 Groundwater Management Plans have been prepared for portions of Madera County as summarized below. The service area for each agency is shown on Figure 1-3.

Water Agency	AB3030 Plan	Groundwater Basin	Madera Co. Plan Area ¹	Ave. Water Delivery ²
<i>Chowchilla WD-Red Top RCD-City of Chowchilla JPA³</i>	1997	Chowchilla	103,220 acres	156,000 AFY ⁴
<i>San Joaquin Exchange Contr. (Columbia Canal Company)</i>	1997	Delta-Mendota	15,746 acres	58,500 AFY
<i>Madera Irrigation District</i>	1999	Madera	128,294 acres	95,557 AFY
<i>Gravelly Ford Water District</i>	1998	Madera	8,300 acres	14,801 AFY
<i>Madera Water District</i>	1997	Madera	3,740 acres	10,084 AFY ⁵
<i>Aliso Water District</i>	1996	Madera	25,723 acres ⁶	0 AFY
<i>Root Creek Water District</i>	1997	Madera	9,234 acres	0 AFY
Total Acreage Covered by AB3030 Plans			294,257 acres	

¹ Approximate Acreage in Madera County covered by an AB3030 Plan

² Average deliveries reported in AB3030 Plans

³ JPA amended to include City of Chowchilla after initial AB3030 Plan prepared

⁴ Includes some delivery outside Madera County

⁵ Includes surface water purchased from MID and groundwater

⁶ Includes 5,575 acres annexed since original AB3030 Plan

The County's AB3030 Plan may not cover the service area of local agencies that provide water service as defined by AB3030. As shown on the table above, two water districts (Aliso Water District, and Root Creek Water District) do not currently deliver water. In addition, Red Top Resource Conservation District (RCD) does not deliver water, although the district participates in the AB3030 process with two agencies that do deliver water (Chowchilla Water District and the City of Chowchilla). According to AB3030, the County could have included these service areas in the County's Plan, but has chosen to exclude areas covered by an existing AB3030 plan and to work cooperatively with all water agencies to manage the County's groundwater.

The Chowchilla-Red Top RCD-City of Chowchilla AB3030 plan excluded service areas for Sierra Water District (approximately 6,200 acres), Progressive Water District (approximately 7,440 acres), and Clayton Water District (approximately 3,140 acres) (Figure 1-3). Sierra Water District is no longer active and has apparently been dissolved (Richard Harman, personal communication, July 30, 2001). No contact has been identified for Clayton Water District, Progressive Water District, or New Stone Water District (approximately 2,100 acres, a portion of which is apparently in the Progressive WD service area). A person familiar with water districts in Madera County believes that these three districts are inactive (Franklin Secara, personal communication, October 9, 2001). For the purposes of this Plan, it is assumed that Sierra Water District, Clayton Water District, Progressive Water District, and New Stone Water District are

inactive and their former service areas are included in the County's Plan area (total 16,780 acres in the Chowchilla Groundwater Basin).

The County's plan will also exclude the incorporated cities of Chowchilla and Madera. The City of Chowchilla has been included in the Chowchilla Water District – Red Top RCD AB3030 Plan through an amended Joint Powers Authority (JPA). With the exception of approximately 800 acres, the city limits of Madera were included in the MID AB3030. Accordingly, only an additional 800 acres in the City of Madera needs to be excluded for the purposes of defining the area covered by the County's Plan. In light of these exclusions, the County Plan will cover approximately 212,689 acres or approximately 42 percent of the valley area as summarized below:

Total Area of Groundwater Basins	507,746 acres
Less Area Covered by Existing AB3030 Plans	-294,257 acres
Less Additional Incorporated Area	- 800 acres
Approximate Area of County AB3030 Plan	212,689 acres

The Plan area covers portions of the Madera Groundwater Basin and the Chowchilla Groundwater Basin. Since the Madera County portion of the Delta-Mendota Groundwater Basin is already covered by an AB3030 Plan, the County Plan area does not include portions of that basin. In the Madera Groundwater Basin, the Plan area includes the gray portions on Figure 1-3 that are not within water district, irrigation district, or city boundaries. In the Chowchilla Groundwater Basin, the Plan area covers the former service areas of Sierra Water District, Clayton Water District, and Progressive Water District (Figure 1-3).

By necessity, all of Madera County that is underlain by groundwater basins (approximately 507,746 acres) is designated as the Study Area, providing a technical basis for cooperative/coordinated management.

1.5 Plan Components

AB3030 provides a checklist of 12 groundwater management components that may be considered in the planning process (Section 10753.7). These components are listed below preserving the order and wording from the AB3030 code. Most of these components are applicable to Madera County and are considered in the assessment of current hydrogeologic conditions and plan development.

1. The control of saline water intrusion
2. Identification and management of wellhead protection and recharge areas
3. Regulation of the migration of contaminated groundwater
4. The administration of a well abandonment and well destruction program
5. Mitigation of conditions of overdraft
6. Replenishment of groundwater extracted by water producers
7. Monitoring of groundwater levels and storage
8. Facilitating conjunctive use operations

9. Identification of well construction policies.
10. The construction and operation of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects
11. The development of relationships with state and federal regulatory agencies
12. The review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination

1.6 Plan Acknowledgements

This Plan was prepared by Phyllis Stanin of Todd Engineers under the direction of the Madera County Water Oversight Committee. This committee is composed of representatives from 12 water agencies, cities, and stakeholders in the County and represents a cooperative effort in county-wide groundwater management. A list of Committee members is included on Table 1-1.

Numerous committee members as well as many County employees were instrumental in providing assistance to this Plan. The AB3030 Subcommittee, including Denis Prosperi, Michele Lasgoity, Loren Freeman, and Dr. Claude Rust, provided overall direction, selection of plan goals, and review of draft documents. Michael Kirn, County Engineer, coordinated the project, furnished data sets, and provided access to key personnel and data from DWR and the County. Kenneth Fransen, attorney for Bolen, Fransen & Russell, representing the County, provided valuable review of the AB3030 Plan. Joe Beck, County Facilities Engineer, provided data on County-operated water systems. Wayne Fox, Senior REHS of the County's Environmental Health Water Program, provided water quality data, answered numerous questions, and facilitated access to data from the California Department of Health Services (DHS). Other personnel in Environmental Health, including Jill Nishi and Ruthanne Harbison, also offered valuable information. Robert Rolan, County Agricultural Commissioner, provided information on crop acreage and agricultural activities in the County. Randy Houk, Manager of Columbia Canal Company, provided numerous technical reports, documents, and data sets for the western portion of the County, as well as valuable insights on technical details in the basin. Don Roberts, Chief Engineer for the Madera Irrigation District, provided District data and helpful information. Leon Lancaster, City Engineer for the City of Madera, answered numerous questions, furnished city maps, and provided access to the City's Draft Water Master Plan. Robert Acree and Douglas Lackey of the Chowchilla City Water Department answered questions and provided data from city wells.

Additional contacts from other water districts and water companies provided information on district activities and data including Doug Welch of Chowchilla Water District, Steve Varner of Sierra Foothills Utility District, Jerry Bryant of the Madera Water District, Roy Jones of Madera Valley Water Company, Richard Harman of the former Sierra Water District, Franklin Secara of Gravelly Ford Water District, Philip Pierre of Root Creek Water District, and Denis Prosperi of Aliso Water District. Carol Matts at DHS provided water quality data, and Jarrod Ramsey-Lewis of the California Regional Water Quality Control Board (RWQCB) facilitated water quality file reviews.

The Department of Water Resources, San Joaquin Division provided historical water level contour maps, well logs, and other valuable data. Additional Todd Engineers staff provided technical assistance, document review, and computer graphics.

2. HYDROGEOLOGIC CONDITIONS

One of the benefits of a groundwater management plan is to provide a review of existing hydrogeologic conditions in the basin and document current groundwater levels, quantity, and quality. This section provides this overview and describes specific hydrogeologic analyses conducted for the County Plan.

2.1 Physical Setting

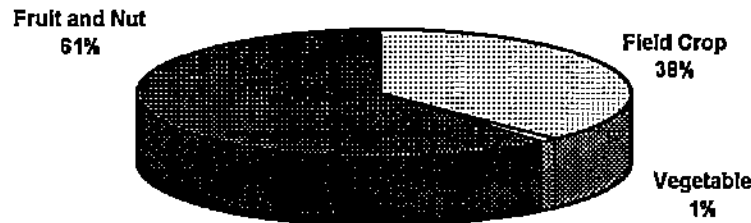
Madera County covers approximately 2,147 square miles (1.4 million acres) in the geographic center of California (Madera County General Plan, 1995). The county consists of three geographic regions, the valley floor in the west, the foothills in the center of the County, and the mountains in the east, with each area covering approximately one-third of the County. The Study Area covers the valley floor, which is a portion of the larger San Joaquin Valley. The valley floor slopes at a rate of approximately nine feet per mile from an approximate elevation of more than 400 feet above mean sea level (msl) near the groundwater basin boundary in the east to approximately 130 feet msl in the northwestern corner.

The 1998 population of Madera County was estimated at 114,349 persons (EDC, 2001). About 44 percent of the County's population resides in the cities of Madera (1998 population of 36,291) and Chowchilla (1998 population of 13,498). All of the land outside of these two cities is unincorporated. By 2005, the population is projected to grow to 152,726 persons. This growth on the valley floor is targeted for current urban areas and areas designated as new growth areas south and east of the City of Madera (Madera County General Plan, 1995). The current mix of urban and agricultural land uses is shown on a 1995 land use map in Figure 2-1 (DWR, 1995b).

Agriculture has supported Madera County since the late 1800s when much of the valley floor was developed for farming and ranching (Madera County Agricultural Crop Report, 2001). The focus of agriculture in Madera County has shifted over the years from rangeland and livestock to wheat to the mix of crops grown today. Over the last 20 years, fruit and nut crop acreage has more than doubled while field crop acreage has declined by almost one-half. A recent shift to permanent plantings has increased the need for a reliable water supply.

Currently, crops are harvested from about 308,850 acres in Madera County, covering more than 60 percent of the Study Area (Madera County Agricultural Crop Report, 2001). The general distribution of crop types and other land uses in 1995 is shown on the DWR Land Use map on Figure 2-1. Harvested acres of each crop type are tabulated each year by the County Department of Agriculture (Madera County Agricultural Crop Report, 2001). Fruit and nut crops cover the largest area (188,090 acres), followed by field crops (116,620 acres excluding un-irrigated rangeland), and vegetables (3,400 acres) as shown graphically below. Additional agricultural acreage includes 740 acres of nursery stock.

Crop Harvested Acreage - 2000



Grapes represent more than one-half of the fruit and nut acreage followed by almonds and pistachios. Field crops consist predominantly of alfalfa, cotton, wheat, and corn. More than 15 types of vegetables are represented by the one percent of harvested acreage for vegetables shown above.

Irrigation requirements vary with crop type. Acreage for specific crops and corresponding irrigation water requirements are provided on Table 2-1. As shown on the table, irrigation amounts (applied water) average approximately 3.1 AF/acre and total approximately 939,955 AFY, based on DWR estimates of irrigation requirements per crop. Actual irrigation amounts can vary considerably with soil types and are used here only as a general indicator of irrigation demand in the Study Area.

Since a portion of the applied water percolates back down to the water table, the total amount of irrigation is not lost from the groundwater system. The amount of percolating groundwater returned to the aquifer, referred to as return flows, is dependent predominantly on the efficiency of irrigation systems and soil types. If an average irrigation efficiency of 80 percent can be assumed across the Study Area, then approximately 751,964 AFY (2.4 AF/acre) of the 939,955 AFY of applied water is consumed by crops in the Study Area. Additional agricultural water uses include dairies (50 in Study Area) and cattle (more than 70,000 head in Madera County).

The Study Area climate is arid to semi-arid with hot summers and mild winters. Relatively small amounts of precipitation occur on the valley floor as shown by annual precipitation over the last 70 years (Figure 2-2). As shown on Figure 2-2, annual precipitation is highly variable, ranging from less than five inches (4.73 inches in 1932) to more than 22 inches (22.13 inches in 1983). The precipitation record demonstrates drought and wet cycles with the wettest periods of record occurring in the last twenty years (1978-1983, 1996, and 1998). Prolonged periods of below normal precipitation (drought cycles) have occurred in the early 1960s, the early to mid-1970s, and the mid- to late 1980s. Mean annual precipitation at the City of Madera is approximately 10.6 inches per year (NOAA, 2001; DWR, 2001). Because more than 80 percent of the precipitation occurs from October through March on an average basis, agriculture depends heavily on groundwater and surface water irrigation during the growing season.

The Study Area is bounded on the south and west by the San Joaquin River, on the north by the Chowchilla River, and on the east by the approximate edge of the valley alluvial sediments (groundwater basin boundary) (Figure 1-3). Internally, the Study Area is drained by the Fresno River as well as various sloughs, creeks, and man-made canals for water delivery. Dams and water storage reservoirs have been constructed upstream on the three principal rivers providing surface water storage as summarized in the table below (USBR, 2001a; SJREC, 2001; DWR, 1996).

<i>Drainage</i>	<i>Dam/Reservoir</i>	<i>Year Constructed</i>	<i>Storage (AF)</i>	<i>Drainage Area (square miles)</i>
<i>San Joaquin River</i>	Friant Dam/ Millerton Lake ¹	1947	520,500 AF	1,650 sq. miles
	Additional upstream storage		607,600 AF	
<i>Fresno River</i>	Hidden Dam/ Hensley Lake ²	1975	90,000 AF	234 sq. miles
<i>Chowchilla River</i>	Buchanan Dam/ Eastman Lake ²	1979	150,000 AF	235 sq. miles

¹ Operated by the U. S. Bureau of Reclamation

² Operated by the Army Corps of Engineers

Water in each of the reservoirs is released and diverted to supplement groundwater for irrigation on the valley floor. The largest water delivery canal in Madera County is the Madera Canal, built by the U.S. Bureau of Reclamation (USBR) in 1945 to convey water from Millerton reservoir to Madera County growers (Figure 1-3). The 36-mile Madera Canal extends across the County near the basin boundary, terminating at the Chowchilla River. Although portions of the canal are concrete-lined (approximately 21 percent), most of the Madera Canal is earth-lined (approximately 79 percent), allowing for seepage to groundwater. Water depths in the canal average nine feet. In water year 1995-1996, more than 363,000 AF of surface water was diverted into the Madera Canal at Friant Dam (USGS, 1996). However, more than 75,000 AF was flood/storage-type releases from October through March and unavailable for irrigation during the growing season.

2.2 Hydrostratigraphy and Groundwater Occurrence

Groundwater hydrology of the Central Valley including the Study Area has been investigated and summarized in numerous documents over the last 95 years (Mendenhall, 1908; Mendenhall, et al., 1916; Davis, et al., 1959; DWR, 1966; Mitten et al., 1970; Templin, 1984; Gronberg, et al., 1998; among others). These published data are the basis of the following discussion on hydrostratigraphy and groundwater occurrence in the Study Area.

The San Joaquin groundwater basin is part of a large, northwest-trending, asymmetric structural trough filled with deeper marine and shallower continental sediments. The crystalline bedrock beneath the sediments in the Study Area is composed of pre-Tertiary granitic rocks of the Sierra Nevada. These rocks outcrop east of the Study Area and slope westward beneath the groundwater basin to depths of more than 10,000 feet. Marine and continental sediments of pre-Tertiary and Tertiary age overlie the

bedrock in the deepest portions of the basin and do not extend to the surface. These sediments are below the aquifers of the groundwater basin and would not likely yield high quantity and quality water to wells as indicated by limited data from exploratory oil and gas well logs.

The aquifers of the Study Area are composed of alluvial sediments of Quaternary and Holocene age that have been eroded and reworked from the granitic rocks to the east forming coalescing alluvial fans. The source area and manner of deposition have resulted in most of the aquifers in the Study Area exhibiting high-yielding wells of good quality water. These deposits are inter-bedded with flood-basin, lacustrine, and marsh deposits in the western portion of the Study Area, where aquifers generally yield poorer quality groundwater associated with these depositional environments. A generalized hydrogeologic cross section is provided on Figure 2-3.

Aquifers are composed of unconsolidated gravels, sands, silts, and clays. The coarse grain sediments (sands and gravels) provide the higher transmissivity of groundwater. The amount of coarse grain sediments in the shallow aquifers was estimated by USGS (Mitten, et al., 1970) using well logs from the Study Area. A map illustrating their findings is reproduced as Figure 2-4. Darker color areas represent aquifers with more than 50 percent fine-grain sediments and lighter color areas represent aquifers with more than 50 percent coarse-grain sediments. In general more coarse-grain sediments were deposited in the southern and west-central portions of the Study Area.

Aquifer parameters were estimated in the USGS studies based on aquifer tests and well log descriptions. Transmissivity (T) values in the Study Area have been estimated to range from 18,000 gallons per day per foot (gpd/ft) to 99,000 gpd/ft. Estimated specific yields for coarse grain aquifer sediments were estimated to be between about 9 percent and 25 percent.

The lacustrine and marsh environments produced extensive clay deposits that are thickest in the west and thin to the east. Early correlations of subsurface sediment layers resulted in alpha-type designations of the clay lenses, including the A-, B-, C-, D-, and E-clays. Because the E-clay was among the most continuous and extensive of the clay lenses and was readily identified on geophysical logs in the area, it has been studied and mapped throughout the Study Area. The E-clay corresponds to the regional Corcoran Clay and is a major confining unit over the Study Area. The depth, thickness, and regional extent of the E-clay beneath the Study Area are shown on Figure 2-3 as separating the unconfined and confined aquifers.

The clays beneath the western portion of the Study Area were deposited in reducing environments as evidenced by the blue and green colors of the fine-grain sediments. Oxidizing environments of deposition are indicated beneath most of the eastern portion of the Study Area (generally east of the Highway 99 corridor). Because these depositional environments may be linked to groundwater quality, the general vertical distributions of oxidized and reduced sediments are shown on Figure 2-3.

The base of the fresh groundwater has been estimated by numerous investigators using water quality samples and geophysical logs (Page, 1973; Hotchkiss and Balding, 1971; Templin, 1984). Beneath the Study Area, the base of the fresh water is estimated at elevations ranging from more than 1,000 feet below msl in the east up to less than 400 feet below msl in the southwest. Since current water levels in the County range from above 200 feet to below 100 feet msl (DWR, 1999), the thickness of the aquifer interval containing fresh water is estimated to range from about 500 to 1,200 feet thick.

Groundwater generally occurs under unconfined conditions in the shallow aquifers beneath the Study Area. Groundwater beneath the E-clay is generally considered to be under confined conditions. Groundwater levels range from less than five feet below ground surface along some portions of the San Joaquin River to more than 150 feet below ground surface in the central portion of the Study Area. Water levels from Spring 1999 are shown on Figure 2-3 and discussed in more detail in the following section.

2.3 Groundwater Levels

Water level data are available in the Study Area from USGS documents and DWR. Early investigations conducted by the USGS provide historical data and maps before groundwater was developed throughout the valley (Mendenhall, 1908; Mendenhall, et al., 1916). Water level data from about the 1920s to the present are compiled and maintained in an electronic database by the DWR. This database, containing water level data from more than 750 wells in the Study Area, was provided by DWR for use in this study. Data were combined, reformatted and reviewed to determine frequency of measurements and quality of data. Wells with more complete historical records were selected for plotting water levels over time (hydrographs) on consistent scales to examine long-term trends in the basin.

Groundwater investigations in the early 1900s documented artesian conditions in the western portion of the Study Area where groundwater flowed naturally to the surface in wells (Mendenhall, 1908). Water levels beneath the Study Area averaged more than 200 feet above mean sea level (msl) during that time. With increasing groundwater development in the 1930s, due in part to the development of the deep-well turbine pump, water levels exhibited a long-term declining trend that continues today. The long-term declining trend in water levels is illustrated on 66 hydrographs that were plotted for this Plan, showing water levels in selected wells from 1920 to 2000. Of the 66 hydrographs constructed, 36 were selected to illustrate long-term trends in various portions of the basin. Three example hydrographs are shown on Figure 2-5. The locations of the 36 wells with hydrographs including the three example wells are shown on Figure 2-6. Hydrographs for the 36 wells are included as Appendix B.

As shown by the first two hydrographs from the Chowchilla and Central Madera basins, water levels beneath portions of Madera County have declined at least since the 1920s (Figure 2-5). As shown by the hydrograph from the Southern Madera Basin, wells close to the San Joaquin River benefit from local streamflow recharge and do not exhibit declines similar to those in the central Study Area. Overall declines since the 1920s range

from less than 10 feet in wells near the San Joaquin River to more than 150 feet in northwestern Madera County. In one well west of Chowchilla, the water table has dropped from 15 feet below the ground surface to more than 160 feet below the ground surface over this time period. Overall declines of approximately 100 feet have been recorded in wells in the central portion of the Study Area, including areas northwest, west, and southwest of the City of Madera.

In general water levels correspond to precipitation and availability of surface water deliveries, rising during wet periods and falling during periods of drought. As shown on the hydrographs, water levels declined sharply during the dry years in the early 1970s, but recovered back to pre-1970 levels during the wet years of the 1980s. During the drought of the middle to late 1980s, water levels generally fell at an accelerated rate compared to other droughts in the period of record and have not recovered significantly even though the drought was followed by several of the wettest years on record. This is likely attributable to increased pumping over time. An additional factor could be lower specific yields associated with deeper sediments. Since the water storage capacity in each foot of aquifer declines with depth, an equivalent amount of groundwater extraction from deeper sediments will result in larger water level declines than in more permeable shallow sediments. Both of these conditions suggest increasingly rapid declines in the future unless overdraft is mitigated.

In addition to the long-term trends, water levels rise and fall on a seasonal basis, representing pumping associated with the growing season. High water levels are typically recorded in February or March, declining to seasonal water level lows in October. The amount of seasonal fluctuation varies considerably with distance to a pumping well and measures more than 30 feet in some areas.

2.4 Groundwater Flow

DWR prepares annual to biannual water level contour maps for the unconfined aquifer of the Southern San Joaquin Valley, including the Madera County Study Area. For this Plan, 24 maps from Spring 1936 through Spring 1999 were compiled and additional water level contour maps prepared by the USGS for 1900, 1952, and 1960 were also reviewed (Mendenhall, 1908; Davis, et al., 1959; Templin, 1984). These maps, which provide useful historical and recent information on groundwater levels and groundwater flow in the Study Area, are the basis of the following analysis.

2.4.1 Regional Flow

The Spring 1999 DWR water level contour map is reproduced on Figure 2-6, indicating general groundwater flow directions in the Study Area with arrows. Depressions in the water table generally control flow in the shallow aquifer. In the southeast, a broadly-defined pumping depression with levels below 180 feet msl captures basin inflow from the northeast and recharge from the San Joaquin River (Figure 2-6). The large area of water levels below 100 feet msl in the west-central and northwestern

portion of the Study Area captures flow from the entire eastern portion of the County and redirects flow in the far western portion to migrate to the east.

2.4.2 Changes in Flow over Time

Maps dating back to 1900 indicate that historical patterns of groundwater flow differ significantly from current flow directions. Prior to development of groundwater in the County, groundwater flow generally followed the major surface water drainage directions from northeast to southwest. The San Joaquin River provided groundwater recharge along its entire southern reach from the basin boundary in the east to the vicinity of the Eastside Bypass. As groundwater reached the western end of the County, flow turned northwestward toward the San Joaquin basin outlet. These conditions generally persisted into the 1930s and 1940s as shown by the generalized groundwater flow arrows on Figure 2-7. Historical groundwater level contour maps prepared by the Department of Water Resources are reproduced in Appendix C for further reference.

Groundwater extraction both within and outside of Madera County began to alter the county-wide natural flow patterns in the late 1940s and 1950s. As water levels around pumping wells were lowered, depressions in the water table redirected natural flow toward pumping centers. Three major pumping centers are evident on the Spring 1958 water level map, located predominantly west of the Highway 99 corridor (orange shaded areas on Figure 2-7). The northwestern pumping depression in Spring 1958 apparently existed near the Madera – Merced county line with the largest water level decline in Merced County, lowering water levels in the area below 100 feet msl. The central depression was located south of Dairyland and the southwestern depression was near Cottonwood Creek (Figure 2-7 and Appendix C). By the late 1960s, the areas of depressed water levels had expanded across the west-central portion of the County where they persist today.

The drought of the late 1970s resulted in a continuous elongated area of water levels below 100 feet msl formed by coalescing pumping depressions. Again the lowest water levels were just north of the Madera County line (Figure 2-7 and Appendix C). By 1995, the entire western, north-central, and southeastern portions of the County had dramatically lowered water levels that controlled groundwater flow directions. These depressions have caused groundwater to migrate toward pumping centers, in some cases reversing natural groundwater flow directions. Flow along the western reach of the San Joaquin River no longer parallels the River, but rather flows eastward toward the pumping depressions (Figure 2-7). This easterly flow in the western portion of the Study Area may result in adverse water quality impacts as discussed in other sections in this Plan.

2.5 Groundwater Quantity

The amount of water stored in a groundwater basin is controlled by the volume of storage space and amounts of inflow and outflow associated with the basin. For a given period of time, the difference between inflows and outflows is the change in storage. The

change in storage is reflected in the change (rise or decline) of water levels. The quantification of these variables is referred to as a basin's water balance.

Because of data uncertainties and limitations of inflow and outflow components for the Study Area, these components are not quantified in this Plan to estimate change in storage. Rather, the average change in storage during a hydrologic cycle is quantified through an assessment of water levels changes. A discussion of major inflows and outflows for the Study Area that impact this change in storage is presented below along with previously-published estimates for some of the inflow and outflow components.

2.5.1 Inflows and Outflows

Inflows into the groundwater basin include the following components:

- Streamflow percolation, predominantly from the San Joaquin River, Chowchilla River, Fresno River, and other creeks and sloughs
- Infiltration of precipitation that falls on the valley floor
- Subsurface inflow along the eastern and northern boundaries of the Study Area, including recharge into the alluvial fans of the groundwater basin from surface water in eastern Madera County
- Seepage losses from unlined canals
- Return flows from land application of water including agricultural irrigation

Natural recharge includes percolation of streamflow in river channels, infiltration from precipitation, and subsurface inflow. Of these components, streamflow percolation likely represents the largest amount of natural recharge. In 1979 DWR estimated this amount to be approximately 184,000 AFY. Since precipitation amounts on the valley are relatively low (mean 10.6 inches), the contribution to groundwater recharge from precipitation is estimated to be lower than the contribution from streams and canals. Assuming a 10 percent infiltration rate, precipitation adds approximately 44,851 AFY to groundwater on average. The amount of subsurface inflow has not been quantified and changes from year to year based on changes in groundwater flow. The amount of subsurface inflow along the eastern groundwater basin subsurface contact was estimated by DWR to be approximately 69,000 AFY in 1979.

Recharge also occurs from seepage losses along unlined canals that transect the Study Area. Data from MID indicate an approximate 30 percent loss of diverted surface water due to canal evaporation and seepage (personal communication, Don Roberts, November 23, 2001). Return flows refer to the amount of irrigation that is not consumed by crops and allowed to percolate to the water table. Because both surface water and groundwater are used for irrigation in the Study Area, return flows represent percolation from both sources. Return flows are related to the efficiency of irrigation, with more efficient irrigation practices resulting in less return flows. Assuming an average irrigation efficiency of 80 percent and irrigation requirements estimated on Table 2-1, return flows in the Study Area may exceed 187,000 AFY.

Outflows from the groundwater basin include:

- Groundwater pumping for agricultural, municipal, industrial, and domestic use
- Subsurface outflow (unknown)
- Discharge to streamflow (if any)

Groundwater pumping is estimated to be the largest outflow component. In general, groundwater pumping for agricultural irrigation in the Study Area is not metered and current pumping amounts are not known. USGS estimated average pumping in the Study Area at 809,286 AFY from 1958 to 1964 (Mitten, et al., 1970). DWR pumping estimates for 1979 were 1,060,000 AFY, including both agricultural and municipal pumping (DWR, 1984). The amount of irrigated acreage in Madera County has not changed significantly since 1979 (slight decrease from 330,000 acres to about 309,000 acres), although the mix of crops grown is different.

With irrigation requirements of approximately 940,000 (Table 2-1) and the diversion of surface water that provides up to about 250,000 AF, current pumping for irrigation may be less than 700,000 AFY. However, significant increases in the cost of surface water over the last ten years have encouraged many growers to increase their reliance on groundwater. Municipal, industrial, and other agricultural water uses besides irrigation account for additional groundwater pumping in the Study Area.

Municipal and industrial pumping is recorded at County-operated and municipal water systems. Recent average pumping amounts for County-operated and other larger water systems in the Study Area are summarized below:

• County-operated water systems	2,392 AFY
• City of Madera	10,400 AFY
• Madera Valley Water Company	2,000 AFY
• City of Chowchilla	2,612 AFY

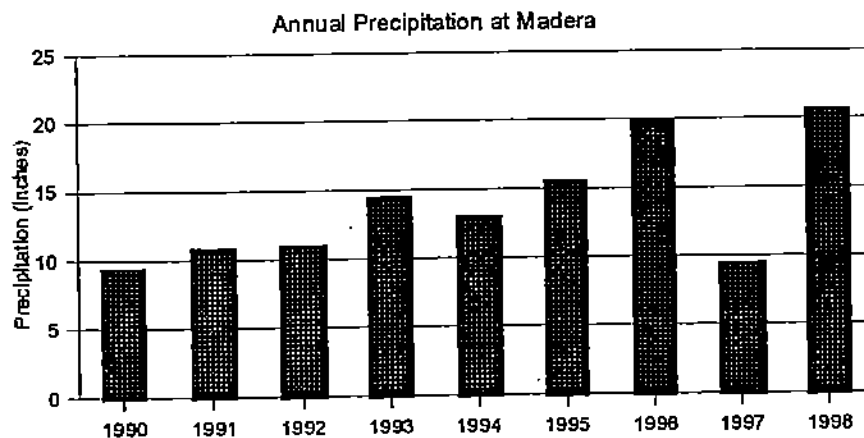
In addition, a small amount of groundwater is pumped for urban use just inside Madera County across the river from the City of Firebaugh. Total urban water use from the main municipal water systems listed above is 17,404 AFY and does not include commercial and residential use from very small water systems or domestic wells. In 1980, DWR estimated total urban water use in the Study Area to be 18,900 AFY.

2.5.2 Change in Storage

DWR (1966; 1992) has calculated long-term change in storage for several periods between 1952 and 1990. In a 1966 study, DWR presented a water balance calculation estimating inflows and outflows and the resultant change in storage from 1952 to 1958. They noted that outflows exceeded inflows over the six-year period for an average decline of -67,500 AFY, indicating an overdraft condition. In 1992, DWR reported the results of additional change in storage calculations based on water level contour maps over a longer time period. Changes in storage were estimated on an annual and

cumulative basis for the unconfined aquifer beneath Madera County from 1970 to 1991. During this time period, the annual change in groundwater storage ranged from a gain of 460,000 AF during 1979 due to above-average precipitation to a loss of -609,300 AF during the drought of 1990-1991. Over the 20-year period 1970 to 1990, the cumulative change in storage was a loss of -1,482,300 AF or an average loss of -74,115 AFY (DWR, 1992).

An assessment of the change in groundwater quantity from the drought conditions of the early 1990s to the wet conditions of the late 1990s was conducted for this Plan. This analysis uses similar methodology to the DWR computations from 1970 to 1990 and updates the DWR assessment. As seen from the chart below, this period was a time of increasing precipitation, allowing water levels to recover somewhat in the basin.



Water level contour maps for the unconfined aquifer for Spring 1990 to Spring 1998 were compared quantitatively to determine the net change in water levels over the Study Area during this time period. A map of the net change in water levels is shown on Figure 2-8, showing areas of water level rise and decline from 1990 to 1998. Areas for water level change contours were computed and converted to net acre-feet of storage change using an average specific yield of 10 percent.

Water levels declined over most of the Study Area during this period even though precipitation was above average for seven of the eight years of analysis. The only areas where water levels recovered were near the San Joaquin River on the southern and western boundaries of the Study Area and areas of focused surface water recharge along the Eastside Bypass (Figure 2-8). The change in storage over the period is estimated at -546,706 AF or an average change in storage of -68,338 AFY. These calculations indicate an average water level decline of approximately -1.5 feet per year throughout the Study Area. The negative change in storage and the net water level declines quantify the overdraft condition of the basin over eight years from drought conditions to wet conditions.

Three separate calculations of change in storage, two by DWR and one by Todd Engineers, have resulted in similar quantification of overdraft for the Madera groundwater basins from 1952 to present. These data indicate that no measures to date have arrested the overdraft condition of the groundwater basin, despite recent record wet years. Without mitigation, water levels are expected to continue to decline into the future with the rate of decline controlled by precipitation and pumping patterns. As water levels reach all-time lows, damage to the groundwater basin may be occurring.

2.6 Groundwater Quality

This section addresses general mineral quality of groundwater in the Study Area as well as specific chemicals of concern. Sources of groundwater quality data compiled and reviewed for this plan include:

- DWR data and published reports
- USGS water quality studies
- Madera County Environmental Health, Water Program data
- Department of Health Services, well data
- Regional Water Quality Control Board files
- Additional published technical studies

Data are summarized in this section. Table 2-2 contains a partial tabulation of water quality data from community water systems in the Study Area.

2.6.1 Study Area Groundwater Quality

In general, data indicate that ambient groundwater in western Madera County is of high quality and meets regulatory requirements for agriculture and drinking water purposes. Total dissolved solids (TDS), one of the broad indicators of water quality, generally averages 240 milligrams per liter (mg/l) in community drinking water supplies (as indicated by recent data in Table 2-2). For reference, the United States Environmental Protection Agency (USEPA) recommends a maximum TDS concentration of 500 mg/l for drinking water purposes. TDS is not associated with health effects and the USEPA recommendation is generally for aesthetic quality such as taste. Because TDS is also impacted by the presence of other constituents in water, it is used here as an indicator of relative differences of groundwater quality.

Figure 2-9 shows the distribution of mineral types of groundwater in the Study Area as mapped by DWR (1965). These mineral types represent a method of categorizing groundwater chemistry based on the predominant cations and anions in the water and are useful as an indicator of groundwater quality. As seen on Figure 2-9, groundwater is predominantly of a bicarbonate type throughout most of the County, transitioning from a calcium- and calcium-magnesium-bicarbonate water in the east to a sodium-bicarbonate water in the west. Along the western rim of the Study Area, sodium continues to increase,

along with increasing chloride, to produce a relatively poor quality sodium-chloride type water.

The sodium-chloride water in the western portion of the County is likely related to changes in geologic sediments as previously discussed in Section 2.2. In the eastern and central Study Area, alluvial fan deposits derived from the Sierra Nevada bedrock contain water that is less mineralized with generally lower concentrations of total dissolved solids (TDS). Sediments in the western Study Area near the San Joaquin River consist of finer-grained flood basin deposits with higher concentrations of sodium chloride and TDS.

This natural progression from high quality water in the east and central Study Area to poorer water quality in the west is confirmed in other water quality studies of the area. Data from 1956 to 1966 in a USGS study indicate that TDS in the unconfined alluvial aquifers averaged 280 mg/l over 80 percent of the valley floor (data from 86 wells, Mitten et al., 1970). This average TDS concentration (280 mg/l) is very similar to more recent TDS concentrations measured in Study Area wells (240 mg/l) (Table 2-2). Groundwater in the western 20 percent of the valley (generally in the vicinity of the Eastside Bypass then west to the River) contained much higher TDS concentrations, up to 3,400 mg/l. The average TDS concentration in the western area was 1,150 mg/l as indicated by data from the 1950s and 1960s.

The 1956 - 1966 TDS data tabulated in the USGS study were plotted and contoured for this Plan to illustrate areas with TDS concentrations greater than 500 mg/l (Figure 2-10). These data were supplemented by 1971 data measured by DWR in the northwestern portion of the Study Area (DWR, 1971). In addition to the broad area of higher TDS in the western portion of the Study Area, local areas of TDS exceeding 500 mg/l also can be identified in areas surrounding Chowchilla and southwest of Madera as shown on Figure 2-10. In the few examples where data were available over time in the same well, TDS concentrations appear to have been higher in 1965-1966 than in the 1950s. Although natural conditions may be responsible for certain areas of high TDS concentrations as previously discussed, increasing concentrations over time may indicate TDS sources from human activities such as wastewater percolation, agricultural drainage, or the migration of poorer quality water toward pumping depressions to the northeast.

All of the community water systems in Madera County are required to monitor for inorganic constituents, including TDS, in their water supply wells. Groundwater quality data were compiled from the largest water systems (>200 connections) as well as all of the County-operated water systems in the Study Area. These water systems are shown on Figure 2-11 along with the service areas of the irrigation and other water districts. Selected constituents are summarized on Table 2-2. In general, ambient water quality in all of the water systems is judged good to excellent for drinking water purposes, although water quality appears to deteriorate somewhat with depth in some areas.

Differences in groundwater quality can be seen from shallow aquifers (generally above 500 feet deep), deep aquifers in the east (below 500 feet deep), and aquifers in the

west (with poorer water quality). Generalized data for these three subsets are compared on a geochemical plot referred to as a Stiff Diagram, named for the geochemist who developed the methodology (Figure 2-12) (Stiff, 1951). This type of plot allows for a visual comparison between water quality types based on concentrations of specific cations and anions in water. Smaller concentrations of cations and anions (lower TDS) are represented by smaller, slimmer plots shown by the top plot on Figure 2-12. The middle plot, representing deeper groundwater in some areas, shows a slightly wider plot indicating a higher TDS concentration and the presence of detectable metals. In contrast, the higher TDS concentrations in western groundwater produce a relatively wide diagram dominated by sodium and chloride (Figure 2-12). The geochemical plot graphically illustrates the changes in water quality with depth and in particular the poorer water quality in the west.

2.6.2 Chemicals of Concern

Local water quality problems include numerous detections of elevated nitrates, a broad area of concern for potential pesticide contamination, elevated concentrations of iron and manganese, some contamination associated with industry, and the encroachment of saline water from the west.

2.6.2.1 Nitrate

Nitrate (NO_3) is an oxidized nitrogen compound found in groundwater that has been linked to adverse health impacts including methemoglobinemia in small children if ingested at sufficiently high concentrations over a long period of time (Hem, 1989). For human health protection, USEPA has set a maximum contaminant level (MCL) at 45 mg/l for nitrate in drinking water. Nitrate in groundwater is often associated with agriculture (pesticides and livestock drainage) as well as human waste disposal methods including septic tanks and leach fields. In general, nitrate data are more limited in coverage than TDS data.

