FINAL ENVIRONMENTAL ASSESSMENT (12-023)

ANNUAL EXCHANGE AT THE MENDOTA POOL BETWEEN THE BUREAU OF RECLAMATION AND DONALD J. PERACCHI AND AFFILIATES FOR UP TO 3,600 ACRE-FEET OF FARMERS WATER DISTRICT'S GROUNDWATER FOR CENTRAL VALLEY PROJECT WATER THROUGH FEBRUARY 2015

Appendix D
Mendota Pool Group Pumping and Monitoring Program: 2010 Annual Report

June 2012

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Prepared for

San Joaquin River Exchange Contractors Water Authority,
Paramount Farming Company, and
Mendota Pool Group

Prepared by

Luhdorff and Scalmanini, Consulting Engineers
Woodland, CA

Kenneth D. Schmidt and Associates
Fresno, CA

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APPENDICES

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List of Abbreviations

af	acre-feet
Agreement	Settlement Agreement for Mendota Pool Transfer Pumping Project
Bank	Meyers Farm Water Bank
CCC	Columbia Canal Company
CCID	Central California Irrigation District
CDFG	California Department of Fish and Game
cfs	cubic feet per second
CGH	Coelho/Gardner/Hansen
CVP	Central Valley Project
CVRWQCB	Central Valley Regional Water Quality Control Board
DMC	Delta-Mendota Canal
DWR	California Department of Water Resources
EC	electrical conductivity
EIS	Environmental Impact Statement
FCWD	Firebaugh Canal Water District
FWD	Farmers Water District
JID	James Irrigation District
KDSA	Kenneth D. Schmidt and Associates
LSCE	Luhdorff and Scalmanini, Consulting Engineers
μg/L	micrograms per liter
μmhos/cm	micromhos per centimeter at 25 ^{o}C
MDL	method detection limit
mg/L	milligrams per liter
MPG	Mendota Pool Group
MRL	method reporting limit
MWA	Mendota Wildlife Area
NLF	Newhall Land and Farming
PFC	Paramount Farming Corporation
ROD	Record of Decision
SLCC	San Luis Canal Company
SLDMWA	San Luis and Delta-Mendota Water Authority
SLWD	San Luis Water District
SJR	San Joaquin River
SJREC	San Joaquin River Exchange Contractors Water Authority
SJRRP	San Joaquin River Restoration Program
TDS	total dissolved solids
TOC	total organic carbon
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WQO	Water Quality Objective
WWD	Westlands Water District

I. Introduction

This annual report was prepared on behalf of the Mendota Pool Group (MPG) in compliance with the *Agreement for Mendota Pool Transfer Pumping Project* (Agreement) and the Environmental Impact Statement (EIS) entitled *Mendota Pool 10-Year Exchange Agreements*. (U.S. Bureau of Reclamation [USBR], 2005a). The purpose of the report is to identify effects of transfer pumping on non-MPG wells and natural resources in the general area around the City of Mendota in Fresno and Madera counties, California (**Figure 1-1**). Data collected as part of the 2010 MPG monitoring program are presented in this report and discussed in the context of the historical data record. The original study area was established in 1999 and encompassed the vicinity around the Mendota Pool south of Avenue 5 and west of the Chowchilla Bypass (**Figure 1-2**). All wells owned by the MPG are located within the original study area along (and mostly west of) the Fresno Slough branch of the Mendota Pool, between the Firebaugh Intake Canal and Whitesbridge Road, and south of the San Joaquin River (SJR) branch of the Pool in Farmers Water District (FWD).

Some of the water pumped by the MPG wells is used to irrigate "adjacent" lands (overlying lands and lands near the Mendota Pool that are irrigated with water diverted directly from the Pool). During some years, the MPG also pumps water for transfer, and the majority of this water is exchanged with USBR and used to irrigate lands owned by MPG members in Westlands Water District (WWD) and San Luis Water District (SLWD).

Background

MPG transfer pumping began in 1989 to make up for some of the cutbacks in deliveries of Central Valley Project (CVP) and State Water Project surface water during the drought. The period of greatest MPG transfer pumping was 1991-1992. There was very little MPG transfer pumping between 1995 and 1999, except for a four-month period in 1997.

A pilot pumping and monitoring program was undertaken in 1999 to determine the impacts of MPG transfer pumping on water users within the San Joaquin River Exchange Contractors Water Authority (SJREC) and Newhall Land and Farming Company (NLF) service areas. NLF's New Columbia Ranch was purchased by Paramount Farming Company (PFC) of Bakersfield on December 1, 2005. The 1999 program was developed and jointly evaluated by Luhdorff and Scalmanini, Consulting Engineers (LSCE) of Woodland, consultants to the MPG, and Kenneth D. Schmidt and Associates (KDSA) of Fresno, consultants to the SJREC and NLF. Extensive monitoring of pumpage, water levels, water quality, and compaction was initiated in 1999 and continues to the present. The impacts observed during the 1999 program were presented in the Phase I report entitled *Results of 1999 Test Pumping Program for Mendota Pool Group Wells* (KDSA and LSCE, 2000a).

A similar transfer-pumping program was conducted in 2000, and the results were summarized in *Mendota Pool Group Pumping and Monitoring Program: 2000 Annual Report* (LSCE and KDSA, 2001). The data collected during the 1999 and 2000 pumping programs were used to evaluate the long-term impacts of MPG transfer pumping on the SJREC and NLF service areas and to develop mitigation measures to address potentially significant impacts. The impacts and recommended mitigation measures were documented in the Phase II report entitled *Long-Term Impacts of Transfer Pumping by the Mendota Pool Group* (KDSA and LSCE, 2000b). This report also included criteria for an agreement between the MPG, the SJREC, and NLF on a 10-year MPG pumping program. This agreement, entitled *Agreement for Mendota Pool Transfer Pumping Project* (Agreement), was signed by all parties in May 2001, with an effective date of January 1, 2001. Annual MPG transfer pumping of up to 31,600 acre-feet (af) in six "normal" years and up to 40,000 af in two "dry" years is permitted under the terms of this agreement. Two out of the 10 years must be classified as "wet" years in which no transfer pumping would occur. The Agreement includes requirements for a detailed monitoring program and other provisions to ensure that MPG transfer pumping will not cause significant increases in surface-water salinity, groundwater basin overdraft, or land subsidence.

The 2001 transfer-pumping program was the first conducted under the provisions of the Agreement. The most significant change to the pumping program for 2001 was that deep-zone transfer pumping was minimized between July 1 and September 15. The 2001 MPG transfer pumpage was approximately 27,400 af, and an additional 13,300 af were pumped by the MPG to irrigate adjacent lands. Annual reports are required under the terms of the Agreement, and the 2001 annual report was entitled *Mendota Pool Group Pumping and Monitoring Program: 2001 Annual Report* (LSCE and KDSA, 2002).

The 2002 transfer-pumping program was the second conducted under the provisions of the Agreement. The most significant change to the pumping program for 2002 was that both shallow and deep transfer pumping were reduced from the 2001 levels, due primarily to residual drawdowns that were observed in many shallow and deep wells in 2001. Transfer pumping was conducted between May 1 and September 30. The total volume of MPG transfer pumpage in 2002 was about 12,500 af, and MPG pumpage for adjacent use was about 15,900 af. The 2002 annual report was entitled *Mendota Pool Group Pumping and Monitoring Program: 2002 Annual Report* (LSCE and KDSA, 2003).

The MPG classified 2003 as a "wet" year, and no transfer pumping was conducted. MPG pumping in 2003 was limited to approximately 14,200 af for adjacent use. The results of the 2003 monitoring program are summarized in an annual report entitled *Mendota Pool Group Pumping and Monitoring Program: 2003 Annual Report* (LSCE and KDSA, 2004). In addition to conducting monitoring activities in 2003, consultants to the MPG prepared an Environmental Impact Statement (EIS) to allow the MPG to obtain exchange agreements with USBR for the 10-year transfer pumping program. The Draft EIS was released in May 2003, and the Final EIS was approved in March 2005 (USBR, 2005a). The Record of Decision (ROD) for the project was signed on March 30, 2005 (USBR, 2005b).

The MPG also classified 2004 and 2005 as "wet" years, and no transfer pumping was conducted. MPG pumping in 2004 was limited to about 12,900 af for adjacent use. The results of the 2004 monitoring program are summarized in an annual report entitled *Mendota Pool Group Pumping and Monitoring Program: 2004 Annual Report* (LSCE and KDSA, 2005). MPG pumping in 2005 was limited to about 10,000 af for adjacent use. The results of the 2005 monitoring program are summarized in an annual report entitled *Mendota Pool Group Pumping and Monitoring Program: 2005 Annual Report* (LSCE and KDSA, 2006). NLF's New Columbia Ranch was purchased by PFC on December 1, 2005.

The MPG classified 2006 as a "normal" year and planned to pump about 23,000 af for transfer, along with about 14,000 af for adjacent use. However, due to the extended period of San Joaquin and Kings River flood releases, which continued until mid-July, the planned transfer pumping program did not occur, and pumpage for adjacent use was limited to about 6,400 af. The results of the 2006 monitoring program are summarized in an annual report entitled *Mendota Pool Group Pumping and Monitoring Program: 2006 Annual Report* (LSCE and KDSA, 2007).

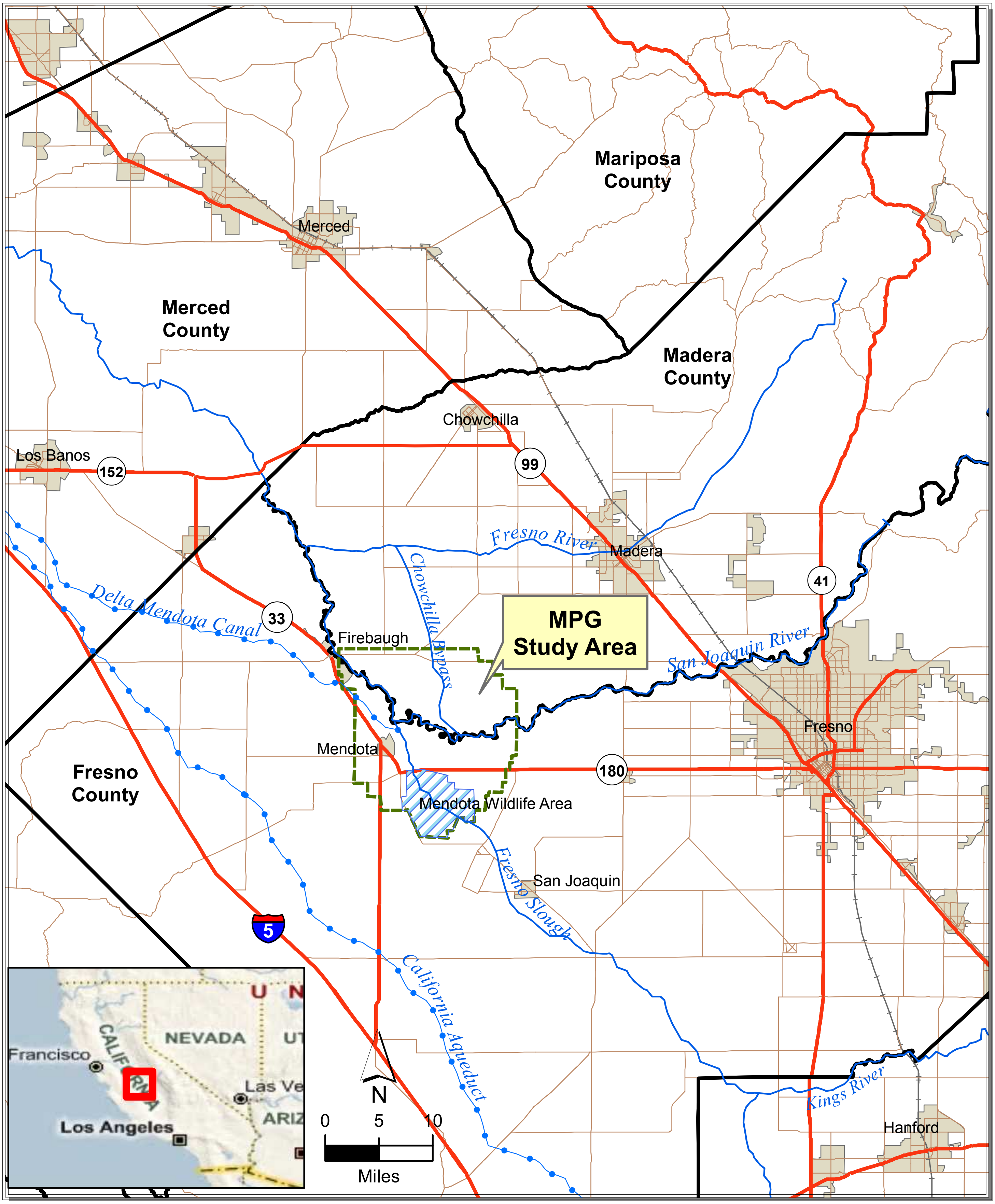
The 2007 transfer pumping program was the third conducted under the provisions of the Agreement. Transfer pumping was conducted between April 1 and November 30. The total volume of MPG transfer pumpage in 2007 was 22,556 af, and MPG pumpage for adjacent use was 15,463 af. The results of the 2007 monitoring program are summarized in an annual report entitled *Mendota Pool Group Pumping and Monitoring Program: 2007 Annual Report* (LSCE and KDSA, 2008).

The 2008 transfer pumping program was the fourth conducted under the provisions of the Agreement. As in 2007, transfer pumping was conducted between April 1 and November 30. The total volume of MPG transfer pumpage in 2008 was 24,017 af, and MPG pumpage for adjacent use was 11,792 af. The results of the 2008 monitoring program are summarized in an annual report entitled *Mendota Pool Group Pumping and Monitoring Program: 2008 Annual Report* (LSCE and KDSA, 2009).

The 2009 transfer pumping program was the fifth conducted under the provisions of the Agreement. Transfer pumping was conducted between March 9 and November 24. The total volume of MPG transfer pumpage in 2009 was 26,792 af, and MPG pumpage for adjacent use was 10,087 af. The results of the 2009 monitoring program are summarized in an annual report entitled *Mendota Pool Group Pumping and Monitoring Program: 2009 Annual Report* (LSCE and KDSA, 2010).

The 2010 transfer pumping program was the sixth and final to be conducted under the provisions of the Agreement. Transfer pumping was conducted between March 15 and November 30. The MPG planned to pump 26,890 af for transfer and 10,131 af for adjacent use in 2010. The actual pumping program was greatly reduced due to wet conditions and the availability of CVP and other surface water in 2010. The total volume of MPG transfer pumpage in 2010 was 11,865 af, and MPG pumpage for adjacent use was 8,071 af. The results of the 2010 pumping and monitoring program are summarized in this report.

Over the ten-year period of the Agreement, the MPG pumped a total of 125,142 af for transfer. This represents an average of 20,857 afy over the six years that transfer pumping was conducted. MPG pumpage for adjacent use totaled 118,221 af and averaged 11,822 afy during this period.



FILE: C:\Documents and Settings\tnguyen.LSCEDOMAIN\Desktop\Job files\Mendota\gis\Figure 1-1 Location Map.mxd Date: 6/3/2010

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Figure 1-1
Location Map - Mendota Pool Group Pumping and Monitoring Program

LEGEND

Mendota Pool Group Wells:

- Shallow Well
- Unused Shallow Well
- Deep Well
- Unused Deep Well
- Composite Well

Other Production Wells:

- Shallow Well
- Deep Well (Above Corcoran Clay)
- Composite Well (Above and Below Corcoran Clay)
- Perforated Interval Unknown
- Unused Well

Monitoring Wells:

- Shallow Monitoring Well
- Deep Monitoring Well
- Extensometer
- GPS Station

NOTES:

1.) "Shallow" wells are completed above the A-clay (maximum depth = 130'). "Deep" wells are completed below the A-clay.

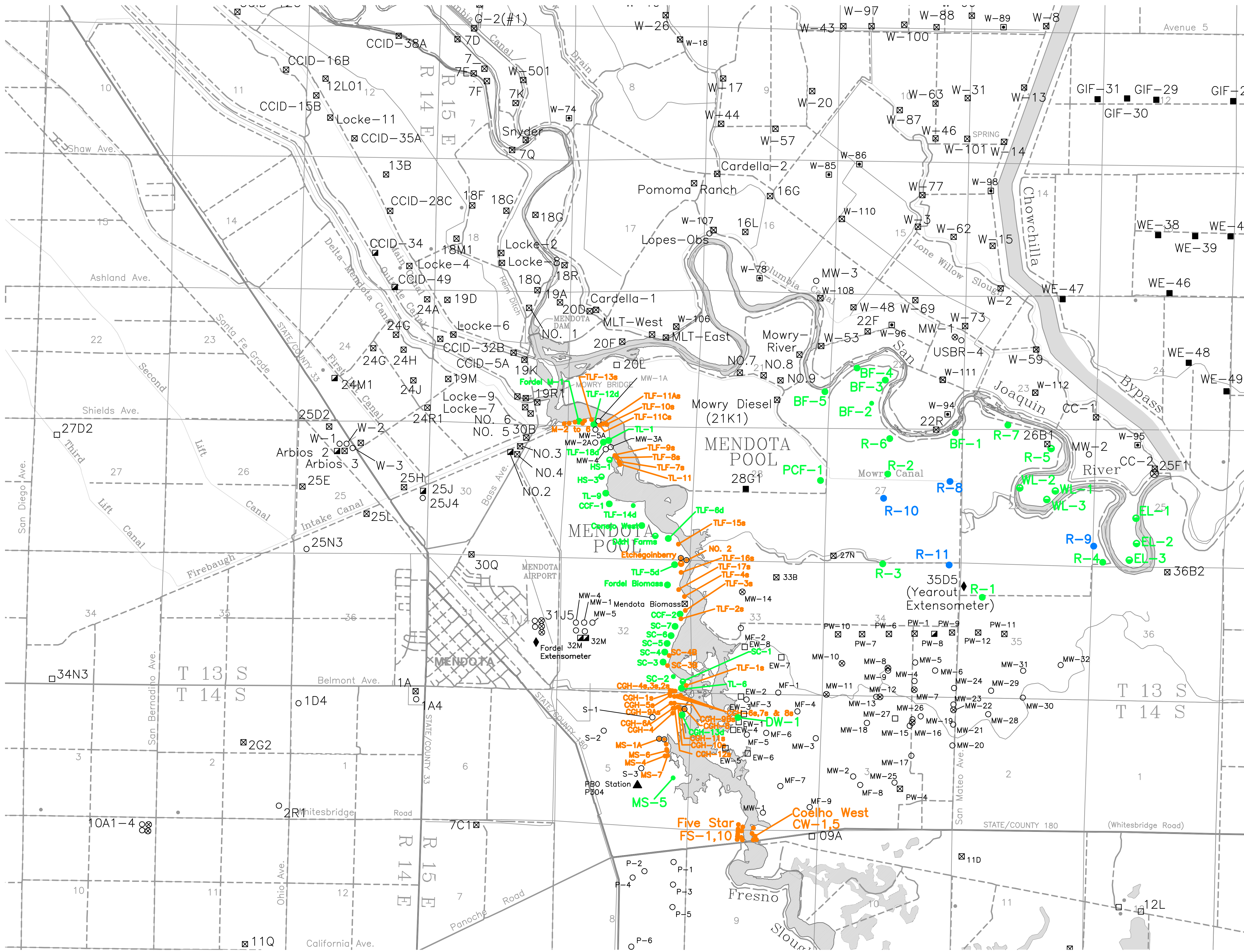

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Figure 1-2
Mendota Pool Group Wells and Other Wells in Original Study Area

II. Monitoring Program

The monitoring program implemented in 2010 (**Table 2-1**) followed the monitoring program set forth in the EIS and is comparable in its scope to the monitoring program conducted in 2009. The monitoring program specifies data collection for the following seven types of data:

1) Pumpage
2) Groundwater Levels
3) Groundwater Quality
4) Surface-Water Flow
5) Surface-Water Quality
6) Sediment Quality
7) Compaction

The original study area was expanded in 2001 to include a radius of at least six miles from the approximate center of the MPG wells in FWD. The evaluation of water-level impacts was extended to the northern and eastern portions of the expanded study area, and the evaluation of surface-water quality impacts was extended to the southern portion of the expanded study area, which includes all of the Mendota Wildlife Area (MWA). Other analyses of pumping impacts, such as groundwater quality and subsidence, remained focused on the original study area.

The monitoring program includes wells owned and/or operated by many entities, including the MPG. Thus, although the MPG collects a large amount of the necessary data, it relies on the cooperation of numerous participants in order to fully accomplish the program objectives. Recognizing that there are different participants in the program, four levels of participation were defined in the EIS to characterize the roles and responsibilities of the various entities:

Level I This level is comprised of the MPG members and encompasses the monitoring activities where the MPG has control over (1) the data being collected, (2) the data quality objectives, and (3) the monitoring frequency. This includes groundwater level and quality monitoring in wells owned by the MPG and the collection of surface-water and sediment samples from the Mendota Pool. The monitoring of the USGS monitoring wells west of the Mendota Airport and the Fordel extensometer are also considered Level I activities because these are located on property owned by one of the MPG members. Level I activities do not include monitoring conducted by the Meyers Farm Water Bank (Bank) and pumpage data collected by the San Luis and Delta-Mendota Water Authority (SLDMWA). Monitoring efforts of the Level I participants are coordinated through the MPG agent and consultants to the MPG.

Level II This level originally consisted of the SJREC and NLF, which were the signatories of the Agreement along with the MPG. PFC has now replaced NLF as one of the signatories of the Agreement. These entities participate in the monitoring program under the terms of the Agreement. The SJREC consists of four entities: Central California Irrigation District (CCID), Columbia Canal Company (CCC), Firebaugh Canal Water District (FCWD), and San Luis

Canal Company (SLCC). These entities are responsible for collection and analysis of groundwater quality samples from wells in their respective service areas and surface-water quality samples from their canal intakes. The SJREC maintains continuous recorders to monitor electrical conductivity (EC) at its canal intakes, and CCID monitors compaction and water levels at the Yearout Ranch extensometer. CCID, CCC, and PFC also provide monthly pumpage data for their wells. These entities grant the MPG access to specific wells, primarily for water-level monitoring purposes. CCID and PFC also conduct water-level monitoring in a number of their own wells. The data quality objectives and monitoring frequency can be coordinated between the MPG and these entities.

Level III This level of participation applies to the various public agencies, including the SLDMWA, USBR, the City of Mendota, the U.S. Geological Survey (USGS), and the Department of Water Resources (DWR), that conduct monitoring programs as part of their regular duties. These agencies generally provide data to the MPG upon request. The data collected, data quality objectives, and monitoring frequencies are set by the respective agencies relative to their requirements. The MPG has no control over monitoring conducted or overseen by these agencies.

Level IV This level includes all other entities in the area not included in the preceding three levels. This includes water districts such as WWD, James Irrigation District (JID), Tranquillity Irrigation District, and Aliso Water District, and private entities such as Spreckels Sugar Co., Covanta Mendota (formerly Mendota Biomass), and Locke Ranch. Participation by these entities in the MPG monitoring program is voluntary. The MPG has regularly requested data from these entities with varying success. In recent years, both Covanta Mendota and Spreckels Sugar Co. have provided all requested data. In certain cases, the MPG has been granted access to non-MPG properties to measure water levels in or collect water-quality samples from specific wells. When samples are collected by the MPG, the MPG would specify the data to be collected and the data quality objectives. The monitoring frequency at these properties depends in part on when access is granted. Otherwise, the MPG has no control over the data collected, data quality objectives, or monitoring frequencies.

Pumpage

Pumpage from the MPG wells along the Fresno Slough branch of the Mendota Pool is metered at the introduction points where water from the MPG wells enters the Pool. The majority of these wells are metered individually, but a number of shallow wells are manifolded together and metered in groups (e.g., the Five Star and Coelho West wells). The SLDMWA typically reads the meters on a weekly basis during the irrigation season and less frequently during the rest of the year. The metered wells include six wells (M-1 through M-6) operated by the City of Mendota (formerly operated by Fordel, Inc.). Wells in FWD are metered individually, and pumpage is monitored on a monthly frequency by FWD. The MPG maintains records to determine whether water from its wells is being pumped for transfer or adjacent use.

Level II participants (the SJREC and PFC) provided monthly data for wells within their service areas. CCID and CCC provided metered pumpage data. SLCC has no wells within the study area, and FCWD has not operated wells within the study area since the early 1990s. Monthly pumpage for most of the PFC wells is now based on flow meter readings. Pumpage for 14 PFC wells without flow meters was estimated based on monthly power records in conjunction with pump efficiency estimates from 2010 pump tests.

The City of Mendota is the only Level III entity that operates water supply wells within the study area, and metered pumpage data for its municipal water supply wells (well Nos. 7, 8, and 9) were supplied on a monthly basis.

Spreckels Sugar Co. and Covanta Mendota were the only Level IV participants west of the Bypass to provide pumpage data for their production wells. As in previous years, 2010 pumpage for Locke Ranch was assumed equal to 2000 pumpage estimates. Pumpage east of the Bypass was assumed equal to 2001 estimates[1].