In their 1970 study, USGS identified five wells with nitrate concentrations exceeding the MCL. Two additional wells with elevated nitrate concentrations were identified in connection with a regional water quality sampling program (Templin, 1984). Areas of nitrate concern are identified on Figure 2-13.

Elevated nitrate concentrations have also been identified at several of the community water systems in the Study Area. Systems that have detected nitrate at or above the MCL in one or more system wells include the following:

- Valeta (MD 85)
- City of Madera
- Madera Ranchos (MD10)

Measures are being taken to ensure that nitrate concentrations in drinking water do not exceed the MCL. These include blending and rehabilitating supply wells with poor seals.

Water systems that only have one water supply well such as the Valeta system are especially vulnerable. Nitrate detections indicate that elevated concentrations exist in many parts of the basin. Since nitrate is not monitored county-wide, it is not known if plumes of nitrate are widespread. Nitrate is difficult to contain and treat once in groundwater. Additional monitoring is critical to preventing further damage to already over-drafted aquifers.

2.6.2.2 DBCP Area of Concern

The soil fumigant, dibromochloropropane (DBCP), has been used historically in the valley to combat parasites such as nematodes. In 1976, this chemical ranked 11th in the list of 354 most commonly used pesticides in California (Moore, 1995). DBCP was historically applied throughout the central portion of the Study Area along the Highway 99 corridor, with the heaviest applications being south of the City of Madera (Templin, 1984). As a result of toxicological studies, the chemical was banned in 1977 (Dubrovsky, et al., 1998). In 1989, the U. S. Environmental Protection Agency (USEPA) reduced the maximum amount of DBCP allowed in drinking water to 0.2 ug/l (Moore, 1995).

In 1998, USGS found that DBCP exceeded USEPA drinking water limits in 20 percent of domestic wells sampled in the eastern San Joaquin Valley (Dubrovsky, et al., 1998). The study correlated the occurrence of the highest concentrations with vineyards, where DBCP was heavily applied. Concentrations generally decreased with depth and were highly variable at the water table.

DBCP sampling in Madera County was first conducted from 1979 to 1984 by Madera County Environmental Health and DHS (Moore, 1995). DBCP was detected in 54 Madera County wells in the southwestern portion of the Study Area, south of the City of Madera and west of Highway 99 (Figure 2-13). This area of detections correlated with the area of heaviest DBCP application in the County (Templin, 1984) and areas of vineyards as shown on land use maps (compare Figures 2-5 and 2-13). Concentrations in groundwater ranged from less than 0.01 ug/l to 40 ug/l. Samples from 48 wells exceeded the maximum allowable concentration of 0.2 ug/l (Moore, 1995).

As part of a Masters Thesis project (Moore, 1995), DBCP was re-sampled in this area in 1993. Of the 127 wells sampled, 28 detected DBCP at levels higher than the MCL with concentrations ranging up to 3.2 ug/l. Although overall concentrations were generally lower in 1993 than in the 1979-1984 sampling events, DBCP concentrations increased at approximately 25 percent of the locations sampled. Further, data on water levels and well construction were not adequate to determine the cause of changes in concentrations.

DBCP has been detected in three of the County-operated community water systems within or near the DBCP area of concern including Eastin Arcola (MD-36), Ripperdan (MD-28) and Parkwood (MD-19) (Figure 2-13). In addition, one City of Madera well has detected DBCP, although recent concentrations have met regulatory levels. Only one well contained DBCP levels (0.25 to 0.5 ug/l) at or above regulatory

limits (0.2 ug/l) and was immediately shut down to prevent exposure to DBCP in drinking water.

Two private facilities, MID and Ripperdan Dehydrator, have installed DBCP remediation systems in the area of concern to remove DBCP from pumped groundwater. The MID system, located in the northeastern corner of the area of concern treats groundwater with a recent concentration of 0.42 ug/l DBCP. The system at the fruit dehydrator is located about one mile north of the San Joaquin River in the south central portion of the DBCP area and treats groundwater from one well with a 2001 DBCP concentration of 0.91 ug/l.

Madera County Division of Environmental Health has designated this broad area (more than 50,000 acres) as an area of concern for DBCP groundwater contamination, subject to increased monitoring and well construction restrictions (Madera County Environmental Health, 2001) (Figure 2-13). Any wells drilled in this area are required to be sealed from the surface down into the competent clay layer at a depth of approximately 150 feet.

Data indicate that concentrations of DBCP are predominantly in the shallow aquifers near the water table. Shallow extraction for agricultural irrigation will likely be beneficial by recycling the DBCP, preventing (to some extent) downgradient migration, and allowing concentrations to dilute and degrade. The two remediation systems discussed above also remove some DBCP from the groundwater. Madera County's policy of sealing off the shallow aquifers in drinking water wells and extracting groundwater below deeper clay layers provides some protection against DBCP contamination in drinking water. However, continued deep extraction for drinking water may eventually cause shallow DBCP to migrate vertically to deeper layers. In addition, to the extent that DBCP concentrations are allowed to continue to migrate downgradient with groundwater flow, additional wells to the west may be impacted. Continued DBCP monitoring both within and in the vicinity of the DBCP Area of Concern will be necessary to protect drinking water in the future.

2.6.2.3 Iron and Manganese

Elevated concentrations of iron and manganese have been detected in some areas of the Madera County groundwater basins. Although these constituents are not generally associated with health effects, USEPA recommends maximum concentrations of iron (0.3 mg/l) and manganese (0.05 mg/l) in drinking water for considerations such as taste, odor, or staining. Local investigators have observed that elevated concentrations are often associated with groundwater in sediments that were originally deposited in reducing environments as indicated by clays that are blue, gray, black, or green in color (Schmidt & Associates, 1998; Montgomery Watson, 1997). County-operated water systems that have detected elevated metals in groundwater generally involve the systems in the southeastern portion of the County including La Vina, Madera Ranchos, Ranchos West, and Rolling Hills (Figure 2-13). The City of Madera has also detected elevated iron and manganese in some of their wells on a sporadic basis (Montgomery Watson, 1997).

2.6.3 Sites Regulated by the RWQCB

The Regional Water Quality Control Board (RWQCB), Central Valley Region, is responsible for protection of the beneficial uses of the waters in the region including groundwater (RWQCB, 1998). As a result, the RWQCB has developed regulations and criteria for discharges to surface water and groundwater. Discharges to groundwater that can degrade water quality have been associated with a variety of historical and ongoing activities including:

- Industrial and agricultural chemical use and spills
- Underground and above ground storage tank and sump leaks
- Landfill leachate and gas releases
- Septic tank failures
- Improper animal waste management

Permits and orders that regulate discharges have been issued at more than 80 sites in the Study Area including the following:

Selected Site Types Regulated by the RWQCB in the Study Area

<u>Type of Site</u>	<u>Number of Sites in Study Area¹</u>
Dairy Farms ²	50
Food Processing	12
Wineries, Distilleries	7
Refuse Systems	5
Sewage Systems	4
Construction, Concrete, Sand/Gravel	4
Bulk Petroleum Station/Terminal	3
Pesticides/Fertilizers	3

¹ From RWQCB Files

² All dairies are not currently regulated by RWQCB Waste Discharge Requirements

RWQCB maintains a list of facilities that have been associated with a spill, leak, investigation, or cleanup (SLIC projects) involving groundwater. Four facilities in the Study Area are associated with active SLIC projects in the Study Area as listed below. The approximate locations of these facilities are shown by triangles on Figure 2-13.

Active SLIC Sites in Study Area

<u>Facility Name</u>	<u>SLIC Description</u>
Chowchilla Cleaners	PCE in soil and groundwater
MacGillis & Gibbs Pole Treatment	Wood treating wastes

3. GROUNDWATER USE AND MANAGEMENT

Water users in Western Madera County rely upon both surface water and groundwater for water supply. Municipal and domestic uses are supplied from groundwater wells with delivery systems permitted and regulated by state or local governmental agencies. Municipal demand is estimated at 17,404 AFY (see Section 2.5.1). Surface water and groundwater are used conjunctively for agricultural irrigation. Irrigation demand is unknown in the Study Area, but is estimated to be approximately 940,000 AFY (Table 2-1). Surface water is delivered to the agricultural community by water and irrigation districts (Figure 1-3). Deliveries are controlled by contracts with the federal government, the state, and the various districts and are not regulated by the County. A large percentage of surface water deliveries is supplied from the Madera Canal. From 1949 through 1995, diversions into the Madera Canal at Friant dam have averaged approximately 256,674 AFY (based on monthly means recorded by USBR and included in USGS, 1996). This amount is considerably higher than surface water delivery to growers and includes amounts diverted for flood control and losses due to evaporation and seepage.

3.1 Agricultural Supply

Five main water agencies provide irrigation water to the agricultural community in the Study Area including Madera Irrigation District, Chowchilla Water District, Gravelly Ford Water District, Madera Water District, and Columbia Canal Company. Additional water districts have been formed for future deliveries, but to date have not provided water service (including Root Creek Water District and Aliso Water District). Apparently Sierra Water District delivered water to its service area at one time, but has since been dissolved (Richard Harman, personal communication, July 30, 2001). Two additional water districts including the Clayton Water District and New Stone Water District may have delivered water in the past, but are apparently inactive now (Franklin Secara, personal communication, October 9, 2001).

Service areas for these water districts are shown on Figure 1-3. Operations, groundwater management activities, and monitoring programs of these water districts are discussed below.

3.1.1 Madera Irrigation District (MID)

The Madera Irrigation District (MID) is the largest water district in the County, covering more than 128,000 acres (Figure 1-3). MID delivers water to the growers of Madera County through a series of pipelines, lined and unlined canals, and natural streambeds. Their main sources of water include releases from Friant Dam and Hidden Dam through contracts with the USBR (Boyle, 1999). Releases are diverted into the Madera Canal and distributed through the MID system.

MID's contract for water from Friant Dam provides for 85,000 AFY of Class 1 water and 186,000 AFY of Class 2 water. On average, 100 percent of Class 1 water and

48 percent of Class 2 water is available. MID also holds water rights to an average of 20,000 AFY from the Fresno River (Boyle, 1999) and contracts for up to 24,000 AFY from Hidden Dam. In 1997, MID delivered 154,821 AFY to growers within the district, approximately 49 percent of estimated irrigation demand in the District. MID engages in the replenishment of the groundwater system by diverting excess surface water into eight recharge facilities totaling more than 350 acres, as well as allowing percolation along unlined channels and canals.

MID monitors groundwater levels in an average of 229 wells located throughout the district, with 15 wells selected as representative of water level conditions (Boyle, 1999). Static water levels are measured in October and February, representing the maximum water level low and high associated with the growing season. Groundwater quality is not currently monitored, although several quality problems relating to high salinity and DBCP contamination have been identified beneath district lands in recent years.

3.1.2 Chowchilla Water District (CWD)

Formed in 1949 from a portion of the original Madera Irrigation District, Chowchilla Water District (CWD) covers 80,000 acres in both Madera and Merced Counties. The estimated service area within Madera County covers approximately 65,600 acres as shown on Figure 1-3. CWD delivers surface water to lands within its boundaries through a delivery system that includes approximately 160 miles of unlined canals and laterals and 46 miles of pipeline (CWD-Red Top RCD, 1997). Water has been transported into the District via the Madera Canal since 1945 (originally by MID, CDWR, 1966). As of 1997, the District contract with the Bureau of Reclamation involved a maximum of 55,000 AFY of Class 1 water and an annual average of 77,000 AFY of Class 2 water from Friant Dam via the Madera Canal. In addition, CWD receives approximately 24,000 AFY from Buchanan Dam releases on the Chowchilla River (CWD-Red Top RCD, 1997). Assuming full delivery of Class 1 water, and adding the average deliveries of Class 2 and Buchanan Dam water, it is estimated that CWD delivers an approximate average of 156,000 AFY to growers in the District.

CWD purchases water to recharge groundwater when available. Natural and artificial recharge is accomplished in the unlined portions of the surface water conveyance system, nearby stream channels, two surface water retention reservoirs, and eight recharge basins located throughout the District. CWD monitors water levels in approximately 143 wells each spring and fall. Plans are underway to improve groundwater monitoring.

3.1.3 Gravelly Ford Water District (GFWD)

The Gravelly Ford Water District (GFWD) was formed in 1962 by the local agricultural community to obtain a permanent water supply. A water delivery system was constructed in 1984, allowing additional surface water to supplement the use of groundwater and water from Cottonwood Creek. The District has contracts with the

USBR for 14,000 AFY of Class II water and a contract with MID to purchase spill waters in Cottonwood Creek (Bair and Westra, 1998). GFWD covers approximately 8,300 acres, as shown on Figure 1-3.

The GFWD distribution system consists primarily of the Gravelly Ford Canal, which extends from the San Joaquin River to Cottonwood Creek, and small connecting pipelines used to deliver water to metered turnouts. The unlined canal allows for groundwater recharge by percolation of water into the underlying sandy soils (Bair and Westra, 1998).

According to their Groundwater Management Plan, GFWD plans to implement a routine groundwater monitoring program to supplement the data currently collected by the USBR and MID (Bair and Westra, 1998). The program would include both water levels and water quality monitoring.

3.1.4 Root Creek Water District (RCWD)

Root Creek Water District (RCWD) was formed in 1996 when agricultural development of district lands was essentially complete. RCWD service area covers approximately 9,234 acres as shown on Figure 1-3. As described in their groundwater management plan (Provost and Pritchard, 1997a), the District does not own or operate any wells or water distribution facilities nor does it deliver water supply within its boundaries. Water needs in the District are served solely by private wells and irrigation systems. In the 1997 groundwater management plan, RCWD expressed the desire to increase groundwater recharge within the District and was exploring various options for obtaining and recharging water. One plan component involved conducting groundwater recharge feasibility studies.

As of 1997, RCWD did not operate nor participate in any groundwater monitoring programs for groundwater levels or quality within District boundaries. As mentioned in their groundwater management plan, RCWD intends to initiate a water level monitoring program in coordination with USBR and DWR that would include measurements of water levels in selected District wells each spring and fall. They were recently awarded a state grant for developing a coordinated groundwater monitoring program.

In 1998, RCWD conducted a hydrogeologic investigation of more than 50,000 acres including RCWD service area, subdivisions of Madera Ranchos, Ranchos West, and Rolling Hills, and the proposed Village of Gateway (Schmidt and Provost & Pritchard, 1998). The study documented overdraft in the area of approximately 22,000 AFY. Four areas were identified as having the most potential for artificial recharge to partially mitigate overdraft conditions. These areas included permeable sediments at two locations along the San Joaquin River, an area south of Avenue 10 and west of Road 39, along Root Creek in the central part of the District, and an area north of Avenue 12, adjacent to MID Lateral 6.2.

3.1.5 Aliso Water District (AWD)

The Aliso Water District consists of approximately 25,723 acres in southwestern Madera County along the San Joaquin River (Figure 1-3). As described in their groundwater management plan (AWD, 1996), AWD has no surface water supply and currently does not deliver water to growers. Its principal objective is to assist growers with the protection and management of the groundwater resources inside of the District boundaries. AWD is pursuing the purchase of surplus surface water to minimize groundwater extractions, using private canals within the district for distribution. The District also intends to investigate cooperative efforts for groundwater management with neighboring water agencies, landowners, and water users. According to the Groundwater Management Plan, AWD will also track and evaluate changing water levels within District boundaries.

3.1.6 Madera Water District (MWD)

The Madera Water District was formed in 1987 to supply 3,740 acres of mature pistachio orchards with irrigation water (Provost and Pritchard, 1997b). The District's only surface water supply is the ability to purchase water from Madera Irrigation District delivered via the Dry Creek Canal. MWD also operates two pumping plants on the canal to supplement groundwater irrigation. MWD also owns and operates wells to provide water for irrigation. Average water use in the district from 1993 through 1997 was 9,150 AFY, with approximately 82 percent (7,459 AFY) from groundwater and 18 percent (1,692 AFY) from surface water. Groundwater pumping decreased after surface water facilities were completed and from 1996 through 1997, groundwater extractions averaged 6,840 AFY. Similar to most areas beneath Madera County, declining water levels indicate conditions of overdraft beneath the District. MWD's AB3030 Groundwater Management Plan expresses a commitment to increased use of surface water from the Dry Creek Canal in lieu of groundwater pumping, hoping to mitigate overdraft conditions.

At the time of their AB3030 Groundwater Management Plan, Madera Water District did not conduct routine groundwater monitoring, although DWR measures water levels for some wells in the vicinity of the District (Provost and Pritchard, 1997b). MWD indicated in their plan that a water level monitoring program will be implemented within a year of the plan and coordinated with the USBR and DWR. The resulting data will be used to construct water level contour maps to estimate changes in groundwater storage.

3.1.7 Columbia Canal Company (CCC)

The Columbia Canal Company covers approximately 15,746 acres in western Madera County and is one of four member agencies of the San Joaquin River Exchange Contractors Water Authority. Under a Joint Powers agreement, the Exchange Contractors receive deliveries of surface water from USBR along the Delta-Mendota Canal in exchange for USBR use of water from water rights held by the Exchange Contractors. Water deliveries by CCC have averaged about 58,500 AFY over the last three years.

(Randy Houk, personal communication, October 15, 2001). Because surface water deliveries are insufficient to meet crop demands during some time periods, groundwater is pumped into the system from wells within the service area. Groundwater is pumped during April, May, and June so that surface water can be "banked" for access during peak demand. Groundwater is also pumped during June, July, and August to supplement surface water.

In the Company's *Rules and Regulations Governing Transfers of Water Under the Central Valley Project Improvement Act of 1992*, the Company recognizes the overdrafted condition of the groundwater basin and the negative impacts created by substituting groundwater for transferred surface water. To protect the underlying groundwater basin, CCC does not allow transfer of groundwater to areas outside the Company service area (SJREC, 1997). Also, CCC does not allow transfer of surface water without following the land to which such surface water would have been delivered.

3.2 Municipal, Domestic, and Industrial Supply

Residents of Madera County rely on public and private water systems as well as domestic wells for their water supply. Almost all of the public and private water systems use groundwater. For the larger water systems, defined as more than 200 connections, the Department of Health Services Drinking Water Division inspects and monitors groundwater used for potable water supply. For systems with less than 200 connections, defined as small water systems, inspections and monitoring are conducted by the County's Department of Environmental Health. Water system permits listing the terms and conditions of operation and monitoring are on file at Environmental Health. Physical inspections are conducted to ensure permit compliance. Groundwater quality monitoring is also conducted according to the conditions of the permit and data are submitted to the County for review.

3.2.1 County-Operated Water Systems

Madera County operates 12 small public water systems that are identified on Figure 2-11. All but one (Sumner Hills) system rely on groundwater to meet residential and commercial use. The eleven groundwater systems are summarized on Table 3-1. These systems provide drinking water in the Study Area to more than 7,000 residents and 32 commercial settings including schools. Water is supplied by 21 groundwater wells that have pumped an average of 2,372 AFY over the last five years.

3.2.2 City of Madera

The City of Madera relies on groundwater to provide potable water to more than 35,000 customers over approximately 12 square miles of incorporated area. Water is pumped from the City's 15 active wells with a combined capacity of more than 23,000 gpm (Montgomery Watson, 1997). Annual pumping from 1993 through 1995 averaged 10,400 AFY. Specific capacities for the wells range from 17 gpm/ft to more than 100

gpm/ft. A portion of this water demand is discharged back into the groundwater system as treated wastewater at the City's percolation ponds.

The City has recognized the need for groundwater management and authorized a preliminary assessment of groundwater conditions and management in their Water System Master Plan (currently in draft form, Montgomery Watson, 1997). The report recommends that the City pursue a comprehensive groundwater recharge program and identifies favorable areas for groundwater recharge including the Fresno River channel to the northeast and underlying the City. The report also recommends favorable areas south and southwest of the City where coarse grain sediments persist with depth. The report also assesses the availability of additional surface water supplies to replace groundwater for direct use.

3.2.3 Madera Valley Water Company

The Madera Valley Water Company is a mutually owned water company providing water to approximately 1,738 residential and 25 commercial connections. The Company has installed five groundwater supply wells and plans to develop a sixth well in the coming year. Over the last four years, the Company has pumped approximately 2,000 AFY to meet water demand. The Company also captures stormwater runoff for recharge back to the groundwater basin.

3.2.4 City of Chowchilla

The City of Chowchilla pumps approximately 2,612 AFY from eight active groundwater wells to provide residents with a reliable water supply (City of Chowchilla, 2001). Stormwater and treated wastewater is returned back to the groundwater system through percolation ponds. Current groundwater management activities include plans to conduct source water assessment tests in compliance with State guidelines for their water supply wells. The City also implements an urban water conservation program that restricts landscape irrigation during the day from April 1 through October 31 of each year (City of Chowchilla, 2001).

3.3 County Groundwater Management Activities

The County has historically conducted groundwater management activities through County Ordinances and Policies as contained in Title 13, Water and Sewers, of the Madera County Code. Two of the County's groundwater management actions are summarized below.

3.3.1 Groundwater Exportation, Groundwater Banking, and Importation of Foreign Water

Article V of Title 13 of the Madera County Code provides rules and regulations pertaining to groundwater banking, importation of foreign water for the purpose of groundwater banking and exportation of groundwater outside the County. The Ordinance

recognizes overdraft conditions and the extent to which the County's residents, environment, and economy rely on groundwater. The Ordinance requires permits for groundwater banking, exportation, or importation for purposes of ground water banking within the area of its application as defined by the Ordinance. Local water agencies as defined by the Ordinance are exempt from permit requirements to allow for the continuation of surface water delivery and recharge activities that benefit the groundwater basin. An application package, referenced in the Ordinance, requires applicants to completely evaluate impacts of banking, import, and/or export projects on the groundwater basin, residents, environment, and economy of the County.

As part of activities associated with the Mendota Pool Group (MPG) pumping contract with the USBR, Farmers Water District (FWD, Fresno County) has been pumping groundwater inside Madera County and exporting this water via the Mendota Pool (USBR, 2001b; Schmidt and Luhdorff and Scalmanini, 2000a; 2000b). FWD owns six wells on the Madera County side of the San Joaquin River in the southwestern corner of the Study Area. The wells are located just west of the Eastside Bypass in two river meanders referred to as the east and west loops. Three wells were installed in each loop (EL-1, EL-2, EL-3, WL-1, WL-2, WL-3) with one well inactive (EL-1). Pumping for export to Westlands Water District has been conducted since 1991. Pumping amounts for three years of data were provided in recent technical documents as follows (Schmidt and Luhdorff and Scalmanini, 2000a; 2000b):

1997 – 1,979 AFY	(5 wells)
1998 – 676 AFY	(4 wells)
1999 – 2,137 AFY	(5 wells)

3.3.2 Well Construction and Abandonment

Chapter 13.51, Article I of Title 13 requires any water supply to meet standards for both quantity and quality. The well testing protocol incorporates published accepted methodologies from the American Water Works Association. Chapter 13.52 regulates the location, construction, maintenance, abandonment, and destruction of all wells that may affect the quality of groundwater. A well permit is required to be obtained from the County for all wells drilled in the unincorporated areas. The chapter adopts water well standards developed by DWR and set forth in DWR Bulletin 74-81. Modifications to the DWR well standards are required in some instances to further protect drinking water or groundwater quality.

4. AB3030 GOALS AND PLAN IMPLEMENTATION

4.1 Goals

Long-term goals of the groundwater management planning process were identified by Water Oversight Committee and County personnel (Table 4-1). Goals are organized by specific issues and conditions to be addressed. It is recognized that this is the first step in the planning process and all goals may not be obtainable in the short-term. This first Plan sets the hydrogeologic framework within which to develop strategies for reaching higher priority goals. Strategies that may be incorporated into the Plan are discussed below.

4.2 Strategies

The following strategies have been developed through discussions with County staff and the AB3030 Subcommittee of the Water Oversight Committee. These strategies will be considered in the long-term planning process for reaching the goals identified in Table 4-1 and are summarized below.

4.2.1 Groundwater Quantity, Overdraft, and Export

As described in Chapter 2 of this Plan, overdraft conditions have persisted in the basin since at least the 1930s and continue today. Since 1952, the loss of groundwater from storage has averaged more than 65,000 AFY. Increased importation of surface water into the County has not arrested the overdraft conditions, but likely has been offset by an increase in pumping. If no action is taken, water levels are expected to continue to decline and may decline at an accelerated rate as water levels move into less permeable portions of the aquifer. In addition, as water levels decline below extensive clay layers in the basin, recharge to the basin may be impacted and dewatering and subsidence may cause a permanent storage loss in the basin. The impacts of the continuation of present trends in water level declines may include the following:

- costs of lowering pumps or installing larger pumps in wells
- installation of new wells
- more expensive lifting costs
- loss of groundwater in storage
- potential land subsidence
- potential loss of aquifer storage capacity
- potential loss of stream baseflow
- potential adverse impacts to groundwater quality

To avoid these impacts and achieve Plan goals for a sustainable groundwater supply for the future (Goal I-1, Table 4-1), either less water must be extracted from the basin or more water must be added into the basin. Four strategies are discussed here to address the water balance of the basin: recharge, limits on export, agricultural land conversion, and urban development strategies. Conservation is discussed in later sections.

4.2.1.1 Maximize Groundwater Recharge

To increase water into the groundwater basin, an additional water source must be identified. Although the County has a contract to purchase water from USBR at Millerton Lake, the amount is small. Maximizing natural streamflow recharge in the County is one strategy to partially mitigate overdraft conditions (Goals I-1 and I-2, Table 4-1). The County should investigate additional potential recharge along current stream channels including the Fresno and Chowchilla Rivers, Dry Creek, Cottonwood Creek, and Berenda and Ash Sloughs. Several irrigation and water districts including MID and CWD already conduct streamflow recharge along stream channels and spreading basins.

One area that appears to provide additional recharge potential is Madera Lake, northeast of Madera and north of the Fresno River Channel. This area is currently used as an artificial recharge basin by MID where approximately 2,500 AFY are percolated to groundwater (personal communication, Don Roberts, November 21, 2001). The basin consists of approximately 1,100 acres and a small earthen dam where seepage problems have occurred in the past.

The County should coordinate with current groundwater management practices by MID and other agencies to ensure streamflow recharge is maximized. These efforts should also be coordinated with flood control where feasible. Downstream rights would need to be considered. Recharge efforts also need to be monitored into the future to evaluate impacts on the basin water balance and changes in groundwater basin conditions.

In the anticipation that excess natural streamflow will not be sufficient to fully mitigate groundwater overdraft, the purchase of additional water should be considered. Diversion records suggest that flood/storage water from Friant Dam is available during most water years. With agricultural demand so low during the non-growing season, water released in the winter months into the Madera Canal to control reservoir storage is mostly unused in Madera County. For example, of the 39,770 AF released into the Madera Canal in March of 1996, MID diverted 29,600 AF into the Fresno River as flood flows. Although some percolation in the river bottom likely occurred, the majority of the release flowed down the river and out of the County. This water available for recharge typically occurs sporadically and at high flow rates. A major challenge will be to develop sufficient storage capacity in the recharge areas to allow a maximum amount of water to be captured.

An additional challenge will be to generate funds to purchase storage/flood surface water when available. As areas for recharging water are identified, the County will need to investigate funding mechanisms for purchasing water.

4.2.1.2 Preclude Export

In addition to increasing basin recharge, the County should endeavor to preclude water exports beyond the County, to the extent of its authority, that would decrease the long-term volume of usable groundwater in the County (Goal I-3, Table 4-1). This goal has been addressed by the recent adoption of Ordinance 573A reproduced in Appendix D. As previously discussed, this ordinance requires an application and permit process for groundwater banking, exportation of groundwater or importation of foreign water for the purpose of groundwater banking within the area of the County's authority.

4.2.1.3 Agricultural Land Conversion

It is difficult to quantify the current amount of pumping or changes in pumping over time because most of the pumping is not metered. Agricultural pumping is estimated to be more than 95 percent of all groundwater pumping in the County and, with more competition for surface water, this pumping may increase in the future. Madera County wishes to support agricultural uses of land and maintain the agricultural economy. Accordingly the County discourages the conversion of prime agricultural land to urban use (Madera County, 1995). Although some agricultural areas may convert to urban land uses in the future, this conversion may or may not result in less groundwater usage. If agricultural lands currently irrigated with surface water convert to urban use with total reliance on groundwater, the groundwater demand may increase, while the surface water return flows are lost from the current system.

4.2.1.4 Develop Standards for Urban Development

While efforts are underway to stabilize water levels in the basin, the County wishes to develop standards for assessing water supply for new urban developments in the County (Goal I-4, Table 4-1). Inconsistent methodologies and analyses are currently being used to satisfy the County's requirements to demonstrate a sufficient water quantity before a new development is approved. In developing comprehensive and consistent standards, the County should require that the regional overdraft conditions and the basin-wide water balance are considered in the analysis rather than a local water balance on a subdivision basis.

4.2.2 Groundwater Quality and Protection

Ambient groundwater quality beneath the Study Area is generally of very high quality for uses identified in the basin. In some areas, groundwater quality has been impacted by chemicals of concern as discussed in Chapter 2. The nature and extent of these impacts have not been fully defined. Additional water quality monitoring and data analysis will be necessary to identify a full range of appropriate strategies. If left unchecked, contamination may spread throughout the aquifer, limiting groundwater use in some areas. Relevant quality issues are addressed below.

4.2.2.1 Nitrate

In order to achieve goals of protecting groundwater quality in the basin (Goals II-1 and II-2, Table 4-1), nitrate detections in groundwater need to be addressed. The sporadic detections of nitrate in excess of MCLs throughout the County are a major concern (Figure 2-13). Septic systems and leach fields are suspected sources of some of the nitrate contamination. The County may want to consider the requirement of denitrification packages for wastewater treatment at the larger proposed developments. Recent waste discharge requirements developed by the RWQCB, Los Angeles Region, sets limits on nitrate concentrations emanating from small commercial and multifamily residential sewage disposal systems (RWQCB, 2001a). This order may be worthy of review for sections applicable to Madera County. In addition, a USEPA guidance document offers ways of upgrading package wastewater treatment systems to limit potential groundwater impacts (USEPA, 1996).

Although all of the water systems in the County are required to monitor water supply wells for nitrate, there is no County-wide monitoring program capable of identifying the nature and extent of the problem upgradient and downgradient of affected wells. Efforts to compile current data and collect additional data for a county-wide analysis of the problem must be undertaken. Recommended strategies for addressing the lack of nitrate data are included in groundwater monitoring strategies (Section 4.2.6).

4.2.2.2 DBCP

Recent research on DBCP contamination in groundwater has identified an area of concern in the southern portion of the Study Area. In this area, the County has adopted a policy of requiring wells with deep seals to lessen the likelihood of contamination. The continued use of shallow groundwater for agriculture and two remediation facilities will likely lessen the impacts of the DBCP in some areas over time. However, wells in this area, including private wells, should be carefully monitored for DBCP in the future. The nature and extent of DBCP has not been investigated on a county-wide basis and other areas may also contain DBCP contamination.

4.2.2.3 Saline Water

The migration of saline water from the western portion of the valley is a threat to the groundwater of Madera County. Because the Columbia Canal Company borders the western portion of the Study Area and the area of saline water, wells in their service area may provide the most critical data for monitoring the movement of saline water into Madera County. Available water quality data from the Columbia Canal Company service area should be incorporated into the county-wide groundwater monitoring program.

4.2.2.4 Other Water Quality Concerns

Other areas of water quality concern including leaking underground storage tanks and spills and leaks from local industry should be carefully monitored. The County

should continue to work with the RWQCB to identify areas of water quality concern. One strategy would be to conduct a detailed file review of active cases at the RWQCB to determine the risk of impacting County or private wells in the future.

The Drinking Water Source Assessment Program (DWSAP) implemented by DHS requires that each new water supply well be evaluated for nearby sources of contamination that could impact water quality. This program provides a useful framework for the evaluation of groundwater quality in the vicinity of all community water systems and should be considered for County implementation.

4.2.3 Groundwater Management, Recharge, Conjunctive Use

Several strategies to reach this goal, including maximizing streamflow recharge, were addressed in Section 4.2.1. The County should investigate for permeable areas where recharge could be maximized and optimally-located areas to provide maximum benefits to the groundwater basin. The County should continue to support and coordinate with ongoing groundwater management efforts of other water agencies in the basin. Hydrogeologic analyses of recharge proposals will be necessary to:

- identify areas where water levels will be most impacted,
- quantify the anticipated water level rise (or decrease in decline) and
- determine which efforts optimize groundwater recharge for the least cost.

4.2.4 Local Control of Groundwater Management and Local Water Rights

The preparation of this Plan demonstrates the County's desire to coordinate with and participate in local control of the groundwater basin. The County recognizes the large role that this resource plays in the vitality and well-being of County's farms, businesses and residents.

4.2.5 Conservation and Reuse

Madera County has a policy of encouraging water conservation efforts including: requiring water-conserving design and equipment in new construction, encouraging water-conserving landscaping, retrofitting existing development with water-conserving devices, and encouraging the use of recycled water for landscaping (Madera County, 1995). The County also supports the reuse of wastewater to offset the demand for new water supplies. Most of the residential wastewater effluent in the County is percolated back to the groundwater basin, thereby recycling a portion of the water supply. To avoid water quality impacts, standards for wastewater percolation at new developments should be developed. This will allow for the continued reuse of water in the critically overdrafted groundwater basins. Water conservation efforts are also encouraged by the County for agricultural users, and are often required as part of a governmental contract for surface water delivery.

The State of California mandates an evaluation of management of urban water for systems with more than 3,000 connections (Urban Water Management Plan, UWMP). Municipalities and local agencies should consider the program's applicability to portions of Madera County. The County wishes to continue to support water conservation and reuse. As the planning process progresses, the County will explore additional options and strategies for water conservation in the County.

4.2.6 Groundwater Monitoring Programs

A variety of groundwater monitoring programs exists throughout the County. However, they generally are for specific purposes and limited to specific areas or data types. These constraints limit their usefulness for countywide assessments. DWR and USBR provide the largest groundwater data depositories of groundwater levels and hydrologic data. The Department of Health Services and Madera County Environmental Health contain the most water quality data from public water supply wells. RWQCB collects regional water quality data, issues water quality orders and permits, and maintains data on specific water quality concerns in the County. In addition, many water agencies maintain their own groundwater monitoring program within their service area.

Although a central clearinghouse for data management would be helpful, none of the entities may have the resources to develop a county-wide groundwater monitoring program. Madera County Environmental Health is currently developing a geographical information system (GIS) for maintaining and displaying water quality data. This system may be the most efficient for storing other water quality data monitored for characterization purposes. Root Creek Water District was recently awarded a grant for a data management system including water levels and water quality in the Root Creek service area. This system could potentially be expanded to incorporate data from the County (Philip Pierre, personal communication, July 10, 2001).

The most logical strategy for reaching the goal of an adequate county-wide monitoring program would be a meeting of all parties currently collecting groundwater data to discuss data collection and management through the Water Oversight Committee. Methods for accessing and sharing data among all parties should also be addressed. Indeed, the California Water Code section 10755.3 requires an annual coordination meeting among all local agencies, including cities and counties, that manage groundwater within the same groundwater basin.

4.2.7 Education

As part of the AB3030 planning process, a public hearing will be held to present the Plan and obtain comments from County residents. This hearing will provide an opportunity to educate County residents on the current status of the groundwater basin and the County's Plan to replenish, preserve, and protect it. Furthermore, it is recommended that the Plan be updated annually to provide an ongoing mechanism to keep County residents informed and to provide a forum to discuss issues and plan ahead.

4.2.8 Coordination

With representatives from water agencies and City and County government, the Water Oversight Committee has provided an excellent forum for involving local stakeholders in County groundwater management decisions. Continued oversight by the Committee is seen as an efficient way to ensure that management decisions by one entity do not unintentionally impact another entity. Ongoing communication can also identify groundwater management opportunities where resources can be pooled to reach a common goal.

Certain activities outside of County boundaries may also impact groundwater beneath the Study Area. The Committee provides an excellent vehicle for working with entities outside of the County, as necessary, to make sure that the County's resources are protected. The Committee should also be involved in the annual update of the AB3030 Plan to guide its efforts and provide coordination among all County stakeholders.

4.3 Plan Development and Implementation

To focus the groundwater management planning efforts for the first year of the program, the County will concentrate first on the issues relating to groundwater overdraft, groundwater quality, monitoring and coordination. Planned activities are summarized below.

Maximize Recharge:

- Investigate recharge possibilities along County creeks and rivers
- Discuss possibility of maximizing recharge in Madera Lake with MID
- Combine recharge projects with flood control where appropriate
- Develop additional surface storage to capture flood flows when available
- Explore funding mechanisms to purchase additional surface water for recharge

Develop Standards for New Developments

- Develop consistent methodologies for proving a sustainable water supply
- Develop guidelines for placement and treatment requirements of new wastewater systems
- Consider a requirement of denitrification packages on wastewater systems

Groundwater Monitoring

- Meet with all entities in the basin that currently monitor groundwater
- Compile details of current monitoring programs including wells, aquifers, constituents, measurements, frequency, and reporting
- Discuss possibility of maintaining a county-wide GIS-based water quality data management system at Madera County Environmental Health

- Explore possibilities of groundwater data management systems in the County including responsibilities and data sharing

Coordination

- Continue to support the efforts of the Water Oversight Committee
- Continue to manage groundwater with the cooperation of local water agencies

Plan Update

For the AB3030 planning process to be useful, the Plan should be viewed as a living document, revisited regularly and updated on an annual basis. This will provide the mechanism by which the County can document progress and re-focus efforts as hydrogeologic and institutional conditions change.

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**Table 1-1
Water Oversight Committee**

<u>Name</u>	<u>Affiliation</u>	
Denis Prosperi	Madera Ranch Project Oversight Committee	Chairman
George Andrew	Gravelly Ford Water District	
Frank Bigelow	County of Madera - Board of Supervisors	
Roy Catania	Aliso Water District	
Loren Freeman	Mosquito/Vector Control District	
Ron Harris	City of Chowchilla	
Randy Houk	Columbia Canal Co.	
Leon Lancaster	City of Madera	
Michele Lasgoity	Madera Ranch Project Oversight Committee	
Vern Moss	County of Madera - Board of Supervisors	
Phillip Pierre	Root Creek Water District	
Ron Pistoiresi	Madera Irrigation District	
Claude Rust	Coarsegold Resource Conservation District	
Kole Upton	Chowchilla Water District	
Glenn Igo	City of Chowchilla	Alternate
Tim Da Silva	Gravelly Ford Water District	Alternate
Michael Kirn	County of Madera - Engineering Department	Technical Staff
Doug Nelson	Madera County Counsel	Technical Staff
Steve Ottemoeller	Madera Irrigation District	Technical Staff
Leonard Garoupa	County of Madera - Planning Department	Technical Staff
Bonnie Holiday	County of Madera - Board of Supervisors	Recording Secretary

Table 2-1
Irrigation Water Requirements

Crop Type	Crop	Irrigated Acreage ¹	Applied Water Requirements ²	Est. Annual Irrigation
Fruit and Nut Crops				
	Grapes	96,210 acres	2.9 AF/acre	279,009 AF
	Almonds	47,600 acres	3.0 AF/acre	142,800 AF
	Pistachios	19,270 acres	3.0 AF/acre	57,810 AF
	Figs	9,550 acres	3.0 AF/acre	28,650 AF
	Other	15,460 acres	3.6 AF/acre	55,656 AF
	TOTAL	188,090 acres		563,925 AF
Field Crops				
	Alfalfa	36,500 acres	4.4 AF/acre	160,600 AF
	Cotton	27,500 acres	3.3 AF/acre	90,750 AF
	Wheat	23,600 acres	1.5 AF/acre	35,400 AF
	Corn	17,100 acres	2.9 AF/acre	49,590 AF
	Irrigated Pasture	4,500 acres	4.4 AF/acre	19,800 AF
	Oat	4,200 acres	1.2 AF/acre	5,040 AF
	Other	3,220 acres	2.5 AF/acre	8,050 AF
	TOTAL	116,620 acres		369,230 AF
Vegetable Crops³	TOTAL	3,400 acres	2.0 AF/acre	6,800 AF
Total Annual Applied Water				939,955 AF
Average Unit Applied Water			3.1 AF/acre	

¹ Harvested acreage from Madera County Department of Agriculture, Agricultural Crop Report 2000

² DWR, San Joaquin Division, applied water averaged for Madera County hydrologic units
Actual irrigation requirements vary with soil type across the County

³ (includes artichokes, cabbage, carrots, cucumbers, eggplant, garlic, herbs, melons, onions, peppers, potatoes, squash, tomatoes, and misc. truck crops)

Table 2-2
Inorganic Water Quality Data¹
Selected Madera County Water Systems²

System	Well Information				Water Quality Data - Selected Constituents (mg/l)											
	Well Name/No.	State Well No.	Depth of Perforations.	Sample Date	Na	K	Ca	Mg	Cl	HCO ₃	SO ₄	Fe	Mn	NO ₃	TDS	
City of Madera	Airport	11S/17E-10E1	240' - 600'	3/4/86	18	3	13	5	20	67	6	<0.100	<0.030	12	180	
				6/30/88	21	3	17	3	21	87	2	<0.100	<0.030	7	184	
				1/9/91	21	5	22	3	22	105	2	<0.100	<0.030	5	182	
	Well #9	11S/17E-23J2		6/29/93	3	17	14	4	17	80	4	0.110	0.240	11	170	
				3/4/86	18	3	14	5	21	79	9	<0.100	<0.030	4	168	
				6/30/88	21	4	20	6	25	104	4	<0.100	<0.030	7	192	
	Well #10	11S/16E-19B2	260' - 620' ?	3/4/86	21	4	16	5	21	98	7	<0.100	<0.030	6	188	
				6/30/88	21	4	48	5	20	104	3	<0.100	<0.030	7	200	
	Well #11	11S/17E-25B2		3/4/86	19	6	17	6	19	104	8	<0.100	<0.030	9	195	
				6/30/88	20	4	17	5	22	99	3	<0.100	<0.030	4	168	
	Well #15	11S/17E-22J1	195' - 465'	3/4/86	41	10	46	15	44	232	14	<0.100	<0.030	25	375	
				6/30/88	48	8	60	17	51	272	18	<0.100	<0.030	27	384	
				1/9/91	53	12	50	14	46	246	14	0.200	<0.030	27	368	
				11/16/93	41	8	48	15	41	244	12	ND	ND	25	380	
				11/22/96	40	8	54	16	41	240	17	0.100	ND	29	390	
				11/18/99	48	8	58	15	41	200	ND	ND	ND	27	350	
				5/24/01										32		
	Well #16	11S/18E-18F1	190' - 520'	3/4/86	19	3	17	5	21	98	6	<0.100	<0.030	6	180	
				9/1/93	3	23	21	6	16	112	5	3.600	0.110	7	200	
				3/27/96	25	2	15	5	20	92	4	ND	ND	4	120	
	Well #17	11S/18E-19P1	260' - 620'	5/20/99	22	3	19	5	14	80	8	ND	ND	7	180	
3/4/86				19	3	15	4	21	85	6	<0.100	<0.030	4	168		
6/30/88				24	5	20	5	26	110	4	<0.100	<0.030	8	188		
			1/9/91	27	4	21	6	25	105	5	<0.100	<0.030	4	188		
			11/16/93	26	4	18	6	21	127	7	ND	ND	4	210		
			11/22/96	26	3	20	6	21	120	9	ND	0.017	5	220		
			11/18/99	28	4	23	7	23	92	10	ND	ND	5	180		
			12/21/00										14			
Well #18	11S/17E-24B1	280' - 610'	3/4/86	22	3	17	5	22	104	7	<0.100	<0.030	5	188		
			1/9/91	25	4	15	4	20	99	2	<0.100	<0.030	1	148		
			1/5/94	25	3	17	5	19	117	4	0.130	ND	5	180		
			2/26/97	22	4	18	6	19	110	6	0.200	ND	6	190		
			2/24/00	22	3	22	6	21		ND	ND	ND	6	170		
Well #19	11S/17E-26C2		3/4/86	34	10	37	11	40	177	15	<0.100	<0.030	23	318		
			5/20/86	38	8	40	12	42	189	13	<0.100	<0.030	2	318		
Well #20	11S/17E-14J1	to 600'?	3/4/86	17	4	16	5	20	79	6	<0.100	<0.030	8	188		
			6/30/88	18	3	17	5	21	93	3	<0.100	<0.030	6	180		
			1/9/91	21	5	18	5	21	99	4	<0.100	<0.030	6	172		
			11/16/93	19	4	20	6	19	106	5	0.080	ND	8	200		
			11/22/96	19	4	22	6	19	100	6	1.810	0.274	9	200		
			11/18/99	22	4	23	6	19	80	7	ND	ND	7	180		
			12/21/00										9			
Well #21	11S/18E-30L1	230' - 600'	3/4/86	29	8	31	9	33	140	31	<0.030	<0.030	6	283		
			5/22/86	34	8	38	11	32	161	36	<0.100	<0.030	2	283		

System	Well Name/No.	State Well No.	Depth of Perforations	Sample Date	Na	K	Ca	Mg	Cl	HCO ₃	SO ₄	Fe	Mn	NO ₃	TDS
City of Madera (continued)	Well #21 (continued)			1/9/91	27	4	18	5	24	105	4	<0.100	<0.030	2	176
				11/16/93	25	5	27	9	26	141	19	0.600	ND	6	260
				11/22/96	24	5	29	9	3	120	2	0.248	ND	0	250
				11/18/99	29	5	30	9	28	94	17	ND	ND	7	230
	Well #22	11S/17E-24G3	240' - 520'	12/21/00										10	
				3/4/86	16	4	15	5	20	85	5	<0.100	<0.030	4	170
				6/30/88	21	3	15	4	23	87	2	<0.100	<0.030	2	156
				1/9/91	18	4	15	5	20	86	2	0.600	<0.030	2	144
	Well #23	11S/17E-12P1	210' - 770'	11/16/93	17	3	15	5	17	101	3	0.230	ND	4	180
				11/22/96	16	3	16	5	17	82	4	0.329	ND	4	170
				11/18/99	20	4	18	5	17	68	4	ND	ND	4	140
				3/4/86	21	5	18	5	20	85	8	0.200	<0.030	11	203
Madera Valley Water Co.	Well #24	11S/18E-18L3	210' - 520'	6/30/88	40	3	13	4	23	133	2	<0.100	0.060	3	244
				1/9/91	24	4	18	4	20	99	2	<0.100	<0.030	1	172
				11/16/93	36	3	13	4	19	138	2	ND	ND	4	210
				11/22/96	19	2	15	5	18	78	4	0.058	ND	5	170
	Well #25	11S/17E-14D1	275' - 505'	11/18/99	22	3	16	5	18	66	4	ND	ND	5	150
				3/4/86	17	4	14	4	16	85	6	<0.100	<0.030	4	163
				5/20/86	19	3	18	4	17	88	3	<0.100	<0.030	<1	143
				6/30/88	19	3	14	4	16	81	3	<0.100	<0.030	2	140
	Well #26	11S/17E-26J3	270' - 510'	1/9/91	24	4	15	5	20	92	2	<0.100	<0.030	2	152
				11/16/93	18	4	15	5	13	109	4	ND	ND	4	180
				11/22/96	17	3	16	5	13	89	5	0.057	ND	5	160
				11/18/99	23	3	16	5	16	76	5	ND	ND	4	150
Madera Valley Water Co.	Well #27	11S/17E-26J3	270' - 510'	3/4/86	19	3	20	3	21	85	5	<0.100	<0.030	12	185
				6/30/88	34	3	18	3	23	127	2	<0.100	<0.030	3	204
				1/9/91	24	5	23	7	23	129	2	0.400	<0.030	7	184
				11/16/93	26	4	22	7	20	131	3	0.670	ND	9	220
	Well #28	11S/18E-18J1	270' - 540'	11/22/96	21	3	24	7	20	120	5	0.062	ND	9	200
				11/18/99	24	4	23	7	20	94	<1	ND	ND	8	170
				12/21/00										10	
				3/27/96	17	3	14	4	18	65	3	0.700	0.200	11	130
	Well #29	11S/17E-23	370' - 590'	2/26/99	19	4	16	5	17	58	3	ND	ND	10	170
				8/20/92	22	5	25	9	25	118	7	<0.050	<0.030	11	220
				6/12/97	24	8	39	13	30	180	7	ND	ND	18	270
				2/25/98	24	8	39	13	31	160	7	ND	ND	23	290
Madera Valley Water Co.	Well #30	11S/17E-26J3	430' - 720'	12/29/00	29	7	44	14	32	150	4	ND	ND	23	300
				5/24/01										44	
				11/16/93	24	2	16	5	19	108	3	ND	ND	2	180
				11/22/96	23	2	16	5	19	95	4	ND	ND	9	160
	Well #1	11S/17E-11C2	238' - 568'	11/18/99	22	3	19	5	19	84	ND	ND	ND	3	160
				2/27/95	20	2	13	4	17	95	4	ND	ND	3	170
				3/5/98	19	<2	15	5	23	77	4	0.005	0.079	4	170
				2/7/95	23	2	16	5	19	110	4	ND	ND	4	180
	Well #1	11S/17E-11C2	238' - 568'	3/5/98	24	<2	16	5	23	89	4	ND	ND	4	170
				4/10/86	15		11	4	18	56	<5	<0.620	0.040	9	93
				4/5/89	18	2	13	4	19	70	2	<0.100	<0.030	11	164
				3/3/92	2	19	15	4	17	78	5	0.080	<0.030	12	156
Madera Valley Water Co.	Well #1	11S/17E-11C2	238' - 568'	5/2/95	15	3	4	4	21	57	<8	<0.005	<0.005	10	180
				1/20/98	19	2	6	4	18	42	4	<0.050	<0.005	10	180

System	Well Name/No.	State Well No.	Depth of Perforations	Sample Date	Na	K	Ca	Mg	Cl	HCO ₃	SO ₄	Fe	Mn	NO ₃	TDS
Madera Valley WC (continued)	Well #2A	10S/17E-35J2	294' - 494'	4/10/85	19		12	5	24	86	<5	<0.100	<0.010	6	116
				4/5/89	20	3	15	5	24	82	2	0.300	<0.030	8	192
				3/3/92	3	21	16	5	22	85	5	<0.050	<0.030	11	176
				5/2/95	16	3	4	4	<8	59	<8	<0.005	<0.005	10	180
				1/20/98	20	2	6	4	19	58	4	<0.050	<0.005	9	190
	Well #3	10S/17E-36B1	250' - 450'	4/10/85	18		12	5	24	72	<5	<0.100	<0.010	3	120
				4/5/89	21	3	15	5	24	82	2	<0.100	<0.030	8	204
				3/3/92	2	20	17	6	21	81	5	<0.050	<0.030	18	176
				5/2/95	17	3	5	4	24	67	<8	<0.005	<0.005	11	210
				1/20/98	19	2	6	4	18	55	4	<0.050	<0.005	10	180
	Well #6	10S/17E-35Q1		3/3/92	2	22	15	5	21	86	5	<0.050	<0.030	14	180
Chowchilla City Water Dept.				5/2/95	17	3	4	4	22	65	<8	<0.005	0.010	7	200
				1/20/98	20	3	6	4	19	56	4	<0.050	<0.005	9	190
	Well #10	10S/17E-36H1	284' - 564'	1/5/94	23	3	16	5	26	99	3	<0.050	<0.030	5	200
				5/2/95	17	3	4	3	24	67	<8	<0.005	0.015	7	200
				1/20/98	20	2	6	4	18	55	4	<0.050	<0.005	10	180
	Well #1	9S/16E-30B2		4/4/85	21		19	4	23	76	<5	<0.010	<0.01	3	132
				11/30/94	18	6	16	4	19	85	ND	ND	ND	2	140
				12/2/97	18	5	6	3	20	66	3	<0.050	0.030	7	190
	Well #2	9S/16E-30L1		4/4/85	21		17	4	24	68	<5	<0.100	0.050	3	125
				10/10/91	18	5	18	5	22	87	8	<0.100	<0.030	5	116
	Well #3	9S/16E-30J1		4/4/85	18		18	4	23	70	<5	<0.100		4	125
				10/10/91	21	6	16	3	23	86	8	<0.100	<0.030	2	115
				12/1/94	21	6	22	6	22	110	3	ND	ND	3	160
				12/2/97	37	2	50	21	36	226	16	0.090	0.013	27	390
	Well #4	9S/15E-25M1		4/4/85	25		38	10	25	140	6	0.050		14	235
				3/15/88	17	5	14	5	21	74	4	<0.100	<0.010	5	179
				10/10/91	18	5	19	4	22	88	8	<0.100	<0.030	5	117
				11/30/94	18	5	19	5	20	95	ND	ND	ND	2	140
				12/18/97	20	4	11	6	22	85	4	0.100	<0.005	6	220
	Well #5	9S/16E-31F1		4/4/85	49		56	16	54	172	15	0.380	<0.020	24	420
				3/16/88	9	4	17	7	22	78	6	<0.100	<0.014	4	181
				10/10/91	19	5	17	5	22	87	8	<0.100	<0.030	3	115
				12/2/94	39	2	64	20	56	270	18	ND	ND	26	420
Chuck Chansl SA 14	Well #6	9S/16E-30B3		4/4/85	16		19	4	21	62	<5	<0.100	<0.010	4	115
				10/10/91	18	4	17	3	21	86	8	<0.100	<0.030	3	111
				12/1/94	16	2	18	5	18	85	ND	ND	ND	2	130
	Well #7	9S/16E-29P1		4/4/85	19		26	6	25	82	<5	0.070		8	157
				3/16/88	20	5	14	5	23	78	5	0.260	<0.018	1	162
				10/10/91	19	4	17	3	21	87	9	<0.100	<0.030	4	113
				12/1/94	26	2	37	10	34	150	10	0.250	ND	19	240
				12/2/97	21	2	21	9	30	108	9	0.050	0.010	19	280
	Well #8	9S/16E-29C1	242' - 402'	10/10/91	17	2	18	4	20	83	8	0.415	<0.030	4	108
				12/1/94	17	3	16	4	19	85	3	ND	ND	1	130
				12/2/97	16	1	8	4	19	56	3	0.240	0.030	10	160
Chuck Chansl SA 14	Well #9	9S/16E-29C2		12/1/94	19	4	17	4	19	82	4	0.140	ND	<1	140
				12/2/97	16	3	7	4	19	64	2	0.050	0.018	8	170
	Well #10	9S/15E-36A1	358' - 474'	12/1/94	26	3	40	12	46	160	6	ND	ND	14	280
				12/2/97	22	3	31	13	46	136	6	<0.050	<0.005	20	310
	Well #11			8/19/96	16	4	16	4	22	78	5	ND	ND	3	120
Chuck Chansl SA 14		10S/18E-32?	to 389'	5/5/99	21	3	5	3	22	60	4	0.070	<0.005	12	210

System	Well Name/No.	State Well No.	Depth of Perforations	Sample Date	Na	K	Ca	Mg	Cl	HCO ₃	SO ₄	Fe	Mn	NO ₃	TDS
Valeia MD 85	Wellhead	10S/15E-27	to 205'	7/28/79											
				8/13/81	27		88	34	91	337	14	<0.010	<0.010	34	551
				1/6/88	31	4	90	36	130	220	22	<0.100	<0.020	63	500
				3/8/91	37		91	25	81	320	14	<0.050	<0.005	39	550
				9/18/95	35	2	86	29	83	255	16	<0.005	<0.005	33	881
	9/9/98	38	3	78	30	72	266	16	<0.050	<0.005	32	530			
	5/22/01													37	
Fairhead MD 33	Well #2	10S/16E-11	240' - 552'	5/12/99	22	2	10	5	27	78	3	0.070	<0.005	14	200
				12/27/89	26	5	24	7	36	108	8	<0.300	<0.050	7	235
				7/7/92	26		27	7	36	80	7	<0.100	<0.030	10	183
				1/31/95	24	5	25	7	34	110	7	ND	ND	7	220
				6/3/98	25		25	7	35	76	6	ND	ND	8	240
	10/20/99													9	
Well 402	10S/17E-6A4			6/4/90	30	5	28	7	40	117	14	<0.300	0.051	4	245
				7/7/92	26		27	7	36	80	7	<0.100	<0.030	12	179
				1/31/95	26	4	25	7	33	100	18	0.300	ND	4	240
				10/20/99										11	
				6/4/90	30	4	25	7	33	107	10	0.056	0.031	11	240
Well 403	10S/17E-6J1			7/7/92	23		24	6	26	67	6	<0.100	<0.030	19	153
				1/31/95	25	4	25	7	30	99	9	ND	ND	9	220
				10/20/99										12	
				5/5/99	21	2	6	3	23	5	3	<0.050	<0.005	7	170
				5/5/99	19	3	5	3	14	71	3	1.400	0.009	2	170
Riparian MD 28	West Well	12S/17E-21	287' - 393'	5/12/99	18	3	6	5	30	64	3	0.070	<0.005	7	200
				5/12/99	43	6	12	10	98	78	4	<0.050	0.311	11	360
				1/13/87	20		11	11	19	80	13	<0.100	<0.020	9	130
				3/14/90	20	3	14	5	20	80	3	<0.100	<0.010	13	170
				5/10/99	21	4	5	3	17	67	4	<0.050	0.007	9	190
	4/5/00												12		
La Vina MD 37	West Well	12S/17E-21	287' - 393'	1/13/87	20		13	9	20	81	3	<0.100	<0.020	9	140
				3/14/90	19	3	14	5	25	80	1	<0.100	<0.010	11	160
				5/10/99	21	4	5	3	17	65	4	<0.050	<0.005	9	180
				4/5/00										12	
				1/13/87	22		18	6	24	87	12	<0.100	<0.020	6	170
Eastin Arcola MD 36	Well #2	11S/18E-28M2	216' - 456'	3/14/90	25	4	23	7	28	105	6	<0.100	<0.010	7	240
				5/12/99	43	11	28	14	51	147	36	0.140	0.005	19	400
				4/5/00										18	
				1/13/87	24		16	7	24	90	5	<0.100	<0.020	5	150
				3/14/90	25	4	20	7	26	100	7	<0.100	<0.010	7	200
Ranchos West MD 95	Well #3	11S/18E-31F1	240' - 456'	5/12/99	23	4	8	5	26	<84	9	0.070	<0.005	8	210
				4/5/00										19	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
	4/5/00												9		
Parkdale SA 3	Well #4	11S/18E-31E1	to 365'	1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
Parkwood MD 19	Well #2	11S/18E-31D3		3/14/90	25	4	20	7	26	100	7	<0.100	<0.010	7	200
				5/12/99	23	4	8	5	26	<84	9	0.070	<0.005	8	210
				4/5/00										19	
				1/13/87	24		16	7	24	90	5	<0.100	<0.020	5	150
				3/14/90	25	4	20	7	26	100	7	<0.100	<0.010	7	200
Valley State Prison for Women	Well #1	11S/18E-31E1		5/12/99	23	4	8	5	26	<84	9	0.070	<0.005	8	210
				4/5/00										19	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
	4/5/00												9		
Well #2	11S/18E-31E1			1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
Well #2	11S/18E-31E1			3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
Well #2	11S/18E-31E1			5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
Well #2	11S/18E-31E1			4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
Well #2	11S/18E-31E1			1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
Well #2	11S/18E-31E1			3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
Well #2	11S/18E-31E1			5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
Well #2	11S/18E-31E1			4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
Well #2	11S/18E-31E1			1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
Well #2	11S/18E-31E1			3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
Well #2	11S/18E-31E1			5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
Well #2	11S/18E-31E1			4/5/00										9	
				1/13/87	23		18	7	25	96	9	<0.100	<0.020	6	160
				3/14/90	26	4	21	7	29	110	7	<0.100	<0.010	8	210
				5/12/99	29	5	10	7	34	<95	14	0.070	<0.005	9	270
				4/5/00										9	
Well #2	11S/18E-31E1			1/13/87	23		18	7	25	96	9				

System	Well Name/No.	State Well No.	Depth Perforation	Sample Date	K	Ca	Mg	Cl	HCO ₃	SO ₄	Mn	NO ₃	TDS		
Maderos Ranchos MD 10A	Sparta	11S/19E-3C1	150' - 50'	4/18/85	18	13	5	13	64	4	0.403	19	148		
				2/26/88	27	23	6	29	87	1	5.703	0.131	28	216	
				5/19/93	30	29	10	61	84	6	ND	ND	18	300	
				9/30/97	35	6	22	10	72	62	8	<0.05	<0.005	17	320
				9/10/98									35		
	Fender	12S/19E-3C1	275' - 660'	4/29/99									45		
				8/5/99									17		
				12/9/99									17		
				4/19/85	14	15	5	14	67	3	0.680	<0.014	20	175	
				2/26/88	26	22	6	31	78	3	<0.03	<0.001	24	200	
Rolling Hills SA 19	Fernwood	11S/19E-35P1		5/19/93	25	4	24	8	43	82	5	0.250	0.036	17	250
				9/30/97	27	5	10	7	10	60	7	0.080	0.110	16	250
				4/29/00	18	1	7	6	27	50	5	0.060	<0.005	21	230
				7/17/00									24		
				10/19/00									21		
	Olive/S&J	12S/20E-4M1	222' - 236'	4/19/85	23	15	5	19	79	4	<0.02	<0.001	19	190	
				2/26/88	28	22	6	31	74	2	<0.06	<0.001	17	209	
				5/19/93	20	4	18	6	19	78	5	ND	ND	18	200
				9/30/97	18	5	6	5	17	53	7	<0.050	0.007	19	210
				4/29/99									24		
New #1	12S/20E-9D1	650' - 861'	1/19/00									51			
			4/28/00	16	2	5	4	12	47	4	0.450	0.018	23	180	
			7/17/00									29			
			10/19/00									23			
			10/22/85	14	3	11	5	10	75	<5	<0.050	0.080	7	110	
Well #2	12S/20E-9L1	240' - 526'	7/16/98	17	4	5	10	64	3	<0.050	<0.005	6	140		
			7/15/86	50	16	12	75	85	15	<0.100	<0.020	4	280		
			3/14/90	49	4	27	8	60	120	7	<0.100	<0.010	5	280	
			4/29/99	47	6	13	7	77	93	14	<0.050	0.018	5	310	
			10/22/85	14	3	13	6	6	94	<5	<0.050	<0.010	2	125	
			3/14/90	17	4	17	8	8	100	9	<0.100	<0.010	9	ND	
			4/29/99	15	4	5	4	11	65	4077	<0.050	<0.005	4	140	

¹ Table contains recent available data from Department of Health Services and Madera County Environmental Health databases

² Water Systems include systems with > 200 connections and County-operated systems in Study Area

MD = Maintenance District

SA = Service Area

Blank cell = no data

<0.100 = Not detected above detection limit shown

ND = Not detected; detection limit not available

Table 3-1
Madera County-Operated Groundwater System Information

District	No.	Location	Water Connections Residential Commercial	Number of Wells	Pumpage (AFY)	Quantity	Water Supply Issues	Quality
Madera Ranchos	MD-10	Ave. 12 & Road 36 1/2	979	25	5	738 AFY	All sources used during peak times	Elevated TDS and nitrate concentrations. Elevated arsenic, iron, and manganese concentrations at depths below 500'
Parkwood	MD-19	Ave. 13 & Hwy. 145	587	4	3	519 AFY		Elevated TDS and nitrate concentrations - DBCP detections
Riparian	MD-28	Ave. 7 & Hwy 145	20	0	1	20 AFY	Only 1 well	Well in DBCP area of concern
Fairmead	MD-33	Ave. 22 1/2 & Road 19 1/2	148	1	2	202 AFY		
Eastin Arcola	MD-36	Ave. 8 1/2 & Road 29 1/2	21	1	2	26 AFY	Only 1 of 2 wells active	DBCP exceedances in one well
La Vina	MD-37	Ave. 9 & Road 23 1/2	101	1	2	116 AFY		Elevated iron concentrations. Wells in DBCP area of concern
Valeja	MD-85	Robertson Blvd & Hwy 152	19	0	1	25 AFY	Only 1 well	Elevated TDS and nitrate concentrations
Parksdale	SA-3	Ave. 13 1/4 & Road 28 1/2	548	5	2	159 AFY		
Chuck Chansl	SA-14	Ave. 18 & Road 28 1/2	31	0	1	37 AFY	System delivery limited by pump problems - only 1 well	
Rolling Hillis	SA-19	Ave. 10 1/2 at Hwy. 41	330	12	1	527 AFY	Water shortage problem - low well yields - using irrigation well to meet demand	Arsenic and other trace metals generally within standards but present
Ranchos West	MD-95	Ave. 12 & Road 34	15	0	2	20 AFY		Elevated iron and manganese in standby well. Septic systems will be within 200' to 500' of well at buildout
TOTAL			2,799	49	22	2,392 AFY		

Ranchos West pumpage estimated

Table 4-1
Long Term Goals
Madera County AB3030 Groundwater Management Plan

- I. Groundwater Quantity, Overdraft, and Export:**
 - I-1.** Ensure a sustainable, long-term groundwater supply for County users
 - I-2.** Preclude water exports that decrease the long-term volume of usable groundwater within the County
 - I-3.** Optimize the volume of usable groundwater within the County
 - I-4.** Develop standards for assessing water quantity for new developments
- II. Groundwater Quality and Protection:**
 - II-1.** Ensure the long-term availability of high-quality groundwater
 - II-2.** Maintain a high-quality drinking water supply for County water systems in the basin
- III. Groundwater Management, Recharge, Conjunctive Use:**
 - III-1.** Investigate and develop opportunities to coordinate or conduct groundwater recharge or groundwater management projects
- IV. Local Control of Groundwater Management and Local Water Rights:**
 - IV-1.** Maintain local groundwater management authority
 - IV-2.** Ensure the unrestricted, non-export-related private use of groundwater within the County
 - IV-3.** Support local control through County Ordinances
- V. Conservation and Reuse:**
 - V-1.** Promote countywide water conservation
 - V-2.** Support incentive programs to enhance efficient use of water in the County
- VI. Groundwater Monitoring Programs:**
 - VI-1.** Monitor the County's groundwater for quantity and quality
- VII. Education:**
 - VII-1.** Conduct, sponsor, or support programs to educate and inform County residents on the status of the county's groundwater supply and conservation efforts
- VIII. Coordination:**
 - VIII-1.** Ensure coordination of groundwater management efforts within the County
 - VIII-2.** Maintain and support the Madera County Water Oversight Committee as the vehicle to ensure coordination of water issues and policy for the County
 - VIII-3.** Develop cooperative relationships between regulatory agencies, neighboring agencies with groundwater management authority, and County of Madera through the Water Oversight Committee

California Groundwater Basins

Preliminary Subject to Change

 Hydrologic Study Area

 Groundwater Basin

Hydrologic Study Areas

CC - Central Coastal

CD - Colorado Desert

NC - North Coastal

NL - North Lahontan

SB - Sacramento Basin

SC - South Coastal

SF - San Francisco

SJ - San Joaquin Basin

SL - South Lahontan

Madera County Groundwater Basins

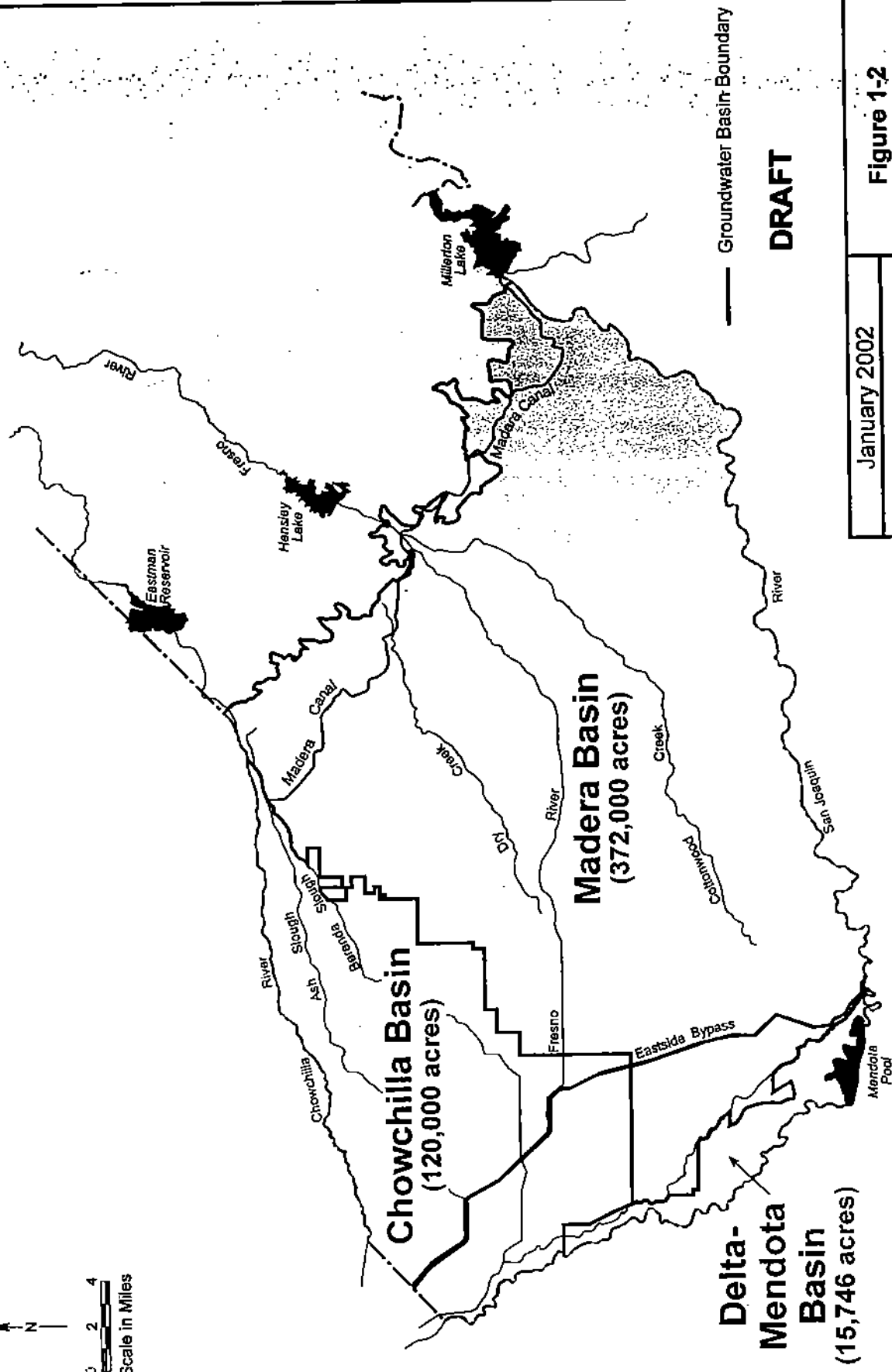
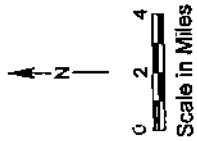
50 0 50 Miles



September 2001

TODD ENGINEERS
Emeryville, California

Figure 1-1
Madera County
Groundwater Basins

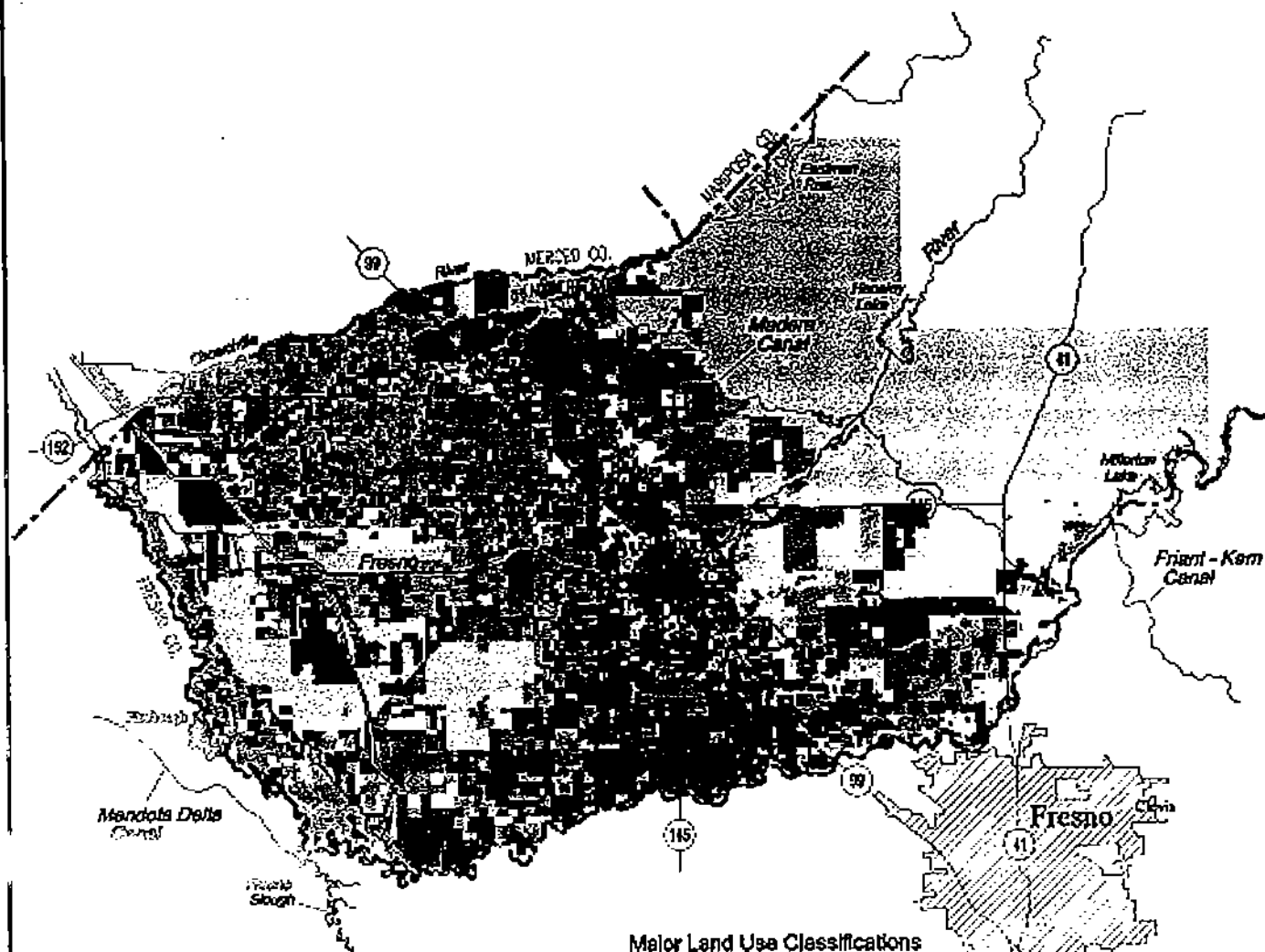


January 2002

Figure 1-2
Groundwater Basin
Boundaries

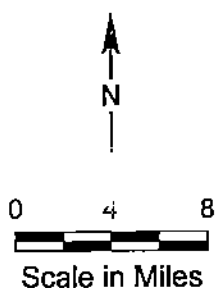
TODD ENGINEERS
Emeryville, California

Source: DWR Bulletin 118, 1995.
Acreages are approximate.