Groundwater Levels

The primary purpose of the groundwater level monitoring program is to generate the data necessary to evaluate the effects of MPG transfer pumping on groundwater levels. Water-level measurements have been made in a large network of wells in the Mendota area since 1999 in order to determine the water-level impacts caused by MPG transfer pumping. The wells in the monitoring network include water supply wells and monitoring wells that are classified as either shallow (completed above the A-clay or its equivalent depth, i.e., less than 130 feet in depth) or deep (completed below the A-clay but above the Corcoran Clay, i.e., generally in the 200 to 450 foot depth range). Some wells in FWD and PFC that have been classified as deep wells are actually composite wells (completed both above and below the Corcoran Clay). Most of the wells monitored by USBR in the eastern portion of the study area are composite wells. Two of the USGS monitoring wells west of the Fresno Slough (31J6 and 10A3) are completed in the lower aquifer below the Corcoran Clay.

Wells included in the water-level monitoring network are listed in **Table 2-2**, along with the entity responsible for monitoring each well, the participation level, and the monitoring frequency. In 2010, the MPG conducted six rounds of water-level measurements in 66 wells, and compiled groundwater level measurements provided by entities such as PFC, CCID, WWD, and Meyers Farm. Well locations are shown on **Figure 2-1**. In addition to the collection of manual water-level measurements, the MPG operates electronic equipment collecting daily water-level information in USGS monitoring well 31J3 (near the Fordel extensometer). CCID installed electronic water-level recording equipment in the Yearout Ranch extensometer, but this equipment failed in 2004 and has not been replaced.

Groundwater Quality

The purpose of the groundwater quality monitoring program is to generate the data necessary to evaluate changes in groundwater quality that may be caused by MPG transfer pumping and to forecast potential surface-water quality impacts in the Mendota Pool. For these purposes, the MPG collects annual samples from its operational production wells along the Fresno Slough branch of the Pool and in FWD (**Table 2-3**). In 2010, the MPG collected groundwater samples

[1] These pumpage estimates were made based on crop and land use maps and crop demands. A detailed discussion of the estimates is provided in the 2001 Annual Report (LSCE and KDSA, 2002).

in May, and wells with 2010 groundwater quality data are shown on **Figure 2-2**. Most of the well samples retrieved by the MPG are analyzed for EC and total dissolved solids (TDS) on an annual basis, and more comprehensive analyses are conducted every other year.

Water quality data from signatories to the Agreement were supplied as available. Water quality data were also obtained from the City of Mendota, Covanta Mendota, Spreckels Sugar Co., and the Bank.

Surface-Water Flow (Water Budget)

The SLDMWA assumed operation of the Mendota Pool from USBR in October 1996. Since then, the SLDMWA responds to delivery requests, monitors inflows, diversions (outflows), and the stage height in the Pool. Some inflows are monitored on a daily basis (e.g., inflow from the DMC, the SJR just west of the Chowchilla Bypass, and the Kings River via the James Bypass). Inflow to the Pool from the SJR is estimated daily by the SLDMWA based on data from the Chowchilla Bypass gage. Pumpage to the Pool is monitored on a weekly basis during the irrigation season and less frequently during the rest of the year. Based on the inflow and outflow components, including delivery requests, the SLDMWA monitors and forecasts the direction of flow in the Fresno Slough branch of the Mendota Pool. This information is needed to prevent water quality degradation at the SJREC's canal intakes caused by MPG transfer pumping. The SLDMWA has agreed to notify the MPG whenever a north flow event is expected to occur.

During most of the year, the flow direction in the Fresno Slough branch of the Mendota Pool is to the south. Northerly flow is typically observed as a result of major upstream flood releases to the Kings River and the Fresno Slough and when the Pool is being drained in preparation for winter maintenance work on Mendota Dam. During such times, the MPG does not pump well water for transfer.

Data provided by the SLDMWA are used by the MPG to prepare a monthly water budget for the Fresno Slough Branch of the Pool south of the Firebaugh Intake Canal. Water delivery demands by entities located along this portion of the Mendota Pool account for approximately 10 to 15 percent of the total DMC deliveries (most of the DMC deliveries are diverted into the SJREC's canal intakes in the northern portion of the Pool). The MPG's water budget accounts for all inflows from and diversions to these entities, evaporation and seepage losses, and the change in storage (as calculated from SLDMWA's stage height measurements). The water budget is used to calculate the monthly amount of inflow from the DMC that reaches the southern portion of the Pool. This quantity is used in combination with water quality information for the DMC and MPG wells to devise MPG pumping programs to meet strict water quality constraints.

Surface-Water Quality

The primary purpose of the surface-water quality monitoring is to allow the MPG to detect any potential exceedances of water quality objectives at key locations in the Pool and adjust the pumping program accordingly. The MPG collected water samples at 12 locations included in the monitoring network (**Table 2-4**) in 2010 (the Mowry Bridge sampling location was discontinued in 2007 due to access problems). Samples were collected in the Mendota Pool, the DMC, and at the intakes of canals that divert water from the Pool in 2010 (**Figure 2-3**).

In June and September, water samples were retrieved from the 12 sampling stations and analyzed for irrigation suitability. This suite of analyses includes TDS, EC, pH, sodium adsorption ratio (SAR), major cations (calcium, magnesium, potassium, and sodium), major anions (carbonate, bicarbonate, sulfate, chloride, and nitrate), and other constituents (boron, copper, iron, manganese, and zinc). In addition, these samples were also analyzed for molybdenum and selenium.

In May, July, August, and October, the MPG retrieved additional water samples at the DMC terminus (at Bass Avenue) and at three locations in the southern portion of the Slough: the MWA, the JID Booster Plant, and the intake shared by Laterals 6 and 7, and these samples were analyzed for irrigation suitability only (not for molybdenum and selenium). All surface-water grab sample analyses are performed on unfiltered samples, so that the results reflect total concentrations rather than dissolved concentrations. The MPG also measures EC in the Pool on an hourly basis with electronic recording equipment at the MWA bridge located one mile south of Whites Bridge Road.

The monitoring program is supplemented by data obtained from the SJREC and USBR. The SJREC operates continuous EC recorders at its four canal intakes that divert water from the Pool, i.e., the Columbia Canal, CCID Main Canal, CCID Outside Canal, and Firebaugh Intake Canal, and typically retrieves several rounds of grab samples from these location during the irrigation season. These samples are analyzed for EC, boron, and selenium. Data obtained from USBR include daily high, low, and average EC values measured and recorded with electronic equipment in the DMC at Bass Avenue (Check 21), and daily selenium concentrations from grab samples retrieved via auto-sampling equipment at Check 21.

Sediment Quality

A sediment quality monitoring program was initiated in 2001 at the request of the California Department of Fish and Game (CDFG). Its objectives are to provide baseline characterization of metal concentrations in Pool sediments and to allow identification of temporal and spatial trends in sediment quality. Sediment sampling was not conducted during years when the MPG did not pump for transfer (2003-2006) or in 2008. Sediment samples were collected in 2001, 2002, 2007, 2009, and 2010.

Compaction and Land Subsidence

Continuous compaction data are collected from two extensometers in the Mendota area to evaluate compliance with the subsidence criterion specified in the Agreement. The MPG installed the Fordel extensometer west of the Fresno Slough in 1999. The Yearout Ranch extensometer, located east of the Slough, was installed by DWR in 1965 and has been monitored by CCID since 1999. The 2010 data from these extensometers are evaluated in this report in the context of the period of record. Both extensometers monitor compaction above the Corcoran Clay, the top of which was encountered at depths of 418 and 428 feet at the Fordel and Yearout Ranch sites, respectively.

Since 2004, total compaction (including compaction occurring in and below the Corcoran Clay) has been measured at a Global Positioning System (GPS) monitoring station located on land owned by Meyers Farming southeast of Mendota and west of the Fresno Slough (see **Figure 1-2**). This GPS station is part of a network of similar stations that have been installed throughout the western United States in recent years by the Plate Boundary Observatory (PBO), which is a division of UNAVCO. The Mendota PBO station (No. P304) began collecting data on April 28, 2004, and the data are uploaded daily to the UNAVCO website.

Table 2-1
Summary of 2010 Monitoring Program

Item	Description	No. of Locations	Frequency
Pumpage	MPG meter readings (Fresno Slough wells)[1]	All	Weekly
	MPG meter readings (FWD wells)	All	Monthly
	SJREC (CCID and CCC) and PFC	All	Monthly
	Pumpage by others (measured or estimated)	All	Varies
Groundwater Levels	Wells monitored by MPG	66	Bimonthly[2]
	Wells monitored by others	Varies	Varies
Groundwater Quality	Wells monitored by MPG	41	Annual
	Wells monitored by others	Varies	Annual[3]
Surface-Water Flow	Inflow and outflow measurements[1]	All	Daily
	Stage measurements[1]	1	Daily
Surface-Water Quality	MPG grab sample locations	4	Monthly (May-Oct.)
	MPG grab sample locations	8	Semiannual (June & Oct.)
	MPG EC recorder at MWA	1	Continuous
	SJREC grab sample locations	6	Varies
	SJREC EC recorders at canal intakes	4	Continuous
	USBR grab sample locations	3	Monthly
	USBR automated composite sampling at DMC	1	Daily
	USBR EC recorder at DMC	1	Continuous
Sediment Quality	MPG sample locations	8	Annual
Compaction	Fordel extensometer monitored by MPG	1	Continuous
	Yearout Ranch extensometer monitored by CCID	1	Monthly

1. Monitored by the San Luis & Delta-Mendota Water Authority.
2. Water level measurements made in Jan, Feb, May, Jul, Sep, and Dec 2010. Includes one well (USGS well No. T13S/R15E-31J3) equipped with electronic logging equipment.
3. Some wells sampled more frequently.

Table 2-2
Groundwater Level Monitoring Network

Owner	Well ID	State Well Number	Depth Zone[1]	WL Monitoring Frequency	WL Monitoring Entity[2]	WL Monitoring 2010 Data	Participation Level[3]
MPG Wells							
Terra Linda Farms	TLF-9s (10A)	T13S/R15E-29C	S	Bimonthly	MPG	Y	I
	HS-3	13S/15E-29F2	D	Bimonthly	MPG	Y	I
	D&H	T13S/R15E-29K	D	Bimonthly	MPG	Y	I
Etchegoinberry	No. 2	T13S/R15E-29R3	S	Bimonthly	MPG	Y	I
Coelho/Coelho/Fordel	CCF-2	T13S/R15E-32	D	Bimonthly	MPG	Y	I
Meyers Farming	MS-4	T14S/R15E-5	S	Bimonthly	MPG	Y	I
	MS-5	T14S/R15E-5	D	Bimonthly	MPG	Y	I
Five Star	FS-5	T14S/R15E-9C6	S	Bimonthly	MPG	Y	I
Farmers Water District	R-5	T13S/R15E-26B1	D	Continuous	MPG	Y	I
	R-7	T13S/R15E-23P1	D	Bimonthly	MPG	Y	I
	R-8	T13S/R15E-27H1	D	Bimonthly	MPG	Y	I
	WL-2	T13S/R15E-26K1	D	Bimonthly	MPG	Y	I
	EL-1	T13S/R15E-25L1	D	Bimonthly	MPG	Y	I
Baker Farming Co.	BF-2	T13S/R15E-22	D	Bimonthly	MPG	Y	I
Panoche Creek Farms	PCF-1	T13S/R15E-27	D	Bimonthly	MPG	Y	I
Non-MPG Wells (West of Chowchilla Bypass)							
Central California ID	5A	T13S/R15E-19G1	D	Bimonthly	MPG	Y	II
	15B	T13S/R14E-12E1	D	Bimonthly	MPG	Y	II
	28C		D	Bimonthly	MPG	N	II
	32B	T13S/R15E-19	D	Bimonthly	MPG	Y	II
	35A	T13S/R14E-12L1	D	Bimonthly	MPG	Y	II
	38A	T13S/R14E-12B3	D	Bimonthly	MPG	Y	II
	Yearout Extensometer	T13S/R15E-35D5	D	Continuous	CCID	Y	II
Firebaugh Canal WD	25D2	T13S/R14E-25D2	D	Bimonthly	MPG	Y	II
Columbia Canal Co.	CC-1	T13S/R15E-25F1	D	Bimonthly	MPG	Y	II
	Cardella-2 (Lopes-1)	T13S/R15E-16D	D	Bimonthly	MPG	Y	II
	MLT-West	T13S/R15E-20G2	D	Bimonthly	MPG	Y	IV
	Lopes-Obs.	T13S/R15E-17	S	Bimonthly	MPG	Y	II
	USBR-4	T13S/R15E-22	S	Bimonthly	MPG	Y	II
USBR	19R1	T13S/R15E-19R1	D	Bimonthly	MPG	Y	III
Paramount Farming Co.	W-7	T12S/R15E-34R1	D	Semi-annual	USBR	N	III
	W-8	T13S/R15E-11B1	D	Bimonthly	MPG	Y	II
	W-11	T12S/R15E-34K1	D	Bimonthly	MPG	Y	II
	W-12	T13S/R15E-2G1	D	Semi-annual	USBR	N	III
	W-15	T13S/R15E-14M1	D	Bimonthly	MPG	Y	II
	W-32	T12S/R15E-33P	D	Bimonthly	MPG	Y	II
	W-42	T13S/R15E-4	D	Bimonthly	MPG	Y	II
	W-53	T13S/R15E-21	D	Bimonthly	MPG	Y	II
	W-74	T13S/R15E-7	D	Bimonthly	MPG	Y	II
	W-77	T13S/R15E-15	D	Bimonthly	MPG	Y	II

Table 2-2 (continued)
Groundwater Level Monitoring Network

Owner	Well ID	State Well Number	Depth Zone[1]	WL Monitoring Frequency	WL Monitoring Entity[2]	WL Monitoring 2010 Data	Participation Level[3]
Paramount Farming Co.	W-78	T13S/R15E-16	D	Bimonthly	MPG	Y	II
	W-89	T13S/R15E-2	D	Bimonthly	MPG	Y	II
	W-91	T12S/R15E-33	D	Bimonthly	MPG	Y	II
	W-94	T13S/R15E-22	D	Bimonthly	MPG	Y	II
	W-95	T13S/R15E-25	D	Bimonthly	MPG	Y	II
	W-106		D	Bimonthly	PFC	Y	II
	W-107		D	Bimonthly	PFC	Y	II
	W-108		D	Bimonthly	PFC	Y	II
	W-110		D	Bimonthly	PFC	Y	II
	W-111		D	Bimonthly	PFC	Y	II
	W-112		D	Bimonthly	PFC	Y	II
	MW-1	T13S/R15A-22	D	Bimonthly	MPG	Y	II
	MW-2	T13S/R15A-25	S	Bimonthly	MPG	Y	II
	MW-3	T13S/R15E-16	S	Bimonthly	MPG	Y	II
	MW-4	T13S/R15E-3	S	Bimonthly	MPG	Y	II
	MW-5	T12S/R15E-33	S	Bimonthly	MPG	Y	II
Spreckels Sugar Co.	MW-1	T14S/R15E-4Q	S	Bimonthly	MF	Y	IV
	MW-3	T14S/R15E-4H	S	Bimonthly	MF	Y	IV
	MW-6	T13S/R15E-34	S	Bimonthly	MPG	Y	IV
	MW-10	T13S/R15E-34	D	Bimonthly	MF	Y	IV
	MW-11	T13S/R15E-34N	D	Bimonthly	MPG	Y	IV
	MW-14	T13S/R15E-33F	D	Bimonthly	MPG	Y	IV
	MW-32	T13S/R15E-35	S	Bimonthly	MPG	Y	IV
City of Mendota	18Q North	T13S/R15E-19	D	Bimonthly	MPG	Y	IV
	Fordel M-1	T13S/R15E-20N1	D	Bimonthly	MPG	Y	IV
	Fordel M-2	T13S/R15E-20N2	S	Bimonthly	MPG	Y	IV
USGS	31J3	T13S/R15E-31J3	D	Continuous	MPG	Y	I
	31J4	T13S/R15E-31J4	S	Bimonthly	MPG	Y	I
	31J5	T13S/R15E-31J5	D	Bimonthly	MPG	Y	I
	31J6	T13S/R15E-31J6	D	Bimonthly	MPG	Y	I
	10A1	T14S/R14E-10A1	S	Semi-annual	WWD	N	IV
	10A2	T14S/R14E-10A2	S	Semi-annual	WWD	Y	IV
	10A3	T14S/R14E-10A3	D	Semi-annual	WWD	Y	IV
	10A4	T14S/R14E-10A4	D	Semi-annual	WWD	Y	IV
Hansen Farms	7C1	T14S/R15E-7C1	D	Bimonthly	MPG	Y	IV
Meyers Farming	S-2		S	Bimonthly	MPG	Y	I
	P-6	T14S/R15E-8Q	S	Bimonthly	MPG	Y	I
	MF-1	T13S/R15E-33Q	S	Monthly	MF	Y	IV
	MF-2	T13S/R15E-33L	S	Monthly	MF	Y	IV
	MF-3	T14S/R15E-4C	S	Monthly	MF	Y	IV
	MF-4	T14S/R15E-4A	S	Monthly	MF	Y	IV
	MF-5	T14S/R15E-4F	S	Monthly	MF	Y	IV
	MF-6	T14S/R15E-4G	S	Monthly	MF	Y	IV
	MF-7	T14S/R15E-4K	S	Monthly	MF	Y	IV
	MF-8	T14S/R15E-3L	S	Monthly	MF	Y	IV
	MF-9	T14S/R15E-4H	S	Monthly	MF	Y	IV

Table 2-2 (continued)
Groundwater Level Monitoring Network

Owner	Well ID	State Well Number	Depth Zone[1]	WL Monitoring Frequency	Entity[2]	2010 Data	Participation Level[3]
Non-MPG Wells (East of Chowchilla Bypass)							
North of study area							
El Pico Ranch	No. 54	T12S/R16E-16R1	D	Semi-annual	USBR	N	III
Aliso Water District							
Woolf Enterprises	WE-51	T13S/R16E-19K1	D	Bimonthly	MPG	Y	IV
Woolf Enterprises	WE-75	T13S/R16E-18H1	D	Bimonthly	MPG	Y	IV
Denis Prosperi	DP-2	T12S/R16E-31G1	D	Bimonthly	MPG	Y	IV
Denis Prosperi	DP-4	T12S/R16E-31A	D	Bimonthly	MPG	Y	IV
Lyon Packing	LP-11		D	Semi-annual	USBR	N	III
Giffen Ranch	GIF-23		D	Semi-annual	USBR	N	III
Groefsema Ranches	GR-28	T13S/R16E-14H2	D	Semi-annual	USBR	N	III
Golden State Vinters	GSV-H	T13S/R16E-16D2	D	Semi-annual	USBR	N	III
Woolf Enterprises	WE-53	T13S/R16E-30A1	D	Semi-annual	USBR	N	III
Golden State Vinters	GSV-646		D	Semi-annual	USBR	N	III
Gravelly Ford WD							
John Simpson	25A1	T12S/R16E-25A1	D	Bimonthly	MPG	Y	IV
John Simpson	26H1	T12S/R16E-26H1	D	Bimonthly	MPG	Y	IV
Undistricted (Fresno County)							
Schaad	22J1		D	Semi-annual	USBR	N	III
Schaad	22J2	T13S/R16E-22J2	D	Semi-annual	USBR	N	III
Schaad	27A2		D	Semi-annual	USBR	N	III
Schaad	No. 3	T13S/R16E-27F1	D	Semi-annual	USBR	N	III
NA	29F1		D	Semi-annual	USBR	N	III
Larry Shehadey Farms	30L3	T13S/R16E-30L3	D	Semi-annual	USBR	N	III
Larry Shehadey Farms	30Q1	T13S/R16E-30Q1	D	Semi-annual	USBR	N	III
Larry Shehadey Farms	32F1	T13S/R16E-32F1	D	Semi-annual	USBR	N	III
Larry Shehadey Farms	33B2	T13S/R16E-33B2	D	Semi-annual	USBR	N	III
Larry Shehadey Farms	33F1	T13S/R16E-33F1	D	Semi-annual	USBR	N	III
Larry Shehadey Farms	33L1	T13S/R16E-33L1	D	Semi-annual	USBR	N	III
Donald Horner	34C1	T13S/R16E-34C1	D	Bimonthly	MPG	Y	IV
Agape Farms	34C2		D	Semi-annual	USBR	N	III
Agape Farms	34D1		D	Semi-annual	USBR	N	III
Agape Farms	34P2	T13S/R16E-34P2	D	Semi-annual	USBR	N	III
Connolly	3F1	T14S/R16E-3F1	D	Semi-annual	USBR	N	III
Duran	3P1		D	Semi-annual	USBR	N	III
Larry Shehadey Farms	4L1		D	Semi-annual	USBR	N	III
Bar 20 Partners Ltd.	5J1	T13S/R15E-21	D	Semi-annual	USBR	N	III
Bar 20 Partners Ltd.	5L2		D	Semi-annual	USBR	N	III
Bar 20 Partners Ltd.	6B1	T13S/R15E-20G2	D	Semi-annual	USBR	N	III

1. S = Shallow wells are completed above the A-clay (maximum depth = 130 feet); D = Deep wells are completed below the A-clay the Corcoran clay)
2. Monitoring activities conducted by MPG = Mendota Pool Group, CCID = Central California Irrigation District, PFC = Paramount I WWD = Westlands Water District, MF = Meyers Farm Water Bank, USBR = U.S. Bureau of Reclamation
3. Level I: Mendotal Pool Group and its agents.
   Level II: SJREC and Paramount Farming Co.
   Level III: Public Agencies, e.g., USBR.
   Level IV: Other entities, e.g., WWD, Spreckels Sugar Co.
   For more detail, see explanation in *Section II - Monitoring Program*.