Major Land Use Classifications

-  Citrus and Subtropical
-  Deciduous Fruits and Nuts
-  Field Crops
 - Grain and Hay Crops
-  Idle
-  Pasture
-  Rice
-  Semiagricultural
-  Truck, Nursery and Berry
-  Vineyards
-  Water Surface
-  Native Vegetation
-  Urban



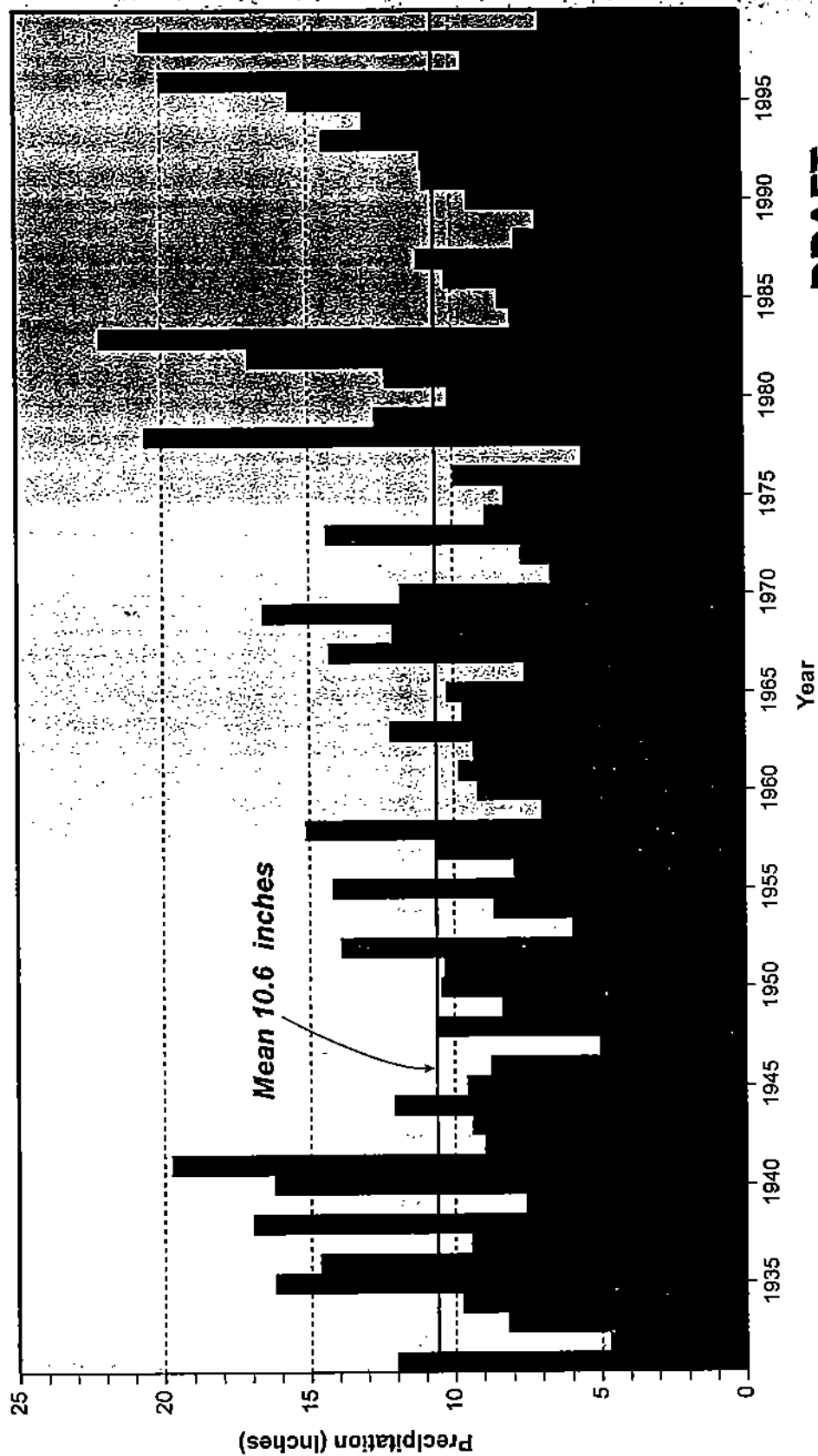
DRAFT

Source: DWR, 1995.

January 2002

TODD ENGINEERS
Emeryville, California

Figure 2-1
1995
Land Use



DRAFT

January 2002

Figure 2-2
Annual Precipitation
1931 - 1999

TODD ENGINEERS
Emeryville, California

Based on monthly data from Madera Station No. 45233 NOAA

Northeast

Southwest

San
Joaquin
River

1999 Water Level

Unconfined Aquifer

Unconfined Aquifer

Confined Aquifer

Reduced
Sediments

Oxidized
Sediments

Reduced
Sediments

Sierra
Nevada
Bedrock

Elevation in feet MSL

Elevation in feet MSL

Sea level

Sea level

-200

-400

-600

200

-200

-400

-600

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January 2002

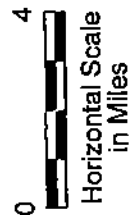
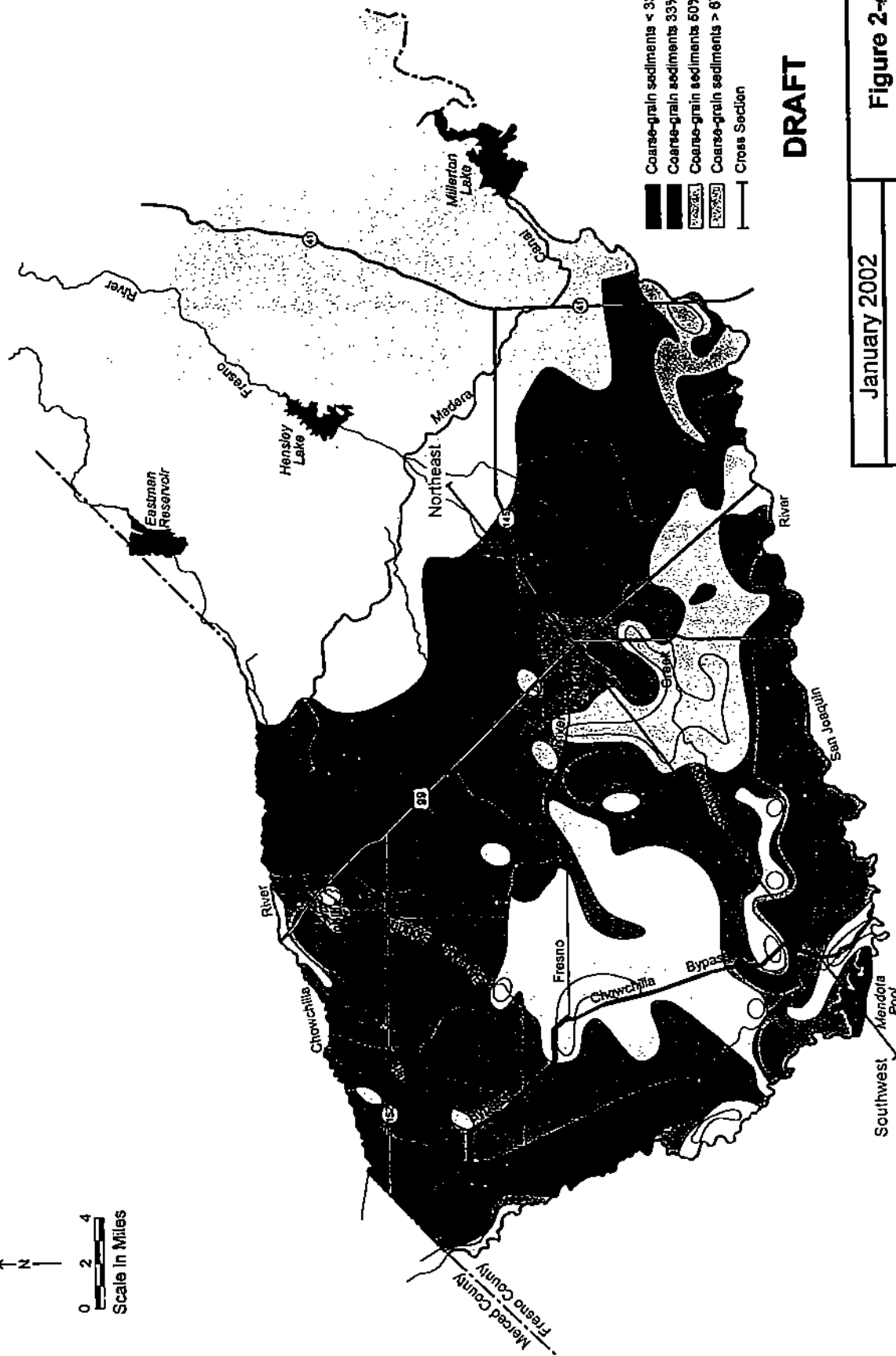


Figure 2-3
Hydrogeologic
Cross Section

TODD ENGINEERS
Emeryville, California

Modified from DWR, 1966 and Davis, et al., 1959
Water level from DWR, 1999

0 2 4
Scale in Miles



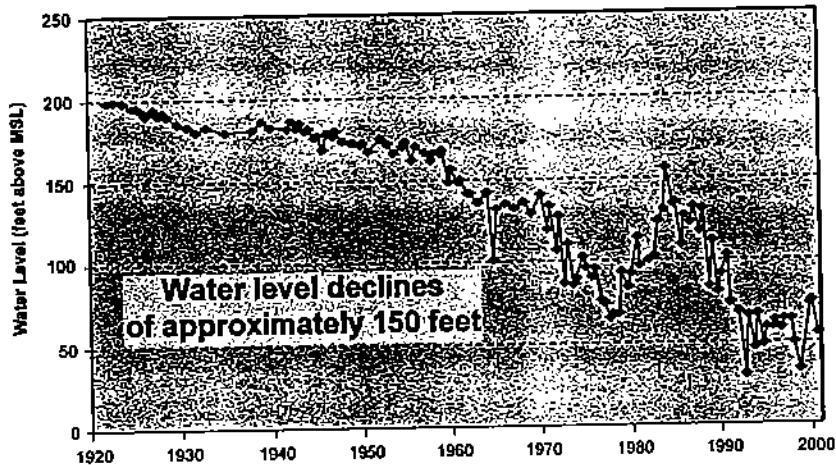
January 2002

Figure 2-4
Lithofacies Map
Unconfined Aquifer

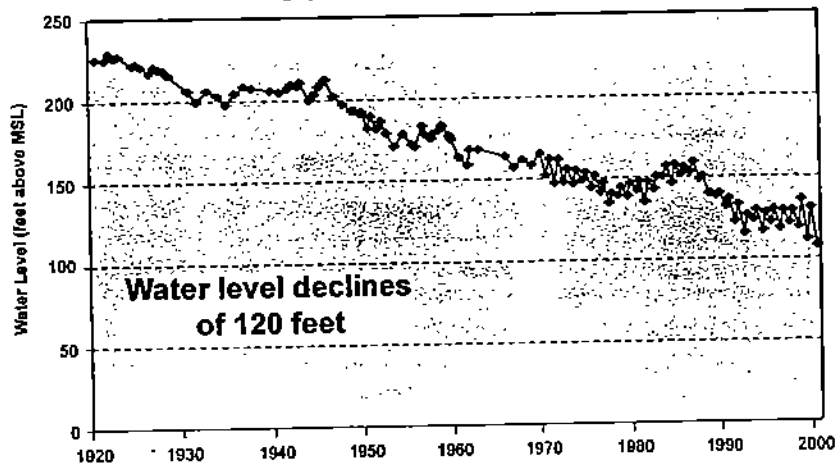
TODD ENGINEERS
Emeryville, California

Source: Mitten, LeBlanc, and Bertoldi, 1970, USGS open-file Report.

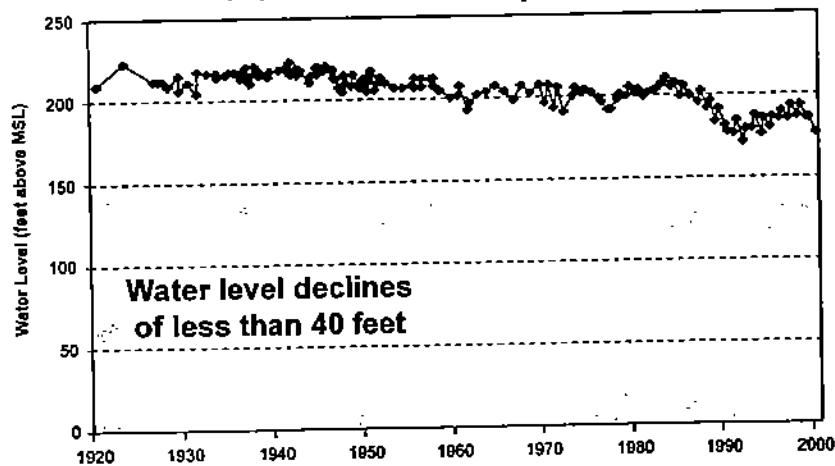
Chowchilla Basin Southwest of Chowchilla



Central Madera Basin Southwest of Madera



Southern Madera Basin North of San Joaquin River



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Emeryville, California

Figure 2-5
Madera County
Hydrographs
1920 - 2000

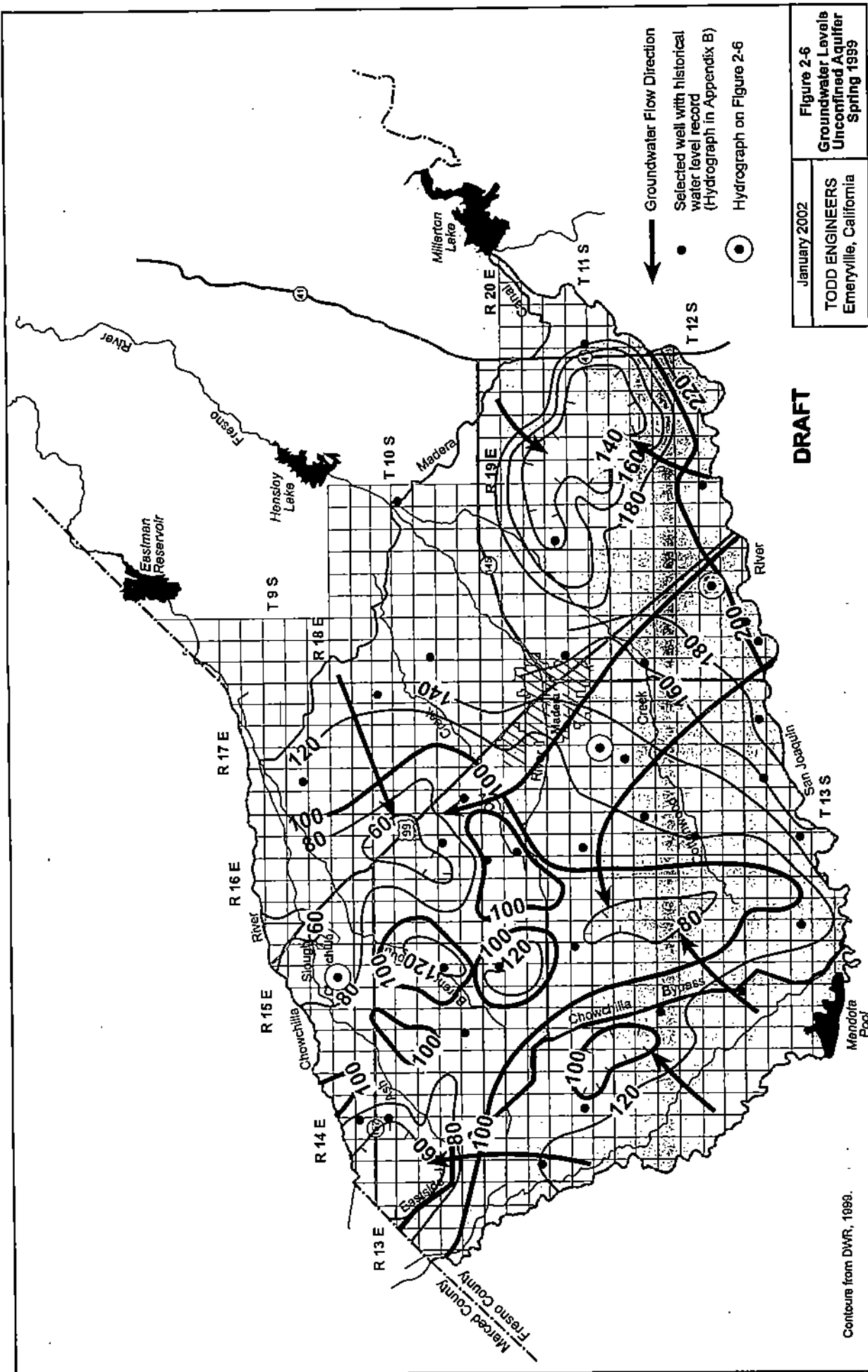
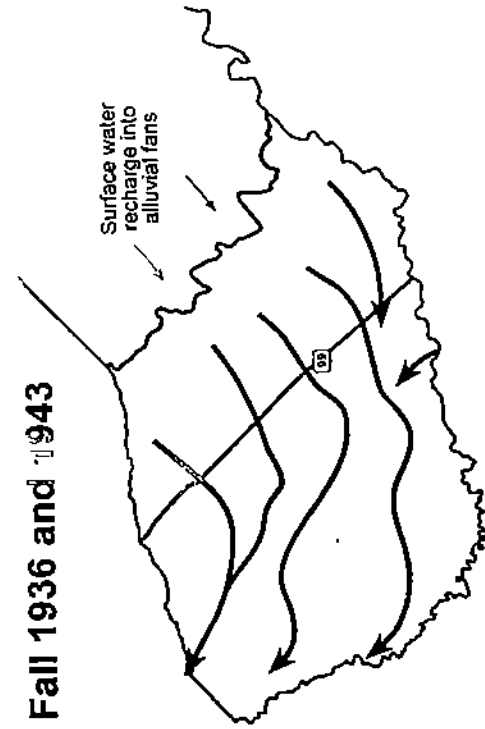


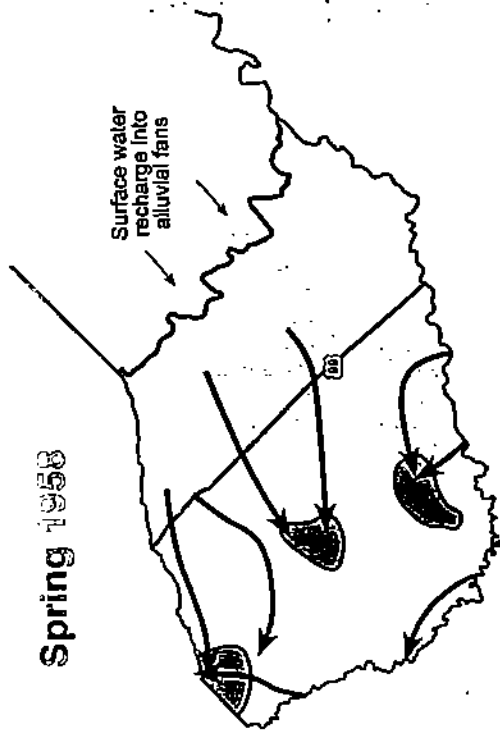
Figure 2-6
Groundwater Levels
Unconfined Aquifer
Spring 1999

January 2002
TODD ENGINEERS
Emeryville, California

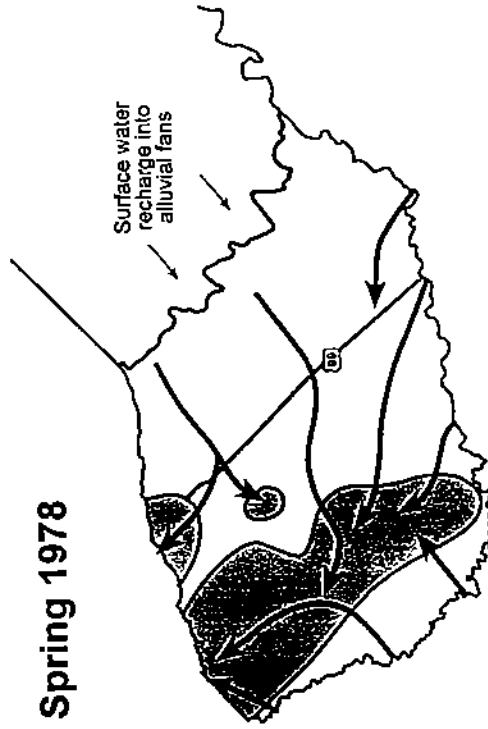
Fall 1936 and 1943



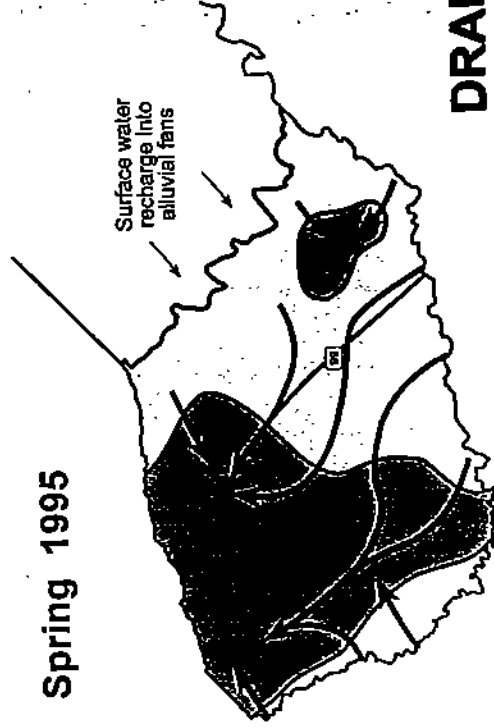
Spring 1958



Spring 1978



Spring 1995



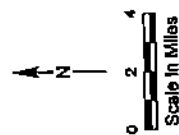
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January 2002

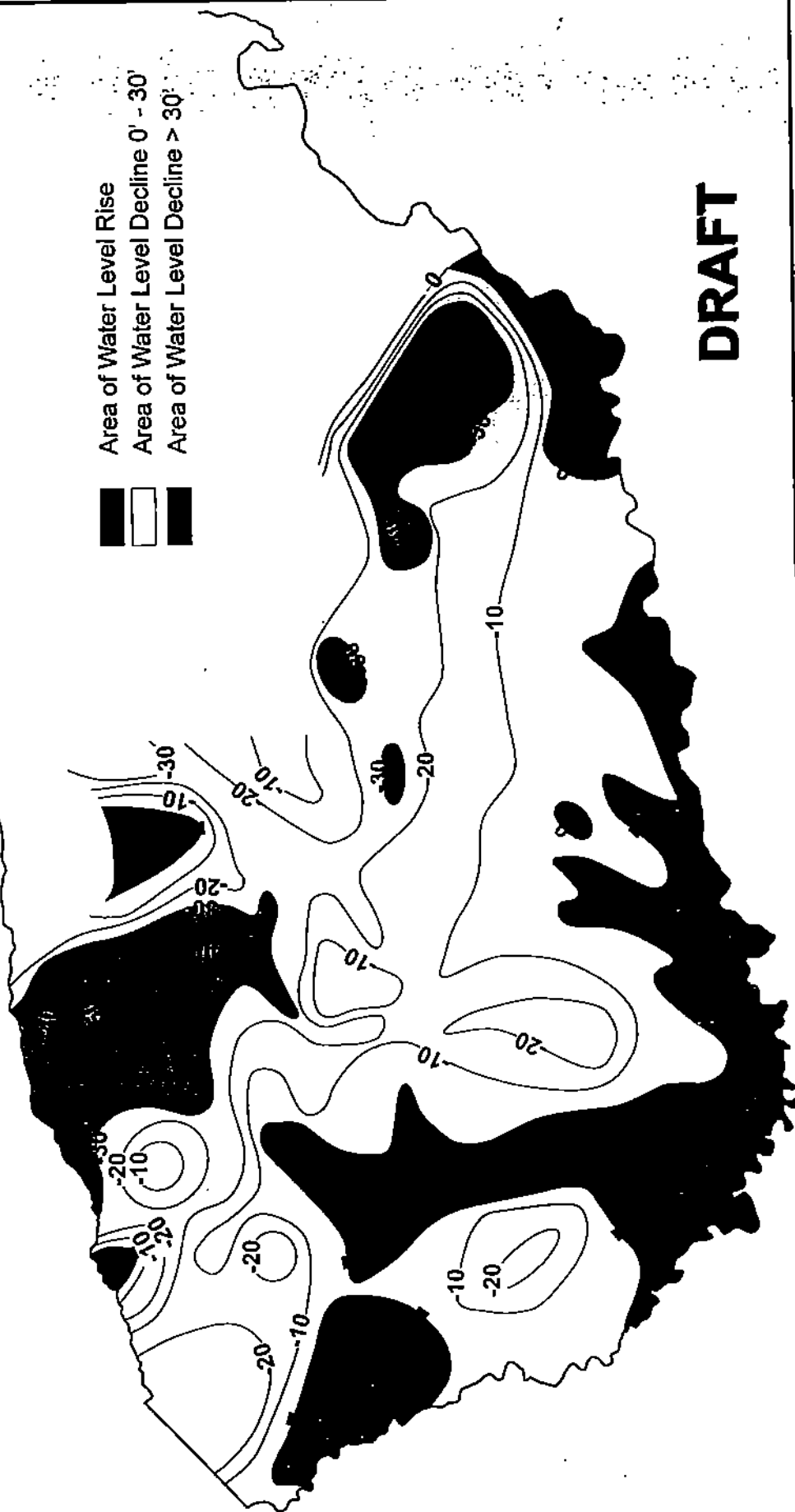
TODD ENGINEERS
Emeryville, California

Figure 2-7
Change in
Groundwater Flow
Directions
over Time

Cumulative Change in Storage **Loss of -546,706 AF from 1990 to 1998** **(average loss of -68,338 AFY)**



Area of Water Level Rise
 Area of Water Level Decline 0' - 30'
 Area of Water Level Decline > 30'



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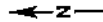
TODD ENGINEERS
 Emeryville, California

Figure 2-8
 Change in
 Groundwater Storage
 1990 - 1998



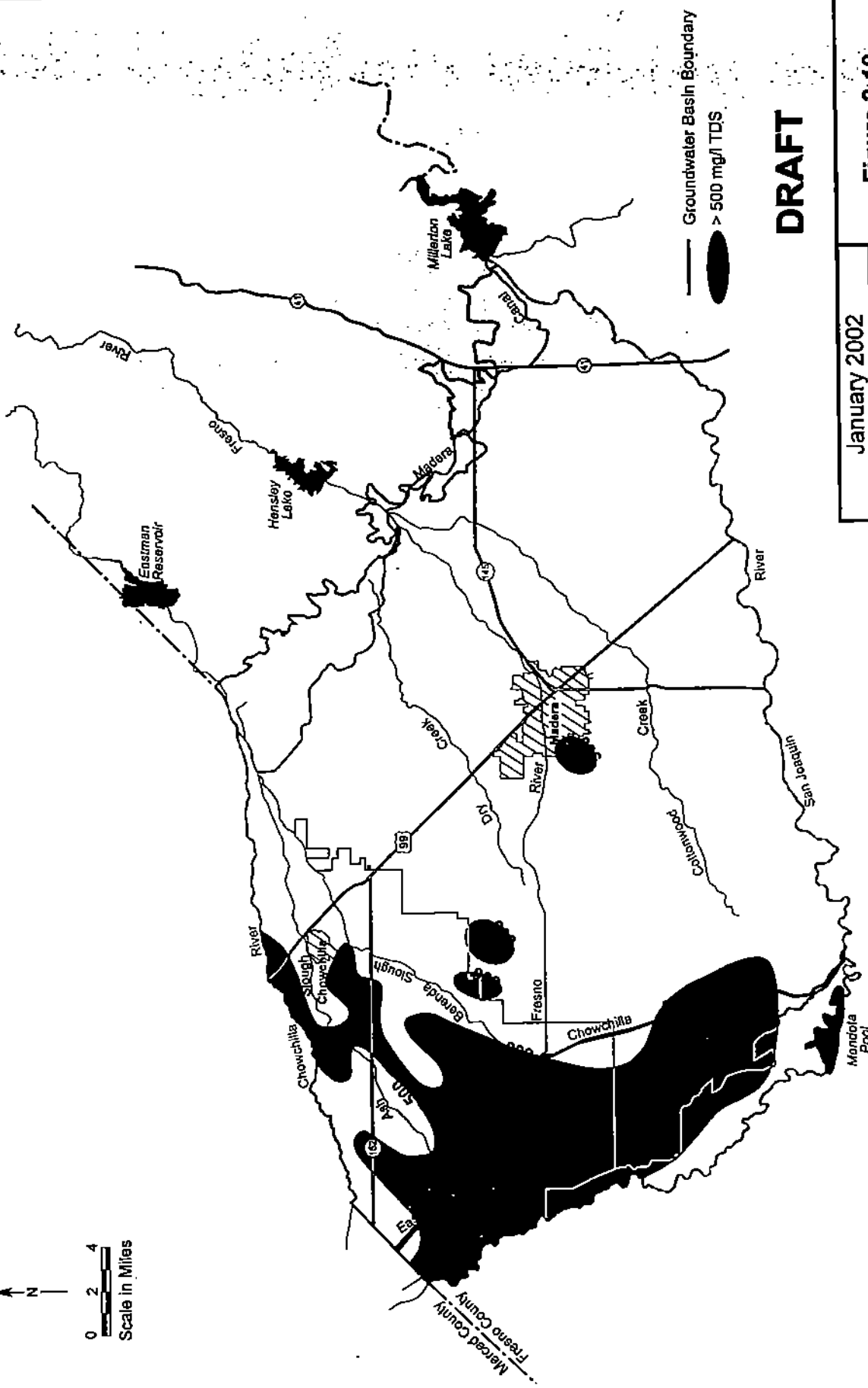
January 2002
TODD ENGINEERS
Emeryville, California

Source: California Department of Water Resources, Bulletin 130-63, 1965.





 Scale in Miles



— Groundwater Basin Boundary
 > 500 mg/l TDS

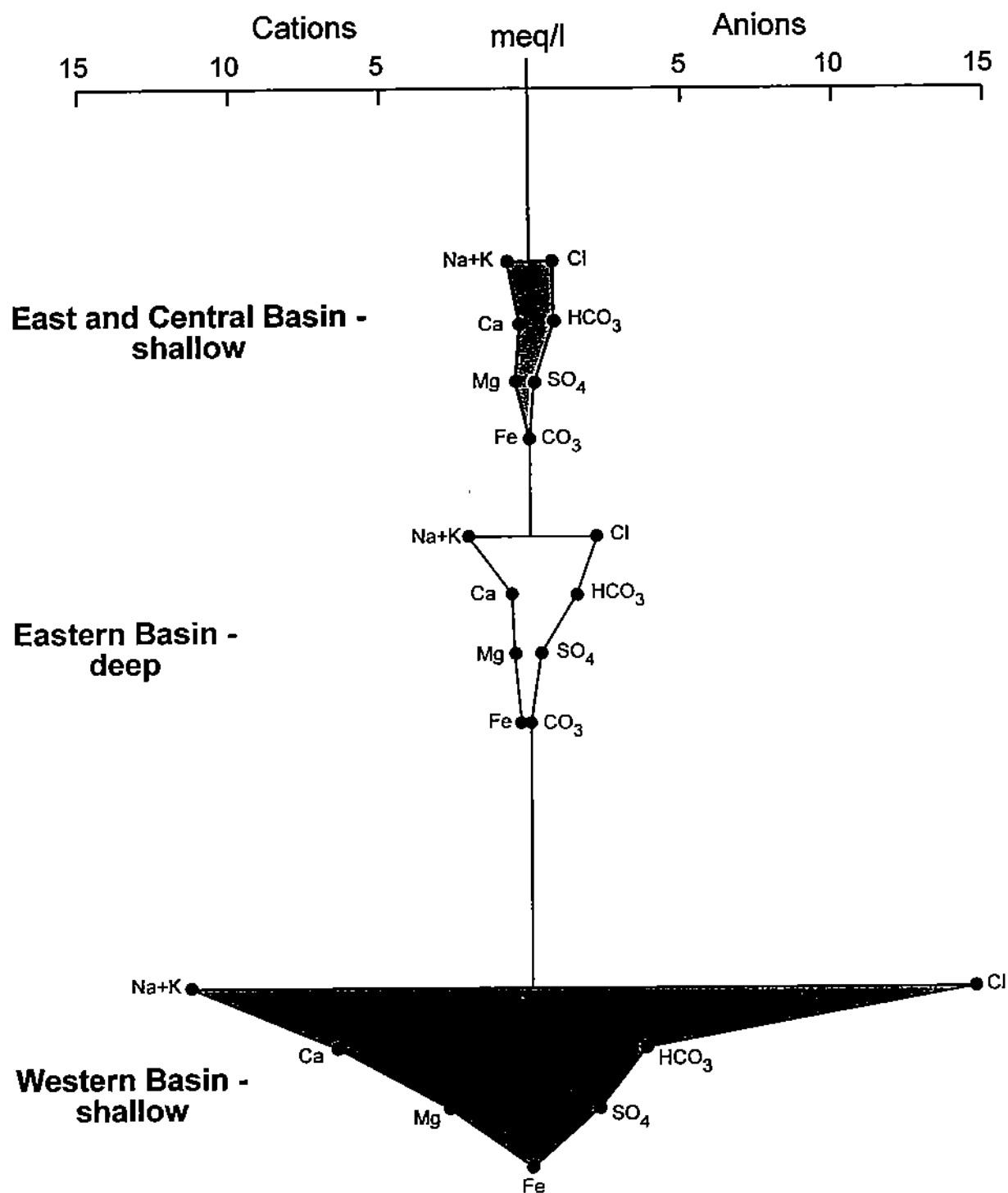
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 Emeryville, California

Figure 2-10
TDS in
Groundwater

Sources of TDS data in wells: DWR, 1971 and Mitten et al., 1970.

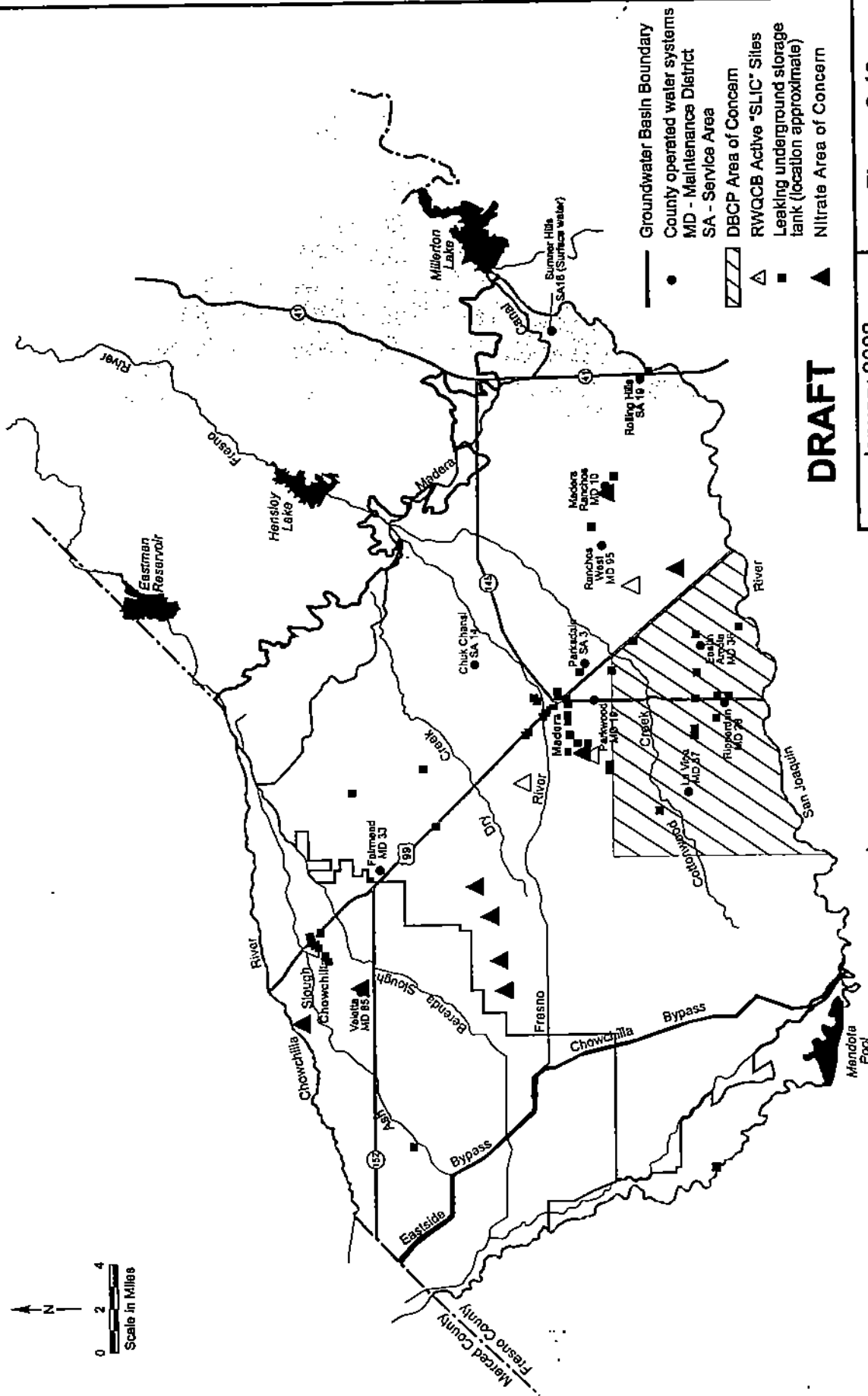
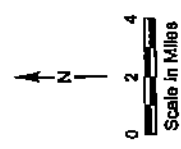


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Emeryville, California

Figure 2-12
Inorganic
Water Quality



- Groundwater Basin Boundary
- County operated water systems
- MD - Maintenance District
- SA - Service Area
- DBCP Area of Concern
- RWQCB Active "SLIC" Sites
- Leaking underground storage tank (location approximate)
- Nitrate Area of Concern

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January 2002 TODD ENGINEERS Emeryville, California		Figure 2-13. Areas of Water Quality Concern
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APPENDIX A

Resolution of Intention of The Board of
Supervisors of The County of Madera to
Draft a Groundwater Management Plan

ED
MAY 30
MADERA COUNTY
DEPT. OF
ENGINEERING

BEFORE
THE BOARD OF SUPERVISORS
OF THE COUNTY OF MADERA
STATE OF CALIFORNIA

In the Matter of)

Resolution No.: 2001- 144

MADERA COUNTY GROUND-
WATER MANAGEMENT PLAN)

RESOLUTION OF INTENTION OF THE
BOARD OF SUPERVISORS OF THE
COUNTY OF MADERA TO DRAFT A
GROUNDWATER MANAGEMENT PLAN

WHEREAS, the Madera, Chowchilla, and Delta-Mendota Groundwater Basins (the "Basins") consist of lands overlying the alluvium in Madera County; and

WHEREAS, the Basins cover the portion of Madera County that is west of the Sierra Nevada foothills; and

WHEREAS, the Basins have been determined by the State of California Department of Water Resources to be critically overdrafted; and

WHEREAS, it is in the best interests of the County and the landowners and other constituents within the County to investigate and develop a plan for the long term management of the groundwater resources within the portions of the Basins located within the County, but not already within the service area of another local agency as defined in the California Water Code section 10752(g) (the "Management Area"), in order to protect the availability of groundwater for continued use in future years; and

WHEREAS, the California State Legislature has authorized the County and other local agencies to develop and adopt groundwater management plans pursuant to California Water Code sections 10750 et seq.:

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of the County of Madera intends to draft a plan for the management of groundwater resources lying beneath the Management Area. The process for the development of the draft groundwater management plan shall consider the relationship of groundwater resource availability and utilization within the Management Area and adjacent areas. Such draft plan shall be acted upon within two (2) years from the date of this resolution, after further public hearing in accordance

1 with the provisions of Section 10750, et seq., of the California Water Code.

2 *****

3 The foregoing Resolution was adopted this 22nd day of May, 2001, by the
4 following vote:

5 Supervisor Bigelow voted:

Yes

6 Supervisor Moss voted:

Yes

7 Supervisor Dominici voted:

Absent

8 Supervisor Silva voted:

Yes

9 Supervisor Gilbert voted:

Yes

10
11
12 *Gay S. Silva*
13 Chairman, Board of Supervisors

14 ATTEST:

15 *Shirley Holiday*
16 Clerk, Board of Supervisors

17 Approved as to Legal Form:
18 COUNTY COUNSEL

19 By *Robert L. Brown*
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APPENDIX B

Water Level Hydrographs

Appendix B Water Level Hydrographs

More than 60 hydrographs were constructed from the DWR water level database to examine long-term trends in the Study Area. Of these hydrographs, 36 were selected as being representative of water levels in various portions of the basin over the last 80 years and are included in this Appendix. Water levels are plotted at consistent vertical scales (one inch equals approximately 60 feet) from 1920 to 2000. Two hydrographs are shown on each page for convenience. The elevation of the ground surface (GSE) at each well is identified on each hydrograph in the lower left corner in feet above msl.

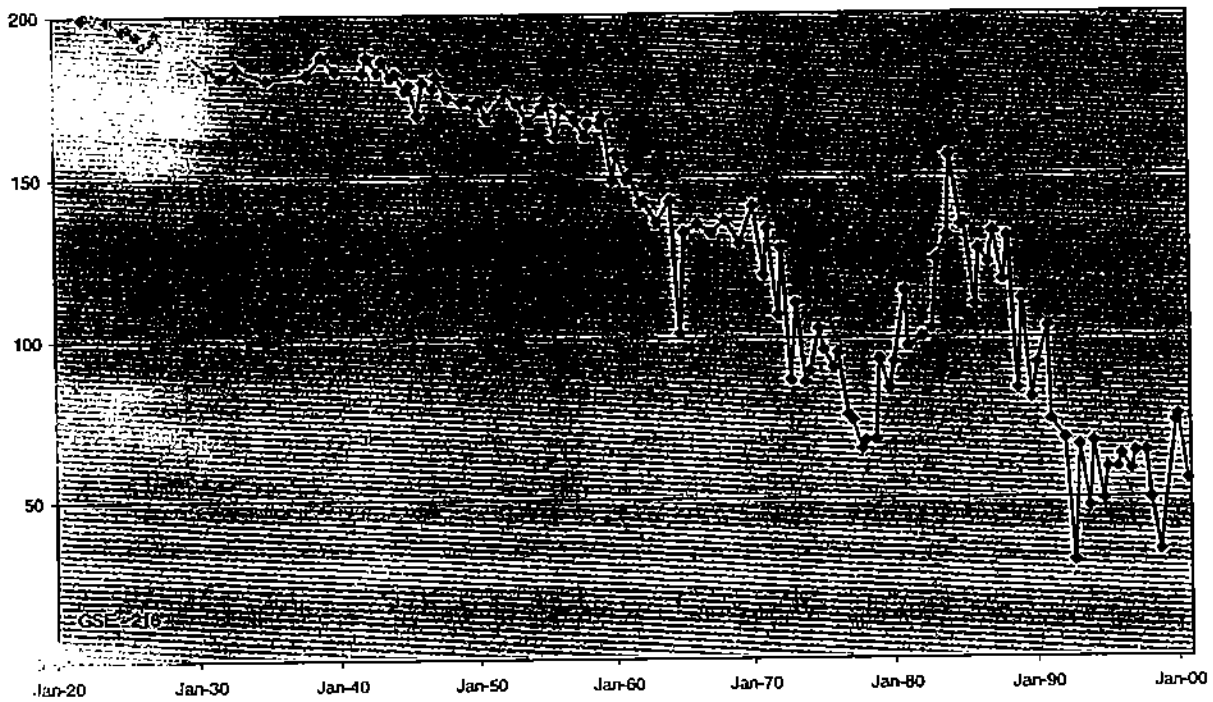
The State Well Number is shown at the top of each hydrograph and can be used to identify the corresponding well location on Figure 2-6 using the section-township-range grid as shown by the following example.

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6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	●	23	24
30	29	28	27	26	25
31	32	33	34	35	36

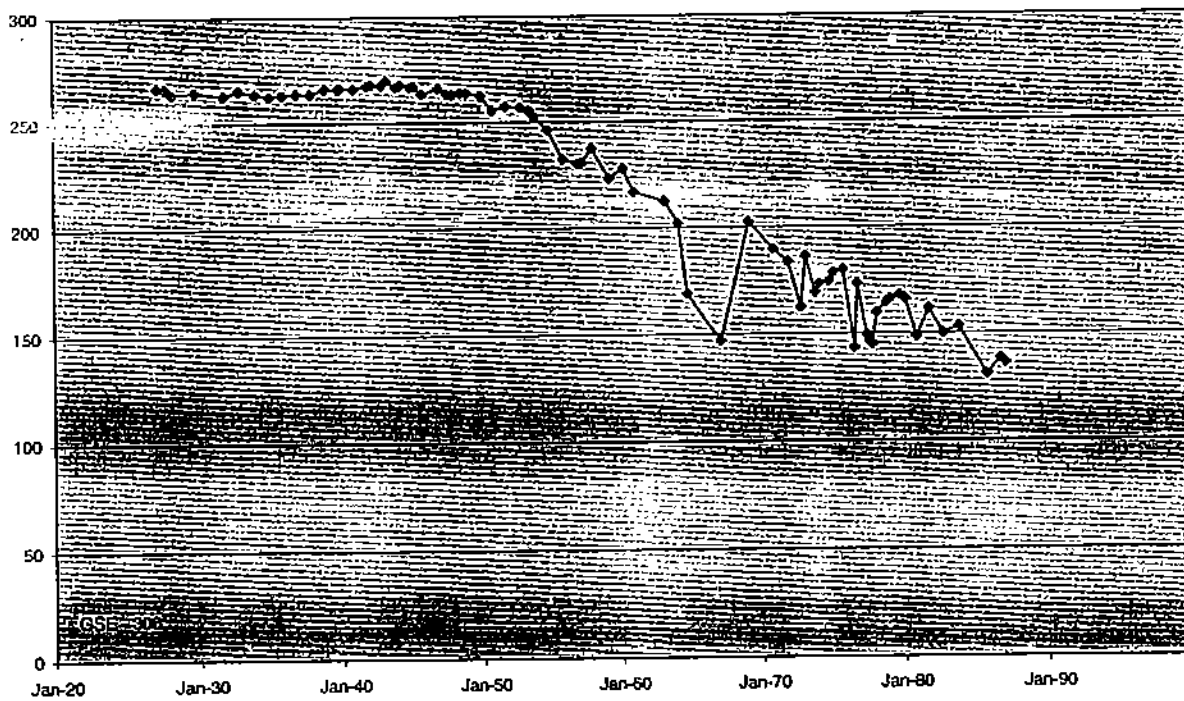
T
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S

This example well is shown in Section 22 of Township 11 South, Range 16 East and would have a state well number of 11S/16E-22. Letters following the section-township-range designation further delineate the location within the section. Each section is one square mile (640 acres).