Table 2-3
Groundwater Quality Monitoring Network

Owner	Well ID (Original)	Depth Zone	Sampling Schedule[1] Annual	Biennial	2010 Data	Responsible Entity[2]
MPG Wells						
Terra Linda Farms[3]	TL-1	D	EC/TDS	Gen. Min./TE	N	MPG
	TLF-18d (TL-2)	D	EC/TDS	Gen. Min./TE	N	MPG
	TLF-12d (TL-3)	D	EC/TDS	Gen. Min./TE	N	MPG
	TLF-11As (TL-4A)	S	EC/TDS	Gen. Min./TE	N	MPG
	TLF-11Cs (TL-4C)	S	Gen. Min./TE	-	N	MPG
	TLF-5d (TL-5)	D	EC/TDS	Gen. Min./TE	Y	MPG
	TLF-6d (TL-7)	D	EC/TDS	Gen. Min./TE	Y	MPG
	TLF-14d (TL-8)	D	EC/TDS	Gen. Min./TE	Y	MPG
	TLF-9s (TL-10A)	S	Gen. Min./TE	-	Y	MPG
	TLF-8s (TL-10B)	S	EC/TDS	Gen. Min./TE	Y	MPG
	TLF-7s (TL-10C)	S	EC/TDS	Gen. Min./TE	Y	MPG
	TL-11	S	EC/TDS	Gen. Min./TE	N	MPG
	TLF-1s (TL-12)	S	EC/TDS	Gen. Min./TE	N	MPG
	TLF-2s (TL-13)	S	EC/TDS	Gen. Min./TE	Y	MPG
	TLF-3s (TL-14)	S	Gen. Min./TE	-	Y	MPG
	TLF-4s (TL-15)	S	EC/TDS	Gen. Min./TE	Y	MPG
	TLF-10s (TL-16)	S	EC/TDS	Gen. Min./TE	Y	MPG
	TLF-13s (TL-17)	S	Gen. Min./TE	-	Y	MPG
	TLF-15s	S	EC/TDS	Gen. Min./TE	Y	MPG
	TLF-16s	S	EC/TDS	Gen. Min./TE	Y	MPG
	TLF-17s	S	EC/TDS	Gen. Min./TE	Y	MPG
Silver Creek Packing	SC-3B	S	EC/TDS	Gen. Min./TE	N	MPG
	SC-4B	S	EC/TDS	Gen. Min./TE	N	MPG
Coelho/Gardner/Hanson[3]	CGH-4s (CGH-1A)	S	EC/TDS	Gen. Min./TE	N	MPG
	CGH-3s (CGH-1B)	S	EC/TDS	Gen. Min./TE	Y	MPG
	CGH-2s (CGH-1C)	S	EC/TDS	Gen. Min./TE	N	MPG
	CGH-1s (CGH-2)	S	EC/TDS	Gen. Min./TE	Y	MPG
	CGH-6A	S	Gen. Min./TE	-	N	MPG
	CGH-12s (CGH-6B)	S	Gen. Min./TE	-	Y	MPG
	CGH-10s (CGH-6C)	S	EC/TDS	Gen. Min./TE	N	MPG
	CGH-11s (CGH-6D)	S	EC/TDS	Gen. Min./TE	Y	MPG
	CGH-13d (CGH-7)	D	EC/TDS	Gen. Min./TE	N	MPG
	CGH-7s (CGH-9)	S	EC/TDS	Gen. Min./TE	Y	MPG
	CGH-8s (CGH-10)	S	EC/TDS	Gen. Min./TE	Y	MPG
	CGH-5s (CGH-3)	S	EC/TDS	Gen. Min./TE	Y	MPG
	CGH-6s (CGH-11)	S	EC/TDS	Gen. Min./TE	Y	MPG
	CGH-9As (CGH-5)	S	EC/TDS	Gen. Min./TE	N	MPG
	CGH-9Bs (unknown)	S	EC/TDS	Gen. Min./TE	N	MPG
Meyers Farming	MS-6	S	EC/TDS	Gen. Min./TE	N	MPG
	MS-7	S	EC/TDS	Gen. Min./TE	N	MPG

Table 2-3 (continued)
Groundwater Quality Monitoring Network

Owner	Well ID (Original)	Depth Zone	Sampling Schedule[1] Annual	Biennial	2010 Data	Responsible Entity[2]
Five Star/Conejo Farms	FS-1	S	EC/TDS	Gen. Min./TE	N	MPG
	FS-2	S	EC/TDS	Gen. Min./TE	Y	MPG
	FS-3	S	EC/TDS	Gen. Min./TE	Y	MPG
	FS-4	S	EC/TDS	Gen. Min./TE	N	MPG
	FS-5	S	Gen. Min./TE	-	Y	MPG
	FS-6	S	EC/TDS	Gen. Min./TE	Y	MPG
	FS-7	S	EC/TDS	Gen. Min./TE	Y	MPG
	FS-8	S	EC/TDS	Gen. Min./TE	Y	MPG
	FS-9	S	EC/TDS	Gen. Min./TE	N	MPG
	FS-10	S	Gen. Min./TE	-	N	MPG
Coelho West	CW-1	S	Gen. Min./TE	-	N	MPG
	CW-2	S	Gen. Min./TE	-	N	MPG
	CW-3	S	Gen. Min./TE	-	N	MPG
	CW-4	S	Gen. Min./TE	-	N	MPG
	CW-5	S	Gen. Min./TE	-	N	MPG
Farmers Water District	R-1	D	Gen. Min./TE	-	Y	MPG
	R-2	D	EC/TDS	Gen. Min./TE	N	MPG
	R-3	D	Gen. Min./TE	-	Y	MPG
	R-4	D	EC/TDS	Gen. Min./TE	Y	MPG
	R-6	D	EC/TDS	Gen. Min./TE	N	MPG
	R-7	D	EC/TDS	Gen. Min./TE	Y	MPG
	R-8	D	EC/TDS	Gen. Min./TE	Y	MPG
	R-9	D	EC/TDS	Gen. Min./TE	Y	MPG
	R-10	D	EC/TDS	Gen. Min./TE	Y	MPG
	R-11	D	Gen. Min./TE	-	Y	MPG
Baker Farming Co.	BF-1	D	EC/TDS	Gen. Min./TE	Y	MPG
	BF-2	D	EC/TDS	Gen. Min./TE	Y	MPG
	BF-3	D	EC/TDS	Gen. Min./TE	N	MPG
	BF-4	D	EC/TDS	Gen. Min./TE	Y	MPG
	BF-5	D	EC/TDS	Gen. Min./TE	Y	MPG
Panoche Creek Farms	PCF-1	D	EC/TDS	Gen. Min./TE	Y	MPG
Non-MPG Wells						
Central California ID	5A	D	Gen. Min.	-	Y	CCID
	12C	D	Gen. Min.	-	Y	CCID
	15B	D	Gen. Min.	-	Y	CCID
	16C	D	Gen. Min.	-	Y	CCID
	23B	D	Gen. Min.	-	Y	CCID
	28C	D	Gen. Min.	-	Y	CCID
	32C	D	Gen. Min.	-	N	CCID
	35A	D	Gen. Min.	-	Y	CCID
	38A	D	Gen. Min.	-	N	CCID

Table 2-3 (continued)
Groundwater Quality Monitoring Network

Owner	Well ID (Original)	Depth Zone	Sampling Schedule[1] Annual	Biennial	2010 Data	Responsible Entity[2]
Columbia Canal Co.	CC-1	D	EC/TDS	Irr. Suitability	N	CCC
	CC-2	D	EC/TDS	Irr. Suitability	N	CCC
	Cardella-1	D	EC/TDS	Irr. Suitability	N	CCC
	Cardella-2 (Lopes-1)	D	EC/TDS	Irr. Suitability	Y	CCC
	Elrod-1	D	EC/TDS	Irr. Suitability	Y	CCC
	Elrod-2	D	EC/TDS	Irr. Suitability	Y	CCC
	Burkhart-Heirs	D	EC/TDS	Irr. Suitability	Y	CCC
	DMA	D	EC/TDS	Irr. Suitability	Y	CCC
	Davis	D	EC/TDS	Irr. Suitability	Y	CCC
	Garcia-1	D	EC/TDS	Irr. Suitability	Y	CCC
	Garcia-2	D	EC/TDS	Irr. Suitability	Y	CCC
	Garcia-3	D	EC/TDS	Irr. Suitability	N	CCC
	Garcia-4	D	EC/TDS	Irr. Suitability	Y	CCC
	Garcia-5	D	EC/TDS	Irr. Suitability	Y	CCC
	Snyder	D	EC/TDS	Irr. Suitability	Y	CCC
Paramount Farming Co.[4]	W-8	D	Irr. Suitability/Se	-	Y	PFC
	W-11	D	Irr. Suitability/Se	-	Y	PFC
	W-15	D	Irr. Suitability/Se	-	Y	PFC
	W-32	D	Irr. Suitability/Se	-	Y	PFC
	W-42	D	Irr. Suitability/Se	-	Y	PFC
	W-53	D	Irr. Suitability/Se	-	Y	PFC
	W-74	D	Irr. Suitability/Se	-	Y	PFC
	W-77	D	Irr. Suitability/Se	-	Y	PFC
	W-78	D	Irr. Suitability/Se	-	Y	PFC
	W-89	D	Irr. Suitability/Se	-	Y	PFC
	W-91	D	Irr. Suitability/Se	-	Y	PFC
	W-94	D	Irr. Suitability/Se	-	Y	PFC
	W-95	D	Irr. Suitability/Se	-	Y	PFC
	W-106	D	Irr. Suitability/Se	-	Y	PFC
	W-107	D	Irr. Suitability/Se	-	Y	PFC
	W-108	D	Irr. Suitability/Se	-	Y	PFC
	W-110	D	Irr. Suitability/Se	-	Y	PFC
	W-111	D	Irr. Suitability/Se	-	Y	PFC
	W-112	D	Irr. Suitability/Se	-	Y	PFC
	MW-1	D	Irr. Suitability/Se	-	Y	PFC
	MW-2	S	Irr. Suitability/Se	-	Y	PFC
	MW-3	S	Irr. Suitability/Se	-	Y	PFC
	MW-4	S	Irr. Suitability/Se	-	Y	PFC
	MW-5	S	Irr. Suitability/Se	-	Y	PFC
Covanta Mendota	Covanta Mendota 6A	D	EC/TDS	-	Y	Covanta
Spreckels Sugar Co.	MW-1	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-2	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-3	S	Gen. Min./TE/Ba	-	Y	SSC

Table 2-3 (continued)
Groundwater Quality Monitoring Network

Owner	Well ID (Original)	Depth Zone	Sampling Schedule[1] Annual	Biennial	2010 Data	Responsible Entity[2]
Spreckels Sugar Co.	MW-4	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-5	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-6	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-7	D	Gen. Min./TE/Ba	-	Y	SSC
	MW-8	D	Gen. Min./TE/Ba	-	Y	SSC
	MW-9	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-10	D	Gen. Min./TE/Ba	-	Y	SSC
	MW-11	D	Gen. Min./TE/Ba	-	Y	SSC
	MW-12	D	Gen. Min./TE/Ba	-	Y	SSC
	MW-13	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-14	D	Gen. Min./TE/Ba	-	Y	SSC
	MW-15	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-16	D	Gen. Min./TE/Ba	-	Y	SSC
	MW-17	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-18	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-19	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-20	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-21	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-22	D	Gen. Min./TE/Ba	-	Y	SSC
	MW-23	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-24	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-25	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-26	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-27	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-28	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-29	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-30	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-31	S	Gen. Min./TE/Ba	-	Y	SSC
	MW-32	S	Gen. Min./TE/Ba	-	Y	SSC
	PW-1	D	Gen. Min./TE/Ba	-	N	SSC
	PW-4	D	Gen. Min./TE/Ba	-	N	SSC
	PW-6	D	Gen. Min./TE/Ba	-	Y	SSC
	PW-7	D	Gen. Min./TE/Ba	-	Y	SSC
	PW-8	D	Gen. Min./TE/Ba	-	N	SSC
	PW-9	D	Gen. Min./TE/Ba	-	Y	SSC
	PW-10	D	Gen. Min./TE/Ba	-	Y	SSC
	PW-11	D	Gen. Min./TE/Ba	-	Y	SSC
	PW-12	D	Gen. Min./TE/Ba	-	Y	SSC
City of Mendota	No. 7	D	Gen. Min./TE	-	N	City
	No. 8	D	Gen. Min./TE	-	N	City
	No. 9	D	Gen. Min./TE	-	N	City
	Fordel M-1	D	Gen. Min./TE	-	N	City
	Fordel M-2	S	Gen. Min./TE	-	N	City

Table 2-3 (continued)
Groundwater Quality Monitoring Network

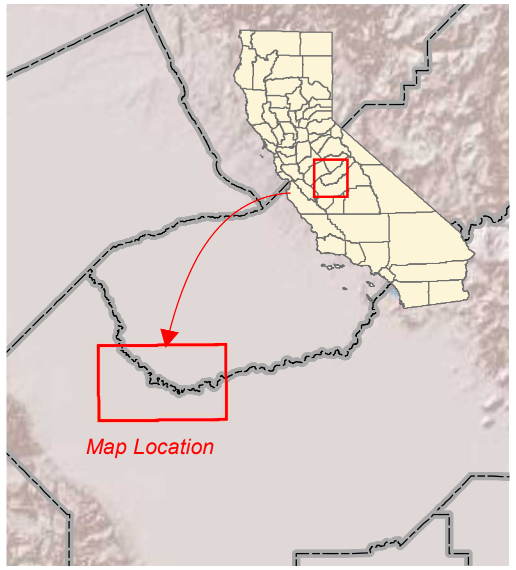
Owner	Well ID (Original)	Depth Zone	Sampling Schedule[1] Annual	Biennial	2010 Data	Responsible Entity[2]
City of Mendota	Fordel M-3	S	Gen. Min./TE	-	N	City
	Fordel M-4	S	Gen. Min./TE	-	N	City
	Fordel M-5	S	EC/TDS	Gen. Min./TE	N	City
	Fordel M-6	S	Gen. Min./TE	-	N	City
USGS	31J4	S	Gen. Min./TE	-	Y	MPG
	31J5	D	Gen. Min./TE	-	Y	MPG
Meyers Farming	S-1	S	Gen. Min./TE	-	N	MPG
	S-2	S	Gen. Min./TE	-	N	MPG
	S-3	S	Gen. Min./TE	-	N	MPG
	P-1	S	Gen. Min./TE	-	N	MPG
	P-4	S	Gen. Min./TE	-	N	MPG
Meyers Farm Water Bank	MF-1	S	Gen. Min./TE	-	Y	MF
	MF-2	S	Gen. Min./TE	-	Y	MF
	MF-3	S	Gen. Min./TE	-	Y	MF
	MF-4	S	Gen. Min./TE	-	Y	MF
	MF-5	S	Gen. Min./TE	-	Y	MF
	MF-6	S	Gen. Min./TE	-	Y	MF
	MF-7	S	Gen. Min./TE	-	Y	MF
	MF-8	S	Gen. Min./TE	-	Y	MF
	MF-9	S	Gen. Min./TE	-	Y	MF
	DW-1	D	Gen. Min./TE	-	N	MF
	EW-1	S	Gen. Min./TE	-	N	MF
	EW-2	S	Gen. Min./TE	-	N	MF
	EW-3	S	Gen. Min./TE	-	N	MF
	EW-4	S	Gen. Min./TE	-	N	MF
	EW-5	S	Gen. Min./TE	-	N	MF
	EW-6	S	Gen. Min./TE	-	N	MF
	EW-7	S	Gen. Min./TE	-	N	MF
	EW-8	S	Gen. Min./TE	-	N	MF

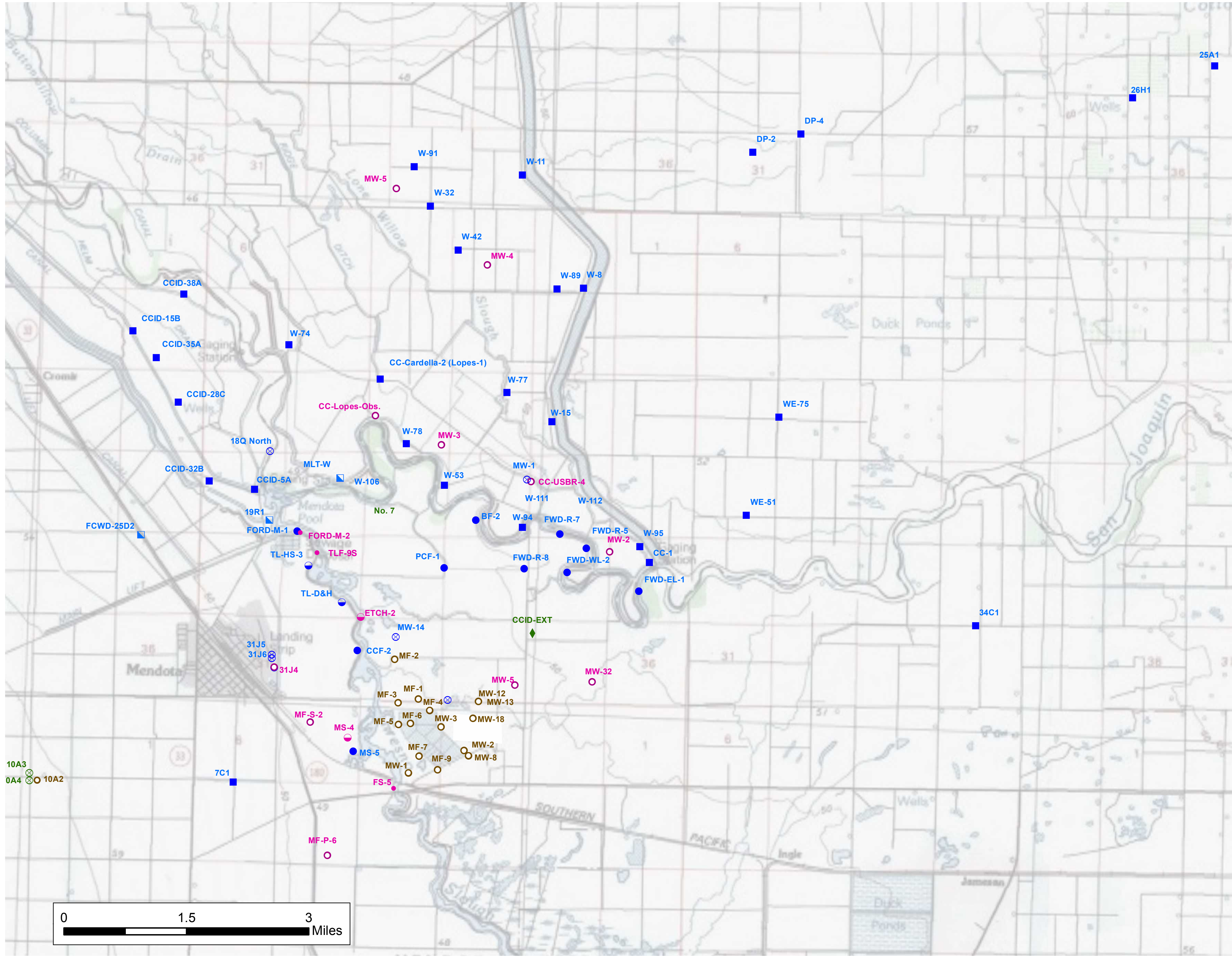
1. Gen. Min. = general minerals; typically consists of anions (sulfate, chloride, bicarbonate, alkalinity, nitrate, and fluoride) and cations (calcium, magnesium, sodium, potassium, boron, copper, iron, manganese, and zinc), EC/TDS, and pH.
   EC/TDS = electrical conductivity, total dissolved solids; Irr. Suitability = Irrigation Suitability; typically includes cations, anions, EC/TDS, pH, and sodium adsorption ratio; TE = trace elements; typically includes arsenic, molybdenum, selenium, and barium for some samples.
2. MPG = Mendota Pool Group, CCID = Central California Irrigation District, PFC = Paramount Farming Co. (formerly NLF) CCC = Columbia Canal Company, SSC = Spreckels Sugar Co., City = City of Mendota, MF = Meyers Farm Water Bank
3. Most of Terra Linda Farms wells and Coelho/Gardner/Hanson wells were renamed in spring 2007. Old names shown in parentheses.
4. The PFC wells were renamed in 2008. The old well names are still used on this table. Both new and old names are shown on water quality table (Table D-2) in Appendix D.

Table 2-4
Surface-Water Quality Monitoring Network

Sample Location	Grab Sampling[1]				Automated Logging Analysis and Entity[3]
	Semi-Annual	Entity[2]	Monthly	Entity[2]	
Columbia Canal	Irr. Suit., As, Mo, Se	MPG	EC, B, Se	SJREC	EC (SJREC)
Mendota Dam	Irr. Suit., As, Mo, Se	MPG	-	-	-
CCID Main Canal	Irr. Suit., As, Mo, Se	MPG	EC, B, Se	SJREC	EC (SJREC) & Se (USBR)
			EC, Se	USBR	
Delta-Mendota Canal (at Bass Avenue, Check 21)	Irr. Suit., As, Mo, Se	MPG	Irr. Suit.	MPG	EC, Se (USBR)
			EC, Se	USBR	
CCID Outside Canal	Irr. Suit., As, Mo, Se	MPG	EC, B, Se	SJREC	EC (SJREC)
			EC, Se	USBR	
Firebaugh Intake Canal	Irr. Suit., As, Mo, Se	MPG	EC, B, Se	SJREC	EC (SJREC)
West of Fordel	Irr. Suit., As, Mo, Se	MPG	-	-	-
Etchegoinberry	Irr. Suit., As, Mo, Se	MPG	-	-	-
Mendota Wildlife Area[4]	Irr. Suit., As, Mo, Se	MPG	Irr. Suit.	MPG	EC (MPG)
James ID Booster Plant	Irr. Suit., As, Mo, Se	MPG	Irr. Suit.	MPG	EC (JID)
Tranquillity ID Intake	Irr. Suit., As, Mo, Se	MPG	-	-	-
Lateral 6&7	Irr. Suit., As, Mo, Se	MPG	Irr. Suit.	MPG	-

1. Irr. Suit. = Irrigation Suitability; typically includes general minerals and sodium adsorption ratio. EC = electrical conductivity, As = arsenic, B = boron, Mo = molybdenum, Se = selenium
2. MPG = Mendota Pool Group, USBR = U.S. Bureau of Reclamation, SJREC = San Joaquin River Exchange Contractors Water Authority
3. USBR collects daily composite samples for Se with automated equipment. Samples are picked up once a week. USBR discontinued its boron monitoring program in January 2004. JID = James Irrigation District
4. Approximately one mile south of Whites Bridge.





Pool Group Wells:

- Shallow Well
- Production Well
- Unused Well

Other Production Wells:

- Shallow Well
- Deep Well (Above Corcoran Clay)
- Unused Well

Monitoring Wells:

- Shallow Monitoring Well
- Deep Monitoring Well
- Extensometer
- mask

MAGENTA Shallow Well Monitored by MPG
BLUE Deep Well Monitored by MPG
BROWN Shallow Well Monitored by other Entity
GREEN Deep Well Monitored by other Entity

Note:
"Shallow" wells are completed above the A-Clay (maximum depth = 130'). "Deep" wells are completed below the A-clay and above the Corcoran Clay.

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Figure 2-1
2010 Groundwater Level Monitoring Network

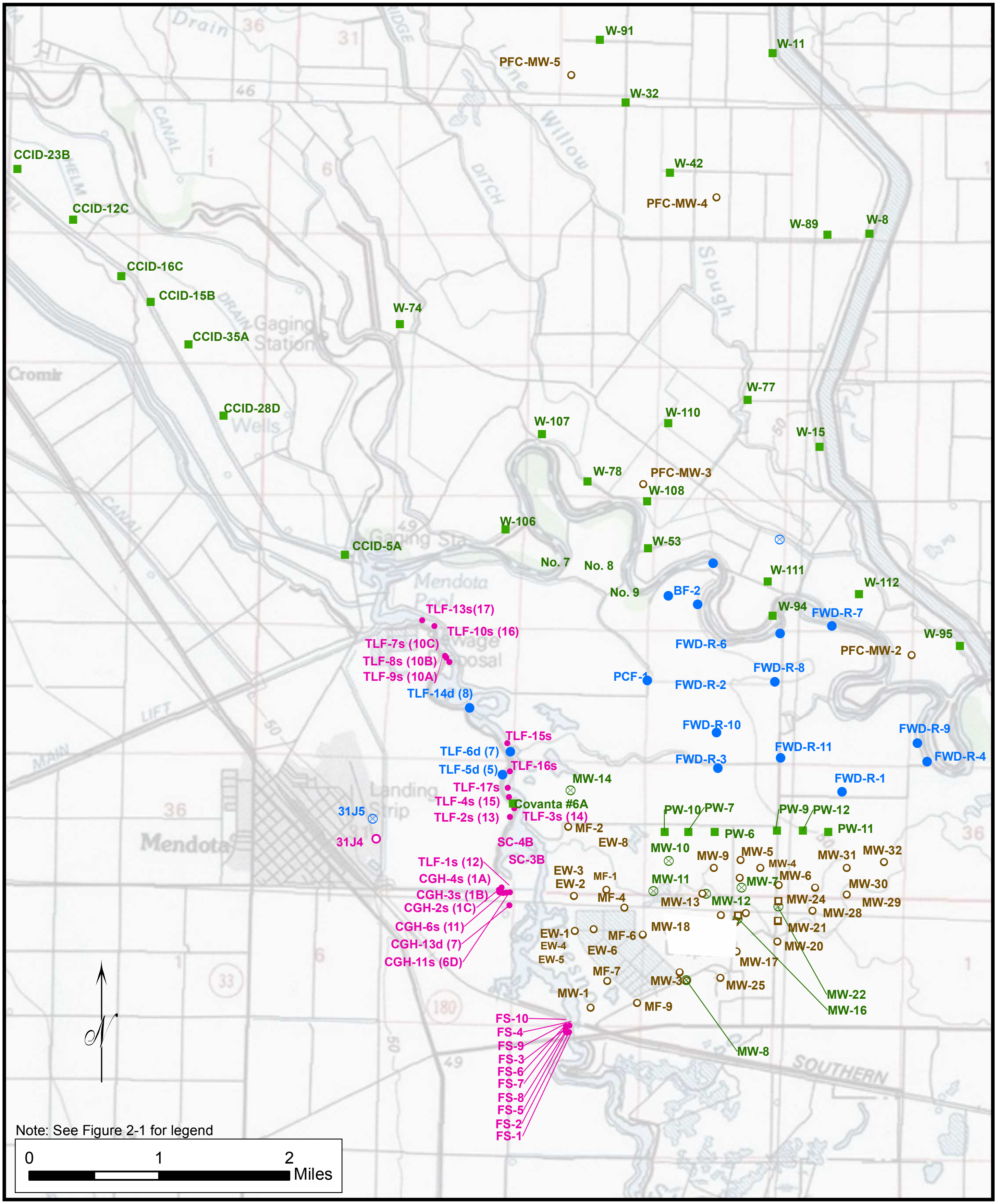

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Figure 2-2
2010 Groundwater Quality Monitoring Network

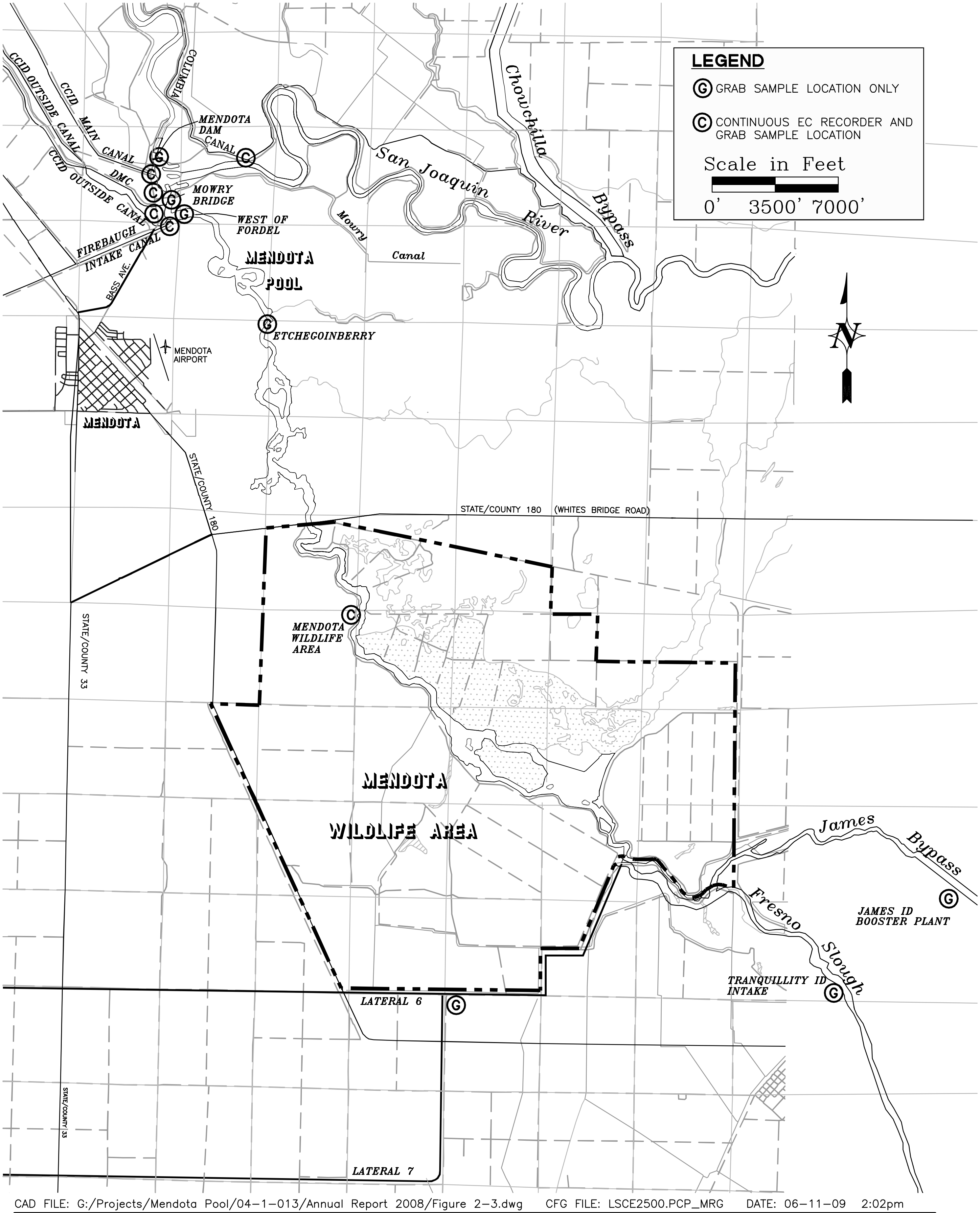

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Figure 2-3
Surface-Water Sampling Locations

III. Pumpage

This section includes a summary of the 2010 pumpage from agricultural, municipal, and industrial wells in the study area compiled from various sources as described in Chapter II. In general, pumpage records based on flow meter readings are deemed most accurate, i.e., records from MPG members, City of Mendota, CCID, CCC, PFC, Covanta Mendota, and Spreckels Sugar Co. Some PFC pumpage is estimated based on power use records and pump efficiency tests, but comparisons conducted in 2002 showed that these estimates were relatively accurate. The 2010 pumpage data are the main inputs to the analytical groundwater flow model used to quantify MPG transfer pumping impacts on groundwater levels in non-MPG wells in the study area. Such quantification is necessary for the calculation of pumping costs reimbursements in Chapter VIII. As in previous years, 2010 pumpage for Locke Ranch was assumed equal to 2000 pumpage estimates, and pumpage east of the Chowchilla Bypass was assumed equal to 2001 estimates[1]. Pumpage from private domestic wells was not included because it is considered negligible compared to agricultural and municipal pumping.

Mendota Pool Group Pumping

The MPG classified 2010 as a normal year and engaged in transfer pumping for the sixth time since the Agreement went into effect in 2001. The approved 2010 MPG transfer pumping program included 14,285 af of shallow-zone pumping and 12,605 af of deep-zone pumping, for a total of 26,890 af. This included 3,543 af of non-MPG transfer pumping by Don Peracchi. The approved pumping program for 2010 also included 10,131 af of pumpage to irrigate overlying and adjacent lands (including 1,500 af for Peracchi). Transfer pumping occurred between March 15 and November 30, and totaled 11,865 af (**Table 3-1**), which is 15,025 af less than the planned pumpage. Pumping for irrigation of overlying and adjacent lands occurred from January through December and totaled 8,071 af (2,060 af less than planned). The sum of MPG transfer and adjacent pumping in 2010 was 19,936 af.

As shown in **Table 3-2**, MPG wells located along the Fresno Slough branch of the Mendota Pool contributed slightly more than half of the total transfer pumpage in 2010 (5,971 af) and the majority of the pumpage for adjacent use (6,116 af). Wells in FWD (including Baker Farming, Panoche Creek Farms, and the FWD R-wells) contributed 5,894 af for transfer (including 2,152 af of non-MPG transfer pumping by Peracchi). Wells in FWD also pumped 1,824 af for adjacent use (including 1,184 af by Peracchi). The total pumpage in FWD was 7,849 af, which is 6,294 af less than the approved 2010 pumping program.

Table 3-3 shows MPG pumpage by aquifer (shallow versus deep) beginning in 1997; this breakdown was not available in years prior to 1997. Deep wells are generally completed below the A-clay and above the Corcoran Clay, i.e., primarily in the 200 to 450 foot depth range. However, four FWD wells (R-8 through R-11) are composite wells completed partially below

[1] These pumpage estimates were made based on crop and land use maps and crop demands. A detailed discussion of the estimates is provided in the 2001 Annual Report (LSCE and KDSA, 2002).

the Corcoran Clay. Estimates of the amount of pumpage coming from the lower aquifer in these composite wells are not currently available but will be developed for the next annual report. Deep MPG wells pumped 7,134 af for transfer in 2010, which was 5,471 af less than the approved program (**Table 3-3**). The total deep zone pumpage in 2010 was 13,005 af, which is less than any transfer pumping year during the period of the Agreement. Shallow wells in the Mendota area are defined as those completed above the A-clay or its equivalent depth, i.e., less than 130 feet deep. The total MPG shallow-zone pumpage in 2010 (6,931 af) was much less than other transfer pumping years during the period of the Agreement. Well-by-well MPG pumpage in 2010 is presented in **Appendix A**.

Non-MPG Pumping

Non-MPG pumpage in the MPG study area west of the Chowchilla Bypass was estimated to be about 32,000 af in 2010 (**Table 3-4**). As usual, pumping was greatest in the PFC service area (14,900 af), followed by CCID (6,700 af), and CCC (3,500 af). Non-MPG pumpage in the study area north of the SJR and west of the Chowchilla Bypass has been highly variable, ranging from 51,700 to 58,500 af during 2001-2003, increasing to 69,600 af in 2004, and decreasing to a low of 23,900 af in 2008 (**Table 3-5**). PFC's pumpage has been lower in recent years due to planting of new orchards in lieu of the annual crops that had previously been produced. Otherwise, year-to-year variability has largely been due to the availability of surface-water supplies to the PFC and CCC service areas.

All of PFC's pumpage has been classified as occurring above the Corcoran Clay because no estimates are available of the contribution from the lower aquifer in composite wells. Logs are not available for all PFC wells, but 12 wells have been identified as composite wells as shown on **Figure 1-2**. The number of composite wells is expected to increase to the northeast as the Corcoran Clay becomes shallower. Estimates of PFC's pumpage from the lower aquifer will be included in the next annual report.

2010 deep zone pumping by Spreckels Sugar Co. was less than previous years due to the termination of sugar processing at the end of 2008, but some water is still pumped for irrigation purposes. **Tables 3-4** and **3-5** do not show extraction from the Bank, which totaled only 13 af in 2010. As of the end of 2010, the Bank had recharged about 36,400 af of water to the shallow aquifer and extracted about 8,500 af, resulting in a surplus of about 27,900 af.

Pumpage data are not available for wells east of the Chowchilla Bypass, and the estimates originally made for the 2001 Annual Report (LSCE and KDSA, 2002) were also used for 2010. The total pumpage above the Corcoran Clay east of the Bypass was estimated to be 68,600 af, which includes about 36,600 af in Aliso Water District and undistricted portions of Madera County and 32,000 af in the undistricted portion of Fresno County east of FWD and Spreckels Sugar Co. The total non-MPG pumpage above the Corcoran Clay in the study area was estimated to be about 101,600 af in 2010 (**Table 3-6**).

Table 3-1
Mendota Pool Group Pumpage (2010)
(including non-MPG pumpage by Don Peracchi)

Total Pumpage (acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Terra Linda	0	581	868	361	1,185	675	1,263	1,061	625	822	842	0	**8,283**
Conejo	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Coelho/Coelho/Fordel	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Silver Creek	0	0	80	18	0	90	77	0	0	0	0	0	**265**
Coelho/Gardner/Hansen	0	0	135	167	548	307	133	341	85	0	0	0	**1,716**
Meyers Farming	0	0	257	125	131	0	0	0	0	0	0	0	**513**
Casaca Vineyards	0	0	127	74	273	56	0	0	0	0	0	0	**530**
Daddy's Pride Farming	0	0	23	9	37	114	137	40	0	0	0	0	**360**
Solo Mio Farms	0	0	43	13	103	4	0	0	0	0	0	0	**163**
Coelho West	0	0	120	54	83	0	0	0	0	0	0	0	**257**
Baker Farming	0	0	517	1,018	940	0	0	0	0	0	0	0	**2,475**
Panoche Creek Farms	0	0	0	173	150	0	0	0	0	0	0	0	**323**
Farmers Water District[1]	0	0	617	980	736	0	157	263	112	34	0	0	**2,899**
Peracchi (Non-MPG)	*0*	*0*	*263*	*491*	*364*	*500*	*363*	*145*	*26*	*0*	*0*	*0*	***2,152***
Total	**0**	**581**	**3,050**	**3,483**	**4,550**	**1,746**	**2,130**	**1,850**	**848**	**856**	**842**	**0**	**19,936**

Pumpage for Irrigation of Adjacent Lands (acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Terra Linda	0	581	605	255	659	675	1,122	770	0	315	133	0	**5,115**
Conejo	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Coelho/Coelho/Fordel	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Silver Creek	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Coelho/Gardner/Hansen	0	0	135	85	233	114	133	216	85	0	0	0	**1,001**
Meyers Farming	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Casaca Vineyards	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Daddy's Pride Farming	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Solo Mio Farms	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Coelho West	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Baker Farming	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Panoche Creek Farms	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Farmers Water District[1]	0	0	0	0	0	0	157	263	112	34	0	0	**566**
Peracchi (Non-MPG)	*0*	*0*	*0*	*100*	*255*	*500*	*363*	*145*	*26*	*0*	*0*	*0*	***1,389***
Total	**0**	**581**	**740**	**441**	**1,147**	**1,289**	**1,775**	**1,394**	**223**	**349**	**133**	**0**	**8,071**

Transfer Pumpage (acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Terra Linda	0	0	263	106	526	0	141	291	625	507	709	0	**3,168**
Conejo	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Coelho/Coelho/Fordel	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Silver Creek	0	0	80	18	0	90	77	0	0	0	0	0	**265**
Coelho/Gardner/Hansen	0	0	0	82	315	193	0	125	0	0	0	0	**715**
Meyers Farming	0	0	257	125	131	0	0	0	0	0	0	0	**513**
Casaca Vineyards	0	0	127	74	273	56	0	0	0	0	0	0	**530**
Daddy's Pride Farming	0	0	23	9	37	114	137	40	0	0	0	0	**360**
Solo Mio Farms	0	0	43	13	103	4	0	0	0	0	0	0	**163**
Coelho West	0	0	120	54	83	0	0	0	0	0	0	0	**257**
Baker Farming	0	0	517	1,018	940	0	0	0	0	0	0	0	**2,475**
Panoche Creek Farms	0	0	0	173	150	0	0	0	0	0	0	0	**323**
Farmers Water District[1]	0	0	617	980	736	0	0	0	0	0	0	0	**2,333**
Peracchi (Non-MPG)	*0*	*0*	*263*	*391*	*109*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	***763***
Total	**0**	**0**	**2,310**	**3,042**	**3,403**	**457**	**355**	**456**	**625**	**507**	**709**	**0**	**11,865**

1. Excluding non-MPG pumpage by Don Peracchi. Non-MPG Peracchi transfer pumpage is based on a percentage of MPG transfer pumpage in FWD (including the R and BF wells, but is extracted from R-wells, only). Peracchi's actual monthly percentage varies. While the shown values and the proportional relationship between FWD and Peracchi pumpage are approximations, the monthly sums (and annual totals) are accurate.

Table 3-2
Annual Mendota Pool Group Pumpage by Location
(Including Non-MPG Pumpage by Don Peracchi)

Year	Pumpage by Wells Along Fresno Slough			Pumpage by Wells South of San Joaquin River[1]			Total Pumpage			Net Exchanged with USBR (af)
	Transfer (af)	Adjacent (af)	Total (af)	Transfer (af)	Adjacent (af)	Total (af)	Transfer (af)	Adjacent (af)	Total (af)	
1989	11,193	N/A	N/A	0	6,418	6,418	11,193	N/A	N/A	N/A
1990	17,810	N/A	N/A	0	6,077	6,077	17,810	N/A	N/A	N/A
1991	40,691	N/A	N/A	9,334	4,409	13,743	50,025	N/A	N/A	N/A
1992	40,571	N/A	N/A	11,850	3,851	15,701	52,421	N/A	N/A	N/A
1993	15,988	N/A	N/A	2,583	6,322	8,905	18,571	N/A	N/A	N/A
1994	31,189	N/A	N/A	9,000	4,624	13,624	40,189	N/A	N/A	N/A
1995	0	N/A	N/A	0	5,973	5,973	0	N/A	N/A	N/A
1996	0	N/A	N/A	0	N/A	0	0	N/A	N/A	N/A
1997	19,977	3,323	23,300	6,604	6,301	12,905	26,581	9,624	36,205	N/A
1998	1,000	1,268	2,268	0	5,593	5,593	1,000	6,861	7,861	0
1999	14,871	5,701	20,572	4,850	7,946	12,796	19,721	13,647	33,368	5,797
2000	14,974	9,104	24,078	4,021	7,061	11,082	18,995	16,165	35,160	7,162
2001	18,510	9,530	28,039	8,906	3,816	12,722	27,415	13,346	40,761	16,416
2002	10,963	10,117	21,080	1,534	5,806	7,340	12,497	15,923	28,420	7,325
2003	0	11,185	11,185	0	3,054	3,054	0	14,239	14,239	0
2004	0	9,573	9,573	0	3,354	3,354	0	12,927	12,927	0
2005	0	6,596	6,596	0	3,413	3,413	0	10,009	10,009	0
2006	0	1,678	1,678	0	4,686	4,686	0	6,364	6,364	0
2007	14,884	9,246	24,130	7,671	6,218	13,889	22,556	15,463	38,019	21,427
2008	14,962	8,469	23,431	9,055	3,323	12,378	24,017	11,792	35,809	22,814
2009	14,527	8,263	22,790	12,265	1,824	14,089	26,792	10,087	36,879	25,453
2010[2]	5,971	6,116	12,087	5,894	1,955	7,849	11,865	8,071	19,936	11,271
2010 Planned	14,577	8,301	22,878	12,313	1,830	14,143	26,890	10,131	37,021	25,546
2010 Actual Minus Planned	-8,606	-2,185	-10,791	-6,419	125	-6,294	-15,025	-2,060	-17,085	-14,274

1. Includes R, BF, and PCF wells. Currently limited to Fresno County wells but Included East and West Loop wells until 2001.
2. 5,894 af transfer pumpage by wells south of SJR in 2010 includes 2,152 af of non-MPG Peracchi transfer pumpage.
   1,955 af adjacent pumpage by wells south of SJR in 2010 includes 1,389 af of non-MPG Peracchi adjacent pumpage.

Table 3-3
Annual Mendota Pool Group Pumpage by Aquifer
(Including Non-MPG Pumpage by Don Peracchi)

Year	Deep Wells		Shallow Wells		Total Pumpage		
	Transfer (af)	Adjacent (af)	Transfer (af)	Adjacent (af)	Deep (af)	Shallow (af)	Total (af)
1997	16,847	7,831	9,734	1,793	24,678	11,527	**36,205**
1998	500	5,093	500	1,768	5,593	2,268	**7,861**
1999	9,765	11,288	9,956	2,359	21,053	12,315	**33,368**
2000	8,921	10,889	10,074	5,276	19,810	15,350	**35,160**
2001	15,587	8,770	11,828	4,576	24,357	16,404	**40,761**
2002	3,668	9,807	8,836	6,109	13,475	14,945	**28,420**
2003	0	6,797	0	7,442	6,797	7,442	**14,239**
2004	0	4,941	0	7,986	4,941	7,986	**12,927**
2005	0	4,664	0	5,345	4,664	5,345	**10,009**
2006	0	4,791	0	1,573	4,791	1,573	**6,364**
2007	11,168	6,218	11,387	6,286	20,346	17,673	**38,019**
2008	13,122	7,138	10,895	4,654	20,260	15,549	**35,809**
2009	14,476	7,921	12,316	2,166	22,397	14,482	**36,879**
2010[1]	7,134	5,871	4,731	2,200	13,005	6,931	**19,936**
2010 Planned	12,605	3,612	14,285	6,519	16,217	20,804	**37,021**
2010 Actual Minus Planned	-5,471	2,259	-9,554	-4,319	-3,212	-13,873	**-17,085**

1. 7134 af of deep-zone transfer pumpage in 2010 includes 2,152 af of non-MPG Peracchi transfer pumpage. 5,871 af deep-zone adjacent pumpage in 2010 includes 1,389 af of non-MPG Peracchi adjacent pumpage.

Table 3-4
Monthly Non-MPG Pumpage West of Chowchilla Bypass (2010)

Well Owner or District	Well ID	Jan (af)	Feb (af)	Mar (af)	Apr (af)	May (af)	Jun (af)	Jul (af)	Aug (af)	Sep (af)	Oct (af)	Nov (af)	Dec (af)	Total (af)	Notes
Paramount	2480-61 (W-43)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)
Farming Co.[1]	2480-62 (W-97)	0	0	0	0	0	0	142	0	0	0	0	0	142	
	2480-63 (W-100)	0	0	0	0	0	2	10	0	0	0	0	0	12	(2)
	2480-64 (W-88)	0	0	0	0	0	0	8	0	0	0	0	0	8	(2)
	2480-65 (W-33)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)
	2480-66 (W-42)	0	0	0	0	0	0	8	8	0	0	0	0	16	(2)
	2480-67 (W-84)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)
	2480-68 (W-41)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)
	2480-69 (W-30)	0	0	0	0	0	0	0	0	0	0	0	0	0	
	2480-70 (W-81)	0	0	0	0	0	3	10	0	0	0	0	0	13	
	2480-71 (W-5)	0	0	0	0	0	0	7	0	0	0	0	0	7	(2)
	2480-72 (W-35)	0	0	0	0	0	6	6	0	0	0	0	0	12	
	2480-73 (W-56)	0	0	0	0	0	0	4	0	0	0	0	0	4	(2)
	2480-74 (W-55)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)
	2480-75 (W-50)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)
	2560-61 (W-82)	0	0	0	0	0	0	9	0	0	0	1	0	10	
	2560-62 (W-25)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)
	2570-61 (W-51)	0	0	0	0	0	7	11	1	0	0	0	0	18	
	2570-62 (W-68)	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3191-61 (W-85)	0	0	0	0	2	2	5	0	4	0	0	0	14	
	3191-62 (W-86)	0	0	0	0	2	5	9	0	7	0	7	0	30	
	3191-63 (W-44)	0	0	4	0	2	5	5	0	0	0	3	0	19	
	3191-64 (W-57)	0	0	0	0	3	9	15	0	11	0	0	0	38	
	3191-65 (W-87)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)
	3191-66 (W-20)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)
	3191-67 (W-17)	0	0	4	0	2	4	6	0	0	0	4	0	21	
	3191-68 (W-76)	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3191-69 (W-52)	0	0	0	0	0	17	9	0	0	0	0	0	26	
	3211-61 (W-73)	0	0	15	4	100	103	98	96	76	51	39	0	582	
	3211-62 (W-69)	0	0	16	4	108	118	113	106	80	39	24	0	608	
	3211-63 (W-2)	0	0	0	0	0	4	22	21	14	9	5	0	76	
	3211-65 (W-62)	0	0	0	0	12	20	21	20	15	9	4	0	101	
	3211-66 (W-15)	0	0	0	0	1	2	23	27	12	5	6	0	78	
	3211-67 (W-3)	0	0	0	1	17	19	17	15	12	5	0	0	86	
	3211-68 (W-110)	0	0	25	9	112	138	127	127	78	23	46	0	685	
	3211-69 (W-77)	0	0	0	6	39	23	0	9	0	0	0	0	76	
	3211-70 (W-98)	4	0	0	4	31	81	104	53	24	15	13	0	328	
	3211-71 (W-46)	0	0	0	2	44	66	57	48	27	4	3	0	252	
	3211-72 (W-101)	0	0	0	4	77	141	116	96	55	10	3	0	501	
	3211-73 (W-14)	0	0	0	2	33	60	50	39	19	4	2	0	209	
	3211-74 (W-31)	0	0	0	0	11	3	10	2	0	0	0	0	26	
	3211-75 (W-63)	0	0	0	0	25	12	16	3	2	0	0	0	58	
	3211-76 (W-13)	0	0	0	2	20	55	50	30	12	11	5	0	185	
	3311-61 (W-89)	0	0	0	0	0	0	5	5	0	0	0	0	10	(2)

Table 3-4 (continued)
Monthly Non-MPG Pumpage West of Chowchilla Bypass (2010)

Well Owner or District	Well ID	Jan (af)	Feb (af)	Mar (af)	Apr (af)	May (af)	Jun (af)	Jul (af)	Aug (af)	Sep (af)	Oct (af)	Nov (af)	Dec (af)	Total (af)	Notes
Paramount	3311-62 (W-8)	0	0	0	1	70	67	77	51	4	18	0	0	288	
Farming Co.	3311-63 (W-12)	0	0	8	3	42	49	49	33	16	15	13	0	227	
(continued)	3311-64 (W-90)	0	0	18	6	93	96	91	65	65	36	29	0	499	
	3421-61 (Card-1)	0	0	3	0	1	2	9	0	0	0	0	0	15	
	3421-62 (W-74)	0	0	0	0	0	0	9	7	0	0	0	0	15	
	3421-64 (W-18)	0	0	5	0	2	6	7	0	0	0	4	0	24	
	3421-66 (W-19)	0	0	4	0	1	7	7	0	0	0	0	0	19	
	3421-68 (W-24)	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3431-61 (W-32)	0	0	0	0	0	0	7	5	0	0	0	0	12	(2)
	3431-62 (W-91)	0	0	0	0	1	0	7	5	0	0	0	0	13	(2)
	3431-63 (W-36)	0	0	0	0	9	1	3	2	0	0	0	0	14	
	3561-61 (W-27)	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3561-62 (W-28)	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3561-63 (W-83)	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3561-64 (W-80)	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3591-61 (W-34)	0	0	0	0	0	0	10	0	0	0	0	0	10	(2)
	3591-62 (W-29)	0	0	0	0	0	0	5	0	0	0	0	0	5	(2)
	3591-63 (W-7)	0	0	5	1	32	57	62	46	7	3	0	0	213	
	3591-64 (W-92)	0	0	3	0	16	48	41	13	2	0	0	0	124	
	3591-65 (W-75)	0	0	8	0	52	79	105	75	19	0	0	0	338	
	3591-66 (W-11)	0	0	6	1	39	64	74	52	9	0	0	0	244	
	3591-67 (W-10)	0	0	0	0	5	7	16	2	0	0	0	0	29	
	3591-68 (W-93)	0	0	11	1	49	86	69	39	19	11	2	0	287	
	3591-69 (W-39)	0	0	4	0	12	7	10	0	1	0	0	0	35	
	3591-70 (W-72)	0	0	10	0	11	5	28	5	4	5	0	0	68	
	3591-71 (W-71)	0	0	8	0	8	4	8	0	0	1	0	0	30	
	3591-72 (W-60)	0	0	6	1	27	45	37	21	11	6	1	0	153	
	3730-61 (W-95)	0	0	17	10	64	104	140	146	147	56	13	0	697	
	3730-62 (W-94)	0	0	14	5	48	75	116	90	89	35	0	0	473	
	3730-63 (W-112)	0	0	32	21	213	247	275	250	264	104	80	0	1,486	
	3730-64 (W-111)	0	0	30	19	179	220	232	215	195	61	0	0	1,152	
	3730-65 (W-53)	0	0	11	6	65	81	87	74	54	16	4	0	398	
	3730-66 (W-59)	0	0	17	10	97	114	122	111	80	51	32	0	634	
	3730-67 (W-96)	0	0	17	9	77	100	116	99	84	38	9	0	549	
	3730-68 (W-48)	1	0	14	4	61	74	0	1	0	0	0	0	155	
	3730-70 (W-108)	0	0	72	28	206	209	223	215	114	67	63	0	1,198	
	3730-71	0	0	3	0	0	0	4	0	0	0	0	0	8	
	3730-72 (W-107)	0	0	0	0	50	73	70	62	63	31	10	14	373	
	3921-61 (W-106)	16	0	8	4	39	29	48	31	36	27	15	5	257	
	3921-62 (W-78)	5	0	31	6	100	72	116	94	56	32	28	3	542	
	7101-61 (W-61)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)
	7102-61 (W-99)	0	0	0	0	0	0	11	0	0	0	0	0	11	(2)
	7102-62 (W-66)	0	0	0	0	0	0	0	6	0	0	0	0	6	(2)
	7102-63 (W-65)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)