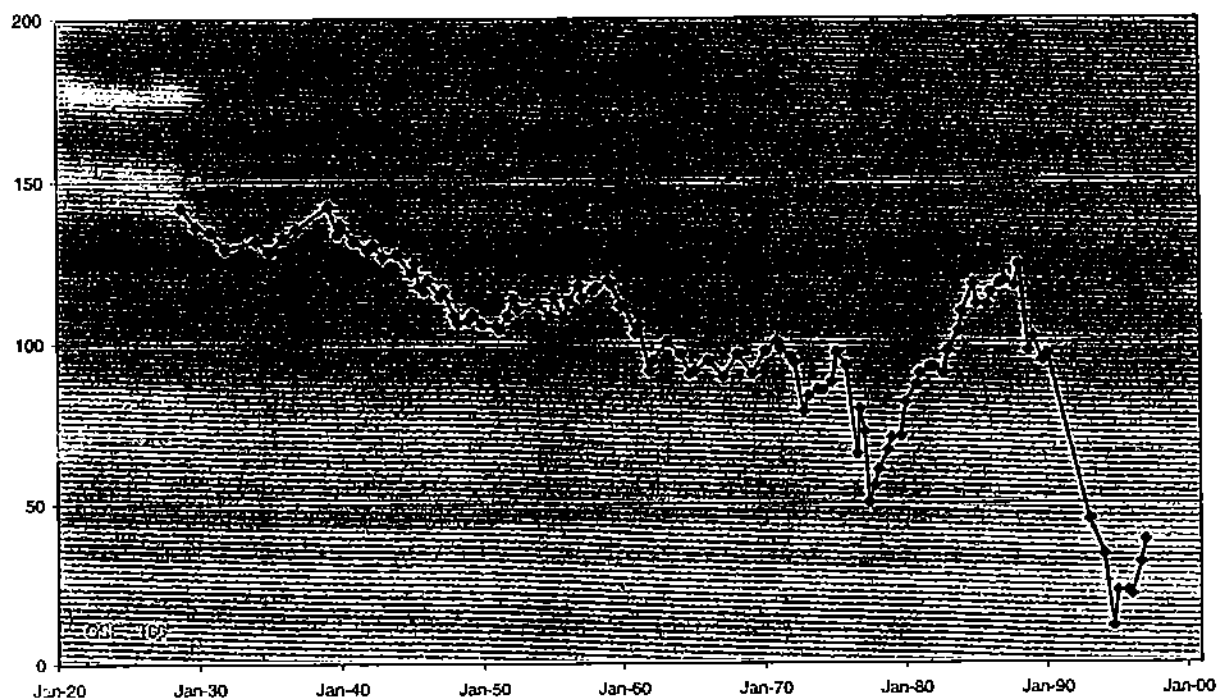
9S/15E-35 C01



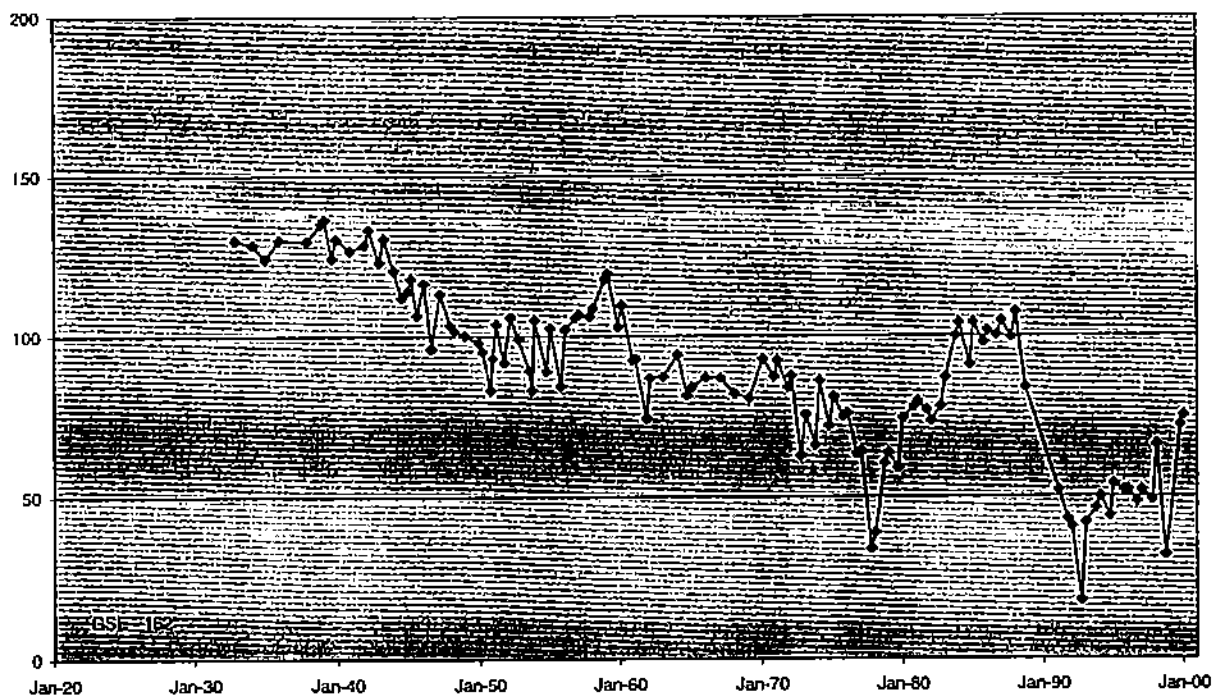
9S/17E-20 L1



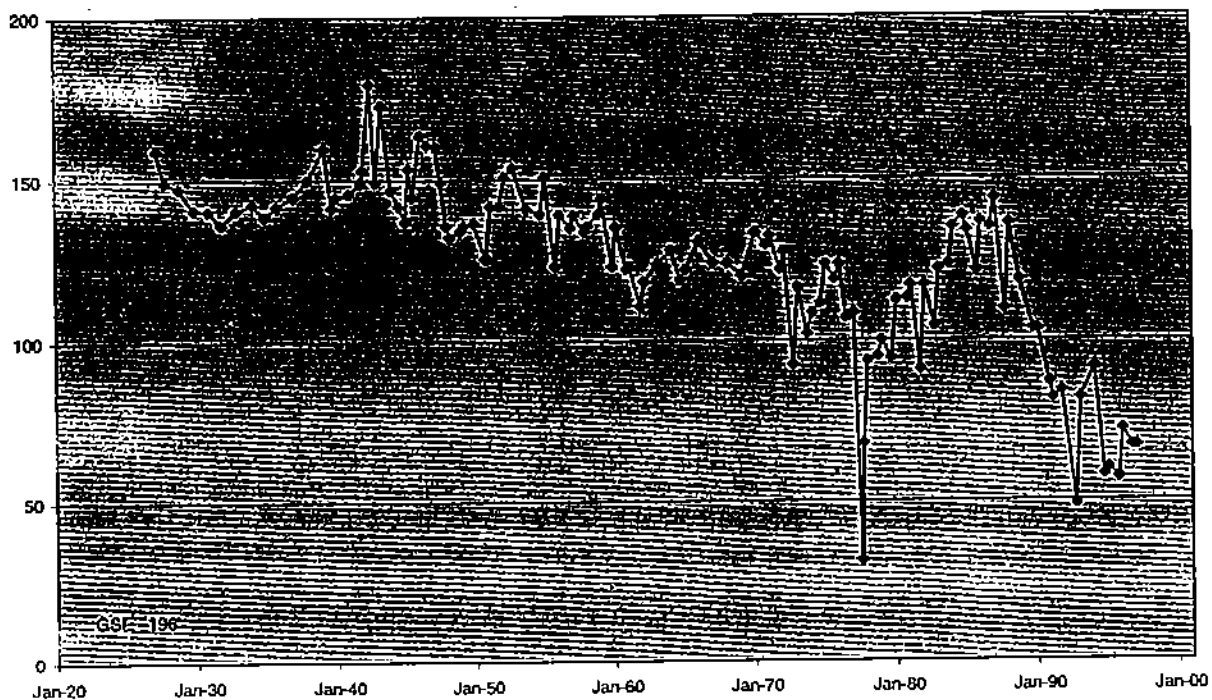
10S/14E-3 A1



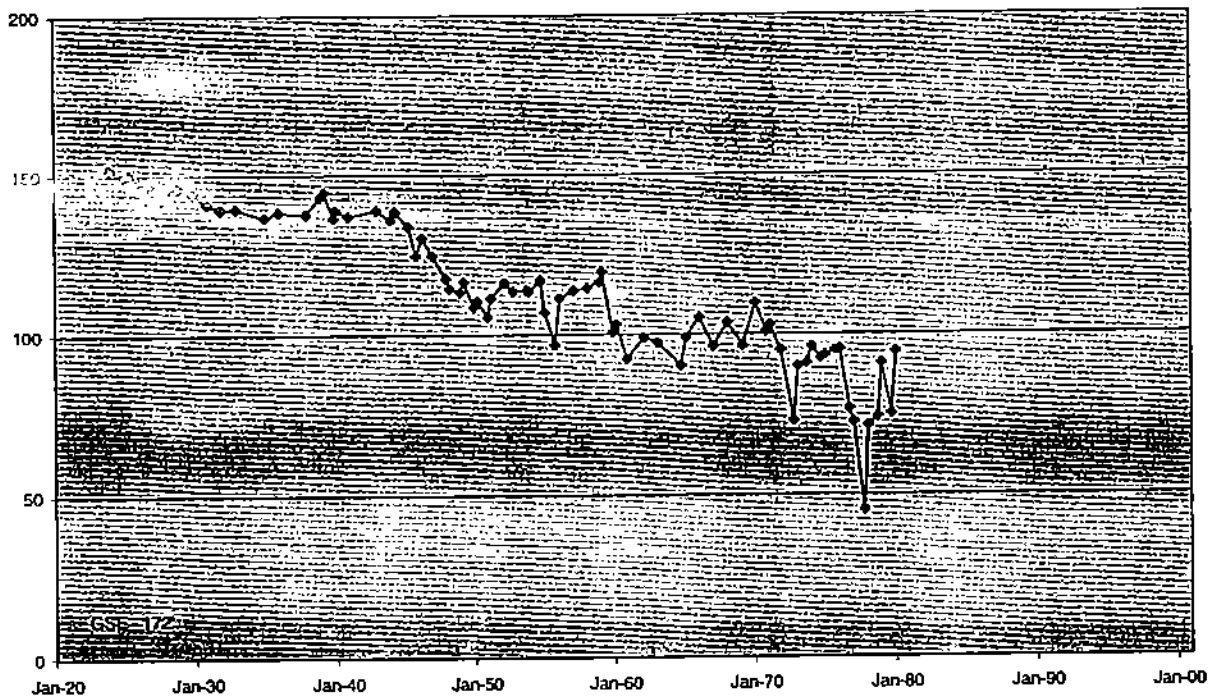
10S-14E-10H1



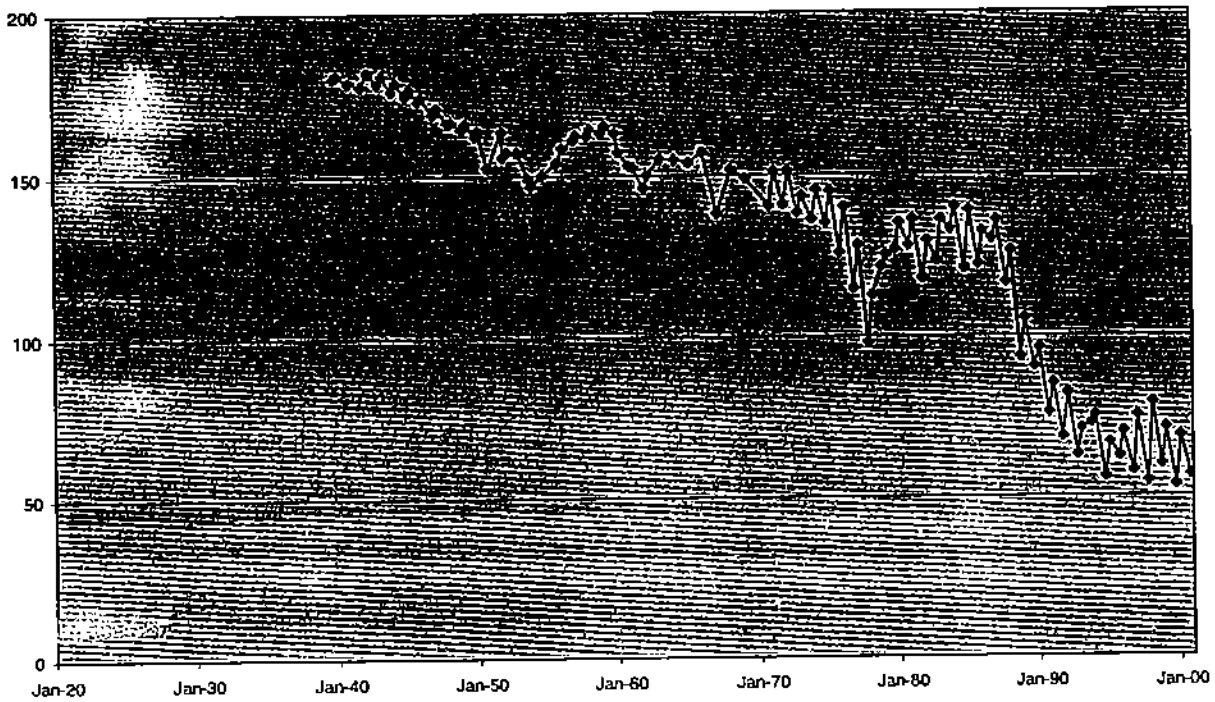
10S/15E-26A1



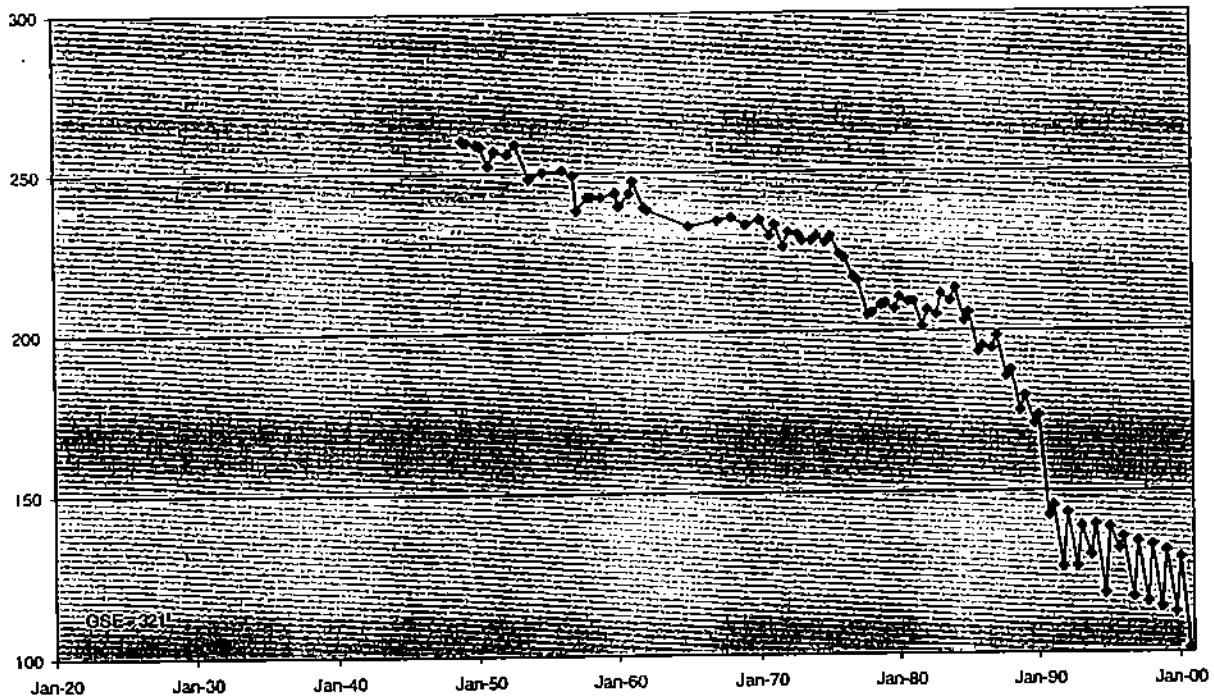
10S/15E-32A1



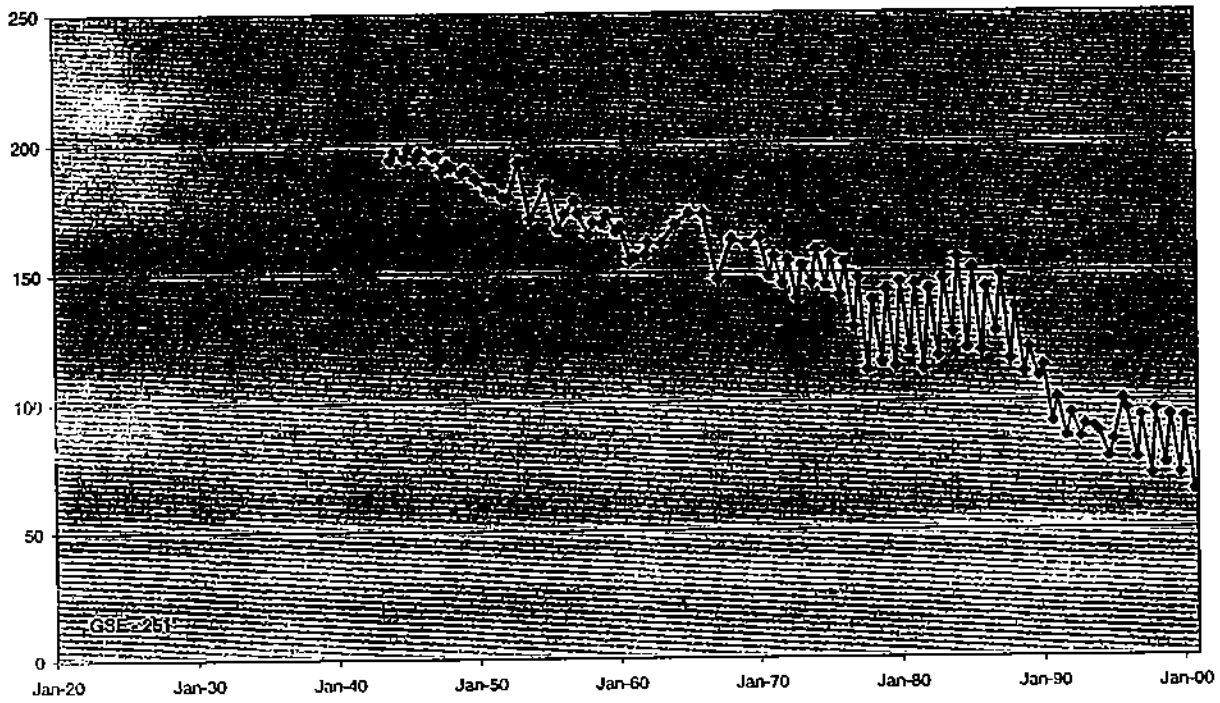
10S/16E-28 B01



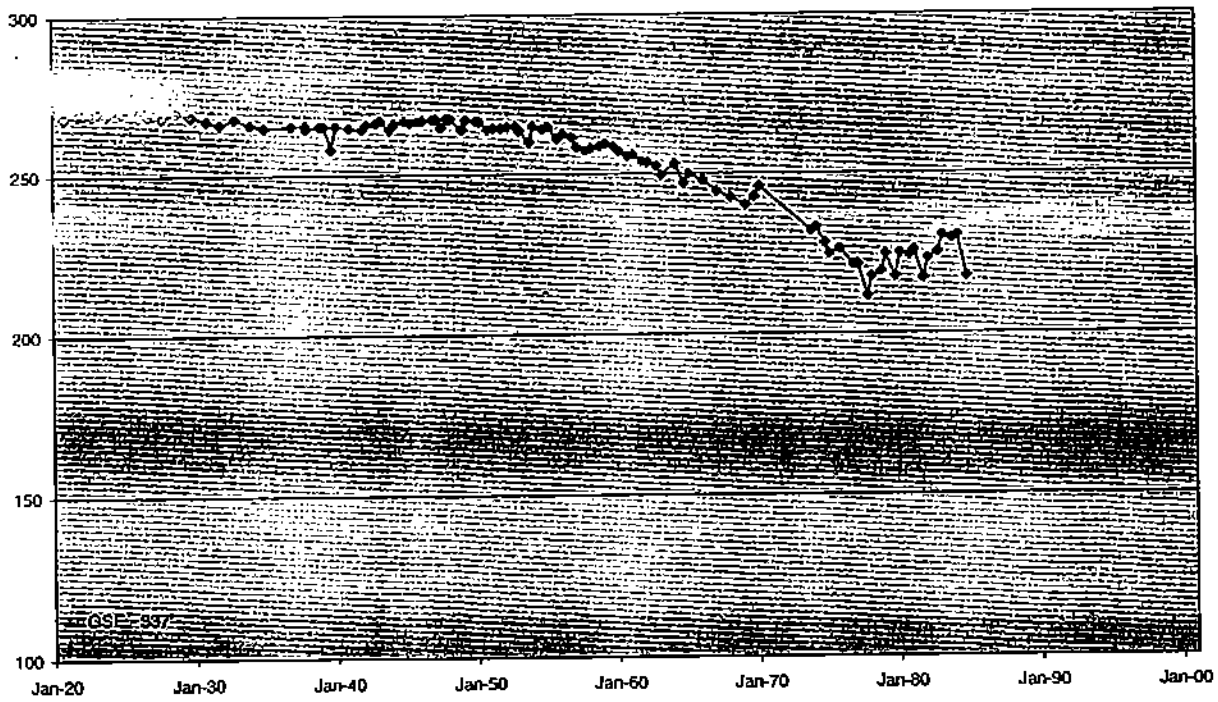
10S/17E-12C1



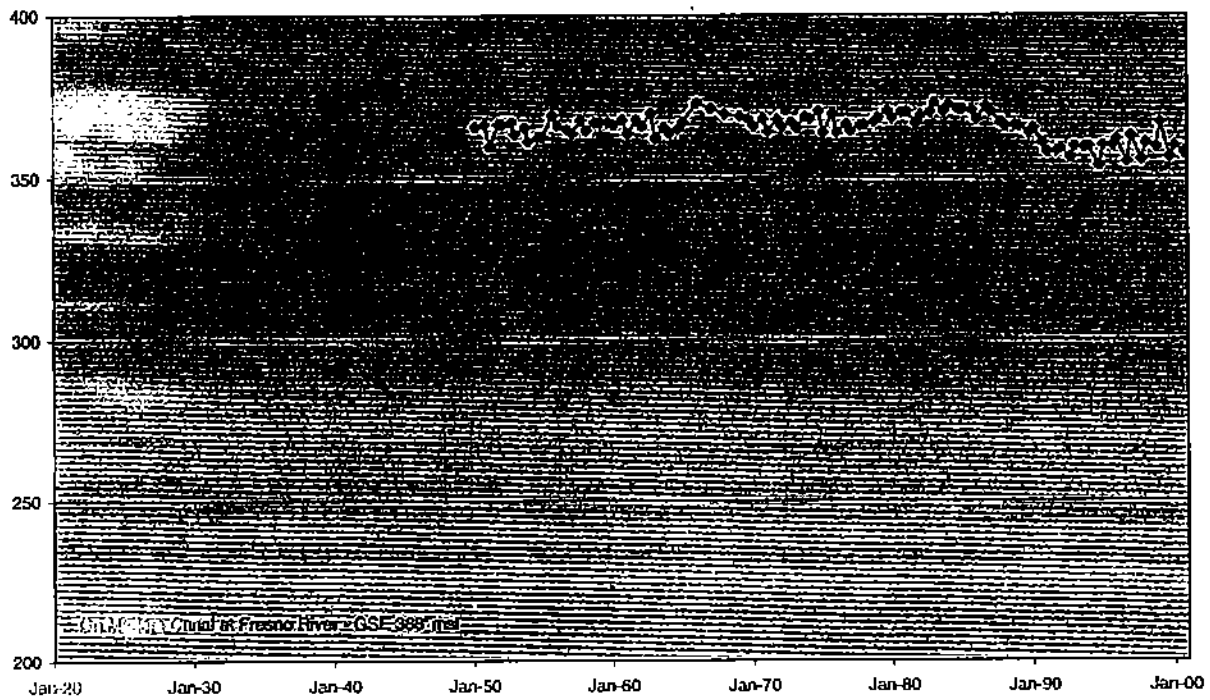
10S/17E-30 802



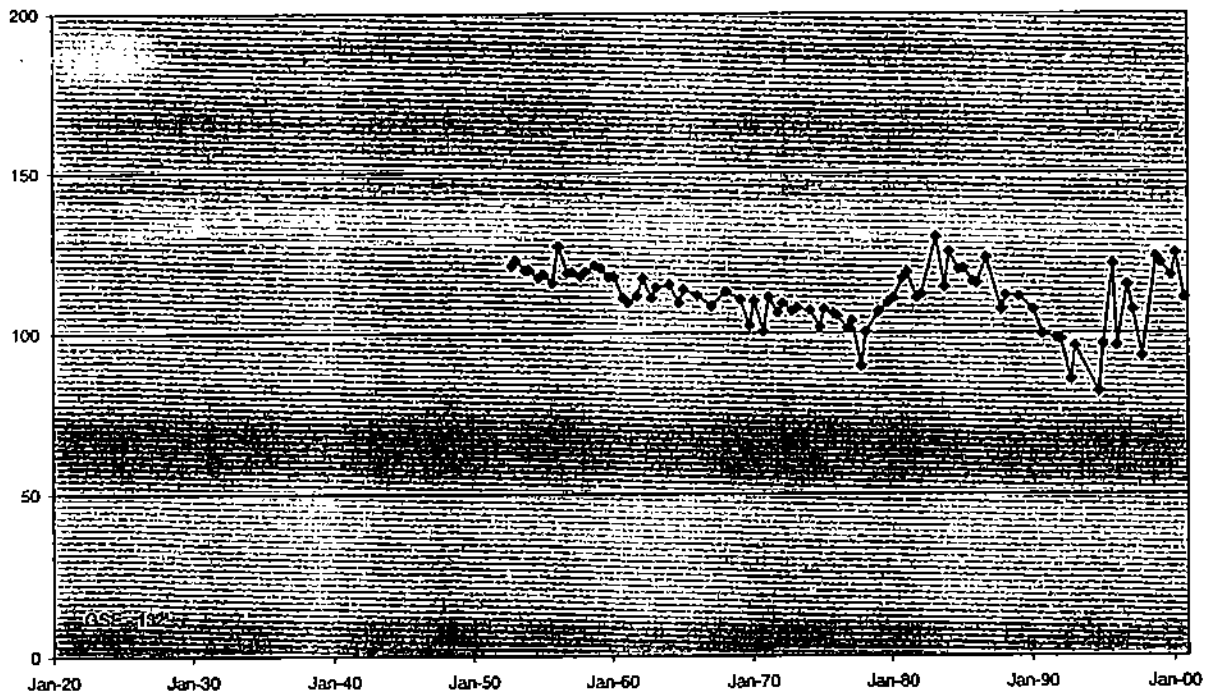
10S/18E-20 M1 and M2



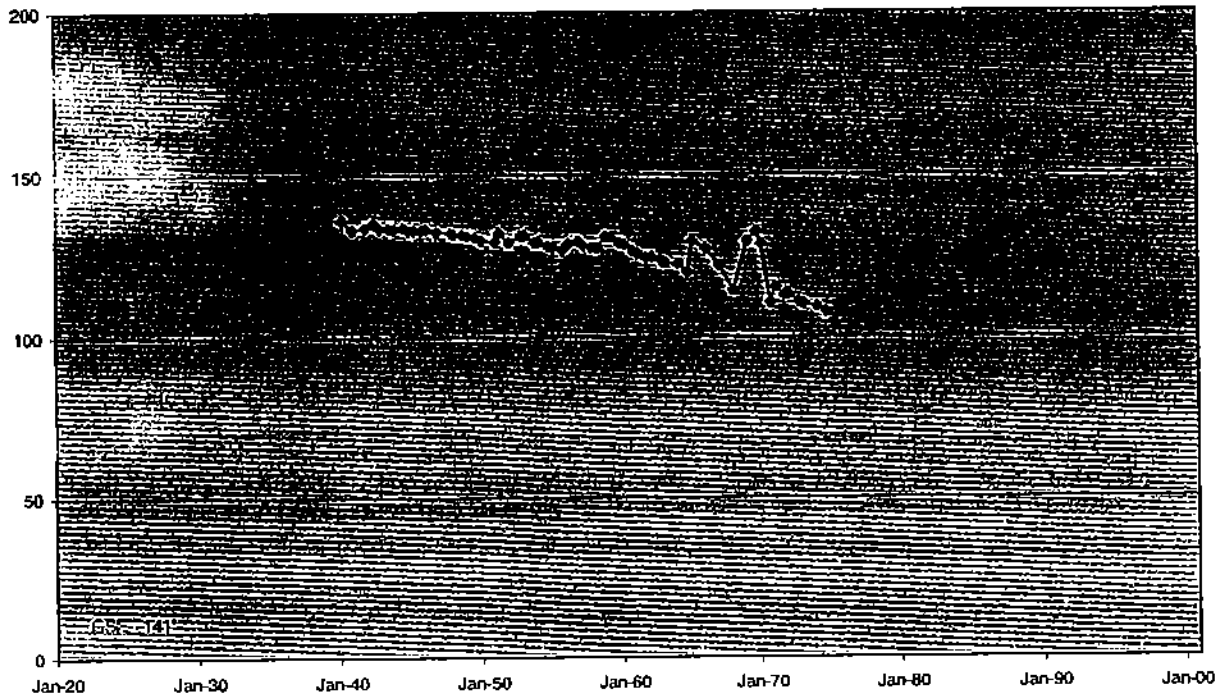
10S/19E-16D1



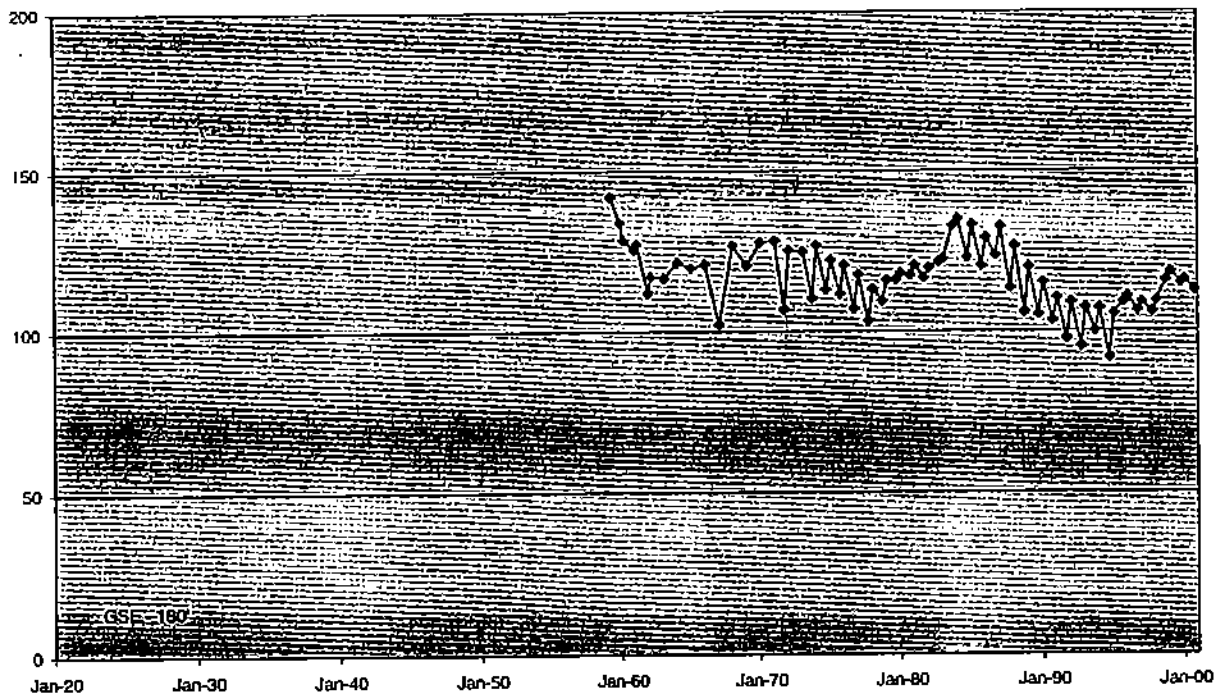
11S/14E-17J1



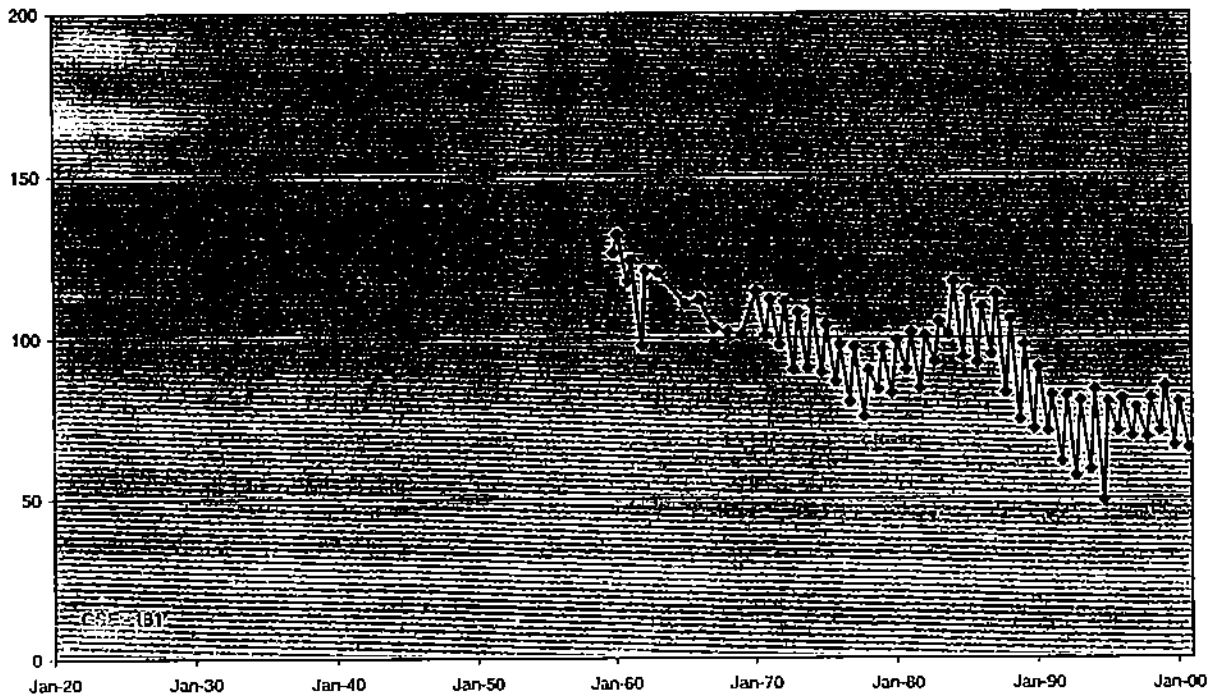
11S/14E-26L1



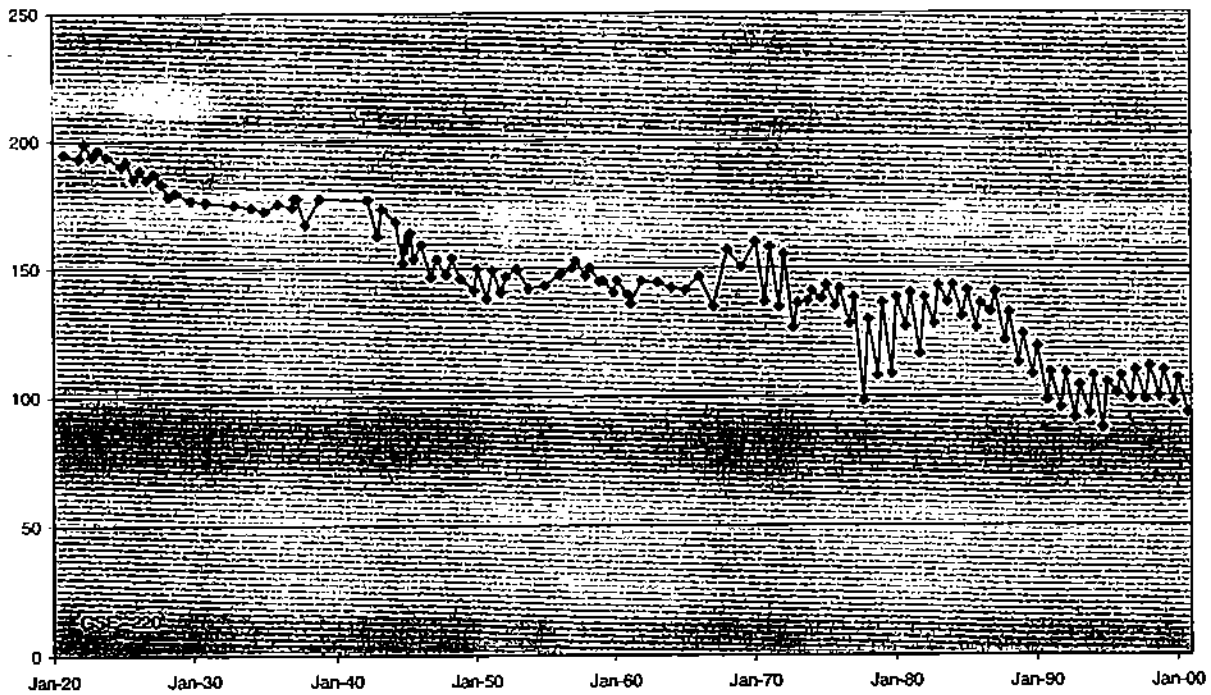
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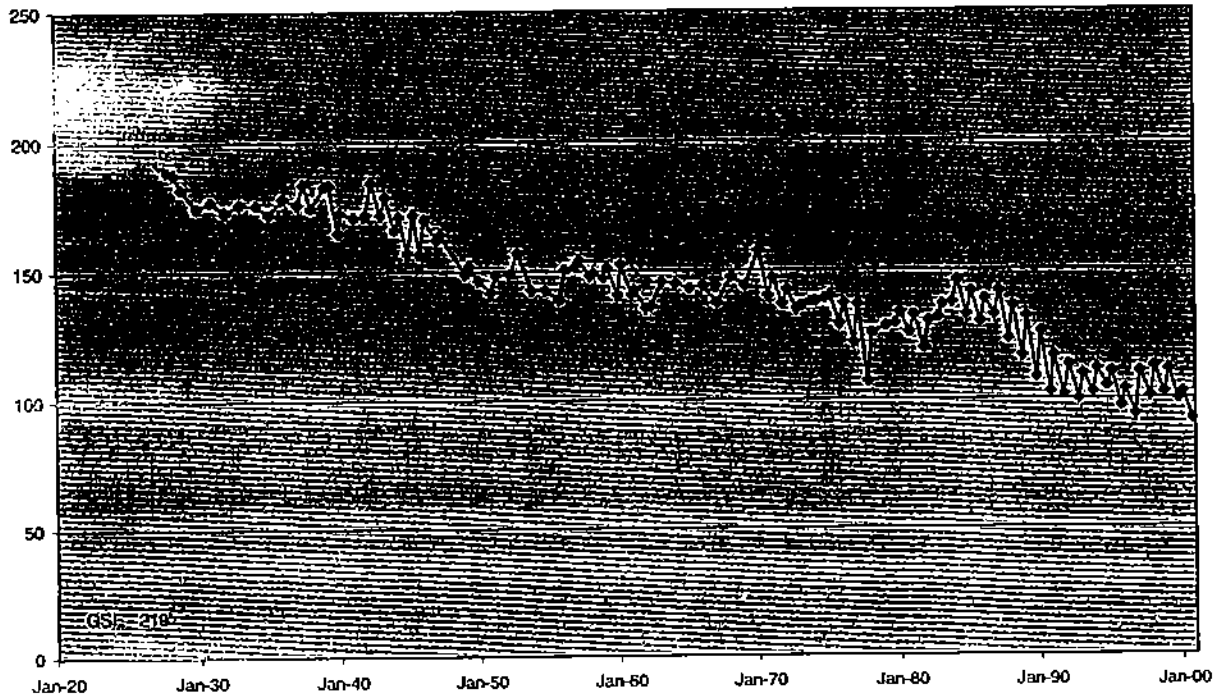
11S/15E-25A1



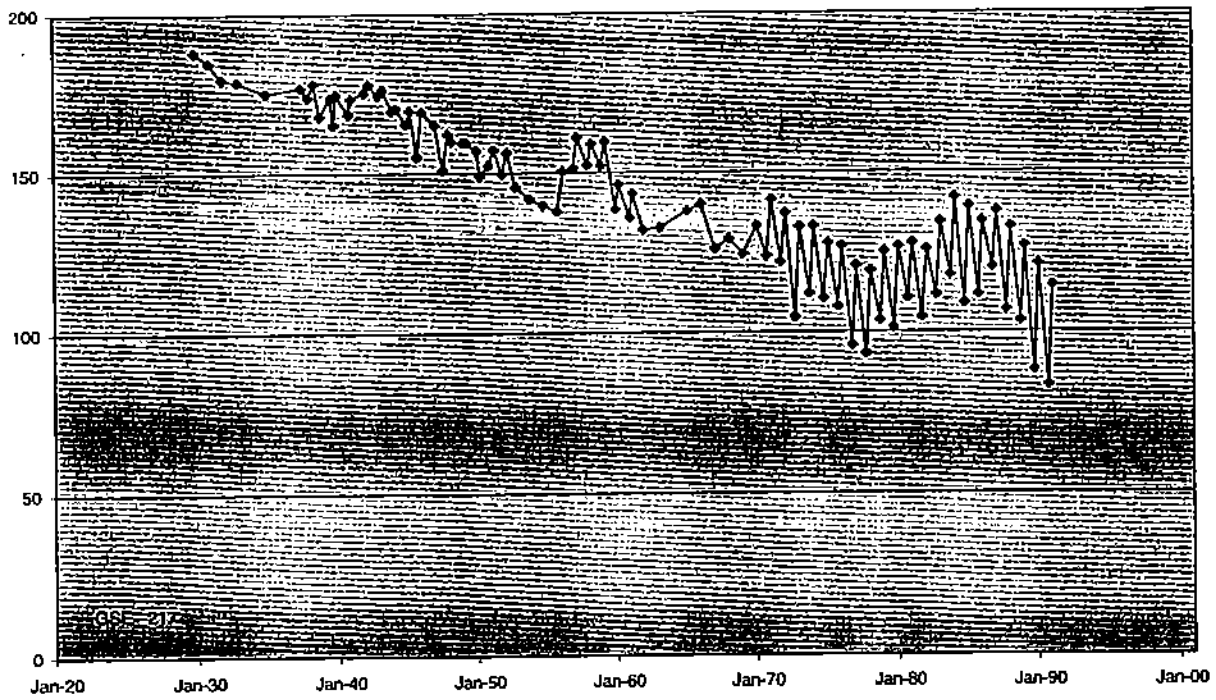
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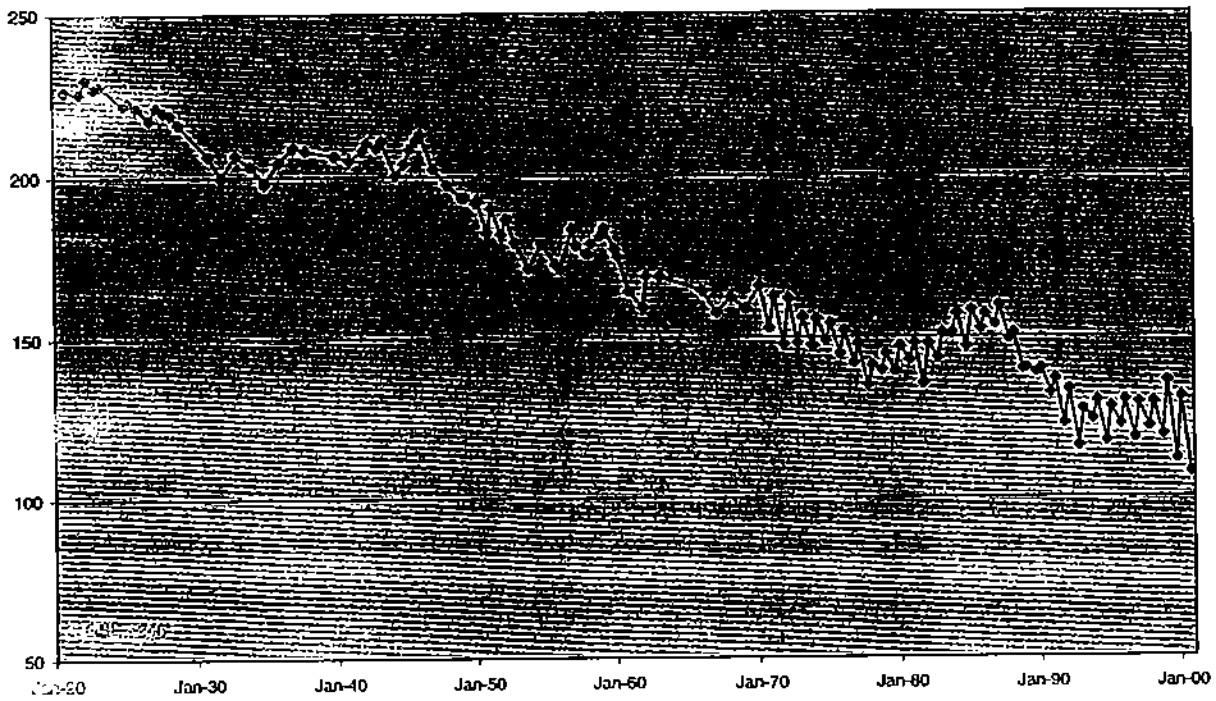
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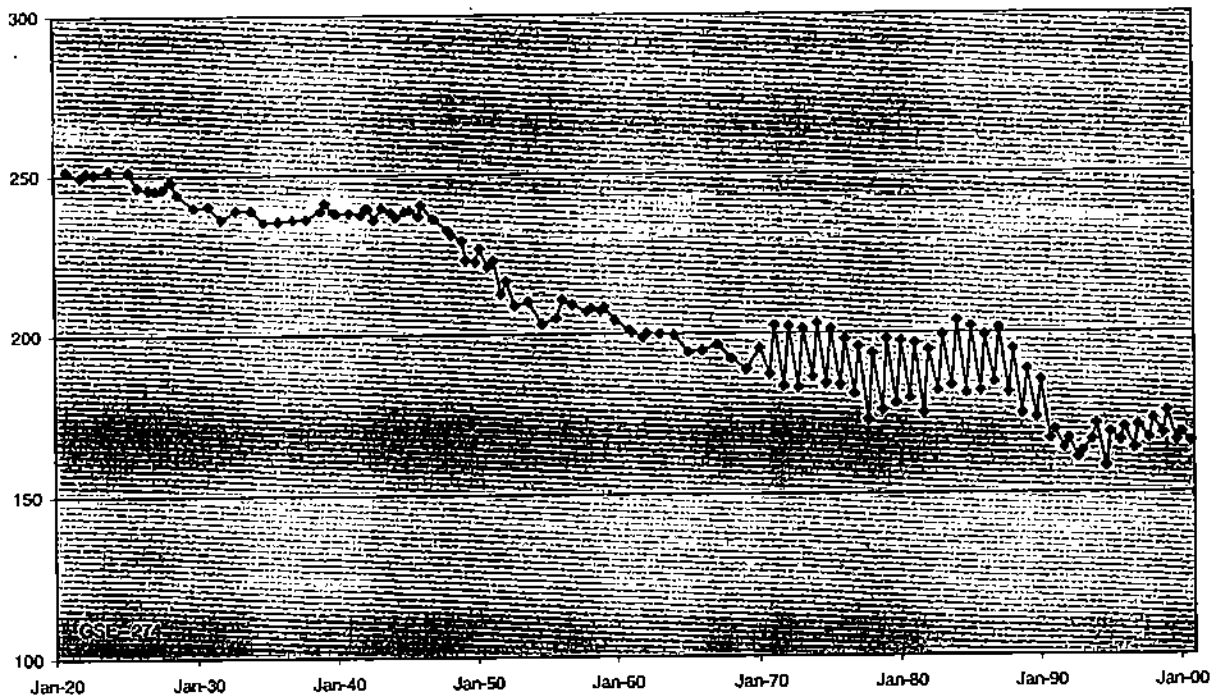
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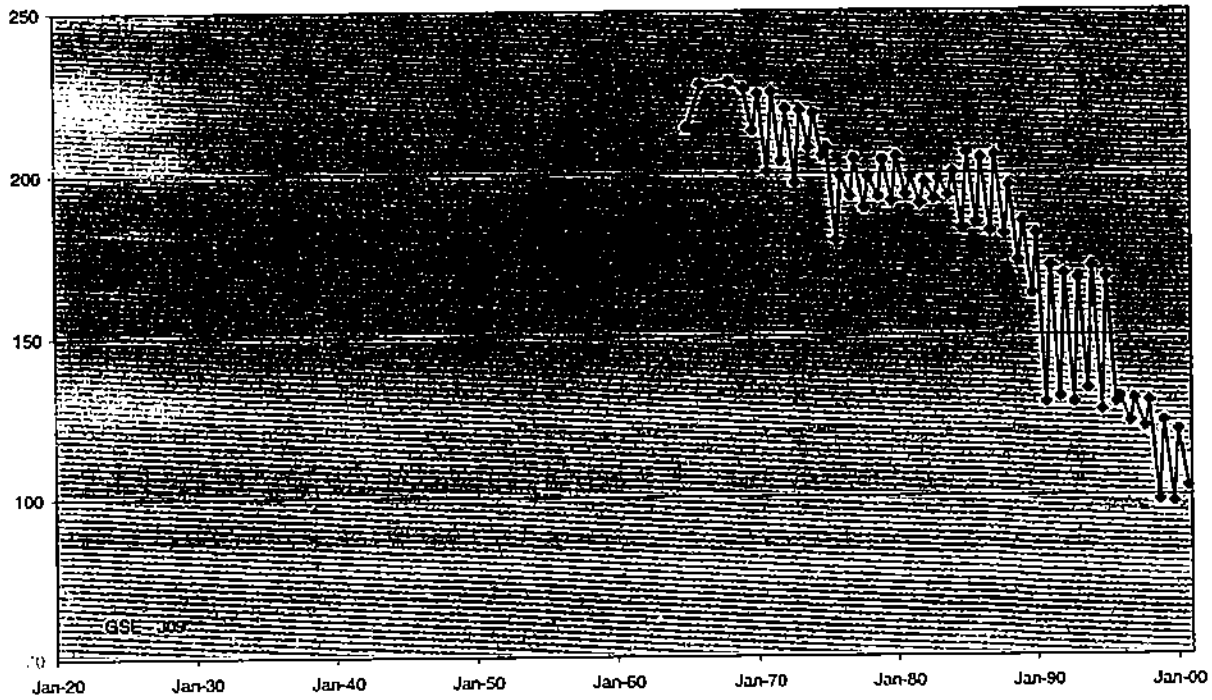
11S/17E-33H1