Table 3-4 (continued)
Monthly Non-MPG Pumpage West of Chowchilla Bypass (2010)

Well Owner or District	Well ID	Jan (af)	Feb (af)	Mar (af)	Apr (af)	May (af)	Jun (af)	Jul (af)	Aug (af)	Sep (af)	Oct (af)	Nov (af)	Dec (af)	Total (af)	Notes
Paramount	7102-64 (W-64)	0	0	0	0	0	0	4	0	0	0	0	0	4	(2)
Farming Co.	7102-65 (W-70)	0	0	0	0	0	0	0	0	0	0	0	0	0	(2)
(continued)	7102-66 (W-67)	0	0	0	0	0	0	5	0	0	0	0	0	5	(2)
	Total	**25**	**0**	**431**	**173**	**2,312**	**2,936**	**3,393**	**2,522**	**1,785**	**797**	**468**	**22**	**14,865**	
Columbia Canal	CC-1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Company[1]	CC-2	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Snyder	0	0	0	0	0	0	10	0	0	0	0	0	10	
	Burkhart-Heirs	0	0	0	0	0	24	30	15	0	0	0	0	69	
	Cardella-2	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Diepersloot #1	0	0	0	0	0	96	96	96	0	0	0	0	289	
	Diepersloot #2	0	0	0	0	0	127	127	127	0	0	0	0	382	
	Elrod #1	0	0	0	0	0	0	3	0	0	0	0	0	3	
	Elrod #2	0	0	0	0	0	0	1	0	0	0	0	0	1	
	Elrod #3	0	0	0	0	0	141	141	141	0	0	0	0	423	
	MLT-West	0	0	0	0	0	0	7	0	0	0	0	0	7	
	N.F. Davis #1	0	0	0	0	0	0	5	0	0	0	0	0	5	
	N.F. Davis #2	0	0	0	0	0	62	62	0	0	0	0	0	124	
	G-2 Farms #1	0	0	0	0	0	0	16	0	0	0	0	0	16	
	G-2 Farms #2	0	0	0	0	378	378	378	378	378	0	0	0	1,891	
	G-2 Farms #3	0	0	0	0	0	73	73	0	0	0	0	0	147	
	G-2 Farms #4	0	0	0	0	0	0	40	41	0	0	0	0	81	
	G-2 Farms #5	0	0	0	0	0	0	30	33	0	0	0	0	63	
	Total	**0**	**0**	**0**	**0**	**378**	**902**	**1,019**	**832**	**378**	**0**	**0**	**0**	**3,510**	
CCID	5A	0	56	148	107	47	6	115	139	59	154	38	0	869	
	12C	0	19	0	124	48	6	94	151	163	109	29	0	743	
	15B	0	41	105	68	30	4	64	91	38	90	22	0	554	
	16C	0	66	146	125	2	0	85	129	60	135	37	0	785	
	23B	0	61	161	117	46	6	85	139	151	99	26	0	889	
	28D	0	39	149	105	57	6	71	114	60	126	37	0	763	
	32B	0	44	160	109	55	6	62	130	163	123	31	0	883	
	35A	0	84	210	142	58	8	145	150	75	169	40	0	1,079	
	38A	0	0	20	0	56	21	20	9	0	0	0	0	126	
	Total	**0**	**408**	**1,099**	**897**	**399**	**62**	**741**	**1,052**	**769**	**1,004**	**260**	**0**	**6,692**	
City of Mendota	Well #3	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Well #5	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Well #7	53	50	71	74	91	115	5	128	114	87	0	58	845	
	Well #8	2	0	1	1	2	20	7	5	1	1	1	0	41	
	Well #9	109	109	68	42	60	106	113	110	79	53	36	29	913	
	Fordel M-1	0	0	121	0	81	167	0	91	8	0	0	0	468	
	Fordel M-2 & 3	0	0	59	0	40	82	0	44	4	0	0	0	229	
	Fordel M-4,5,6	0	0	89	0	59	122	0	67	6	0	0	0	343	
	Total	**165**	**159**	**409**	**117**	**332**	**611**	**126**	**445**	**212**	**140**	**37**	**86**	**2,839**	

Table 3-4 (continued)
Monthly Non-MPG Pumpage West of Chowchilla Bypass (2010)

Well Owner or District	Well ID	Jan (af)	Feb (af)	Mar (af)	Apr (af)	May (af)	Jun (af)	Jul (af)	Aug (af)	Sep (af)	Oct (af)	Nov (af)	Dec (af)	Total (af)	Notes
Covanta Mendota	Biomass	56	49	57	61	28	51	58	48	51	40	52	58	609	
	Total	**56**	**49**	**57**	**61**	**28**	**51**	**58**	**48**	**51**	**40**	**52**	**58**	**609**	
Locke Ranch	No.4	*0*	*0*	*0*	*0*	*0*	*215*	*430*	*215*	*0*	*0*	*0*	*0*	*860*	(3)
	No.6	*0*	*0*	*0*	*0*	*0*	*215*	*430*	*215*	*0*	*0*	*0*	*0*	*860*	(3)
	No.7	*0*	*0*	*0*	*0*	*0*	*64*	*128*	*64*	*0*	*0*	*0*	*0*	*255*	(3)
	No.8	*0*	*0*	*0*	*0*	*0*	*109*	*218*	*109*	*0*	*0*	*0*	*0*	*435*	(3)
	Total	***0***	***0***	***0***	***0***	***0***	***603***	***1,205***	***603***	***0***	***0***	***0***	***0***	***2,410***	
Spreckels Sugar	PW-6	3	3	1	12	9	0	0	0	0	0	0	0	28	
Company	PW-7	0	0	1	3	36	63	72	46	37	2	3	7	270	
	PW-9	18	21	4	1	38	55	71	24	1	11	0	0	245	
	PW-10	0	0	0	0	20	14	12	26	38	115	34	0	260	
	PW-11	0	0	4	7	14	33	52	46	40	79	10	0	284	
	PW-12	0	0	0	0	1	0	0	0	0	0	0	0	2	
	Total	**21**	**24**	**10**	**23**	**118**	**166**	**207**	**142**	**116**	**207**	**47**	**7**	**1,089**	
Total Pumpage		**267**	**640**	**2,006**	**1,270**	**3,567**	**5,330**	**6,749**	**5,645**	**3,311**	**2,190**	**863**	**173**	**32,012**	

Notes:

1. Only includes PFC and CCC wells located within the MPG study area.
2. PFC pumpage for these wells based on power use records. Pumpage for other PFC wells is based on meter readings.
3. Locke Ranch pumpage is based on 2001 estimates.

Table 3-5
Summary of Non-MPG Pumpage West of Chowchilla Bypass: 2001-2010 (acre-feet)

Year	PFC[1]	CCID	Locke Ranch[2]	City of Mendota: W of Fresno Slough: City Wells	City of Mendota: W of Fresno Slough: Fordel Wells	City of Mendota: E of Fresno Slough at B&B Ranch	Spreckels Sugar Co.[2]	Columbia Canal Co.[1]	Covanta Mendota[3]	Total
2001	37,400	6,900	2,400	1,400	-	-	1,900	7,700	700	**58,500**
2002	32,700	7,200	"	1,500	-	-	"	6,600	700	**53,000**
2003	33,400	7,300	"	1,600	-	-	"	4,300	600	**51,700**
2004	45,200	9,700	"	-	1,900	1,700	"	4,500	600	**67,900**
2005	19,600	3,300	"	-	2,100	1,600	"	1,400	500	**32,800**
2006	22,700	100	"	-	1,300	1,600	"	1,200	600	**31,800**
2007	13,200	10,400	"	-	1,900	1,800	"	3,900	600	**36,100**
2008	4,900	6,700	"	-	2,600	1,800	"	800	600	**21,700**
2009	12,500	9,400	"	-	2,100	1,800	1,000	2,400	700	**32,300**
2010	14,900	6,700	"	-	1,000	1,800	1,100	3,500	600	**32,000**

Notes:

Values are rounded to the nearest 100 acre-feet. Totals are based on monthly pumpage records, not on rounded annual values.

1. Paramount Farming Company and Columbia Canal Company totals only include wells within the MPG study area.
2. 2001-2008 pumpage assumed equal to 2000 pumpage. 2009-2010 Spreckels Sugar Co. pumpage based on meter readings.
3. Formerly AES Mendota and Mendota Biomass. 2001 pumpage estimated; 2002-2005 based on power records. 2006 - 2010 pumpage based on meter readings.

Table 3-6
Summary of Non-MPG Pumpage Above Corcoran Clay in 2010 (acre-feet)

	West of Chowchilla Bypass									East of Chowchilla Bypass[4]				
				City of Mendota[2]										
Month	PFC[1]	CCID	Locke Ranch[2]	Wells on B&B Ranch	Fordel Wells	Spreckels Sugar Co.	Columbia Canal Co.[1]	Covanta Mendota[3]	**Total**	Aliso WD	Madera County (undistricted)	Fresno County	**Total**	**Grand Total**
Jan	25	0	0	165	0	21	0	56	300	128	37	51	200	**500**
Feb	0	408	0	159	0	24	0	49	600	398	68	130	600	**1,200**
Mar	431	1,099	0	140	269	10	0	57	2,000	1,704	180	1,410	3,300	**5,300**
Apr	173	897	0	117	0	23	0	61	1,300	3,224	382	2,637	6,200	**7,500**
May	2,312	399	0	152	180	118	378	28	3,600	4,939	729	3,913	9,600	**13,100**
Jun	2,936	62	603	240	371	166	902	51	5,300	6,140	871	5,923	12,900	**18,300**
Jul	3,393	741	1,205	126	0	207	1,019	58	6,700	6,779	888	7,425	15,100	**21,800**
Aug	2,522	1,052	603	243	202	142	832	48	5,600	5,058	571	5,791	11,400	**17,100**
Sep	1,785	769	0	194	18	116	378	51	3,300	2,669	260	2,989	5,900	**9,200**
Oct	797	1,004	0	140	0	207	0	40	2,200	1,103	126	1,616	2,800	**5,000**
Nov	468	260	0	37	0	47	0	52	900	141	43	115	300	**1,200**
Dec	22	0	0	86	0	7	0	58	200	58	30	35	100	**300**
Total	14,900	6,700	2,400	1,800	1,000	1,100	3,500	600	**32,000**	32,300	4,200	32,000	**68,600**	**100,600**

Notes:
Values are rounded to the nearest 100 acre-feet. Totals are based on monthly pumpage records, not on rounded annual values.
1. Paramount Farming Company and Columbia Canal Company totals only include wells within the MPG study area.
2. Based on 2000 estimates.
3. Formerly AES Mendota and Mendota Biomass; based on meter readings.
4. Based on 2001 estimates for geographic areas, not entities.

IV. Groundwater Levels

Water-Level Hydrographs

Short-term water-level hydrographs (2000-2011) for all wells in the MPG monitoring program are included in **Appendix B**, and long-term hydrographs are included in **Appendix C**. Water levels measured in shallow and deep wells are summarized below. Groundwater level changes in 2010 are shown in **Table 4-1** (shallow zone) and **Table 4-2** (deep zone).

Shallow Zone

Water levels in the shallow zone west of the Fresno Slough showed full recovery in 2010 after declining during 2007-2009. Water levels at USGS monitoring well T13S/R15E-31J4 west of the Mendota Airport had risen about 17 feet during 2003-2006 when the MPG did not pump for transfer, and there was a similar amount of water-level decline during 2007-2009. Due primarily to reduced MPG transfer pumping in 2010, there were only about two feet of drawdown during the irrigation season and seven feet of recovery at the end of the irrigation season. As shown on the long-term hydrograph in **Appendix C**, water levels in this well are still considerably above the low levels observed during the 1987-1992 drought.

Water levels in the shallow zone in the northern half of the MPG well field west of the Fresno Slough also declined during 2007-2009, but rose in 2010. The hydrograph of Terra Linda Farms well No. 9s (formerly TL-10A) shows about five feet of water-level rise between January 2010 and March 2011. The long-term hydrograph of this well shows that water levels in March 2011 were about 13 feet higher than when measurements began in 1993.

In the southern portion of the MPG well field west of the Fresno Slough, water-level measurements in Five Star FS-5 showed about 12 feet of drawdown in 2010 and 26 feet of recovery by March 2011. This meant that water levels were about 14 feet higher at the end of the 2010 irrigation season. Water levels in this well declined by about 25 feet during 2007-2009 but have now recovered to 2000 levels. Some of the recovery is due to recharge by the Bank, as discussed below. The long-term hydrograph shows that water levels in this area are about 28 feet higher than when measurements began in 1993.

East of the Fresno Slough, water levels at shallow monitoring wells in the western portion of Spreckels Sugar Co. declined significantly between 1986 and 1993 due to MPG pumping and drought conditions. Water levels recovered between 1993 and 2007, with the greatest rise occurring between 2003 and 2007. Rising water levels during this period were due primarily to reduced MPG pumping west of the Fresno Slough and recharge by the Bank, which is located east of the Slough in the western portion of the Spreckels Sugar Co. property. By January 2007, water levels had recovered to the mid-1980s levels. During 2007-2009, water levels declined due to MPG pumping and extraction from the Bank. Water levels rose significantly in 2010 due to reduced pumping and Bank recharge.

At Spreckels' MW-1, water levels rose throughout 2010 and were about 19 feet higher by March 2011. Water levels at that time were about 13 feet higher than prior to the start of the Bank in 2002. However, the March 2011 water levels in MW-1 were still about nine feet lower than the highest water levels measured in 1984-1986 and 2006-2007.

Water levels in the Spreckels Sugar Co. monitoring wells east of San Mateo Avenue are primarily influenced by recharge from the SJR. The water level in Spreckels' MW-32 had declined about eight feet during 2002-2005. Water levels rose about five feet during 2006-2008 and have declined by a similar amount since 2008. The water level in this well declined by less than one foot between January 2010 and March 2011.

North of the SJR, the easternmost shallow PFC monitoring well (MW-2) shows the most response to recharge from the River during periods of flow. MW-2 is located near the River and the Chowchilla Bypass and is too far east to be influenced by seepage from the Pool. There was little flow in the SJR in the reach east of the Pool in 2001, and no flow during 2002-2005. Water levels at PFC MW-2 declined about 30 feet during this period. There were relatively large SJR flows during 2005 and 2006, and water levels in MW-2 rose about 27 feet during those years. During 2007-2009, SJR flows were very small (there was no flow in 2008), and water levels in MW-2 declined by about 26 feet. In 2010, interim releases from Friant Dam for the San Joaquin River Restoration Program (SJRRP) began in February and continued until December. Due to the SJRRP releases, the River flowed to the Pool from February 28 to December 8, 2010, and water levels in MW-2 rose throughout the year as a result. The total water-level rise between January 2010 and March 2011 was about 16 feet. Water levels are still well below the highs reached in 2000 and 2006, but are expected to continue to rise in 2011.

Water levels in PFC wells MW-4 and MW-5, in the northern portion of the study area, are influenced by pumping from deeper zones and declined from 2000 to 2005. Water levels in MW-4 are also strongly influenced by flows in the Bypass and rose in 2005 and 2006 due to recharge from the Bypass and a pilot water banking project conducted by PFC. Water levels declined by an average of eight feet per year during 2007-2009. Water levels in MW-4 rose by about 17 feet between January and March 2011 due to flow in the Bypass. However, water levels in March 2011 were still lower than in January 2007. Compared to MW-4, water levels in MW-5 rose by a smaller amount during 2005-2007 and declined by a larger amount (about 18 feet) since January 2007. The water-level decline at MW-5 was about four feet between January 2010 and March 2011.

Water levels in shallow monitoring wells near the SJR branch of the Pool, including PFC well MW-3 and the CCC Lopes-Observation well, are influenced by year-round recharge from the Pool and, as a result, show much smaller seasonal and year-to-year fluctuations. There wasa smaller water-level decline at MW-3 between 2000 and 2005 (about seven feet) than at other shallow wells north of the River, and there was less water-level recovery (about five feet) during 2005-2006. Water levels in this well have declined by about six feet since 2007.

Deep Zone

There was water-level recovery in almost all deep-zone wells in 2005 and 2006, due primarily to reduced deep-zone pumping in the study area and recharge from flood releases to the SJR and the Chowchilla Bypass. Water levels in all wells declined during 2007-2009, but there was full recovery in most wells after the 2010 irrigation season.

North of the City of Mendota, hydrographs of the CCID wells showed rising water levels during 2005-2006 and declining water levels during 2007-2009. Year-to-year water-level declines (the difference between the annual drawdown and recovery) are referred to as "residual drawdowns". There were large residual drawdowns at the end of 2007 and smaller residual drawdowns in 2008 and 2009. Seasonal drawdowns were smaller in 2010, and water levels were generally higher in March 2011 as compared to January 2010.

Water levels have been measured since 1985 at the USGS monitoring wells west of the Mendota Airport. Water levels in the deep wells rose during 2003-2006 and declined during 2007-2009. Monitoring well T13S/R15E-31J5 experienced about 12 feet of drawdown in 2010 followed by 17 feet of recovery, resulting in a net water-level rise of about five feet between January 2010 and January 2011.

Water levels in the deepest USGS monitoring well (T13S/R15E-31J6), which is completed in the lower aquifer (below the Corcoran Clay), had declined by approximately 35 feet between 1999 and 2003, due primarily to pumping below the Corcoran Clay occurring both northeast and west of the Mendota area. Reduced lower aquifer pumping in subsequent years resulted in about 25 feet of water-level rise during 2004-2006. Water levels declined during 2007-2009, and there were residual drawdowns of approximately 20 feet at the end of each year. The depth to water reached a new historical low of about 160 feet in September 2009. Water-level declines in the lower aquifer result in increased leakage through the Corcoran Clay and lower water levels in the deep zone above the Corcoran Clay. These declines have caused subsidence, as discussed in Chapter VII. In 2010, there was very little drawdown in monitoring well 31J6, and the water level rose about 25 feet between January 2010 and April 2011. In August 2010, the USGS installed a pressure transducer to collect daily water level data from 31J6.

East of the Fresno Slough, water levels rose in the deep Spreckels Sugar Co. monitoring wells from 1994 through 2006, with the largest rise occurring in wells near the Bank during 2003-2006. Water levels at Spreckels' MW-11 rose by about 14 feet from 1994 to 2003 and by an additional 20 feet from 2003 to January 2007. Water levels at MW-11 declined by about 20 feet during 2007-2009 due primarily to MPG pumping and Bank extraction. The seasonal drawdown was relatively large in 2009, which was the year of greatest extraction from the Bank. The seasonal drawdown was much smaller in 2010, and water levels rose about 13 feet between February 2010 and February 2011. The long-term hydrograph for MW-11 shows that water levels in February 2011 were almost as high as when measurements began in 1984.

North of Spreckels Sugar Co., the FWD wells also experienced declining water levels during 1998-2004, rising water levels during 2005-2006, and declining water levels during 2007-2009. In 2010, the seasonal drawdowns were similar to previous years, but there was full recovery at the end of the irrigation season. Overall, water levels rose by two to 11 feet between February 2010 and January 2011. Water levels in the FWD wells are influenced primarily by MPG pumping and recharge from the SJR during periods of flow.

North of the SJR, hydrographs of PFC and CCC wells also showed water-level declines from the late 1990s through 2004, followed by rising water levels during 2005-2006 and declining water levels during 2007-2009. In 2010, the seasonal drawdowns were similar to previous years, and there was full recovery in wells near the SJR at the end of the irrigation season. Four wells in the northern and eastern portion of PFC experienced water level declines of one to four feet between February 2010 and March 2011. Water level rose slightly (less than one foot) at the other three wells in this area.

Water levels are measured in four wells in Aliso Water District located in the historically overdrafted area of Madera County east of the Chowchilla Bypass. Two wells owned by Woolf Enterprises have a longer period of record than other wells in the area and experienced water-level declines of 25-30 feet between February 2001 and January 2005. Due to reduced pumping in the area and the SJR flood releases in 2005 and 2006, water levels in these wells rose 13 to 15 feet between January 2005 and January 2007. Drawdowns in 2010 were similar to previous years, but there was full recovery at the end of the year.

Groundwater Elevation Contour Maps

Three groundwater elevation contour maps were prepared for both the shallow and deep zones. Contour maps for both zones were based on water levels measured in January-February 2010, Summer 2010, and December 2010-January 2011. For the shallow-zone contour maps, data were only available for the original study area. The deep-zone contour maps extend farther to the north and much farther to the east due to the greater availability of data from deep wells. The shallow-zone contour maps (**Figures 4-1** to **4-3**) and the deep-zone contour maps (**Figures 4-4** to **4-6**) are discussed below. The groundwater elevations are shown as feet above mean sea level (ft msl) based on the National Geodetic Vertical Datum of 1929 (NGVD 29).

Shallow Zone

Groundwater elevation contours above the A-Clay in January-February 2010 are shown on **Figure 4-1**. Groundwater elevations ranged from about 185 ft msl in the southwest corner of the study area to about 96 ft msl in the northeast. Southwest of the City of Mendota, the direction of groundwater flow was to the northeast toward the Fresno Slough. There was a cone of depression beneath the MPG well field west of the Fresno Slough, due in part to pumping by MPG wells in this area in late 2009. Water levels were lowest at the Meyers Farm and Five Star wells in the southern portion of the MPG well field. East of the Pool, there was a small groundwater mound beneath the Bank, and the direction of flow was away from the Bank in all directions. There was a groundwater ridge beneath the SJR north of FWD, and groundwater flowed away from the River to both the north and south. Groundwater elevations shown on the contour map were lowest at PFC wells MW-4 and MW-5 in the northern portion of PFC. The contour map does not show March 2011 data, but the water level in MW-4 rose about 17 feet between the January and March measurement.

Groundwater elevation contours above the A-Clay in the summer of 2010 are shown on **Figure 4-2**. Most of the data shown on this contour map are for the month of July, but data for three wells are from October. Compared to January-February 2010, groundwater elevations were similar in the southwestern portion of the study area and about five feet lower in the northeastern portion. The cone of depression beneath the central portion of the MPG well field west of the Fresno Slough was larger and slightly deeper than in January-February 2010. The July 2010 groundwater levels were similar to those in January-February 2010 in the southern portion of the MPG well field due to recharge from the Bank. The groundwater mound beneath the Bank was much more apparent in July 2010, with a gradient for flow away from the Bank in all directions. Groundwater levels remained high beneath the SJR, with a gradient for flow away from the River to the north and south. Groundwater levels near the SJR in July 2010 were similar at PFC well MW-3 but about six feet higher at PFC well MW-2 northeast of the West Loop.

Groundwater elevation contours above the A-Clay in December 2010-January 2011 are shown on **Figure 4-3**. The shape of the groundwater elevation contours shown on this map is similar to the July 2010 contour map (**Figure 4-2**), but the cone of depression beneath the central portion of the MPG well field west of the Pool was smaller and not as deep. Water levels in the southern portion of the MPG well field were much higher due to recharge from the Bank. The groundwater mound beneath the Bank was larger than in July 2010, and water levels in the center of the mound were about four feet higher. Groundwater levels in December 2010-January 2011 were also higher beneath the SJR. Compared with January-February 2010, groundwater levels were about 14 feet higher at PFC MW-2 due to recharge from the River.

Deep Zone

Groundwater elevation contours below the A-Clay and above the Corcoran Clay in January-February 2010 are shown on **Figure 4-4**. Groundwater elevations ranged from about 163 ft msl near the southwest corner of the study area to 61 ft msl in the cone of depression east of the Chowchilla Bypass. Water levels were also low at well No. 3431-62 (W-91) in the northern portion of PFC. Low water levels in these wells are due in part to the fact these are composite wells. Water-level data from wells completed only in the deep zone above the Corcoran Clay are not available in this area. A relatively shallow cone of depression was present beneath the central portion of the MPG well field west of the Fresno Slough. This extended into the vicinity of the Bank due to extraction occurring in 2009.

Groundwater elevation contours below the A-Clay in the summer of 2010 are shown on **Figure 4-5**. This contour map is based primarily on July and August water-level measurements. Compared to January-February 2010, groundwater elevations in the summer were about 32 feet lower beneath the central portion of the MPG well field west of the Fresno Slough, 65 to 70 feet lower in the southern portion of PFC, and 24 to 34 feet lower in the northeastern portion of Aliso WD. Although the overall direction of groundwater flow was still to the northeast, there was an elongated cone of depression that extended to the west from Aliso WD into the southern portion of PFC. There was also a small cone of depression in FWD due to pumping for adjacent use.

Groundwater elevation contours below the A-Clay in December 2010-January 2011 are shown on **Figure 4-6**. Compared to January-February 2010, groundwater elevations were about five feet higher beneath the MPG well field west of the Fresno Slough. The cone of depression west of the Fresno Slough was no longer present, and there was a northeasterly gradient for groundwater flow except near the Bank. Water levels were up to 15 feet higher beneath the Bank, and there was groundwater flow away from the Bank to the north and west. Groundwater levels in the PFC wells were much higher than in summer 2010 and up to five feet higher than in January-February 2010.

Table 4-1
Change in Groundwater Levels in Shallow Wells: Winter 2009-2010 to Winter 2010-2011 (feet)

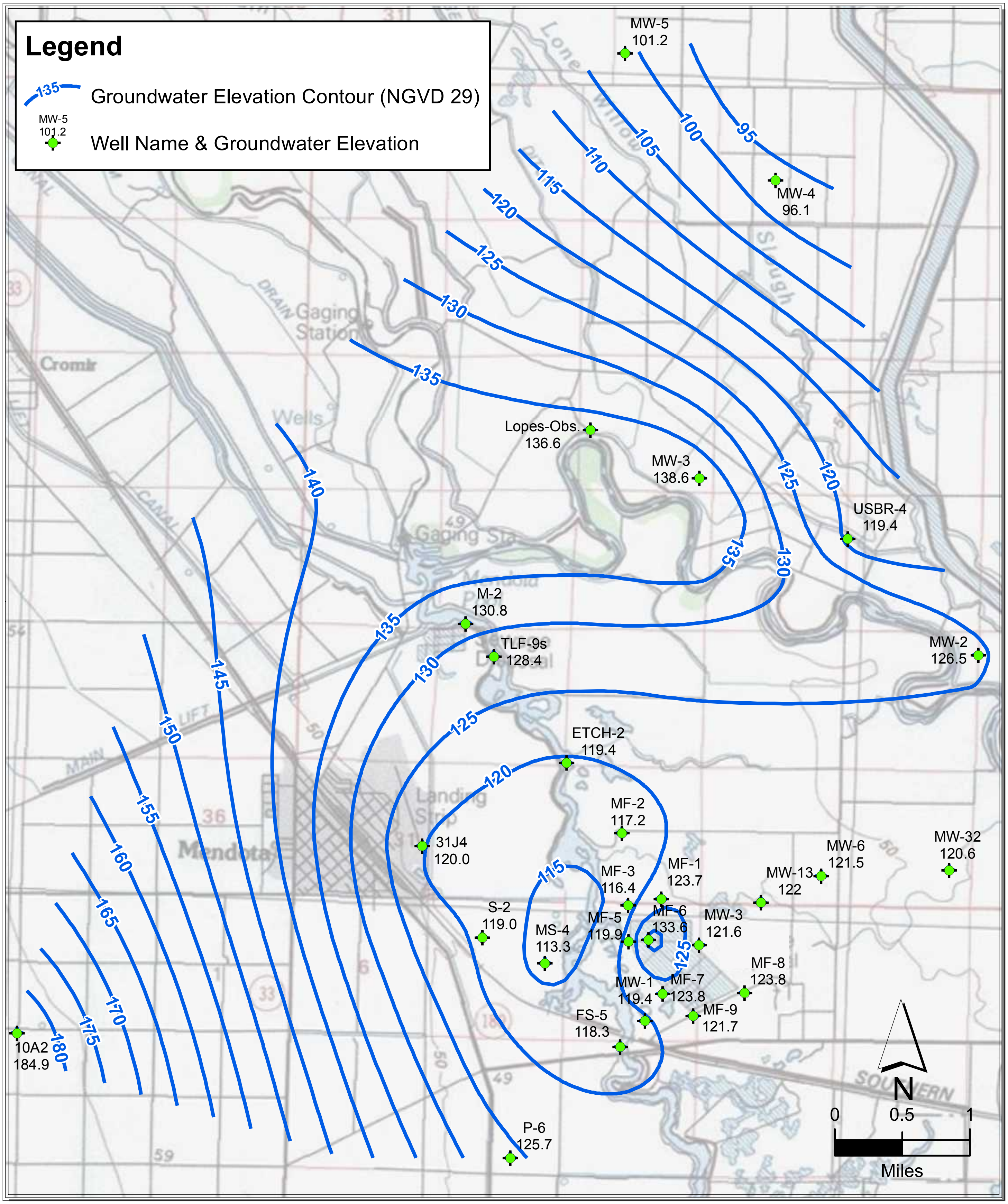
Well Owner	Well ID	Maximum Drawdown[1]	Recovery[2]	Residual Drawdown[3]
USGS	31J4	2.3	6.6	-4.3
City of Mendota	Fordel M-2	6.7	10.2	-3.5
Terra Linda	TL-9S (10A)	3.9	8.5	-4.5
Etchegoinberry	No. 2	3.1	9.5	-6.4
Meyers Farming	MS-4	0.0	23.1	-23.1
	S-2	0.0	12.0	-12.0
	P-6	1.2	5.3	-4.2
Five Star	FS-5	12.2	25.7	-13.5
Spreckels Sugar Company	MW-1	0.0	19.3	-19.3
	MW-3	0.0	28.8	-28.8
	MW-6	1.6	4.1	-2.5
	MW-32	1.8	1.3	0.5
Columbia Canal Company	Lopes-Obs	11.0	11.6	-0.6
	USBR-4	0.0	5.8	-5.8
Paramount Farming Company	MW-2	0.0	16.2	-16.2
	MW-3	1.5	1.4	0.1
	MW-4	8.1	17.9	-9.9
	MW-5	4.6	0.8	3.9

1. Difference between the highest water level measured during winter 2009-2010 and the lowest non-pumping water level measured during the irrigation season.
2. Recovery as of winter 2010-2011 (December-January).
3. Difference between seasonal drawdown and recovery. Negative values indicate rising water levels.

Table 4-2
Change in Groundwater Levels in Deep Wells: Winter 2009-2010 to Winter 2010-2011 (feet)

Well Owner	Well ID	Maximum Drawdown[1]	Recovery[2]	Residual Drawdown[3]
Central California ID	38A	3.0	6.6	-3.7
	5A	7.1	10.6	-3.4
	15B	0.7	3.9	-3.2
	32B	3.2	5.8	-2.6
	35A	0.7	4.2	-3.5
Firebaugh Canal WD	25D2	3.1	6.9	-3.8
USBR	19R1	34.0	27.7	6.2
USGS	31J3	25.9	30.8	-4.9
	31J5	12.2	17.0	-4.8
Terra Linda Farms	HS-3	32.5	34.2	-1.8
Coelho/Coelho/Fordel	CCF-2	44.9	49.7	-4.8
Meyers Farming	MS-5	6.3	14.8	-8.5
Spreckels Sugar Company	MW-10	9.3	20.4	-11.1
	MW-11	9.0	22.0	-13.0
	MW-14	24.9	25.9	-1.0
City of Mendota	18Q North	19.5	22.4	-2.9
Panoche Creek Farms	PCF-1	50.9	54.8	-3.8
Baker Farming	BF-2	26.6	35.6	-9.0
Farmers Water District	R-5	66.5	69.9	-3.4
	R-7	36.5	40.7	-4.2
	R-8	56.2	60.7	-4.5
	WL-2	27.6	38.2	-10.6
	EL-1	40.1	42.5	-2.4
Columbia Canal Company	CC-1	40.5	44.1	-3.6
	Lopes-1	25.4	23.9	1.6
	MLT-W	31.1	40.1	-9.0
Paramount Farming Company	W-8	25.0	22.0	3.1
	W-11	18.0	18.7	-0.7
	W-15	NA	28.5	NA
	W-32	11.0	7.3	3.7
	W-42	12.0	10.1	1.8
	W-53	60.6	62.0	-1.4
	W-74	18.0	17.8	0.2
	W-77	52.6	52.1	0.5
	W-78	NA	50.8	NA
	W-89	22.0	22.3	-0.3
	W-91	18.1	18.2	-0.1
	W-94	80.0	93.3	-13.3
	W-95	69.2	67.7	1.4

1. Difference between the highest water level measured during winter 2009-2010 and the lowest non-pumping water level measured during the irrigation season.
2. Maximum recovery as of December 2010 to March 2011.
3. Difference between seasonal drawdown and recovery. Negative values indicate rising water levels.



FILE: C:\Documents and Settings\tnguyen.LSCEDOMAIN\Desktop\Job files\Mendota\gis\Figure 4-3 Jan-Feb 2010.mxd Date: 6/2/2010

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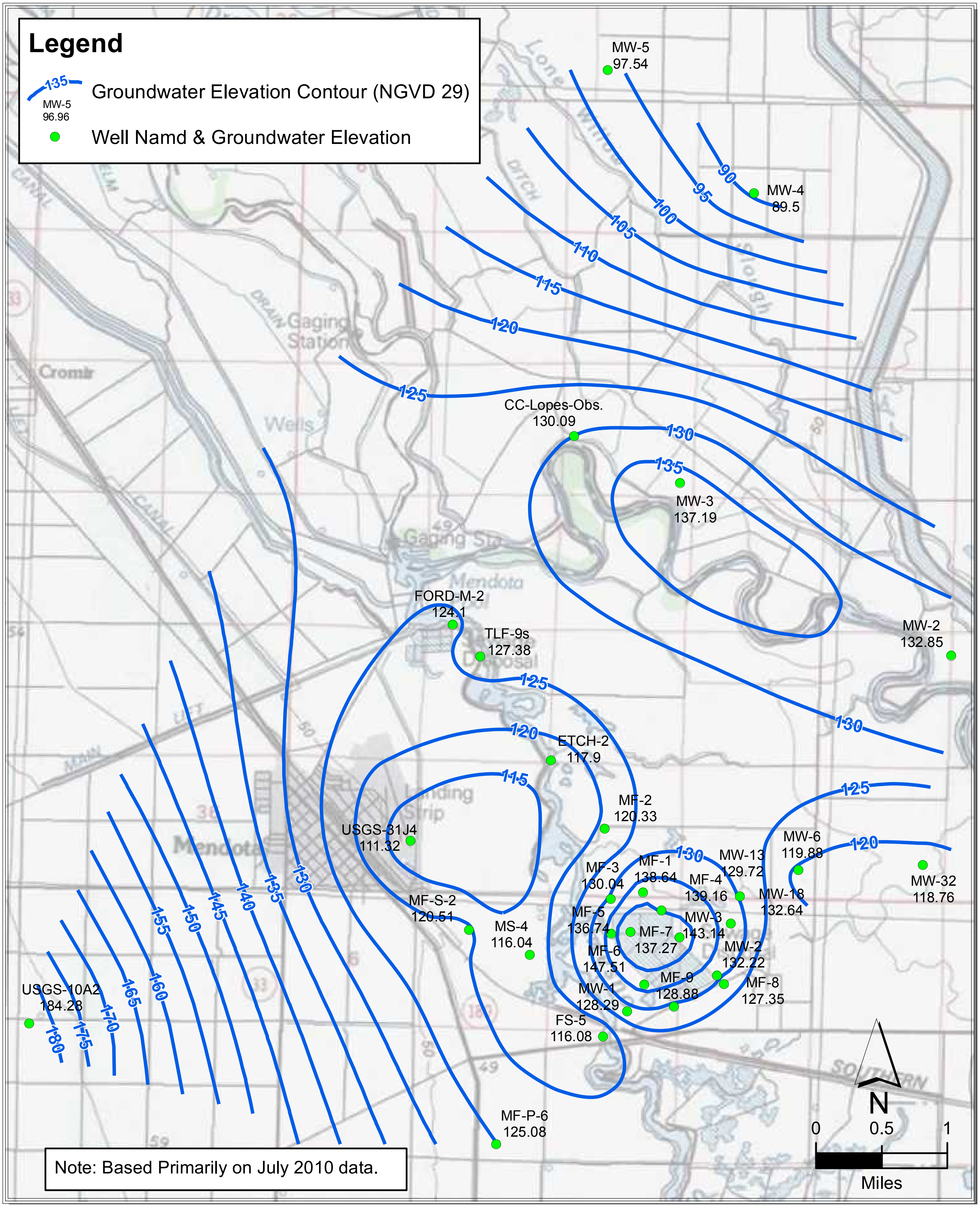
Figure 4-1
Groundwater Elevation Above A-Clay: January-February 2010



Path: C:\Users\tnguyen.LSCEDOMAIN\Desktop\Job files\Mendota\gis\map files\010311\Figure 4-2 GWE Contour Shallow Summer 2010.mxd

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Figure 4-2
Groundwater Elevation Above A-Clay: Summer 2010

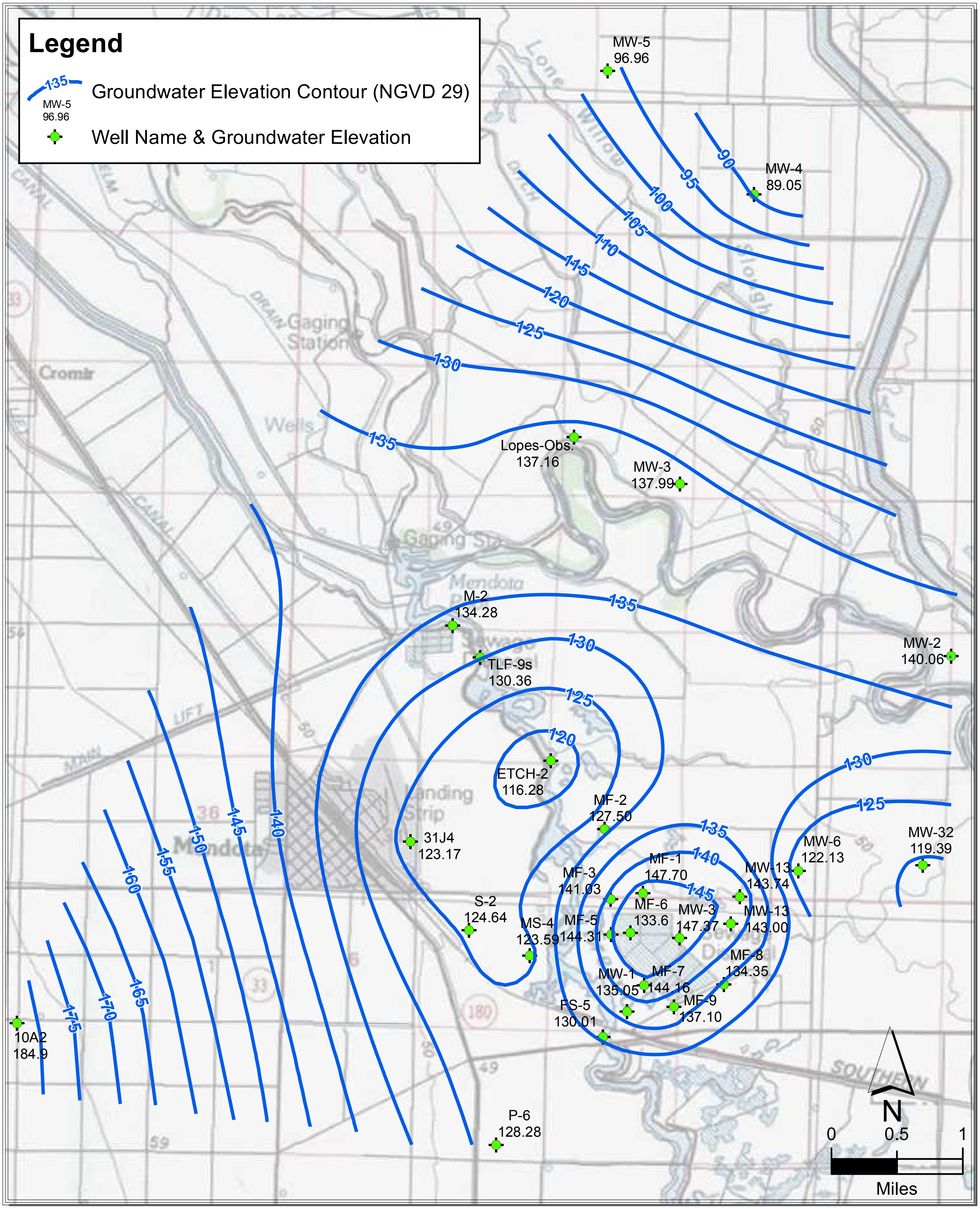

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Figure 4-3
Groundwater Elevation Above A-Clay: December 2010 - January 2011

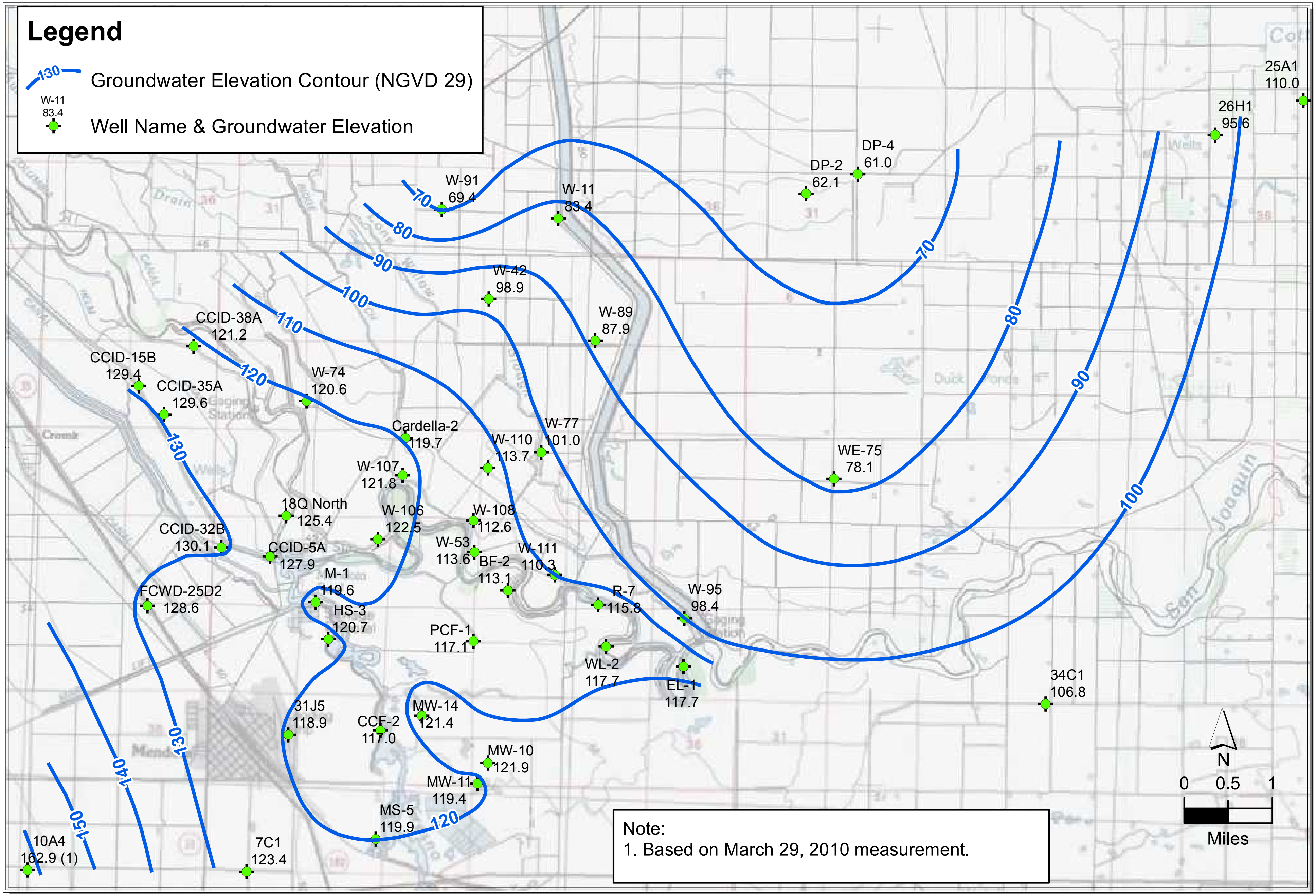

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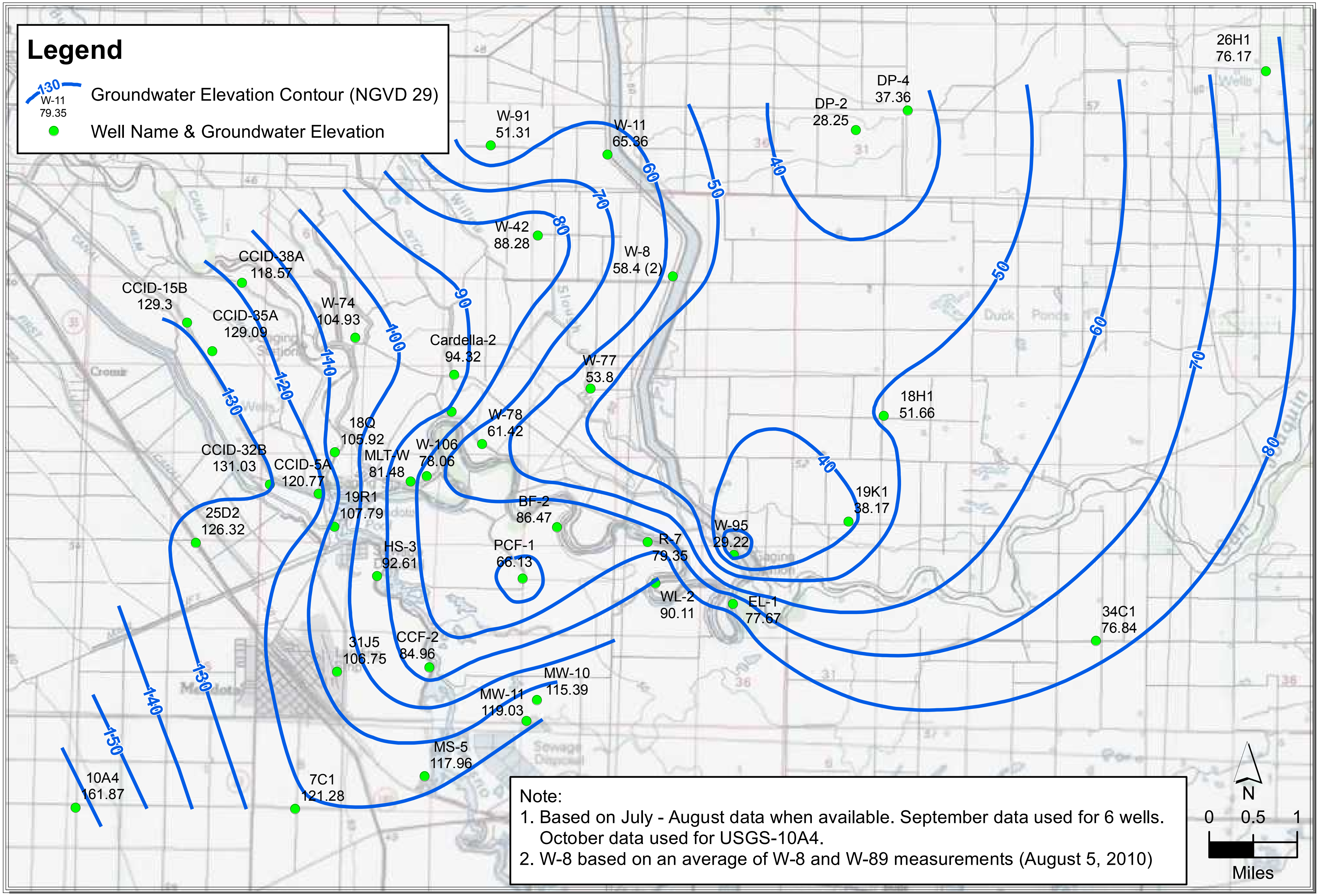
Figure 4-4
Groundwater Elevation Below A-Clay: January-February 2010



Note:
1. Based on July - August data when available. September data used for 6 wells. October data used for USGS-10A4.
2. W-8 based on an average of W-8 and W-89 measurements (August 5, 2010)