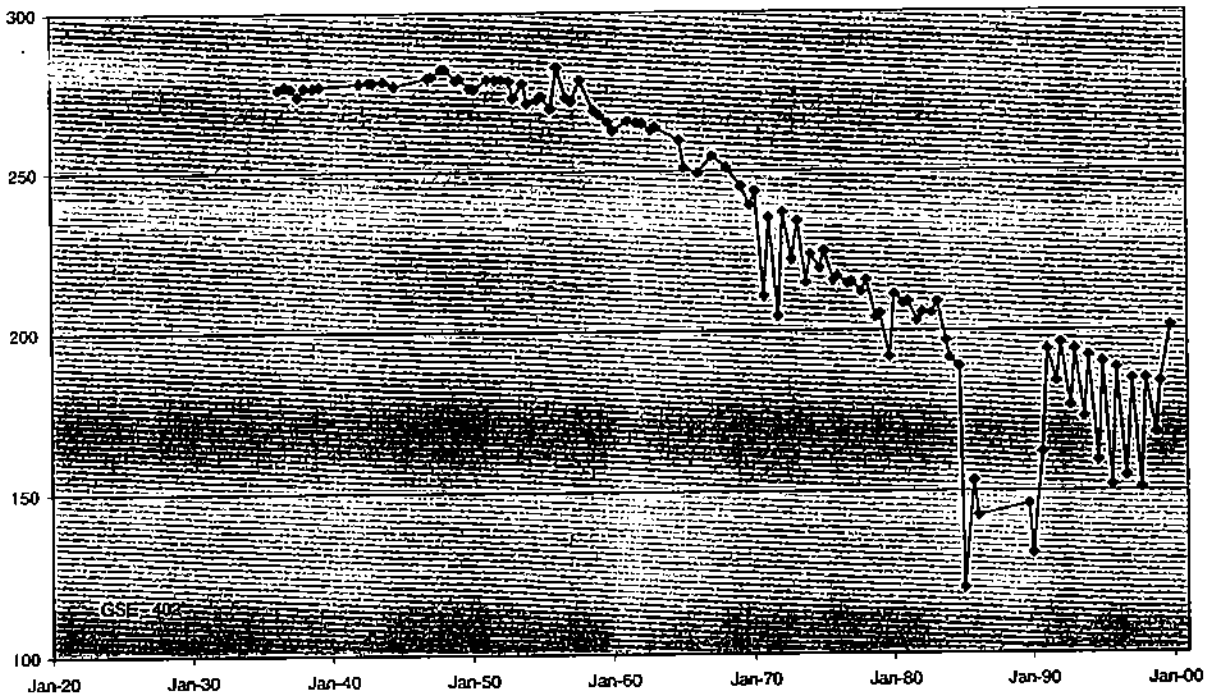
11S/18E-20N1



11S/19E-19F1

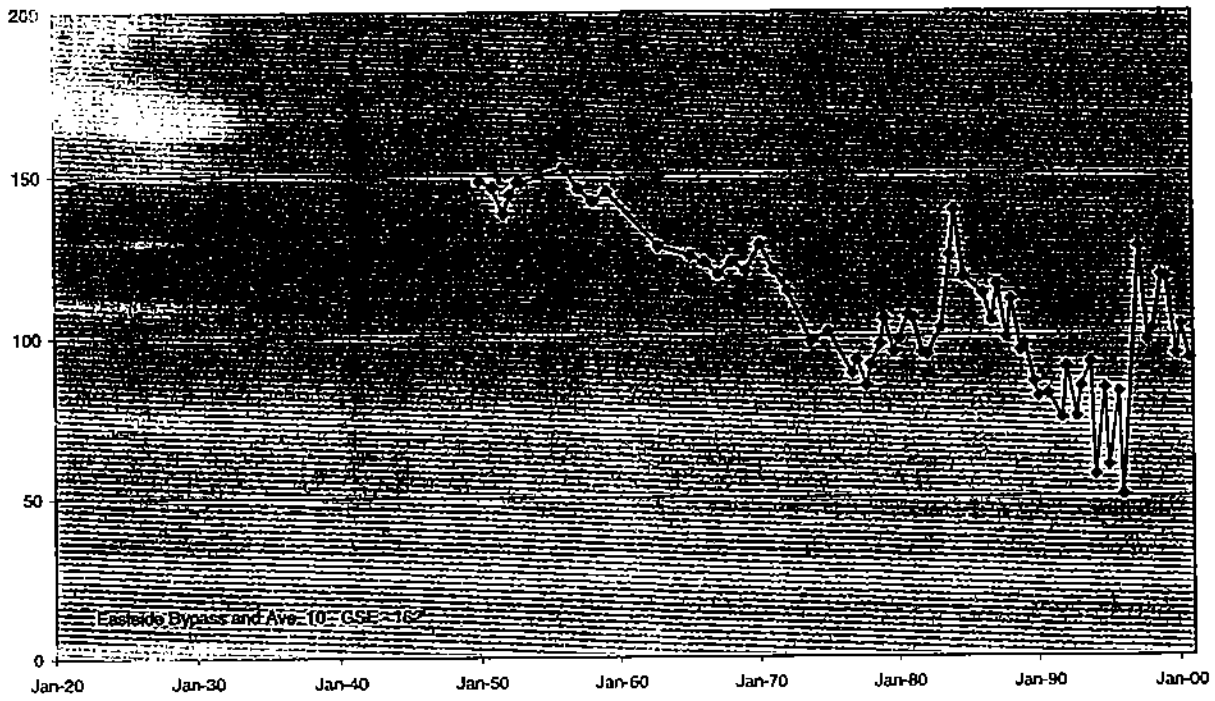


11S/20E-27N1 and 27N2

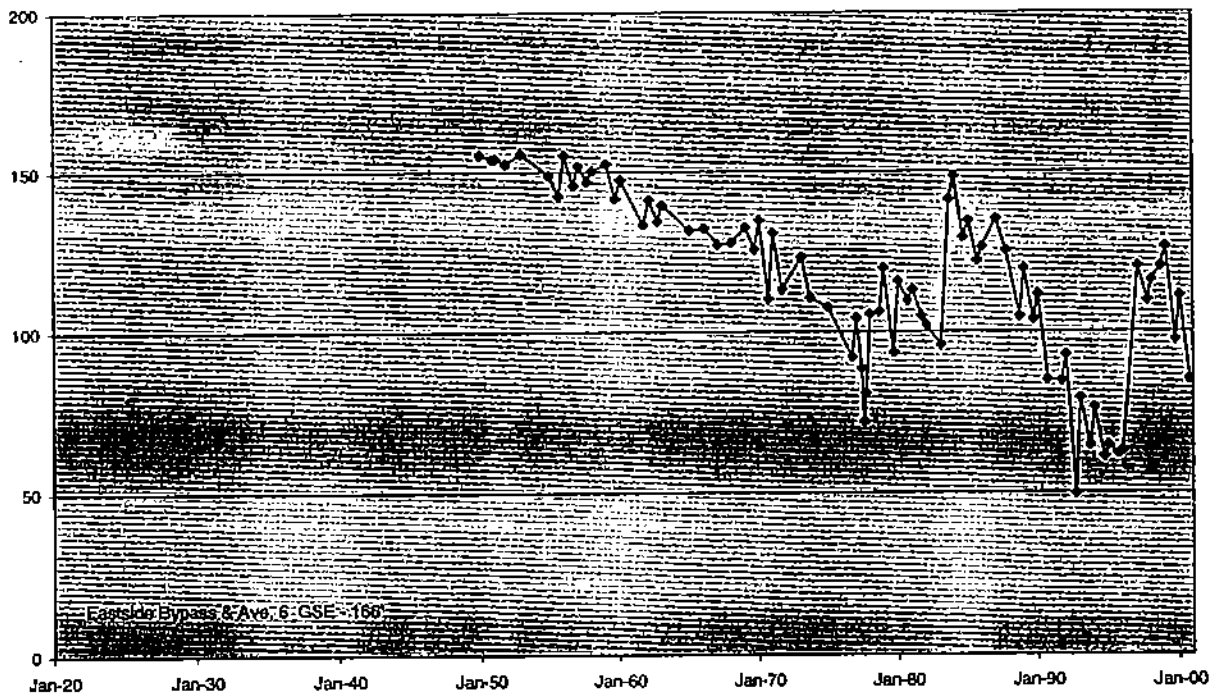


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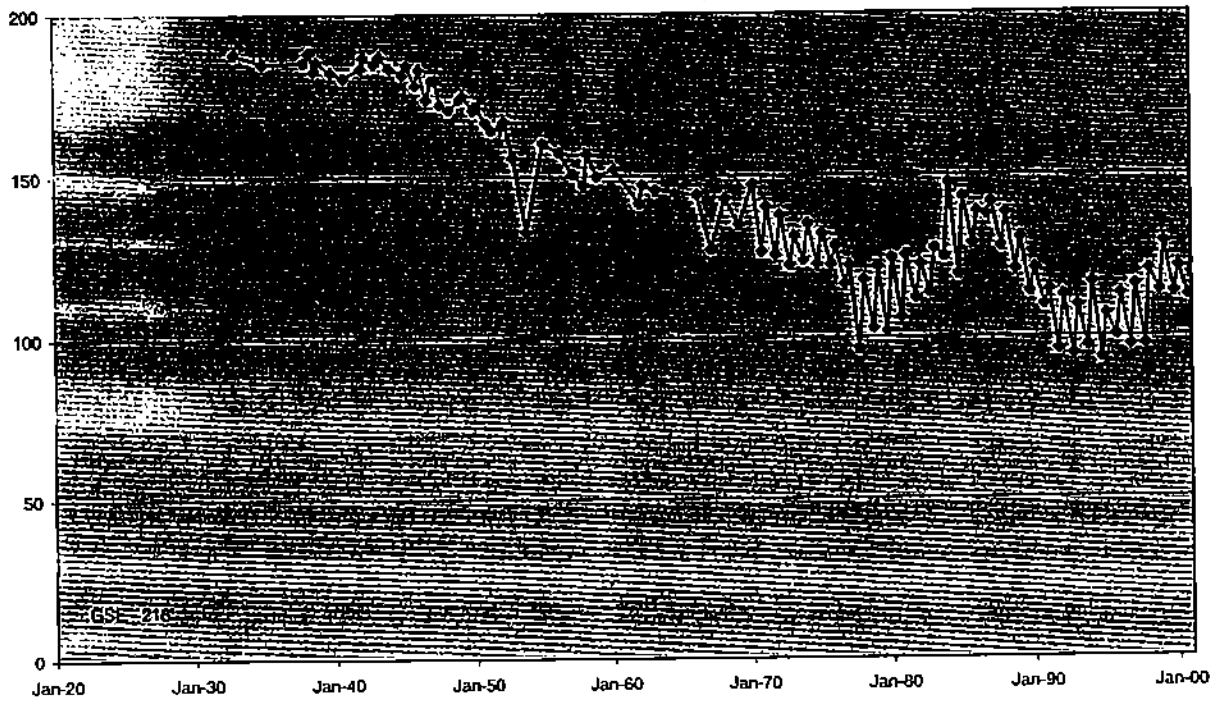
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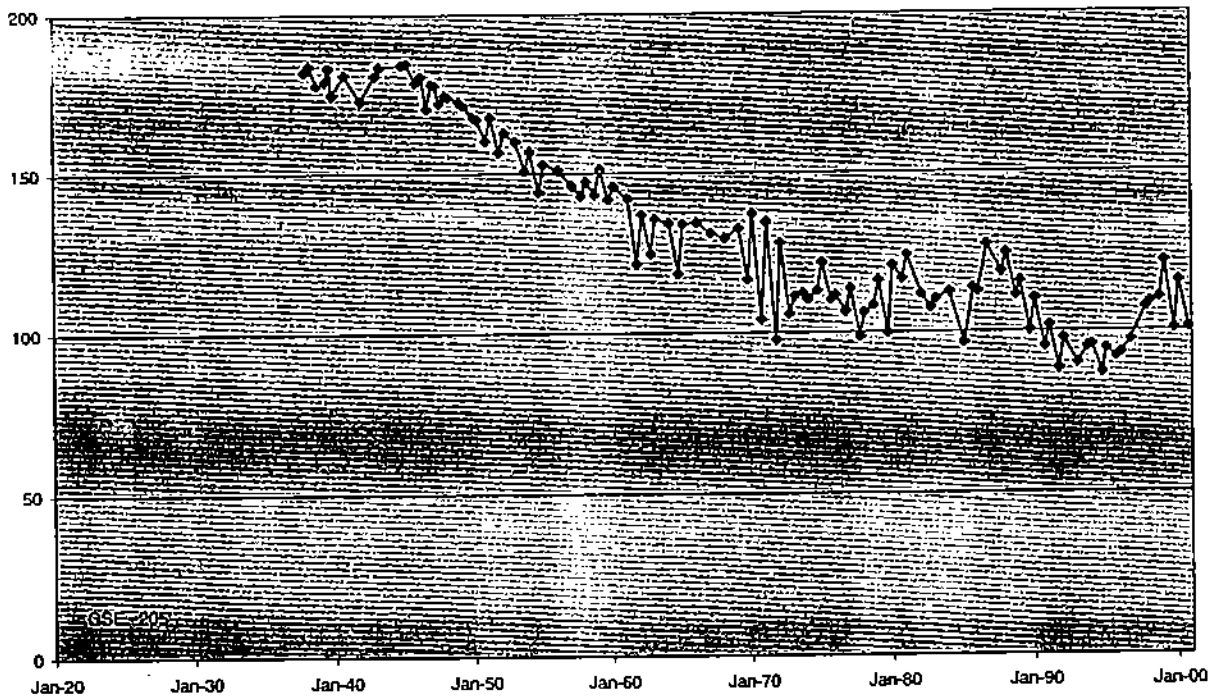
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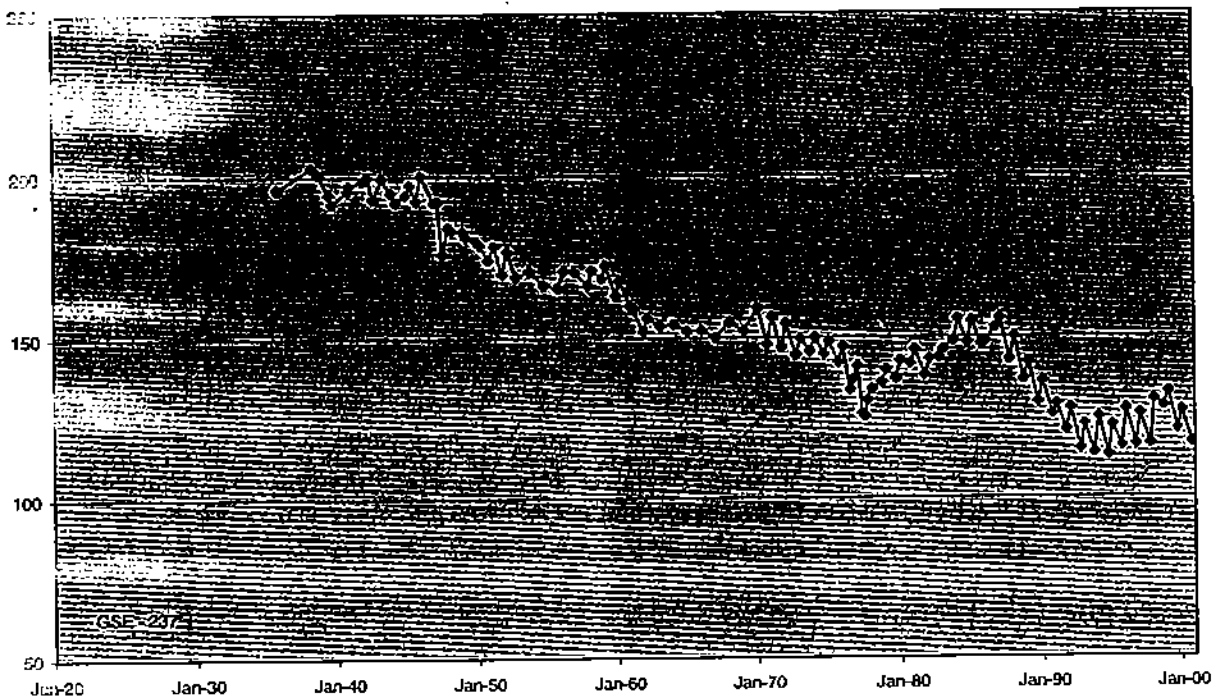
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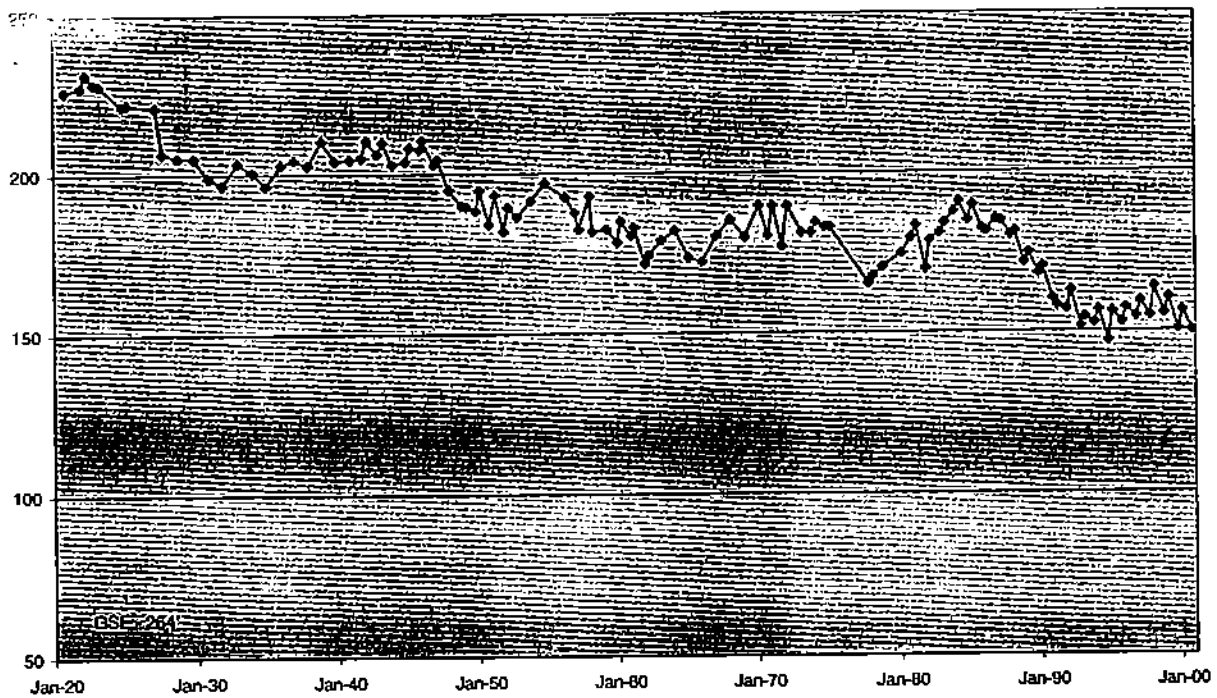
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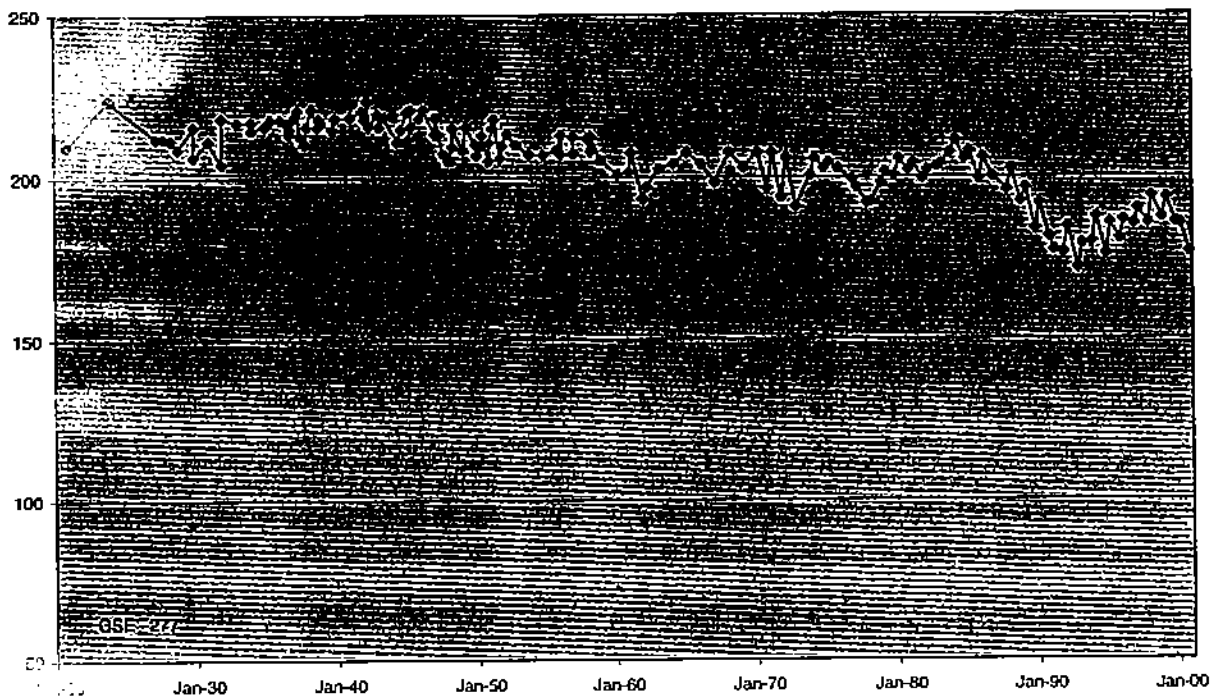
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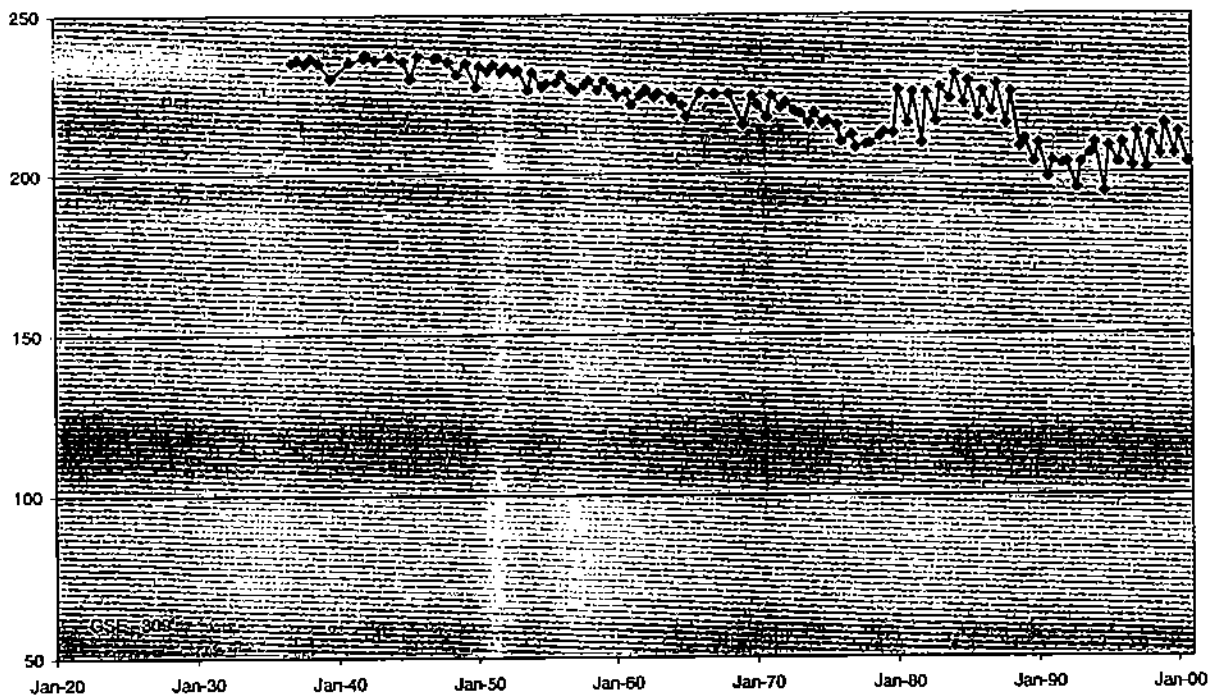
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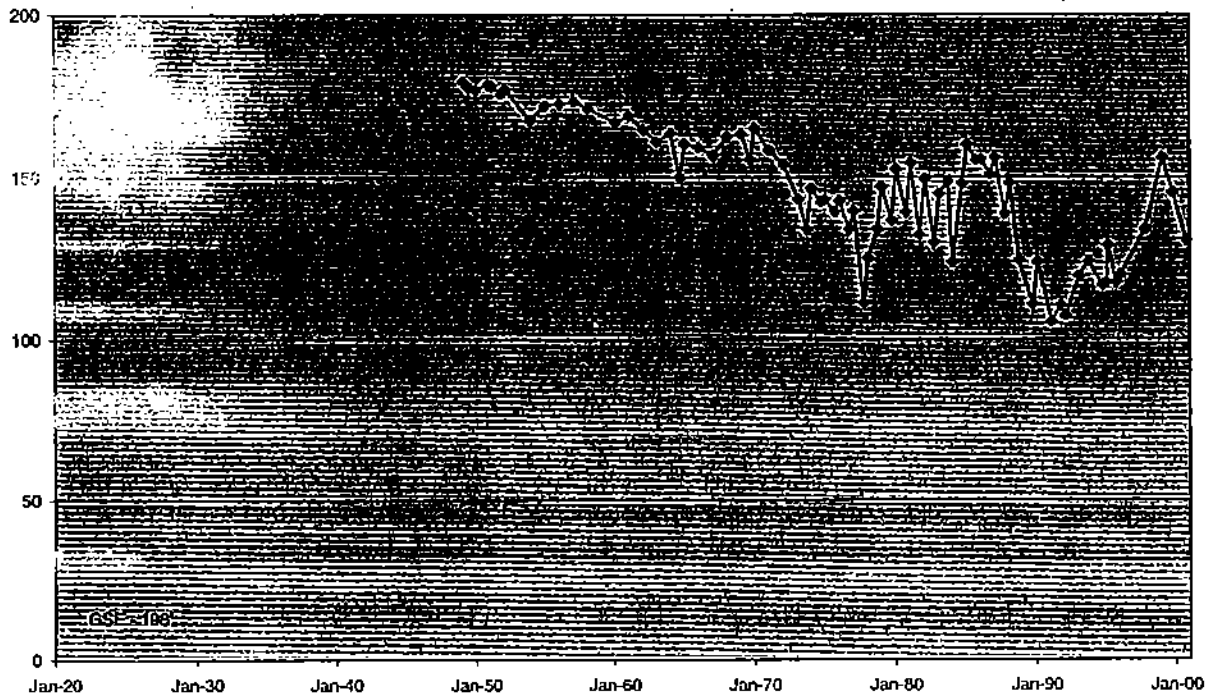
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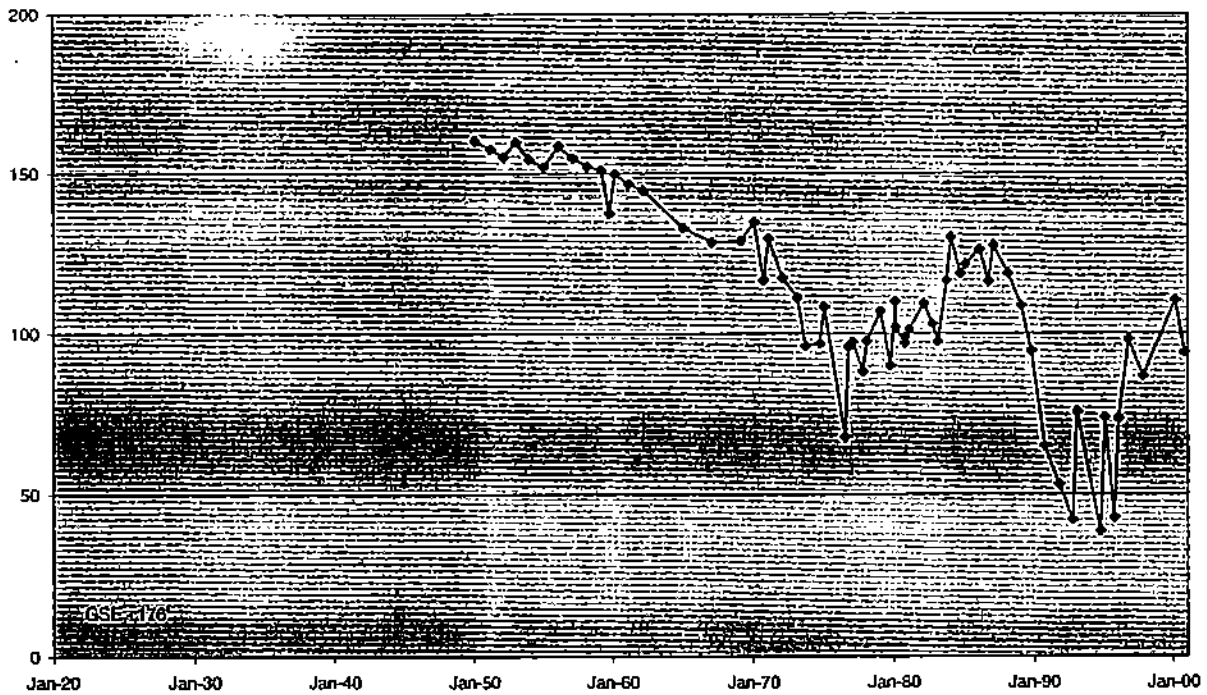
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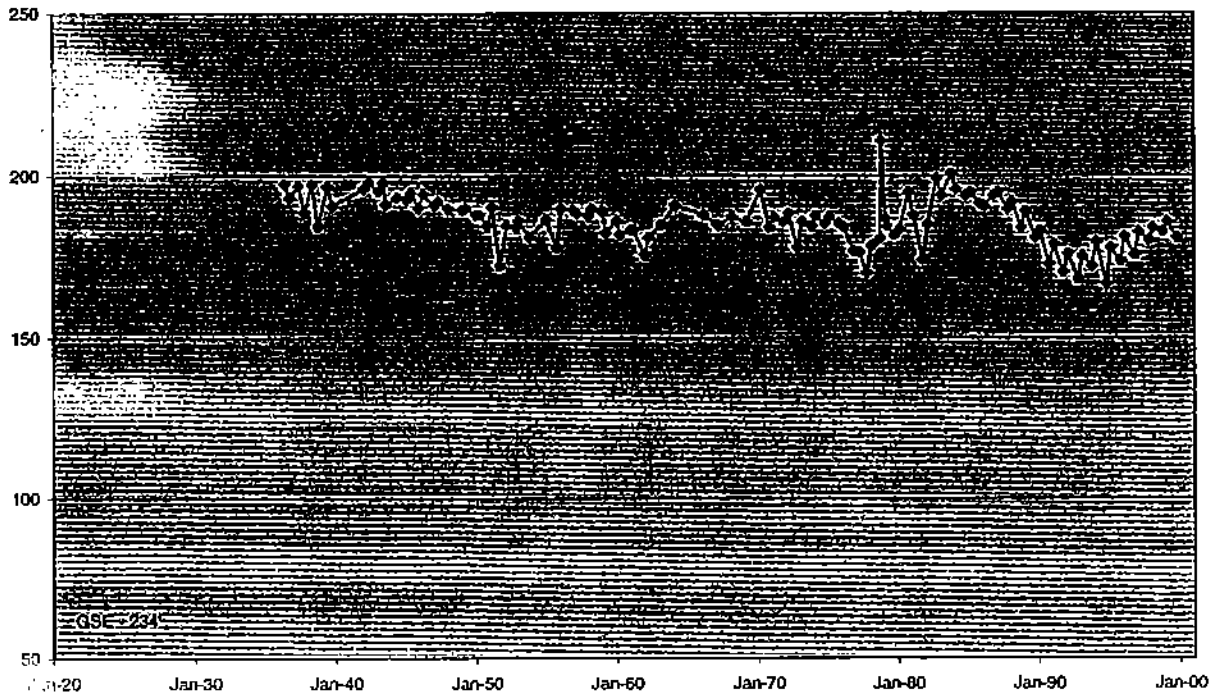
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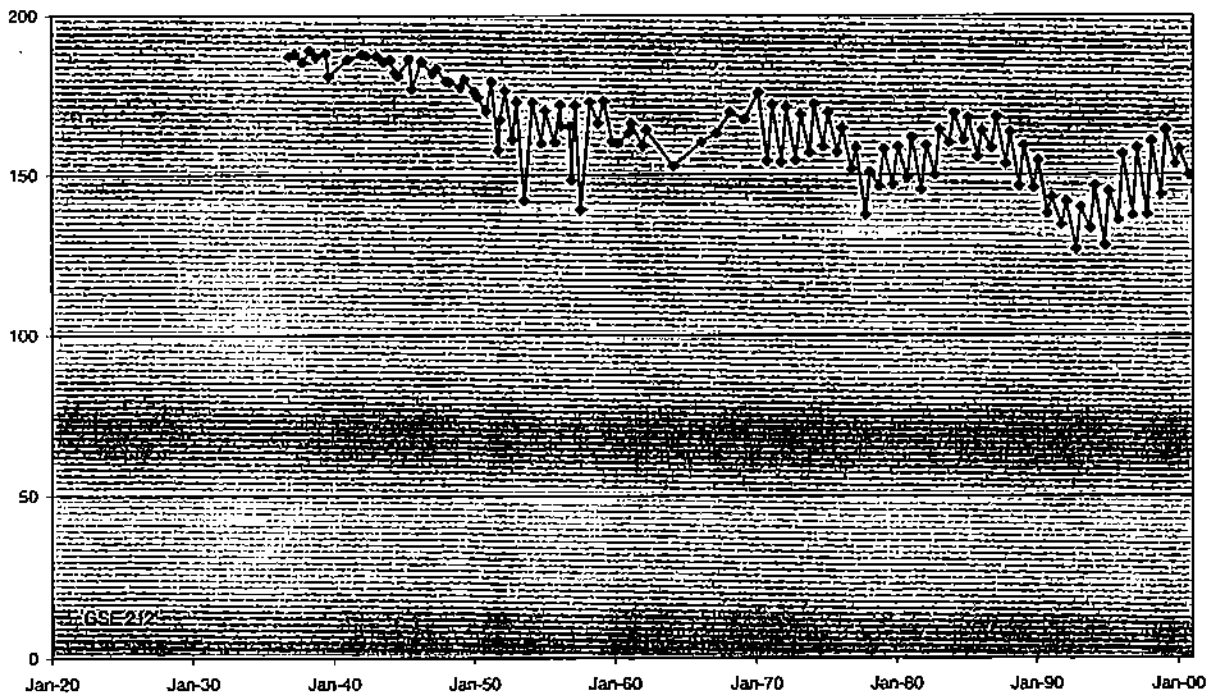
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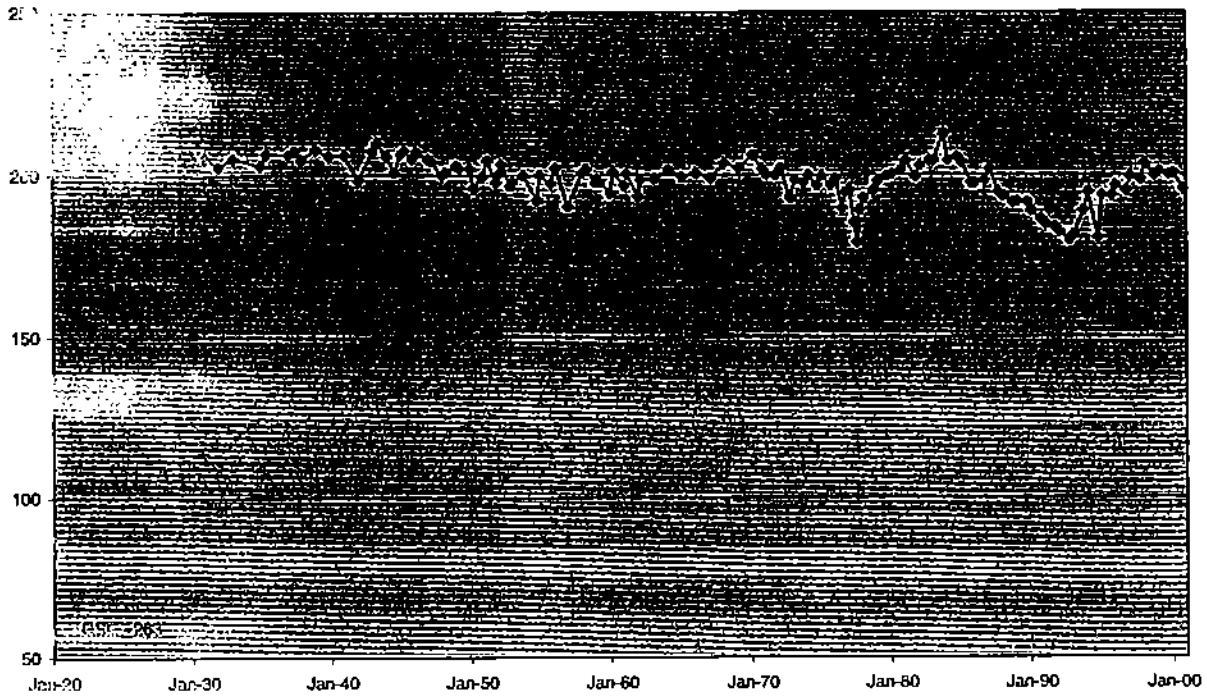
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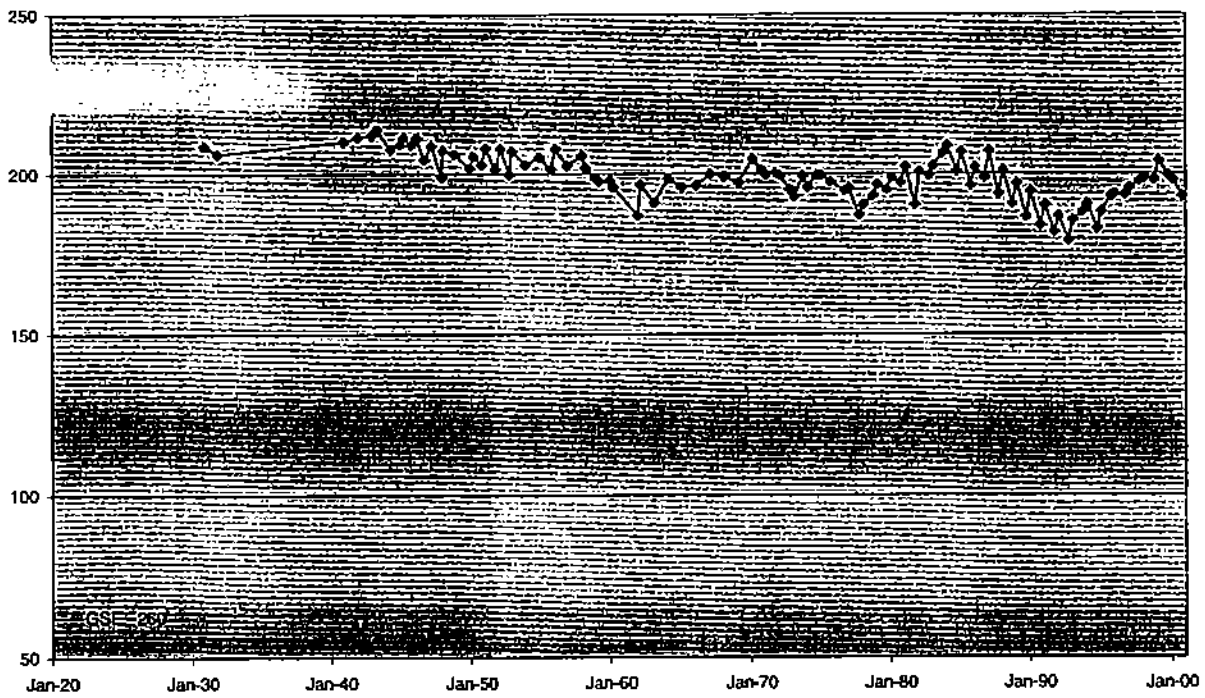
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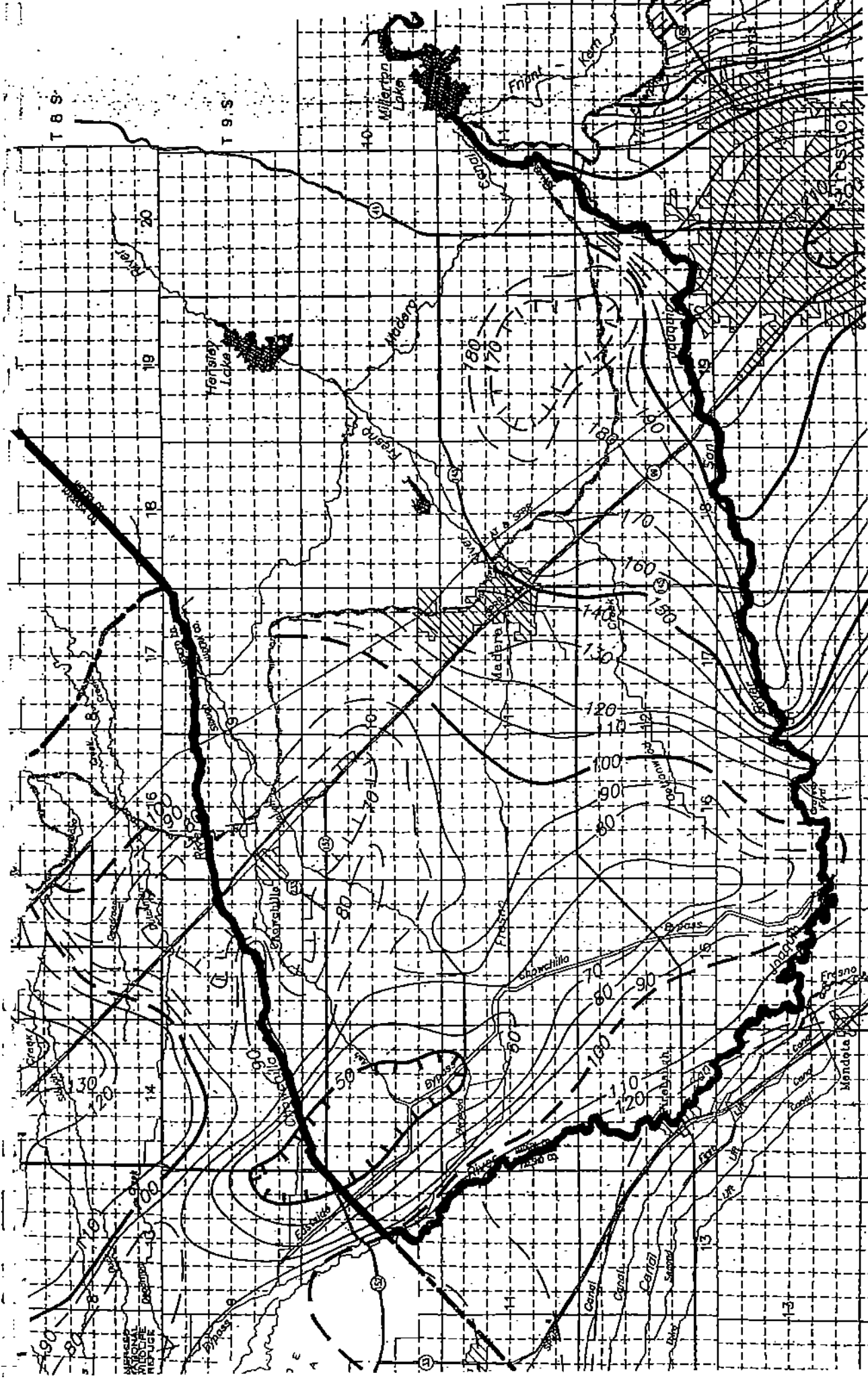


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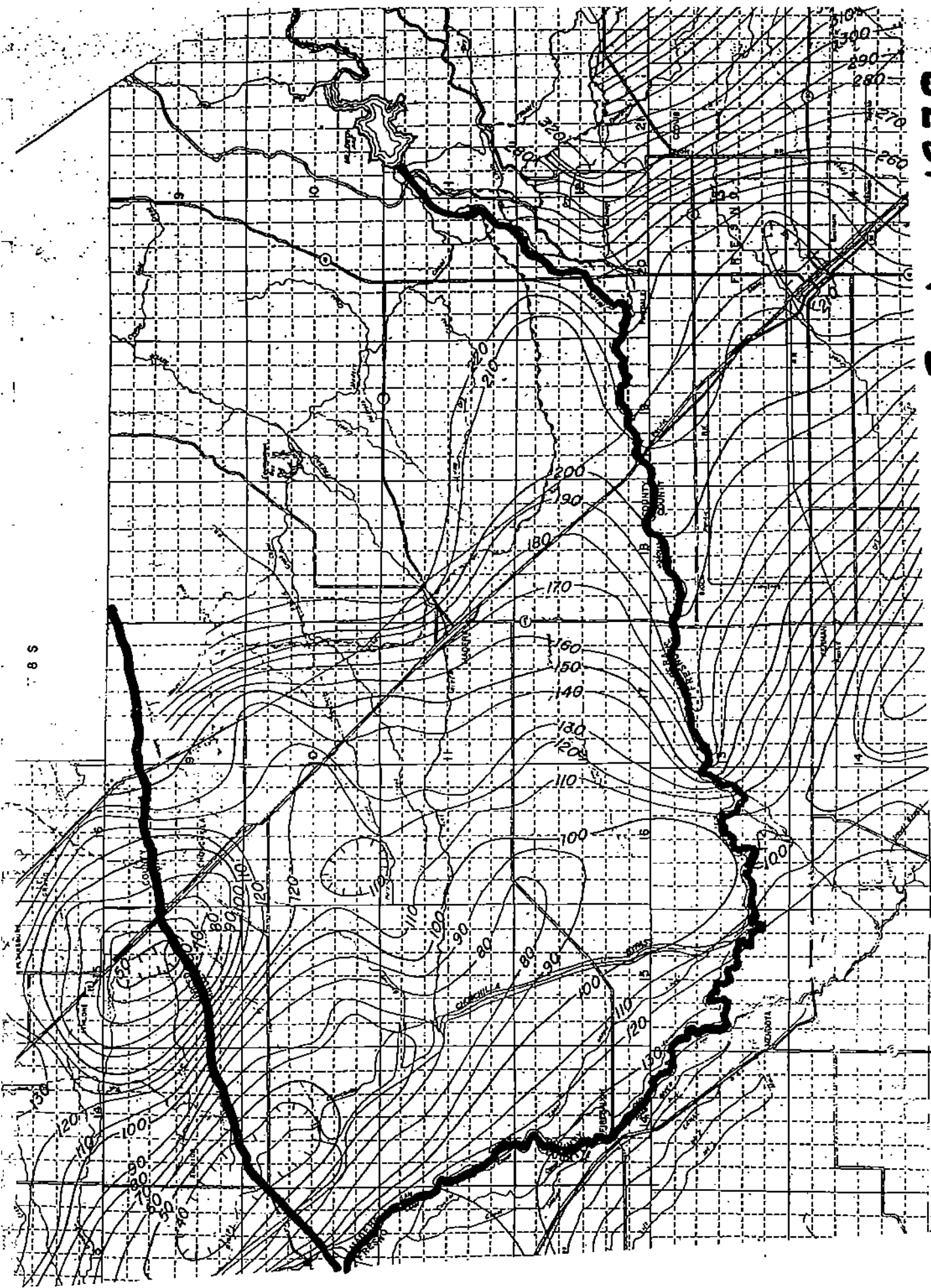


APPENDIX C

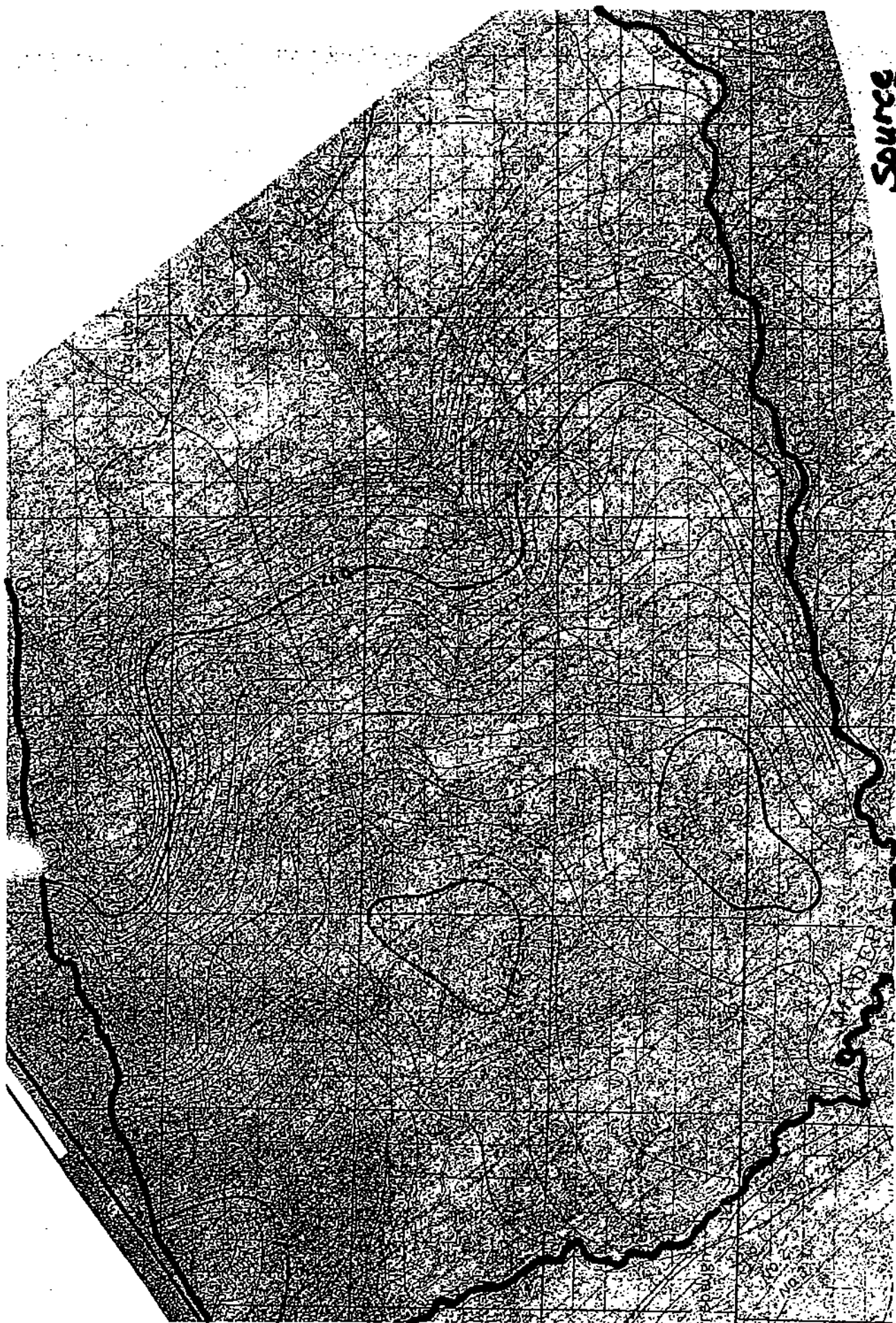
Water Level Contour Maps



Spring 1995
Source DWR

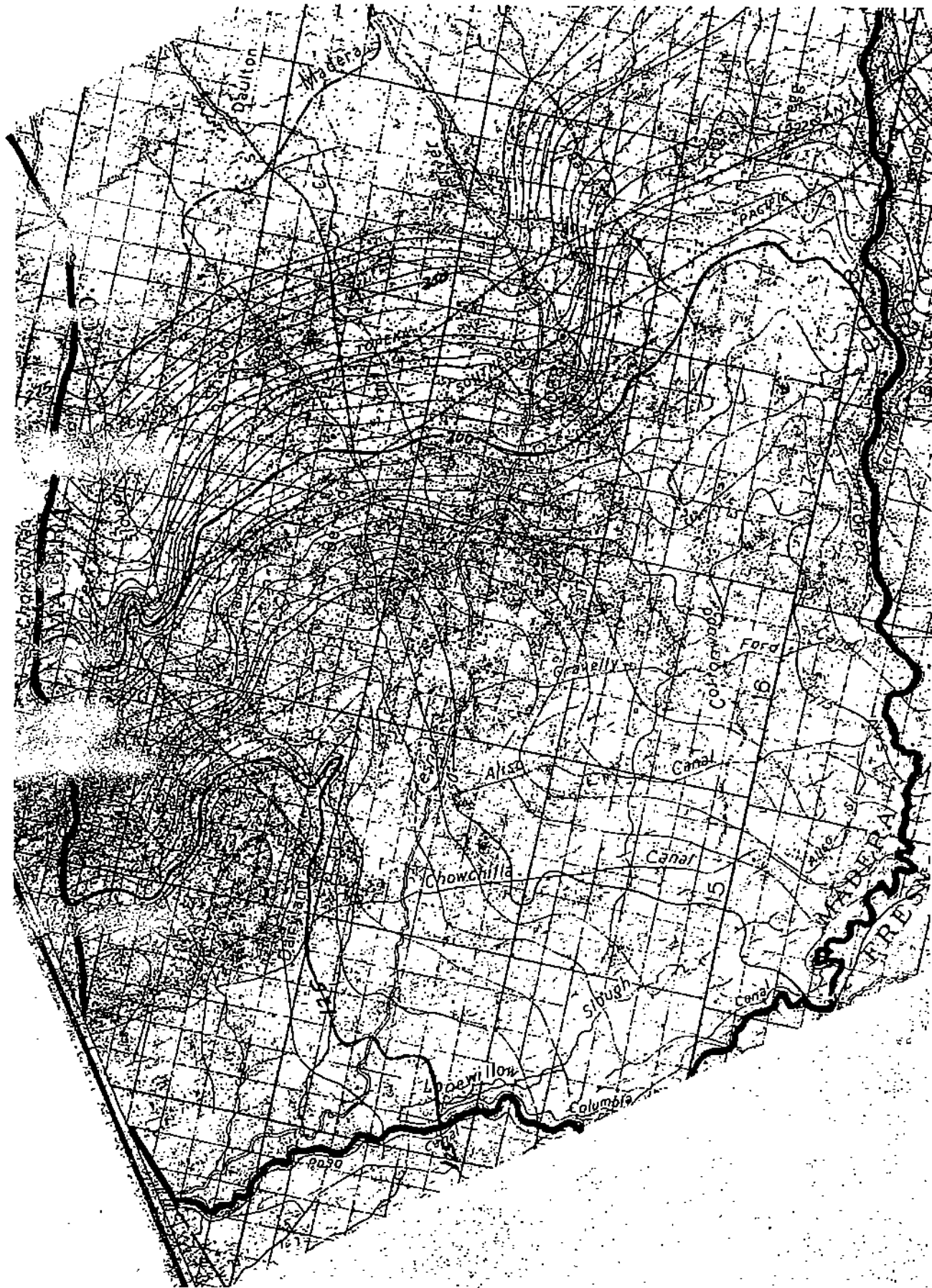


Spring 1978
Source DWR



Source
DWR

Spring 1958



Fall 1947 Source DWR

APPENDIX D

Madera County Ordinance 573B

1
2
3 BEFORE
4 THE BOARD OF SUPERVISORS
5 OF THE COUNTY OF MADERA
6 STATE OF CALIFORNIA
7 ORDINANCE NO. 573B

8 AN ORDINANCE AMENDING ARTICLE V OF TITLE 13
9 OF THE MADERA COUNTY CODE RELATING TO GROUNDWATER
10 EXPORTATION, GROUNDWATER BANKING, AND
11 IMPORTATION OF FOREIGN WATER

12 The Board of Supervisors of the County of Madera, State of California, ordains as
13 follows:

14 SECTION 1:

15 Article V of Title 13 of the Madera County Code is hereby amended to read as
16 follows:

17 V. GROUNDWATER EXPORTATION, GROUNDWATER BANKING,
18 AND IMPORTATION OF FOREIGN WATER FOR PURPOSES OF GROUNDWATER
19 BANKING, TO AREAS OF MADERA COUNTY WHICH ARE OUTSIDE OF LOCAL
20 WATER AGENCIES THAT DELIVER WATER TO LANDS WITHIN THEIR
21 BOUNDARIES.

22 Chapter 13.100

23 Rules and Regulations Pertaining to Groundwater Banking; Importation of Foreign Water
24 for the Purpose of Groundwater Banking, to Areas of Madera County Which Are Outside
25 of Local Water Agencies That Deliver Water to Lands Within Their Boundaries; and
26 Exportation of Groundwater Outside the County.
27
28

Sections:

13.100.010 Purpose and Intent.

13.100.020 Title.

13.100.030 Definitions.

13.100.040 Lands Subject to Chapter.

13.100.050 Permits Required for Exportation of Groundwater Beyond County Boundaries, for Groundwater Banking, and/or for Importation of Foreign Water for Purposes of Groundwater Banking, to Areas of Madera County Which Are Outside of Local Water Agencies That Deliver Water to Lands Within Their Boundaries.