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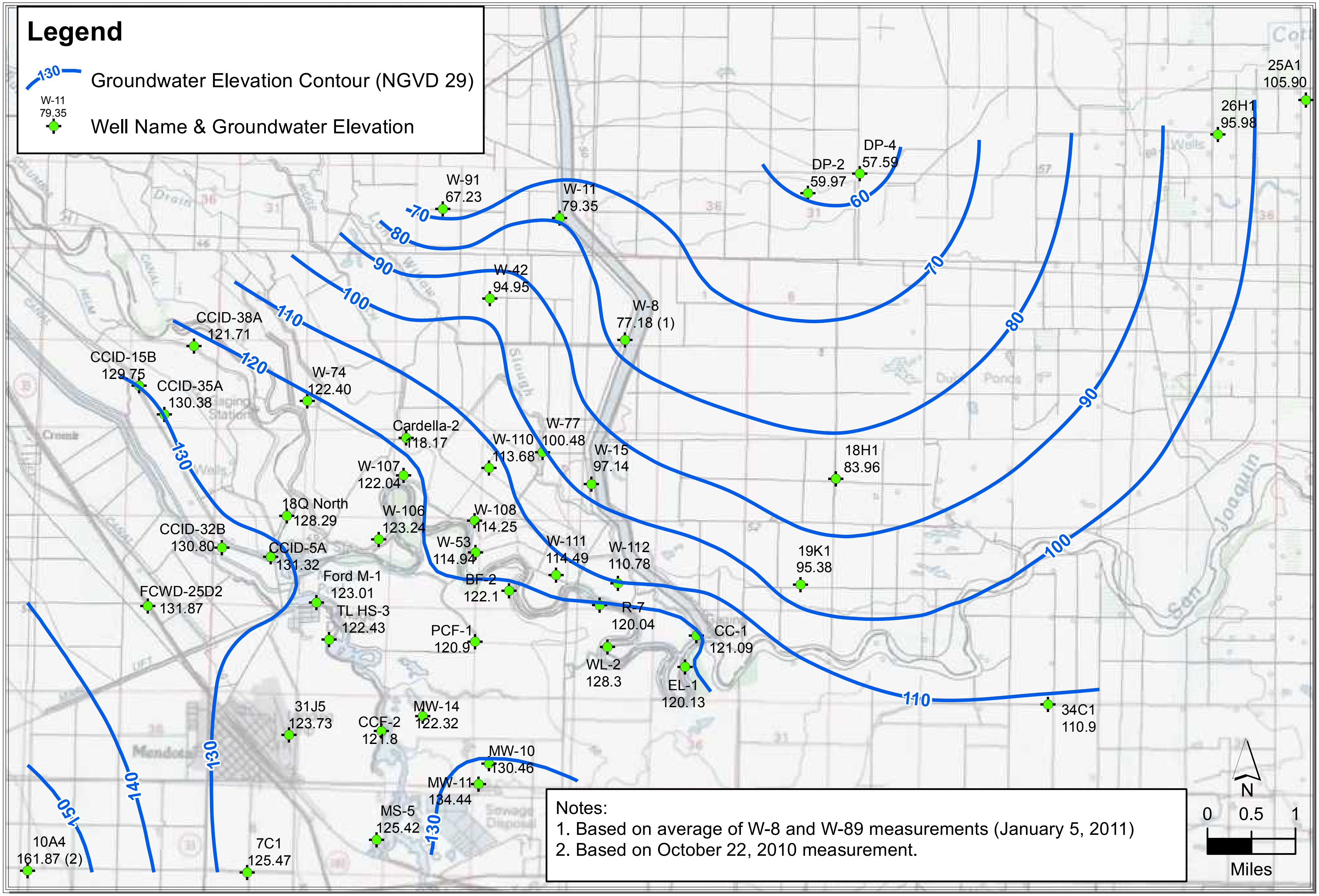
Figure 4-5
Groundwater Elevation Below A-Clay: Summer 2010



Path: C:\Users\tnguyen.LSCEDOMAIN\Desktop\Job files\Mendota\gis\map files\010311\Figure 4-6 GWE Below Contour Dec 2010-Jan 2011.mxd

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Figure 4-6
Groundwater Elevation Below A-Clay: December 2010-January 2011

V. Groundwater Quality

Groundwater quality in the Mendota area is highly variable, with the poorest water quality generally occurring in the western portion of the study area and the best water quality in the eastern area near the SJR. The primary water quality concern is high salinity, which is partly due to natural factors but has been exacerbated by deep percolation of applied irrigation water and concentration by evaporation in areas where groundwater is very shallow. Localized degradation due to percolated wastewater has also occurred in certain areas. Except for areas that benefit from recharge from the River or the Pool, shallow groundwater generally has higher salinity than deep groundwater above the Corcoran Clay. The best water quality in the study area typically occurs in shallow and deep wells located east of Mendota Dam near the Mendota Pool and the SJR, including the FWD, CCC, and PFC wells, due to recharge from the Pool and the River.

Groundwater quality degradation has occurred for decades in the western portion of the study area due to the northeasterly movement of a “front” of saline groundwater, which is present west of the Fresno Slough and the SJR. This poor quality groundwater flows into the Mendota area due to a northeasterly regional hydraulic gradient above the Corcoran Clay toward a pumping depression east of the Chowchilla Bypass in western Madera County. Groundwater pumping near the saline front steepens the gradient and accelerates the movement of this water toward the pumping wells.

Historical and recent groundwater quality data are shown in **Tables D-1** to **D-3** in **Appendix D**. **Table D-1** contains data for shallow-zone wells, **Table D-2** contains data for deep-zone wells, and **Table D-3** contains data for the Spreckels Sugar Co. and Meyers Farm Water Bank shallow and deep wells. Hydrographs of EC data from individual wells are compiled in **Appendix E**.

Salinity in the Shallow Zone

Recent EC and TDS data (2008-2010) for shallow wells in the monitoring program are summarized in **Table 5-1**. These parameters (especially TDS concentrations) are highlighted in the following discussion because they represent the best measures of groundwater salinity. Concentrations of other constituents (general minerals and trace elements) shown in tables in **Appendix D** were reviewed for this report and are generally consistent with the TDS and EC data.

West of Fresno Slough

The water quality data for shallow MPG wells located west of the Fresno Slough have different trends, with some wells showing degradation, some showing stable water quality, and some showing water quality improvements. The shallow Terra Linda wells located at the northern end of the MPG well field along the Fresno Slough had relatively good water quality in 2010, with TDS concentrations ranging from 420 to 530 mg/L. Of the four wells that were sampled in 2009 or 2010, all show generally stable TDS concentrations.

In the central portion of the MPG's Fresno Slough well field, TDS concentrations in the shallow zone generally increase from north to south. Wells that are located farther west (closer to the saline front) also have higher salinities than more easterly wells. The Terra Linda wells in this area have the lowest TDS concentrations, ranging from 500 to 770 mg/L in 2009 or 2010. Seven of these wells were sampled in 2009 or 2010; three show degradation and four show generally stable water quality. The Silver Creek wells had higher TDS concentrations than the Terra Linda wells (870 to 1,020 mg/L in 2009) because they are located farther west. Degradation has occurred at both of the Silver Creek wells since 2002.

TDS concentrations in shallow MPG wells were highest at the CGH wells in the south-central portion of the MPG well field along the Fresno Slough. TDS concentrations at the CGH wells ranged from 910 to 4,080 mg/L in 2009 and 2010. Ten CGH wells were sampled in 2009 or 2010, and significant degradation has occurred at almost all of these wells since the initial samples were collected in 2001 or 2002. Several of the CGH wells have been dropped from the MPG pumping program because the TDS concentrations exceeded 2,000 mg/L, and three wells that pumped a small amount of water in 2010 will be dropped in 2011.

In the southern portion of the MPG well field along the Fresno Slough, TDS concentrations at Meyers Farming wells MS-6 and MS-7 were 960 and 920 mg/L, respectively in 2007; these wells have not been sampled since that time. Salinity had decreased considerably in these wells since 2004 due to westerly migration of low salinity water recharged by the Bank. Six of the Five Star wells, located near Whites Bridge, were sampled in 2010, and all ten wells were sampled in 2009. The most recent TDS concentrations ranged from 620 to 1,490 mg/L. The initial samples from these wells were collected in 1993 (two wells), 1999 (one well), and 2001 (seven wells). Since that time, three wells show degradation, two show generally stable TDS concentrations, and five show TDS decreases. However, it is difficult to identify salinity trends for some of these wells because the data are highly variable.

East of Fresno Slough

East of the Fresno Slough, groundwater quality in and near the western portion of Spreckels Sugar Co. is also highly variable due to the combined effects of degradation caused by Spreckels' historical wastewater disposal practices and recent water quality improvements caused by surface water recharged by the Bank.

Like the Five Star wells, water quality at the shallow MPG wells near Jack's Resort (the Coelho West wells) has been highly variable. Most of these wells have experienced degradation due to Spreckels' wastewater, and some wells appear to show water quality improvements in recent years due to Bank recharge. These wells were not sampled in 2010, but the 2008 or 2009 TDS concentrations ranged from 570 mg/L at CW-1 to 1,410 mg/L at CW-4. The northernmost wells (CW-4 and CW-5) have experienced the most degradation due to Spreckels' wastewater, which moves toward these wells due to the cone of depression created by MPG pumping.

Many of the Spreckels Sugar Co. monitoring wells have experienced long-term groundwater quality degradation due to Spreckels' wastewater disposal practices and recent improvements due to recharge from the Bank. MW-3 is the best example of this variability due to its central location between the former Spreckels' wastewater ponds and the Bank's recharge ponds. TDS concentrations at this well increased from 735 mg/L in 1988 to 1,800 mg/L in 2003 and have generally declined since 2003. The TDS concentration of samples collected in 2010 ranged from 530 to 1,300 mg/L.

Spreckels' MW-1 is located between the Coelho West wells and Spreckels' pasture that, until recently, had been irrigated with factory wastewater. The TDS concentration was relatively stable at about 900 to 1,000 mg/L from 1982 until the MPG wells near Whites Bridge started pumping in 1990; this created a southwesterly direction of groundwater flow during pumping periods. TDS concentrations at MW-1 rose sharply to about 2,600 mg/L in 1994 and more gradually to over 3,000 mg/L in 2006. Water recharged by the Bank reached this area in 2007, and TDS concentrations decreased to about 900-1,400 mg/L in 2010.

The nine Meyers Farm monitoring wells east of the Fresno Slough have a shorter period of record but show substantial water quality improvement due to their proximity to the Bank. Since Bank recharge began in 2002, TDS concentrations have decreased in all but two of these wells. TDS concentrations in all Bank monitoring wells have decreased from the maximum reported levels, and TDS concentrations at seven wells have declined by more than 500 mg/L. The largest decrease (2,100 mg/L) occurred at MF-7. MF-9 is the only Bank monitoring well that has not experienced some water quality improvement.

2010 water quality data for monitoring wells in the central and eastern portions of the Spreckels property show that TDS concentrations continue to be highest in the central area due to the ongoing effects of previous percolation of Steffens' wastewater, which was a byproduct of the process used to produce molasses at the Spreckels' plant until 1994. TDS concentrations near the center of the Steffens' plume have decreased in recent years. In 2010, TDS concentrations were highest at Spreckels' MW-15 (4,000 mg/L), MW-17 (3,200 mg/L), MW-19 (4,200 mg/L), MW-26 (3,900 mg/L), and MW-27 (3,700 mg/L). TDS concentrations have decreased considerably west of the former Steffens' ponds due to good quality recharge from the Bank. In 2010, the TDS concentration decreased to 260-490 mg/L at MW-13 and 1,300-1,500 mg/L at MW-18. The Steffens' plume appears to be migrating to the north and northeast, and TDS concentrations have been increasing at MW-4, MW-5, MW-6, MW-9, and MW-24. TDS concentrations are also increasing at MW-17 and MW-25 in the area south of the former Steffens' ponds.

Groundwater quality is much better in monitoring wells in the eastern portion of the Spreckels' property (east of San Mateo Avenue) due in part to recharge from the SJR. TDS concentrations in areas too far east to be affected by the Steffens' plume were as low as 220 mg/L at MW-32 in 2010. The maximum TDS concentration east of San Mateo Avenue in the area impacted by Spreckels' wastewater was 1,200 mg/L at MW-29.

North of San Joaquin River

There are four shallow PFC monitoring wells north of the SJR included in the monitoring program. Monitoring wells MW-2 and MW-3 are located just north of the River, and MW-4 and MW-5 are located two to three miles north of MW-3. Water quality at these monitoring wells has been highly variable, but some of the large year-to-year changes may be due to the duration of purging prior to sample collection and may not reflect actual changes in groundwater quality. Most of the samples collected from these wells were not analyzed for TDS; therefore, the salinity is discussed in terms of EC.

The salinity has decreased considerably at MW-2 due to recharge from the SJR. The EC at this location decreased from 1,090 µmhos/cm in 2002 to 290 µmhos/cm in 2010. At PFC MW-3, the 2010 EC value (410 µmhos/cm) was lower than the high values reported in 2004 and spring 2006 (640 µmhos/cm) and slightly higher than the early measurements in 2002 and 2003 (320 to 350 µmhos/cm).

The salinity is significantly greater and more variable away from the River and the Pool at MW-4 and MW-5. At MW-4, the 2010 EC measurement (1,750 µmhos/cm) was lower than the high values reported in 2005 and spring 2006 (2,170 to 2,650 µmhos/cm, respectively). Similarly, the 2008 EC measurement for MW-5 (1,220 µmhos/cm) was lower than high values reported in spring 2005 and spring 2006 (1,970 and 1,950 µmhos/cm, respectively). However, degradation appears to be occurring over the long term in this area as indicated by higher EC measurements at both wells in 2010 compared to the initial sample collected in 2002.

Salinity in the Deep Zone

Recent EC and TDS data (2006-2009) for all deep wells are summarized in **Table 5-2**. All water quality data for the deep wells are shown in tables in **Appendix D**, and plots of EC measurements at individual wells are compiled in **Appendix E**.

Northwestern Area

The CCID wells in the northwestern portion of the study area have some of the longest periods of record showing water quality changes in the Mendota area, with salinity data going back to the 1960s at several wells. Salinity increases were observed at wells Nos. 32B, 34, 35A, and 49 during or before 1970. Wells Nos. 34 and 49, located northwest of well No. 32B along the Outside Canal, experienced sharp salinity increases in the 1960s and 1970s due to easterly movement of the saline front and have since been abandoned. Salinity increase in these wells has primarily been in response to horizontal migration of the saline front due to regional groundwater flow conditions (especially pumping occurring in western Madera County). Nine CCID wells were sampled in 2009 or 2010, and all have experienced some historical salinity increases. Based on EC data, salinity increases have ranged from very small (80 µmhos/cm) at CCID-38A over a 12-year period to more than 1,000 µmhos/cm at CCID wells Nos. 32 and 35 (and their replacements) over a period of more than 40 years. However, there were water quality improvements at most of the CCID wells in 2010. The greatest improvement occurred at CCID-5A, where the TDS concentration decreased from 700 to 390 mg/L. This may be the result of reduced pumpage in 2010. The only well showing significant degradation in 2010 was CCID-28C, where the TDS concentration increased from 860 to 1,100 mg/L. TDS concentrations at the other CCID wells ranged from 360 to 1,700 mg/L in 2009 or 2010.

West of Fresno Slough

The City of Mendota's older municipal wells located along Bass Avenue have been replaced by wells on the B&B Ranch east of the Fresno Slough, and salinity analyses (TDS or EC) for the old wells were discontinued in 2003. The City has operated the former Fordel wells south of Bass Avenue since 2004, but has not provided sampling results for those wells since that time.

The USGS monitoring wells west of the Mendota Airport were sampled in 2010. One of the deep wells in this cluster (31J5) had the highest salinity (TDS concentration of about 6,780 mg/L) of any deep well in the study area for which data are available. Groundwater quality at this location has been relatively stable since 2000.

The MPG operated six deep wells west of the Fresno Slough in 2010, and four of these were sampled in 2009 or 2010. This includes three Terra Linda wells and one CGH well. TDS concentrations in the Terra Linda wells ranged from 1,030 mg/L at TLF-14d to 1,330 mg/L at TLF-5d. Since the initial samples collected in 1999 or 2000, TDS concentrations have decreased at TLF-18d and increased at the other three Terra Linda wells (TLF-5d, 6d, and 14d). These wells have experienced significant salinity increases since 1999, but the highest degradation rate has occurred further south at CGH-13d. Since 1997, the TDS concentration at this well has increased from 680 to 1,640 mg/L.

East of Fresno Slough

TDS concentrations at the City of Mendota municipal wells on the B&B Ranch ranged from about 250 to 490 mg/L in the fall of 2009 and have remained relatively stable since these wells were first sampled in 2001. The 2010 data have not been provided for these wells. Water from the Baker Farming wells and most FWD wells continues to have relatively low salinity. TDS concentrations in Baker Farming wells BF-1 through BF-5, located along the SJR between the B&B Ranch and San Mateo Avenue, ranged from 340 to 390 mg/L in 2009 and 2010. Most of these wells were not sampled in 2009, and there were salinity increases between 2008 and 2010. The largest increase in TDS concentrations was about 100 mg/L at BF-2 and BF-5.

TDS concentrations in the FWD wells ranged from 290 mg/L at R-7 to 600 mg/L at R-11 in 2009 or 2010. TDS concentrations have been stable at most of the FWD wells, but the three southernmost wells (R-1, R-3, and R-11) appear to be affected by percolated Steffens' wastewater moving north from Spreckels Sugar Co. FWD well R-4 has also shown salinity increases, although the TDS concentration is still very low at this well (360 mg/L).

Water quality degradation has occurred at most of the Spreckels' production wells located in the northern, central, and southern portions of the property, and the wells with the poorest water quality (PW-1, PW-2, PW-3, PW-5, and PW-8) have been abandoned. In the north central portion of the Spreckels' site, the degradation is believed to be due to the downward and northerly movement of percolated Steffens' wastewater. PW-9, located just west of San Mateo Avenue, has experienced the greatest salinity increase of the production wells that are still in service. The TDS concentration at PW-9 increased from about 400 mg/L in 1988 to 2,000 mg/L in September 2010. Other wells show historical degradation followed by water quality improvement in recent years. For example, the TDS concentration at PW-6 increased from 300 mg/L in 1983 to 1,200 mg/L in 2005 but had decreased to 630 mg/L by 2010. TDS concentrations in PW-12, located east of PW-9 and San Mateo Avenue, have increased from the initial measurement of 320 mg/L in 2004 to 570 mg/L in 2009. This suggests that the Steffens' plume is also spreading to the east in this area. PW-11 is located farther east, and still has the best water quality of any deep well at Spreckels Sugar Co. (TDS concentration of 320 mg/L in 2010). Although the Spreckels' factory closed at the end of 2008, some of the production wells continue to be pumped for irrigation purposes.

North of San Joaquin River

North of the SJR, water quality data for the PFC and CCC wells show considerable variability. Some of the large year-to-year changes appear to be due to sampling procedures rather than actual changes in groundwater quality. Samples from the PFC and CCC wells are not analyzed for TDS concentrations so the salinity is discussed in terms of EC.

TDS concentrations at most PFC wells have generally been stable since the mid-1990s, but gradual salinity increases have occurred at some of the northern wells (e.g., No. 3311-61 [W-89]). The salinity is lowest in wells near the SJR in the southeastern portion of PFC and highest in the northern area. In 2010, the EC ranged from 340 µmhos/cm at well No. 3730-61 (W-95) to 1,310 µmhos/cm at well No. 3311-61 (W-89).

The wells in the CCC service area were sampled in 2010, and there were water quality improvements at all wells since the previous sample collected in 2008. Many of these wells are located near the SJR north of Mendota Dam and have experienced slight TDS increases due to the easterly movement of higher salinity groundwater beneath the River. Groundwater quality is still acceptable for irrigation in this area, with ECs ranging from 640 to 980 µmhos/cm in 2010. There is an area of elevated salinity approximately two miles east of the River in the northern portion of CCC. The Diepersloot-1 (formerly DMA) and Elrod-1 wells in this area had ECs of about 1,500 to 1,700 µmhos/cm in 2010. The easternmost CCC wells (CC-1 and CC-2) had the best water quality of any CCC wells when they were last sampled in 2007 (ECs of 290 and 400 µmhos/cm, respectively).

Trace Elements

Except for manganese, concentrations of trace elements are generally low in both shallow and deep production wells in the Mendota area. However, samples from many irrigation wells have not been analyzed for trace elements, except for boron and selenium. Samples collected from all MPG wells are analyzed for a number of trace elements. Arsenic and selenium concentrations in groundwater discharged to the Pool from MPG wells along the Fresno Slough have typically been below the reporting limits of 2 and 0.4 µg/L, respectively. Likewise, boron concentrations in these wells are low (typically below 0.5 mg/L).

Molybdenum concentrations in groundwater are much more variable, and concentrations in MPG wells tend to be higher in the southern portion of the well field along the Fresno Slough. Molybdenum concentrations measured between 2007 and 2009 averaged about 7 µg/L in the Terra Linda wells, 12 µg/L in the CGH wells, 15 µg/L in the Five Star wells, and 21 µg/L in the Coelho West wells.

Summary

Shallow Wells

TDS concentrations in shallow wells in the Mendota area vary widely, from less than 500 mg/L near the SJR east of San Mateo Avenue to over 3,000 mg/L west of the Fresno Slough. Many wells show large salinity fluctuations from year to year, and salinity is sometimes higher in the summer and fall than in the spring. Groundwater quality appears to generally have been stable or improved in the northern and southern portion of the MPG well field west of the Fresno Slough, but salinity increases have continued at a number of the MPG wells in the central portion of the well field. A number of Terra Linda, Silver Creek, and CGH wells in this area have experienced increasing salinity over time due to easterly movement of the saline front, which has increased due to MPG pumping.

The operation of the Bank east of the Fresno Slough, in the western portion of the Spreckels Sugar Co. property, has resulted in substantial water quality improvements due to recharge of low salinity surface water. In the central portion of the Spreckels' property, however, shallow groundwater remains degraded due to historical wastewater disposal practices. This groundwater has generally moved in a northeasterly direction.

In the PFC service area, shallow monitoring wells in the vicinity of the SJR continue to have better water quality than shallow wells located farther north, due to recharge of high quality surface water from the River. Some salinity increases appear to occurring at the two northern PFC monitoring wells.

Deep Wells

The CCID wells have some of the longest periods of record showing water quality changes in the Mendota area, with salinity data going back to the 1960s at several wells. Eight CCID wells are still operating in the study area, and all but one have experienced long-term historical water quality degradation. Seven wells were sampled in 2010, and all but one (CCID-28C) showed short-term water quality improvements. This was likely associated with reduced pumpage in 2010.

Deep MPG wells west of the Fresno Slough continued to experience salinity increases due to easterly movement of the saline front, which has increased due to MPG pumping. The MPG operated six deep wells west of the Fresno Slough in 2010, and five of these were sampled during 2008-2010. This includes four Terra Linda wells and one CGH well. Since the initial samples collected in 1999 or 2000, TDS concentrations have decreased at TLF-18d and increased at three Terra Linda wells. These three wells have experienced significant salinity increases since 1999, but the greatest increases have occurred further south at CGH-13d.

East of the Fresno Slough, most wells in or near FWD exhibit low salinity and stable groundwater quality due to recharge from the River. In the central portion of the Spreckels Sugar Co. property, degraded shallow groundwater has moved downward to the deep zone and has moved north toward the southernmost FWD wells. Three FWD wells (R-1, R-3, and R-11) appear to be affected by the northerly movement of the Steffens' plume.

North of the SJR, most wells in the PFC and the CCC service areas also have acceptable quality, although some salinity increases have occurred at wells in the northern portion of PFC. The salinity at CCC wells and the other PFC wells does not show an increasing trend, but most wells have experienced large year-to-year fluctuations.