13.100.060 Permitting Process.

13.100.070 Penalties for Violation.

13.100.080 Severability.

13.100.010 PURPOSE AND INTENT.

A. Those portions of the County of Madera lying in the floor of the San Joaquin Valley are dependent upon Groundwater from the Madera, Chowchilla and Delta-Mendota Groundwater Basins, as delineated by the State Department of Water Resources, for domestic, municipal, industrial, and agricultural purposes. These Groundwater Basins are severely overdrafted and surface supplies of water are imported by the Chowchilla Water District, Columbia Canal Company, Gravelly Ford Water District, Madera Irrigation District and Root Creek Water District to alleviate, to the extent possible, the existing Groundwater overdraft. In spite of these importations, the Groundwater overdraft still continues.

1 a building, facility, or well, and other applicable impacts specified in Paragraphs F. and G.
2 above.

3 I. Groundwater Banking can be reasonable and beneficial if it can

4 be accomplished without:
5

- 6 1. causing or increasing an overdraft of Groundwater underlying the County;
- 7 2. adversely affecting the ability of other Groundwater users to use, store, or
8 transmit Groundwater within any aquifer(s) underlying the County (for
9 example by utilizing storage that might otherwise be subject to natural or
10 passive recharge and thus depriving other Groundwater users of their use
11 of the aquifer and the Groundwater derived therefrom);
- 12 3. adversely affecting the reasonable and beneficial uses of Groundwater by
13 other Groundwater users within the County;
- 14 4. resulting in, expanding, or exacerbating degradation of the quality or
15 quantity of surface or Groundwater within Madera County, or
16 Groundwater basins and aquifers within Madera County;
- 17 5. resulting in injury to a water replenishment, storage, restoration, or
18 conveyance project or facility;
- 19 6. adversely affecting the surface or subsurface of neighboring or nearby
20 lands, or the trees, vines, or crops growing or to be grown thereon;
- 21 7. adversely affecting the economy or environment of the County; or
- 22 8. adversely affecting the storage ability on adjacent lands where passive
23 recharge may take place.
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1 J. For Groundwater Banking projects all or a portion of which will be located within
2 areas of the County of Madera which are outside of the boundaries of a Local Water Agency or
3 an incorporated city, it is essential that the County of Madera be the agency that determines
4 whether a permit should be issued to allow Groundwater Banking within such areas (but without
5 affecting the right of such a Local Water Agency or incorporated city to determine whether to
6 issue a permit for Groundwater Banking within the boundaries of such agency or city). Without
7 a permit process which allows public notice, public hearings, and compliance with environmental
8 and other appropriate requirements, there would be no or inadequate local control over such
9 Groundwater Banking, nor a method to insure that Groundwater Banking will meet the
10 requirements of Paragraph I., above.

11 K. In the absence of regulation by such Local Water Agencies, the County of Madera
12 should exercise its police power to protect the public health, safety, and welfare of the County
13 and its various areas by adopting reasonable regulatory measures in relation to exportation of
14 Groundwater, Groundwater Banking, and the importation of Foreign Water for the purpose of
15 Groundwater Banking. The purpose of this Chapter is to provide Madera County with the
16 regulatory controls over the exportation of Groundwater, Groundwater Banking, and the
17 importation of Foreign Water for the purpose of Groundwater Banking.

18 L. Local Water Agencies (as defined below) within the County have a Long Term
19 Water Supply (as defined below) to enable them to deliver a reliable supply of surface water to
20 lands within their boundaries, , and have adopted Groundwater Management Plans which may
21 include Groundwater Banking within their boundaries. Such Local Water Agencies therefore
22 control Groundwater Banking as a part of the integrated management of both groundwater and
23 surface water resources within their boundaries. Such Local Water Agencies, being public

1 agencies, are governed by various statutes and regulations, including CEQA, that assure that all
2 decisions of the governing body regarding matters affecting Groundwater will take into account
3 the environmental effects, both within and outside of its boundaries, of any proposed project that
4 is to take place within its boundaries. This insures that any Groundwater Banking permitted
5 within the boundaries of those agencies will not adversely affect the Groundwater supply or
6 damage neighboring lands' Groundwater extractions, or the environment. The decision of
7 whether or not to permit Groundwater Banking within the boundaries of such agencies should be
8 left in the hands of the elected officials thereof who have close knowledge of the surface and
9 Groundwater supplies within the boundaries of the respective agencies and are in the best
10 position to allow Groundwater Banking within their boundaries. This Chapter, therefore, shall
11 apply only to lands within the County of Madera that overlay the Madera, Chowchilla, or Delta-
12 Mendota Groundwater Basins, but which are outside of the boundaries of a Local Water Agency
13
14
15 incorporated city.

17 M. The purpose and intent of this ordinance is not to usurp, hinder, or infringe upon
18 the authority of the Local Water Agencies and their elected officials, to carry out their
19 responsibilities to their constituents.
20

- 21 1. Further, it is clearly understood that such Local Water Agencies engage in
22 Groundwater recharge both directly and indirectly as a normal operational
23 procedure. Nothing in this ordinance shall be interpreted as allowing the
24 County or anyone else to prohibit or hinder such Local Water Agencies'
25 Groundwater recharge operations to benefit their constituents.
26
- 27 2. Further, it is clearly understood that Local Water Agencies routinely
28 import water into the County. Nothing in this ordinance shall be

1 and protect the public and surrounding properties; and/or the water resources of Madera County.

2 The Plan will also provide details of corrective actions that Applicant will take if any such
3 damage occurs.

4
5 D. "Exportation of Groundwater" means the extraction of Groundwater from any
6 well within the boundaries of the County and located on or under lands subject to this Chapter
7 and used on lands which are outside of the boundaries of the County, unless the lands on which
8 the water is being used are contiguous to the lands where the water is extracted, and are owned
9 by the same landowner. Exportation of Groundwater also includes activities by which
10 Groundwater (or surface water or Groundwater for which such Groundwater is or may be
11 exchanged or that may be used to replace such Groundwater) will or may be, through one or
12 more exchanges or transactions (including subsequent Groundwater Banking), directly or
13 indirectly transferred out of the County.
14
15

16 E. "Foreign Water" means water originating outside of Madera County, whether or
17 not conveyed through or pooled with facilities located in or adjacent to Madera County, which is
18 imported into Madera County for purposes of Groundwater Banking.
19

20 F. "Groundwater" means water located beneath the land surface that fills the pore
21 spaces of the alluvium, soil, or rock formation in which it is situated.

22 G. "Groundwater Banking" means the importation of a surface supply of water that is
23 percolated into the subsurface for storage, or placed underground by means of in-lieu recharge,
24 for later extraction by any Person, unless the Board, on application in such form and according to
25 such procedures as shall be adopted by the County Engineer, issues a Certificate of Exemption.
26

27 A Certificate of Exemption shall be issued if the information and supporting documentation
28 show to the reasonable satisfaction of the Board that the water to be extracted shall only be

1 delivered, and ultimately used, solely within Madera County. If the percolated or recharged
2 Groundwater (or surface water or Groundwater for which such Groundwater is or may be
3 exchanged or that may be used to replace such Groundwater) will or may be, through one or
4 more exchanges or transactions (including subsequent Groundwater Banking), directly or
5 indirectly transferred out of Madera County, then no Certificate of Exemption shall be issued.
6

7 For purposes of determining whether extracted water is delivered and used solely within Madera
8 County, the transfer out of Madera County of less than an amount equal to 1% of a Person's
9 annual surface water entitlement, due to the normal operating practices of such Person, shall not
10 be taken into account. Consideration of the application for a Certificate of Exemption shall be
11 contingent upon:
12

- 13 (1) The applicant's payment of such fees as are or may be established
14 and/or modified by resolution of the Board for processing the
15 application for a Certificate of Exemption.
16
- 17 (2) The applicant's written agreement, in the form provided by the County
18 Engineer, to reimburse the County for all fees and costs of engineering,
19 hydrogeological, legal, and other consultants engaged by the County
20 for the purpose of assisting the County in reviewing, evaluating and
21 processing the application for a Certificate of Exemption, and in
22 monitoring the project to confirm that it is continuing to comply with
23 the terms of the Certificate of Exemption.
24
- 25 (3) The applicant's agreement, in the form provided by the County
26 Engineer, to provide such periodic reports, and such supporting data, as
27
28

1 may be required by the County Engineer to confirm compliance with
2 the terms of the Certificate of Exemption.

3 Notwithstanding any of the foregoing, recharge attributable to normal and customary farming
4 and irrigation practices, and the extraction of such recharged water solely for irrigation on
5 overlying lands, is not Groundwater Banking and no Certificate of Exemption shall be required
6 for such activities. A Certificate of Exemption is not evidence of a Groundwater or other right,
7 but only evidences exemption from the permit requirements of this Chapter. The use of
8 Groundwater by a party holding a Certificate of Exemption remains subject to the state and other
9 laws and regulations applicable to Groundwater generally.
10
11

12 H. "Groundwater Management Plan" means a groundwater management plan
13 adopted pursuant to California Water Code section 10750 *et seq.*
14

15 I. "Local Water Agency" means a district or other public agency, a majority of the
16 ownership of which, as of July 11, 2000, was located within Madera County, that has as its primary
17 function the supplying of water for domestic, agricultural, industrial, or municipal purposes to
18 lands within their boundaries, that had, as of July 11, 2000, a Long Term Water Supply, and that
19 had adopted as of July 11, 2000 a Groundwater Management Plan (directly or through a joint
20 powers authority of which it is a party, and whether or not such Plan is subsequently modified,
21 terminated, or rescinded). For purposes of this Chapter, the boundaries of a Local Water Agency
22 shall mean, and all provisions applicable to any exemptions for the operations of such an Agency
23 shall be fully applicable within, the boundaries of such Agency as they existed as of July 11,
24 2000. For purposes of this Chapter, "Long Term Water Supply" means a contract between the
25 Local Water Agency and the United States Bureau of Reclamation for a Class I supply of
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1 irrigation water, or such other surface supply that the Board may determine, on application by an
2 affected district or other public agency, as having equivalent or better permanence and reliability.

3 J. "Operations and Maintenance Plan" means a written plan which provides
4 complete details of how the Applicant plans to operate and maintain the project, including any
5 conveyance facilities, after construction is completed, including but not limited to the sources,
6 quantities and qualities of water to be imported, used for recharge, extracted, and/or exported.
7 This Plan must show which entity or entities will assume the responsibility for the operation and
8 maintenance of the project, how such responsibility will be shared; and for each such entity
9 provide an organizational chart detailing the job responsibilities of each position shown.
10

11 K. "Person" means an individual, general or limited partnership, limited liability
12 company, corporation, unincorporated association, public agency, or other form of public or
13 business entity.
14

15 L. "Plans and Specifications" means written and detailed plans and specifications, in
16 such format and subject to such requirements as may be established and/or modified from time to
17 time by the County Engineer. All Plans and Specifications shall contain certification stamps of a
18 California Registered Civil Engineer and, where applicable, a California Certified
19 Hydrogeologist.
20

21 M. "Project Monitoring Plan" means a written plan which details how the Applicant
22 will monitor the surface and subsurface of the project site and of properties outside of the project
23 boundaries for possible impacts from operation of the project, including but not limited to
24 locations, frequencies, and methods for monitoring ground subsidence, Groundwater levels and
25 quality, and for monitoring quantity and quality of imported and extracted water.
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1. N. "Project Plans" means the Damage Prevention Plan, Emergency Action Plan,
2 Operations and Maintenance Plan, Project Monitoring Plan, Project Water Measurement and
3 Water Loss Accountability Plan, Rehabilitation Plan, and Safety Action Plan.

4
5 O. "Project Water Measurement and Water Loss Accountability Plan" means a
6 written plan which details how water into and out of the project will be measured and how the
7 Applicant plans to calculate or otherwise account for project water losses. The Plan must
8 provide details of what types of measuring equipment will be used on the project, where it will
9 be installed, and how it will be calibrated and maintained.

10
11 P. "Rehabilitation Plan" means, and shall consist of, (i) a statement of planned
12 rehabilitation after the project terminates including methods of accomplishment and timing and
13 how rehabilitation of the site may affect future uses of the property and surrounding areas, (ii) a
14 detailed site plan showing the rehabilitation proposal including new contouring, (iii) a soil
15 salvage plan and, if refill is proposed, the sources thereof, (iv) a schedule to accomplish the
16 rehabilitation work, and if applicable the phases thereof, (v) the disposition of any equipment or
17 structures, (vi) the security to be provided by the applicant to the County to assure performance
18 of the obligations under the rehabilitation plan.

19
20
21 Q. "Safety Action Plan" means a written plan which provides details of all project
22 safety requirements, including those needed to protect the public and surrounding properties. It
23 shall also provide information on which entity or entities will be responsible for implementing
24 the safety requirements for the project, how such responsibility will be shared, and for each such
25 entity provide an organizational chart detailing the job responsibilities of each position shown.
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13.100.040 LANDS SUBJECT TO CHAPTER

This Chapter shall be applicable to all unincorporated-area lands in the San Joaquin Valley floor of the County of Madera which overlay the Madera, Delta-Mendota and Chowchilla Groundwater Basins as delineated by the State Department of Water Resources and which are located outside of the boundaries of (1) a Local Water Agency or (2) an incorporated city. If a portion of a Groundwater Banking project (or other project to which this Chapter applies) lies within such an Agency or city, and a portion lies outside the boundaries of such an Agency or city, then this Chapter shall apply to that portion that lies outside the boundaries of such an Agency or city, and such Agency or city shall have full authority as to that portion that lies within the boundaries of that Agency or city.

SECTION 13.100.050 PERMITS REQUIRED FOR EXPORTATION OF GROUNDWATER BEYOND COUNTY BOUNDARIES, FOR GROUNDWATER BANKING, AND/OR FOR IMPORTATION OF FOREIGN WATER FOR PURPOSES OF GROUNDWATER BANKING, TO AREAS OF MADERA COUNTY WHICH ARE OUTSIDE OF LOCAL WATER AGENCIES THAT DELIVER WATER TO LANDS WITHIN THEIR BOUNDARIES.

A. Except as otherwise provided in this Chapter, no person shall engage in (1) the Exportation of Groundwater, (2) Groundwater Banking, (3) importation of Foreign Water, for purposes of Groundwater Banking, or (4) any combination of these activities, on or under land subject to this Chapter without first obtaining a permit to do so pursuant to the terms and procedures of this Chapter.

18 B. While engaging in their normal and/or historical operation of serving their
2 constituents, Local Water Agencies are specifically exempted from the requirements of
3 Paragraph A. above, with respect to such operations.
4

5 C. A single permit may be issued under this Chapter for one or more of the activities
6 listed in Paragraph A. above, provided that the permit holder shall be authorized to engage only
7 in those activities or combination of activities specifically authorized by the permit. A permit
8 that authorizes the importation of Foreign Water shall be limited to importation from the sources
9 identified and any importation from other sources is prohibited unless a new or amended permit
10 is granted for such importation.
11

12 SECTION 13.100.060 PERMITTING PROCESS

13 A. APPLICATION FOR PERMIT: Applications for permits under this Chapter shall
14 be made to the County Engineer on forms provided by the County Engineer and shall contain all
15 information and reports required therein. An Application shall be accompanied by a
16 hydrogeologic report ("Report") and Project Plans prepared at the applicant's expense by a
17 qualified California Registered Civil Engineer and a California Certified Hydrogeologist, versed
18 in geologic, hydrogeologic, and hydrologic investigations, which describes hydrogeologic
19 conditions at and in the vicinity of the project site as well as details regarding the proposed
20 project. The Report and Project Plans shall include detailed Plans and Specifications of all
21 project facilities. The Report and Project Plans shall contain the certification stamps of the
22 California Registered Civil Engineer and the California Certified Hydrogeologist responsible for
23 their preparation. The Report and Project Plans shall comply with all requirements, and shall be
24 in such format(s), as may be established and/or modified from time to time by the County
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Engineer, and shall include, but not be limited to, the following items as deemed applicable by the County Engineer:

1. The sources of all water to be exported.
2. The quantity and quality of all water proposed to be exported.
3. The locations to which and purposes for which all water is to be exported, including the reasonable and beneficial uses to which the water is to be put.
4. The geologic and hydrologic properties of the aquifers from which all extraction will be made and/or into which recharge will occur and from which extraction will be made, including possibilities or likelihood of subsidence problems.
5. Percolation tests to determine the ability of the aquifer(s) to recharge.
6. An investigation of the vadose zone that evaluates the geologic and hydrologic properties of the soils and subsurface sediments above the water table (including but not limited to clay layers and their effect on percolation), storage capacity, and soil chemistry (including but not limited to the potential for leaching of soil constituents or impacts to vadose zone soils from imported water).
7. The location, size, spacing and depths of all extraction wells.
8. Migration of Groundwater from surrounding locations and anticipated changes in Groundwater migration as a result of the project.
9. The effect on surrounding lands and their Groundwater supplies, including but not limited to impacts on Groundwater levels and flows, Groundwater quality and quantity, and surface water/Groundwater interactions and the water balance of potentially affected areas.
10. The location, plans, and specifications of the proposed project.

11. The quantity of all water proposed to be imported, and the quality standards thereof, including potential for contamination or degradation problems and/or compatibility problems with the receiving waters or vadose zone soils.
12. The quality and quantity of all Groundwater to be extracted.
13. Design of spreading areas.
14. The methods of placement and storage of the water.
15. The sources of all water to be imported.
16. The quantity and quality of all water proposed to be imported.
17. The manner in which all water is to be conveyed to the Groundwater Banking facility, including the specific location of all conveyance facilities, and copies of all permits and agreements showing consent for the use of such conveyance facilities (provided, however, that any consents that may not be granted without an EIR under the California Environmental Quality Act or an EIS under the National Environmental Protection Act may be provided after compliance with such requirements provided that in all events such consents shall be provided within 60 days after the EIR required under Paragraph C. below is certified).
18. The physical, and where applicable the geologic and hydrologic, properties of all conveyance facilities, including possibilities or likelihood of contamination or degradation problems.
19. The effect on lands surrounding or neighboring all conveyance facilities and on their Groundwater or surface water supplies.
20. The effect on all other water supplies into which all proposed Foreign Water may be commingled while being conveyed, such as in a pool or reservoir.

21. The applicant's Damage Prevention Plan.
22. The applicant's Emergency Action Plan.
23. The applicant's Operations and Maintenance Plan.
24. The applicant's Project Monitoring Plan.
25. The applicant's Project Water Measurement and Water Loss Accountability Plan.
26. The applicant's Safety Action Plan.
27. The applicant's Rehabilitation Plan.
28. Such other matters as the County Engineer may require in order to properly evaluate the project and its potential impacts.
29. An agreement ("Reimbursement Agreement"), in the form as may be established and/or modified from time to time by the County Engineer, executed by the applicant agreeing to reimburse the County for all consultant fees and other costs as provided in Paragraph B. below.
30. A letter of credit, bond, or other form of security, as specified by, and in such form and amount as shall be required by, the County Engineer to secure the reimbursement of costs and expenses provided for in the Reimbursement Agreement.

All technical interpretations, analyses and/or conclusions shall be accompanied by all supporting data used in connection therewith. The applicant shall provide as many copies of the Application, Report, and other information submitted as may be requested by the County Engineer.

The Application shall not be deemed received by the County until each of the foregoing items is provided.

1 **B. PAYMENT OF FEES AND REIMBURSEMENT OF COUNTY**

2 **CONSULTANT AND OTHER COSTS:** The applicant at the time of filing shall pay such fees
3 as are or may be established and/or modified by resolution of the Board for processing the
4 application and the giving and publication of required notices. The applicant shall also reimburse
5 the County for all fees and costs of engineering, hydrogeological, legal, and other consultants
6 engaged by the County for the purpose of assisting the County in reviewing, evaluating and
7 processing the Application, and the fees and costs for any environmental investigations, reviews
8 and reports done by or on behalf of the County in connection with the preparation of the EIR or
9 otherwise in compliance with the California Environmental Quality Act.
10

11 C. **ENVIRONMENTAL IMPACT REPORT:** An Application for a permit under this
12 Chapter is deemed to be a "project" under the California Environmental Quality Act ("CEQA")
13 and its implementing regulations ("CEQA Guidelines"). In order to ensure that decision-makers
14 have sufficient information on the potential impacts of such a project, the preparation and
15 certification of an Environmental Impact Report ("EIR") is hereby required for each such project
16 application. The EIR must conform to CEQA, CEQA Guidelines, and all County requirements.
17 The EIR shall be prepared in accordance with the County's CEQA implementation procedures
18 and the County shall be the lead agency for the preparation thereof. As set forth in Paragraph B.
19 above, the fees and costs incurred in connection with the preparation of the EIR shall be paid by
20 the applicant.
21

22 D. **ADDITIONAL STUDIES AND REQUIREMENTS:** If, after accepting the
23 Application referred to in Paragraph A. of this Section 13.100.060, above, the County Engineer
24 or the County Planning Director desires more information in order to comply with the
25 requirements of the California Environmental Quality Act, he or she may require the applicant to
26

1 provide that information including but not limited to the preparation by or on behalf of applicant
2 at applicant's expense, of any additional geologic, hydrogeologic, or hydrologic studies, or other
3 information or studies, that he or she deems reasonably necessary to obtain information needed
4 in order to make a recommendation on the application. Furthermore, at any time after accepting
5 the Application the County Engineer may, in the course of processing the Application, require
6 the applicant to clarify, amplify, correct, or otherwise supplement the information required for
7 the Application. At any time and from time to time, the County Engineer may review the
8 application with other potentially affected County Departments, with the staff of applicable state
9 and federal agencies and with all local agencies and with the Madera County Water Oversight
10 Committee.

13 E. REVIEW OF APPLICATION: Copies of the Application, Report, Environmental
14 Impact Report, and any additional studies and other information required under Paragraph D. of
15 this Section 13.100.060, above, shall be forwarded by the County Engineer to the County
16 Environmental Health Department, and to other affected County departments, including, but not
17 limited to, the Agricultural Commissioner and Planning Director, and other permitting agencies,
18 for review and comments. The County Engineer shall coordinate his or her review of the project,
19 to the extent practicable, with other permitting agencies having jurisdiction over any aspect of
20 the project. After all reviews have been made, and all comments have been received, the County
21 Engineer shall prepare a written report with all comments attached thereto (the "County
22 Engineer's Report"), in which he or she either shall recommend denial of the permit, or granting
23 the permit. Any recommendation to grant the permit shall also contain any recommended
24 conditions for the project and the permit. The County Engineer's Report also shall include
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1 recommendations from the Planning Director concerning the adequacy of the EIR. All

2 documents shall be filed with the Clerk of the Board.

3 F. NOTICE TO LANDOWNERS: Upon the filing of an application with the
4 County Engineer, the County Engineer shall give written notice to all owners of lands located
5 within six miles of the exterior boundaries of the proposed project site, setting forth the name of
6 the applicant, a description of the project, a description or map of the land involved, and a
7 statement that all documents submitted in connection with the application are public records
8 subject to inspection at the office of the County Engineer. In the case of an application for a
9 permit to export Groundwater, the project site shall mean the entire landholding (whether
10 consisting of one or more parcels in common ownership) upon which any well or other
11 extraction facility is to be located, and all conveyance facilities to be used to convey such water
12 from the extraction site to the Madera County border. In the case of the importation of Foreign
13 Water for purpose of Groundwater Banking, the project site consists of both the Groundwater
14 Banking project site, and all conveyance facilities to be used to convey such imported water from
15 the Madera County border to the Groundwater Banking project site. In addition thereto, the
16 County Engineer shall cause to be published pursuant to Government Code § § 6060 and 6061.3
17 a notice that the application has been filed, setting forth the name of the applicant, a description
18 of the project, a description or map of the land involved, and a statement that all documents
19 submitted in connection with the application are public records subject to inspection at the office
20 of the County Engineer. The County Engineer shall retain one copy of the application
21 documents, EIR, and any comments or reports thereon and make them available for public
22 inspection and copying in accordance with the Public Records Act.
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G. NOTICED PUBLIC HEARING: No permit shall be issued without a noticed

public hearing before the Board pursuant to Government Code § § 6060 and 6061.3. The notice shall be given by the Clerk of the Board after completion and filing of the County Engineer's Report and the environmental review process. The notice shall specify the time and place of the hearing, a description of the project site (as determined under Paragraph F. above), and a general description of the project, and a statement that any interested person may submit evidence at the hearing. At least fifteen days must elapse between filing the documents with the Clerk of the Board and the date of the hearing.

H. PROCEDURES FOR CONDUCTING HEARING: At the hearing, the Application, Report, Environmental Impact Report, additional submittals, comments from County Departments and State, Regional, or Federal permitting agencies, and the County Engineer's Report shall become evidence. The applicant and members of the public, or their representatives, may testify and introduce evidence in favor of, or in opposition to, the project.

I. FINDINGS REQUIRED FOR PERMIT APPROVAL OR DENIAL BY THE BOARD: The permit may only be approved if the Madera County Board finds that the proposed project will not have detrimental impacts on Madera County. For this purpose, a finding of no detrimental impact shall include but not be limited to the following specific findings:

1. The project will not cause or increase an overdraft on parts or all of the Groundwater basins underlying the County.
2. The project will not adversely affect the ability of other Groundwater users to use, store, recharge, or transmit Groundwater within any aquifer(s) underlying the County (for example by utilizing storage that might otherwise be subject to

1. natural or passive recharge and thus depriving other Groundwater users of their
2. use of the aquifer and the Groundwater derived therefrom).

3. The project will not adversely affect the reasonable and beneficial uses of
4. Groundwater by other Groundwater users within Madera County.
4. The project will not result in, expand, or exacerbate degradation of the quality or
5. quantity of surface or Groundwater within Madera County, or Groundwater basins
6. and aquifers within Madera County.
5. The project will not result in injury to a water replenishment, storage, restoration,
7. or conveyance project or facility;
6. The project will not adversely affect the economy or environment of the County.
7. The project will not result in land subsidence, uncontrolled movement of
8. contaminated or poor quality Groundwater, or increased soil degradation.
8. The project will not adversely affect the surface or subsurface of neighboring or
9. nearby lands, or the trees, vines, or crops growing or to be grown thereon.
9. The project will not adversely affect the storage or recharge capability on adjacent
10. lands where passive recharge may take place.
10. The project will not adversely affect the existing qualities of any of the
11. underground aquifers within Madera County. Due to the risk of Groundwater
12. contamination from direct injection of water into an underground aquifer, no
13. permit may be issued to any project that will or may use direct injection.

14. If the Board determines that one or more of the findings required by this Section cannot
15. be made, even after all reasonable mitigation measures are considered, then the Board shall deny

1 the permit application. The basis for any such denial shall be reflected in the Board's official
2 record of proceedings.

3 J. DECISION AFTER HEARING. At the conclusion of the hearing, the Board shall
4 approve the application and grant the permit if the Board makes the findings set forth in
5 Paragraph I. of this Section 13.100.060, above, subject to the terms and provisions authorized in
6 Paragraph K. of this Section 13.100.060, below. If the Board is unable to make the findings set
7 forth in said Paragraph I. then the application shall be denied and no permit shall be issued. The
8 Board shall direct that written findings be prepared in conformity with its decision and shall
9 adopt said findings when prepared.

10 K. TERMS AND CONDITIONS OF PERMIT: If an application is approved, the
11 Board may impose such terms and conditions and mitigation measures thereon as the Board
12 deems necessary to prevent adverse effects on the aquifer(s); the quality and quantity of the
13 Groundwater supply, adjacent or neighboring lands, or the environment, including a reasonable
14 time limit on the life of the permit and a requirement that the applicant provide such periodic
15 reports to the County as the County Engineer may reasonably require. The terms and conditions
16 of any permit shall also include the following:

- 17 1. All reports, data, and information to be provided by the permit holder
18 shall be certified as true, accurate, and complete. If the County Engineer
19 determines, at any time, that reports, data, and/or information provided
20 as part of the application, or provided to the County pursuant to the
21 terms and conditions of the permit, were not true, accurate, and
22 complete, or have been altered so as to misrepresent project impacts, the
23 County may, following notice and hearing, revoke the permit.

1 2. In addition to the monitoring and reporting requirements approved in
2 the Monitoring Plan, the County Engineer or other County
3 representatives may, at any reasonable time, from time to time, and with
4 or without notice, enter the project site to inspect monitoring
5 procedures, equipment, data collection methodologies and frequencies,
6 and other monitoring components. The County Engineer or County
7 representatives shall also conduct such independent monitoring and
8 other activities as are necessary to reasonably verify compliance with
9 the terms and conditions of the permit, including without limitation the
10 Monitoring Plan.
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13 3. Upon request of the County Engineer, the applicant shall deposit with
14 the County Engineer such amounts as may be requested from time to
15 time in order to compensate the County for any onsite monitoring
16 and/or inspection activities, including ongoing water sampling, that the
17 County Engineer may undertake or cause to be undertaken, whether by
18 County employees or by contractors engaged by, and who shall report
19 to, the County Engineer.
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22 4. For a Groundwater Banking project, the permit may contain any
23 appropriate limitations on extraction of banked water, whether
24 characterized by a maximum ratio of permitted extractions to deposits
25 or otherwise.
26

27 L. DECISION OF BOARD FINAL: The decision of the Board in any matter set
28 forth herein, other than criminal penalties, shall be final upon its adoption of written findings.

Any action of the County Engineer that under the express provisions of this Chapter requires a determination of what is "reasonable" shall be made in the first instance by such Engineer, and if appealed to the Board, the decision of the Board likewise shall be final.

RE-APPLICATION AFTER BOARD DENIAL: Re-application for a permit that has been denied by the Board may not be filed until one year after the date of denial.

INSPECTIONS; NOTICE BY PERMIT HOLDER OF VIOLATIONS: If an application is approved and a permit granted, then the applicant's acceptance of the permit shall constitute the applicant's consent for the County Engineer, or his or her representatives, at any reasonable time, and from time to time, and with or without notice, to enter the project site and make such observations and measurements as are deemed necessary to assure that the project is being carried out under the terms of the permit. The permit holder shall notify the County Engineer in writing within 48 hours of any violation of the terms of any permit (including any permit conditions).

PERMIT REVIEWS:

1. The County Engineer, or his or her designee, periodically shall review the operation of the project and its compliance with all applicable terms, conditions, and mitigation measures of the permit. This review, which shall be conducted at the expense of the permit holder, shall be conducted at such intervals as the Board shall establish as a part of the permit's terms, conditions and mitigation measures, but in no case shall the intervals exceed five (5) years in length. Such periodic review shall be conducted in accordance with the procedures adopted therefore by the Board.

2. During each periodic review, the permit holder shall be required to demonstrate

compliance with the terms, conditions, and mitigation measures of the permit. By acceptance of the permit, the permit holder agrees to furnish such reasonable evidence of compliance as the County Engineer (or his or her designee), in the exercise of reasonable discretion, may require.

3. In addition to the periodic review, the Board may at any time initiate a review of the permit holder's compliance with the terms, conditions, and mitigation measures applicable to the permit by giving written notice to the permit holder. Within thirty (30) days following receipt of such notice, the permit holder shall submit evidence to the County Engineer (or his or her designee) of the permit holder's compliance with the terms, conditions, and mitigation measures applicable to the permit.

P. REVOCATION OR MODIFICATION OF PERMIT: Upon receiving knowledge of an alleged violation of the Ordinance, and/or the terms of any Permit (including any Permit conditions), the County will provide written notice of the alleged violation to the permit holder or other allegedly violating party. The notice shall detail the alleged violation and require the permit holder to cease and desist immediately upon receipt of the notice from continuing the alleged violations or within five (5) working days demonstrate to the County Engineer that the alleged violating activities in fact do not violate the Ordinance. No civil fines, as set forth below, shall accrue during this notification process. Any violation of the terms, conditions, and/or mitigation measures of the permit not corrected during such five (5) day period will constitute grounds for revocation of the permit after a duly noticed public hearing thereon held by the Board in the manner described in the preceding Paragraphs; provided that nothing in this

Paragraph is intended to deprive the Board of its authority to grant one or more extensions of time within which the permit holder shall be required to cure the violation.

Any change in circumstances which shows that the project as operated may result in any of the kinds of detrimental impacts referred to in Paragraph I. of section 13.100.060 above constitutes independent grounds for revocation of the project's permit, or modification thereof as next set forth.

In lieu of revocation of the permit, the Board may, after a duly noticed public hearing held in the manner described in the preceding paragraphs, modify the permit to include such different, and/or additional, terms, conditions, and/or mitigation measures as the Board determines are necessary and appropriate in light of the change in circumstances then existing.

"Change in circumstances" may include, but is not necessarily limited to, changes in the physical characteristics of the project site or surrounding properties, or changes in applicable statutes or regulations affecting the project.

Q. JUDICIAL REVIEW: Any judicial action to set aside, annul, or vacate any decision or action taken by the Board pursuant to this Chapter shall be filed pursuant to California Code of Civil Procedure section 1094.5 and within the time limits prescribed in California Code of Civil Procedure section 1094.6.

SECTION 13.100.070 PENALTIES FOR VIOLATION:

The County may elect to proceed with any or all of the following remedies for violation of this Chapter, in addition to all other remedies provided in this Chapter or provided by law:

- A. Civil action against the violator, including injunctive relief.
- B. Any person or entity who violates any provision of this Chapter or any term or condition of any permit issued under this Chapter, shall be subject to a civil fine up to \$5,000.00

1 for each separate violation. A person or entity shall be deemed to have committed a separate
2 violation for each and every day or portion thereof during which any such violation is committed,
3 continued, or permitted as well as for each and every separate Groundwater well within or in
4 connection with which any such violations are committed, continued or permitted.
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6 C. Any person who violates any provision of this Chapter, or the terms and/or the
7 conditions of any permit issued pursuant to this Chapter, with intent to do so, shall be guilty of a
8 misdemeanor, punishable by fine not exceeding \$1,000.00 per violation, or imprisonment not
9 exceeding six months, or by both such fine and imprisonment; and any person shall be deemed
10 guilty of a separate offense for each and every day, or portion thereof, during which any such
11 violation is committed, continued, or permitted; and for each such day shall be subject to the
12 same punishment as for the original offense.
13

14 13.100.080 SEVERABILITY:

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16 If any section, subsection, sentence, clause or phrase of this Chapter is for any reason
17 held to be illegal, invalid or unconstitutional by the decision of any court of competent
18 jurisdiction, such decision shall not affect the validity of the remaining portions hereof. The
19 Board hereby declares it would have passed this Chapter and each section, subsection, sentence,
20 clause or phrase hereof, irrespective of the fact that any one or more sections, subsections,
21 sentences, clauses or phrases are declared illegal, invalid or unconstitutional.
22

23 SECTION 2:

24 This Ordinance shall take effect and be in force thirty (30) days after its adoption.
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26 * * * * *

27 The foregoing Ordinance was adopted this 10th day of April 2001, by the
28 following vote:

1 Supervisor Bigelow voted: *Yes*

2 Supervisor Moss voted: *Yes*

3 Supervisor Dominici voted: *Yes*

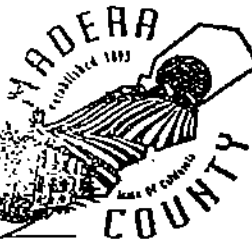
4 Supervisor Silva voted: *Yes*

5 Supervisor Gilbert voted: *Yes*

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8 *[Signature]*
9 Chairman, Board of Supervisors

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11 ATTEST:

12 *[Signature]*
13 Clerk, Board of Supervisors



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16 Approved as to Legal Form:

17 COUNTY COUNSEL

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19 By *[Signature]*
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TODD ENGINEERS

GROUNDWATER • WATER RESOURCES • HYDROGEOLOGY • ENVIRONMENTAL ENGINEERING

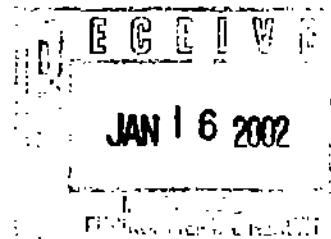
January 14, 2002

To: Distribution List
From: Phyllis Stanin
Re: Transmittal of Final Draft
AB3030 Groundwater Management Plan
County of Madera

Todd Engineers is pleased to transmit the Final Draft AB3030 Groundwater Management Plan to the Water Oversight Committee and Madera County Board of Supervisors. The Final Draft incorporates comments from both the Committee and County staff who reviewed the previous drafts.

The Plan is being distributed to Committee members and the County office of the Board of Supervisors. Board representatives on the committee will receive their copy from the County office. The Final Draft will be made available to the public for review. After receiving comments from the public, the Board of Supervisors will consider the Plan for adoption.

We commend the cooperative efforts of Committee members, County staff, and the Board for developing this plan to actively manage their groundwater resources for the future.



cc: Wayne

Distribution List

Board of Supervisors, County of Madera
209 W. Yosemite Avenue
Madera, CA 93637
10 copies including committee members:
Frank Bigelow
Vern Moss
Doug Nelson

Denis Prosperi
Madera Ranch Project Oversight Committee
22307 Avenue 13
Madera, CA 93638

George Andrew
Tim Da Silva
Gravelly Ford Water District
1836 West 5th Street
Madera, CA 93637

Roy Catania
Aliso Water District
10302 Ave. 7 1/2
Firebaugh, CA 93622

Loren Freeman
Mosquito/Vector Control District
900 North Gateway
Madera, CA 93637

Ron Harris
Glenn Igo
City of Chowchilla
145 West Robertson Blvd
Chowchilla, CA 93610

Randy Houk
Columbia Canal Co.
6770 Ave. 7 1/2
Firebaugh, CA 93622

Michele Lasgoity
Madera Ranch Project Oversight Committee
6410 Road 23
Madera, CA 93637

Phillip Pierre
Root Creek Water District
7359 North Warren
Fresno, CA 93711

Ron Pistoressi
Steve Ottemoeller
Madera Irrigation District
12152 Road 28 1/4
Madera, CA 93637

Claude Rust
Coarsegold Resource Conservation District
32632 Bluff Drive
Coarsegold, CA 93614

Kole Upton
Chowchilla Water District
P.O. Box 905
Chowchilla, CA 93610

Michael Kim
County of Madera – Engineering Department
135 W. Yosemite Ave.
Madera, CA 93637

Leonard Garoupa
County of Madera – Planning Department
135 West Yosemite Ave.
Madera, CA 93637

Kenneth Fransen
Bolen, Fransen & Boostrom, LLP
345 Pollasky Avenue
Clovis, CA 93612

Jill Nishi
Wayne Fox
Madera County – Environmental Health
216 W. 6th Street
Madera, CA 93637