Table 5-1
Recent EC and TDS Results for Shallow Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
U.S. Geological Survey					
	31J4	09/17/08	FGL	8060	5230
	31J4	05/12/10	FGL	8310	5370
Terra Linda Farms					
	TLF-11As (4A)	09/17/08	FGL	766	430
	TLF-11Cs (4C)	09/17/08	FGL	1170	680
	TLF-9s (10A)	09/16/08	FGL	827	460
	TLF-9s (10A)	05/12/10	FGL	913	530
	TLF-8s (10B)	09/16/08	FGL	825	480
	TLF-8s (10B)	05/12/10	FGL	938	520
	TLF-7s (10C)	09/16/08	FGL	668	380
	TLF-7s (10C)	05/12/10	FGL	790	430
	TLF-1s (12)	09/17/08	FGL	1160	690
	TLF-1s (12)	05/26/09	FGL	1080	650
	TLF-2s (13)	09/16/08	FGL	965	540
	TLF-2s (13)	05/26/09	FGL	952	560
	TLF-2s (13)	05/11/10	FGL	945	560
	TLF-3s (14)	09/16/08	FGL	1320	790
	TLF-3s (14)	05/26/09	FGL	1300	770
	TLF-3s (14)	05/11/10	FGL	1340	770
	TLF-4s (15)	09/16/08	FGL	1310	760
	TLF-4s (15)	05/26/09	FGL	1260	750
	TLF-4s (15)	05/11/10	FGL	1210	720
	TLF-10s (16)	09/17/08	FGL	972	520
	TLF-10s (16)	05/26/09	FGL	875	540
	TLF-10s (16)	05/13/10	FGL	900	530
	TLF-13s (17)	09/17/08	FGL	630	340
	TLF-13s (17)	05/26/09	FGL	715	410
	TLF-13s (17)	05/13/10	FGL	697	420
	TLF-15s	05/26/09	FGL	808	500
	TLF-15s	05/11/10	FGL	817	500
	TLF-16s	09/16/08	FGL	762	450
	TLF-16s	05/26/09	FGL	749	460
	TLF-16s	05/11/10	FGL	903	560
	TLF-17s	09/16/08	FGL	1070	620
	TLF-17s	05/26/09	FGL	1050	630
	TLF-17s	05/11/10	FGL	1010	600
Silver Creek Packing Co.					
	SC-3B	09/16/08	FGL	1580	890
	SC-3B	05/26/09	FGL	1440	870
	SC-4B	09/16/08	FGL	1790	1030
	SC-4B	05/26/09	FGL	1760	1020
Coelho/Gardner/Hansen					
	CGH-4s (1A)	09/17/08	FGL	3960	2480
	CGH-4s (1A)	05/26/09	FGL	4010	2900
	CGH-3s (1B)	05/26/09	FGL	2850	1780

Table 5-1 (continued)
Recent EC and TDS Results for Shallow Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
	CGH-3s (1B)	05/11/10	FGL	1540	910
	CGH-2s (1C)	09/17/08	FGL	1700	1010
	CGH-2s (1C)	05/26/09	FGL	2350	1450
	CGH-1s (2)	05/11/10	FGL	4620	3030
	CGH-5s (3)	05/10/10	FGL	5880	4080
	CGH-9As (5)	09/17/08	FGL	5310	3120
	CGH-12s (6B)	05/10/10	FGL	3710	2360
	CGH-11s (6D)	09/17/08	FGL	4750	3110
	CGH-11s (6D)	05/26/09	FGL	2480	1520
	CGH-11s (6D)	05/10/10	FGL	1590	920
	CGH-7s (9)	05/11/10	FGL	1670	990
	CGH-8s (10)	09/17/08	FGL	1440	860
	CGH-8s (10)	05/11/10	FGL	1730	1090
	CGH-6s (11)	09/17/08	FGL	2580	1510
	CGH-6s (11)	05/26/09	FGL	4910	3720
	CGH-6s (11)	05/11/10	FGL	4690	3070
Five Star					
	FS-1	09/15/08	FGL	1020	560
	FS-1	05/27/09	FGL	1060	620
	FS-2	09/15/08	FGL	1050	560
	FS-2	05/27/09	FGL	1270	730
	FS-2	05/13/10	FGL	1350	750
	FS-3	09/16/08	FGL	1380	810
	FS-3	05/27/09	FGL	1740	1070
	FS-3	05/13/10	FGL	1250	760
	FS-4	09/16/08	FGL	1340	760
	FS-4	05/27/09	FGL	1280	740
	FS-5	05/27/09	FGL	1270	750
	FS-5	05/13/10	FGL	1210	720
	FS-6	07/13/09	FGL	1960	1150
	FS-6	05/13/10	FGL	1970	1180
	FS-7	09/16/08	FGL	2190	1330
	FS-7	07/13/09	FGL	2330	1450
	FS-7	05/13/10	FGL	2350	1490
	FS-8	09/16/08	FGL	1800	1000
	FS-8	05/27/09	FGL	2140	1250
	FS-8	05/13/10	FGL	2040	1190
	FS-9	09/16/08	FGL	1890	1130
	FS-9	05/27/09	FGL	2130	1340
	FS-10	09/16/08	FGL	2480	1550
	FS-10	07/13/09	FGL	2360	1420
Coelho West					
	CW-1	09/16/08	FGL	1150	710
	CW-1	05/27/09	FGL	947	570
	CW-2	09/16/08	FGL	1510	870
	CW-3	09/16/08	FGL	1970	1170
	CW-3	05/27/09	FGL	1780	1040

Table 5-1 (continued)
Recent EC and TDS Results for Shallow Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
	CW-4	09/16/08	FGL	2410	1410
	CW-5	09/16/08	FGL	2120	1260
	CW-5	05/27/09	FGL	2020	1250
Meyers Farm Water Bank					
	MF-1	04/06/08	BCL	937	550
	MF-1	09/03/08	BCL	1260	740
	MF-1	04/02/09	BCL	1200	840
	MF-1	10/20/09	BCL	1250	780
	MF-1	05/12/10	BCL	1290	840
	MF-1	09/14/10	BCL	492	310
	MF-2	07/10/08	BCL	977	550
	MF-2	09/03/08	BCL	864	510
	MF-2	04/02/09	BCL	1090	730
	MF-2	10/20/09	BCL	1560	960
	MF-2	05/20/10	BCL	1560	1000
	MF-2	09/14/10	BCL	1400	920
	MF-3	04/06/08	BCL	1960	1200
	MF-3	09/03/08	BCL	924	570
	MF-3	04/02/09	BCL	1370	1000
	MF-3	10/21/09	BCL	872	540
	MF-3	05/12/10	BCL	1130	720
	MF-3	09/14/10	BCL	1420	900
	MF-4	04/06/08	BCL	1380	880
	MF-4	09/03/08	BCL	2110	1200
	MF-4	04/02/09	BCL	2000	1300
	MF-4	10/21/09	BCL	1830	990
	MF-4	05/12/10	BCL	1750	980
	MF-4	09/14/10	BCL	1290	780
	MF-5	04/06/08	BCL	638	490
	MF-5	09/03/08	BCL	1100	680
	MF-5	04/02/09	BCL	947	730
	MF-5	10/21/09	BCL	1300	780
	MF-5	05/12/10	BCL	1200	740
	MF-5	09/14/10	BCL	483	310
	MF-6	04/06/08	BCL	1460	830
	MF-6	09/03/08	BCL	2150	1300
	MF-6	04/02/09	BCL	1850	1400
	MF-6	10/21/09	BCL	1520	1100
	MF-6	05/12/10	BCL	1820	1100
	MF-6	09/14/10	BCL	444	280
	MF-7	04/06/08	BCL	770	430
	MF-7	09/03/08	BCL	837	480
	MF-7	04/02/09	BCL	794	510
	MF-7	10/21/09	BCL	946	580
	MF-7	05/12/10	BCL	841	510
	MF-7	09/14/10	BCL	652	420
	MF-8	04/06/08	BCL	2760	1600
	MF-8	09/03/08	BCL	2800	1700
	MF-8	04/02/09	BCL	2820	1600

Table 5-1 (continued)
Recent EC and TDS Results for Shallow Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
	MF-8	10/21/09	BCL	3560	2200
	MF-8	05/12/10	BCL	3480	2100
	MF-8	09/14/10	BCL	2930	2000
	MF-9	04/06/08	BCL	1540	1000
	MF-9	09/03/08	BCL	2000	1200
	MF-9	04/02/09	BCL	2200	1400
	MF-9	10/21/09	BCL	3010	2000
	MF-9	05/12/10	BCL	2960	1900
	MF-9	09/14/10	BCL	3120	2100
	EW-1	05/09/08	BCL	660	440
	EW-1	11/25/08	BCL	807	480
	EW-1	03/11/09	BCL	1090	800
	EW-1	08/14/09	BCL	1100	720
	EW-2	06/02/08	BCL	1530	980
	EW-2	11/25/08	BCL	956	580
	EW-2	08/14/09	BCL	1390	920
	EW-3	05/09/08	BCL	960	640
	EW-3	11/25/08	BCL	796	450
	EW-3	08/14/09	BCL	1350	980
	EW-4	06/02/08	BCL	635	440
	EW-4	11/25/08	BCL	738	430
	EW-4	03/11/09	BCL	883	580
	EW-5	06/02/08	BCL	954	620
	EW-5	11/25/08	BCL	746	450
	EW-5	03/11/09	BCL	1220	880
	EW-5	08/14/09	BCL	1640	1100
	EW-6	06/02/08	BCL	682	440
	EW-6	11/25/08	BCL	802	470
	EW-6	03/11/09	BCL	1070	660
	EW-6	08/14/09	BCL	1180	740
	EW-7	11/12/08	BCL	1330	800
	EW-7	03/11/09	BCL	1550	860
	EW-7	08/14/09	BCL	1410	900
	EW-8	11/08/08	BCL	1130	680
	EW-8	03/11/09	BCL	1090	720
	EW-8	08/14/09	BCL	1030	670
Spreckels Sugar Co.					
	MW-1	04/06/08	BCL	1520	980
	MW-1	09/03/08	BCL	1720	1100
	MW-1	04/02/09	UNK	1820	1300
	MW-1	04/02/09	BCL	1820	1200
	MW-1	10/02/09	BSK	1800	1000
	MW-1	10/20/09	BCL	1760	1200
	MW-1	05/20/10	BCL	2050	1400
	MW-1	09/15/10	BCL	1460	1100
	MW-1	09/15/10	SSC	1500	890
	MW-2	04/06/08	BCL	2720	1700
	MW-2	09/03/08	BCL	2650	1600
	MW-2	04/02/09	UNK	2590	1300

Table 5-1 (continued)
Recent EC and TDS Results for Shallow Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
	MW-2	04/02/09	BCL	2500	1700
	MW-2	10/02/09	BSK	2600	1500
	MW-2	10/20/09	BCL	2670	1500
	MW-2	05/20/10	BCL	2600	1400
	MW-2	09/15/10	BCL	2610	1500
	MW-2	09/15/10	SSC	2700	1600
	MW-3	04/06/08	BCL	1560	930
	MW-3	09/03/08	BCL	1640	940
	MW-3	04/02/09	BCL	1730	1100
	MW-3	04/02/09	UNK	1790	980
	MW-3	10/02/09	BSK	1200	690
	MW-3	10/20/09	BCL	1260	740
	MW-3	05/20/10	BCL	1950	1300
	MW-3	09/15/10	BCL	906	660
	MW-3	09/15/10	SSC	950	530
	MW-4	04/05/08	BCL	2270	1400
	MW-4	09/02/08	BCL	2160	1200
	MW-4	04/02/09	UNK	2100	1100
	MW-4	09/30/09	BSK	2300	1300
	MW-4	10/19/10	SSC	2300	1400
	MW-5	04/05/08	BCL	1490	960
	MW-5	09/02/08	BCL	1510	870
	MW-5	04/02/09	UNK	1510	890
	MW-5	09/30/09	BSK	1500	840
	MW-5	10/06/10	SSC	1600	920
	MW-6	09/04/08	BCL	2070	1300
	MW-6	04/03/09	UNK	2020	1300
	MW-6	09/30/09	BSK	2400	1400
	MW-6	10/06/10	SSC	2300	1300
	MW-9	04/05/08	BCL	2050	1300
	MW-9	09/02/08	BCL	1900	1000
	MW-9	04/02/09	UNK	1580	940
	MW-9	10/02/09	BSK	1500	950
	MW-9	10/06/10	SSC	1800	1000
	MW-13	04/05/08	BCL	515	320
	MW-13	09/03/08	BCL	633	380
	MW-13	04/02/09	BCL	931	610
	MW-13	10/01/09	BSK	760	420
	MW-13	10/20/09	BCL	700	470
	MW-13	05/20/10	BCL	786	490
	MW-13	09/15/10	BCL	459	330
	MW-13	09/15/10	SSC	460	260
	MW-15	04/05/08	BCL	8110	6300
	MW-15	09/02/08	BCL	8160	5600
	MW-15	04/03/09	BCL	7320	5700
	MW-15	10/01/09	BSK	7700	4400
	MW-15	09/23/10	SSC	6500	4000
	MW-17	04/05/08	BCL	4920	3100
	MW-17	09/02/08	BCL	5370	2700
	MW-17	04/03/09	BCL	5210	3300

Table 5-1 (continued)
Recent EC and TDS Results for Shallow Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
	MW-17	10/01/09	BSK	5100	4700
	MW-17	10/19/10	SSC	5200	3200
	MW-18	04/05/08	BCL	4010	2500
	MW-18	09/04/08	BCL	3500	2200
	MW-18	04/02/09	BCL	4440	3500
	MW-18	10/02/09	BSK	4300	2500
	MW-18	10/20/09	BCL	4320	2700
	MW-18	05/20/10	BCL	3670	2400
	MW-18	09/15/10	SSC	2100	1300
	MW-18	09/15/10	BCL	1990	1500
	MW-19	04/05/08	BCL	8590	5200
	MW-19	09/03/08	BCL	8700	5000
	MW-19	04/03/09	UNK	8620	5300
	MW-19	10/01/09	BSK	7600	3700
	MW-19	10/19/10	SSC	7100	4200
	MW-20	04/06/08	BCL	2930	1900
	MW-20	09/04/08	BCL	2940	1800
	MW-20	04/03/09	UNK	2760	1800
	MW-20	10/01/09	BSK	2600	1600
	MW-20	10/19/10	SSC	2800	1700
	MW-21	04/02/09	UNK	2840	1600
	MW-21	10/01/09	BSK	2800	1600
	MW-21	10/19/10	SSC	2900	1800
	MW-23	04/02/09	UNK	3800	2200
	MW-23	10/01/09	BSK	3200	1700
	MW-23	10/19/10	SSC	3300	1800
	MW-24	04/05/08	BCL	2150	1400
	MW-24	09/02/08	BCL	2320	1400
	MW-24	04/03/09	UNK	2740	1800
	MW-24	09/30/09	BSK	2600	1600
	MW-24	10/19/10	SSC	2900	1800
	MW-25	04/06/08	BCL	3520	2300
	MW-25	09/04/08	BCL	3470	2300
	MW-25	04/03/09	UNK	3470	2400
	MW-25	10/02/09	BSK	3400	2100
	MW-25	10/19/10	SSC	3600	2200
	MW-26	04/06/08	BCL	7290	4200
	MW-26	09/04/08	BCL	7000	4000
	MW-26	04/03/09	UNK	6730	4000
	MW-26	09/30/09	BSK	6400	3300
	MW-26	09/23/10	SSC	6700	3900
	MW-27	09/03/08	BCL	6290	3700
	MW-27	04/03/09	UNK	5990	3700
	MW-27	10/02/09	BSK	6000	2900
	MW-27	09/23/10	SSC	6100	3700
	MW-28	04/06/08	BCL	1830	1200
	MW-28	09/04/08	BCL	1740	1200
	MW-28	04/03/09	UNK	1730	1200
	MW-28	10/05/09	BSK	1800	1100
	MW-28	10/06/10	SSC	2200	1300

Table 5-1 (continued)
Recent EC and TDS Results for Shallow Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
	MW-29	04/06/08	BCL	2180	1500
	MW-29	09/04/08	BCL	1800	1300
	MW-29	04/03/09	UNK	1930	1400
	MW-29	10/05/09	BSK	1800	1200
	MW-29	10/06/10	SSC	2000	1200
	MW-30	04/06/08	BCL	855	550
	MW-30	09/04/08	BCL	852	590
	MW-30	04/03/09	UNK	840	620
	MW-30	10/05/09	BSK	820	520
	MW-30	10/06/10	SSC	820	560
	MW-31	04/06/08	BCL	792	560
	MW-31	09/04/08	BCL	828	590
	MW-31	04/03/09	UNK	776	580
	MW-31	09/30/09	BSK	780	510
	MW-31	10/06/10	SSC	810	560
	MW-32	04/06/08	BCL	284	200
	MW-32	09/04/08	BCL	291	210
	MW-32	04/03/09	UNK	282	210
	MW-32	09/30/09	BSK	290	190
	MW-32	10/06/10	SSC	330	220
Paramount Farming Co.					
	MW-2	09/11/08	JML	540	
	MW-2	08/17/10	JML	290	
	MW-3	09/11/08	JML	370	
	MW-3	08/17/10	JML	410	
	MW-4	09/11/08	JML	1490	
	MW-4	08/17/10	JML	1750	
	MW-5	09/11/08	JML	1350	
	MW-5	08/17/10	JML	1220	

1. BD - Betz Dearborn; BSK - BSK Analytical Laboratories, Fresno; FGL - Fruit Growers Laboratory, Santa Paula; JML - JM Lord Inc., Fresno; SSC - Spreckels Sugar Company; TL - The Twining Laboratories, Inc.; NA - Not Available; UNK - Unknown

Table 5-2
Recent EC and TDS Results for Deep Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
Central California ID					
	5A	09/02/08	NA	1100	
	5A	07/16/09	BSK	1200	700
	5A	09/23/10	BSK	660	390
	12C	09/02/08	NA	2200	
	12C	07/16/09	BSK	2300	1500
	12C	09/23/10	BSK	2200	1600
	15B	09/02/08	NA	1100	
	15B	07/16/09	BSK	1200	680
	15B	09/23/10	BSK	940	600
	16C	07/16/09	BSK	1200	720
	16C	09/23/10	BSK	850	510
	23B	09/03/08	NA	2700	
	23B	07/16/09	BSK	2900	2000
	23B	09/23/10	BSK	2600	1700
	28C	09/02/08	NA	1400	
	28C	07/27/09	BSK	1400	860
	28C	09/23/10	BSK	1800	1100
	32B	08/27/08	NA	1300	
	32C	08/12/09	BSK	1600	1100
	35A	09/02/08	NA	1500	
	35A	07/16/09	BSK	1600	998
	35A	09/23/10	BSK	1200	700
	38A	10/17/08	NA	590	
	38A	07/16/09	BSK	620	360
U.S. Geological Survey					
	31J5	09/17/08	FGL	10300	6920
	31J5	05/12/10	FGL	10000	6780
Covanta Mendota					
	Well 6A	06/01/08	NA	2046	
	Well 6A	11/01/08	NA	2585	
	Well 6A	04/01/09	NA	2417	
	Well 6A	06/01/09	NA	2019	
	Well 6A	02/08/10	NA	3109	
Terra Linda Farms					
	TLF-18d (2)	09/16/08	FGL	1340	780
	TLF-5d (5)	05/26/09	FGL	2240	1280
	TLF-5d (5)	05/11/10	FGL	2370	1330
	TLF-6d (7)	09/16/08	FGL	1680	950
	TLF-6d (7)	05/26/09	FGL	1740	980
	TLF-6d (7)	05/11/10	FGL	1960	1120
	TLF-14d (8)	09/16/08	FGL	1650	950
	TLF-14d (8)	05/26/09	FGL	1680	1000
	TLF-14d (8)	05/12/10	FGL	1790	1030
Coelho/Gardner/Hansen					

Table 5-2 (continued)
Recent EC and TDS Results for Deep Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
	CGH-13d (7)	09/17/08	FGL	2170	1270
	CGH-13d (7)	05/26/09	FGL	2770	1640
Meyers Farm Water Bank					
	DW-1	04/17/08	BCL	2000	1100
	DW-1	10/04/08	BCL	1970	1100
	DW-1	07/22/09	BCL	2940	1800
Spreckels Sugar Co.					
	MW-7	04/05/08	BCL	6920	4400
	MW-7	09/02/08	BCL	6800	4000
	MW-7	04/02/09	UNK	6600	3700
	MW-7	09/30/09	BSK	6200	3600
	MW-7	10/19/10	SSC	6400	3900
	MW-8	04/05/08	BCL	1670	1100
	MW-8	09/02/08	BCL	1640	1000
	MW-8	04/02/09	UNK	1500	960
	MW-8	10/02/09	BSK	1500	880
	MW-8	10/06/10	SSC	1600	940
	MW-10	04/06/08	BCL	1330	820
	MW-10	09/03/08	BCL	1330	880
	MW-10	04/02/09	BCL	1330	860
	MW-10	10/01/09	BSK	1400	830
	MW-10	10/20/09	BCL	1430	900
	MW-10	05/20/10	BCL	1370	860
	MW-10	09/15/10	BCL	1300	920
	MW-10	09/15/10	SSC	1300	770
	MW-11	04/06/08	BCL	2200	1400
	MW-11	09/03/08	BCL	2200	1400
	MW-11	04/02/09	BCL	2060	1300
	MW-11	10/01/09	BSK	2000	1200
	MW-11	10/20/09	BCL	2130	1300
	MW-11	05/20/10	BCL	2110	1300
	MW-11	09/15/10	SSC	2200	1300
	MW-11	09/15/10	BCL	2140	1400
	MW-12	04/05/08	BCL	3250	1900
	MW-12	09/03/08	BCL	3530	2100
	MW-12	04/02/09	BCL	3400	2100
	MW-12	10/01/09	BSK	3000	1700
	MW-12	09/23/10	SSC	5100	3100
	MW-14	04/06/08	BCL	1100	670
	MW-14	09/03/08	BCL	1100	640
	MW-14	10/02/09	BSK	1000	630
	MW-14	10/06/10	SSC	1200	720
	MW-16	04/05/08	BCL	6420	3400
	MW-16	09/02/08	BCL	6400	3300
	MW-16	04/02/09	BCL	5930	3200
	MW-16	10/01/09	BSK	5700	2700
	MW-16	09/23/10	SSC	5400	2800
	MW-22	04/05/08	BCL	2490	1500

Table 5-2 (continued)
Recent EC and TDS Results for Deep Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
	MW-22	09/03/08	BCL	2710	1700
	MW-22	04/02/09	UNK	2800	1700
	MW-22	10/01/09	BSK	3000	1600
	MW-22	10/19/10	SSC	3100	1900
	PW-6	04/06/08	BCL	1840	1100
	PW-6	09/04/08	BCL	1650	1000
	PW-6	04/03/09	UNK	1320	810
	PW-6	10/05/09	BSK	1000	600
	PW-6	09/23/10	SSC	1100	630
	PW-7	04/06/08	BCL	1180	720
	PW-7	09/04/08	BCL	1860	1200
	PW-7	04/03/09	UNK	1080	690
	PW-7	10/05/09	BSK	1700	970
	PW-7	09/23/10	SSC	1300	810
	PW-9	04/06/08	BCL	2830	1800
	PW-9	09/04/08	BCL	3340	2200
	PW-9	04/03/09	UNK	3100	2000
	PW-9	05/27/09	FGL	2840	1710
	PW-9	10/15/09	BSK	3100	1700
	PW-9	09/23/10	SSC	3400	2000
	PW-10	04/06/08	BCL	1180	720
	PW-10	09/04/08	BCL	1120	690
	PW-10	04/03/09	UNK	960	650
	PW-10	10/05/09	BSK	1100	600
	PW-10	09/23/10	SSC	1200	700
	PW-11	04/06/08	BCL	444	300
	PW-11	09/04/08	BCL	514	330
	PW-11	10/05/09	BSK	470	270
	PW-11	09/23/10	SSC	520	320
	PW-12	04/06/08	BCL	825	510
	PW-12	09/04/08	BCL	843	530
	PW-12	10/05/09	BSK	900	520
	PW-12	09/23/10	SSC	940	570
City of Mendota					
	No. 7	04/02/08	NA	800	490
	No. 7	02/23/09	NA	500	420
	No. 7	04/14/09	NA	910	500
	No. 7	11/03/09	NA	719	490
	No. 8	04/02/08	NA	330	220
	No. 8	02/23/09	NA	500	430
	No. 8	04/14/09	NA	830	
	No. 8	11/03/09	NA	337	250
	No. 9	04/02/08	NA	750	460
	No. 9	02/23/09	NA	500	420
	No. 9	04/14/09	NA	820	460
	No. 9	11/03/09	NA	676	460
Panoche Creek Farms					
	PCF-1	09/18/08	FGL	633	410

Table 5-2 (continued)
Recent EC and TDS Results for Deep Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
	PCF-1	05/27/09	FGL	676	430
	PCF-1	05/17/10	FGL	685	390
Baker Farming Co.					
	BF-1	09/19/08	FGL	474	290
	BF-1	05/17/10	FGL	563	350
	BF-2	09/19/08	FGL	486	290
	BF-2	05/27/09	FGL	520	310
	BF-2	05/18/10	FGL	603	380
	BF-3	09/19/08	FGL	521	310
	BF-4	09/19/08	FGL	515	310
	BF-4	05/18/10	FGL	548	340
	BF-5	09/19/08	FGL	467	290
	BF-5	05/18/10	FGL	662	390
Farmers Water District					
	R-1	05/27/09	FGL	571	350
	R-1	05/17/10	FGL	720	440
	R-2	09/18/08	FGL	631	380
	R-2	05/27/09	FGL	564	360
	R-3	09/18/08	FGL	934	580
	R-3	05/27/09	FGL	917	580
	R-3	05/17/10	FGL	952	570
	R-4	09/18/08	FGL	341	210
	R-4	05/27/09	FGL	305	220
	R-4	05/17/10	FGL	617	360
	R-6	05/27/09	FGL	498	300
	R-7	09/18/08	FGL	466	280
	R-7	05/27/09	FGL	452	270
	R-7	05/17/10	FGL	445	290
	R-8	09/18/08	FGL	623	380
	R-8	05/27/09	FGL	603	380
	R-8	05/17/10	FGL	595	380
	R-9	09/18/08	FGL	804	510
	R-9	05/27/09	FGL	766	450
	R-9	05/17/10	FGL	763	480
	R-10	09/18/08	FGL	846	520
	R-10	05/27/09	FGL	844	530
	R-10	05/17/10	FGL	859	520
	R-11	09/18/08	FGL	859	490
	R-11	05/27/09	FGL	870	490
	R-11	05/17/10	FGL	1000	600
Columbia Canal Co.					
	MLT-W	07/21/10	JML	540	
	Cardella-1	07/17/08	JML	700	
	Lopes-1	07/21/10	JML	650	
	Elrod-1	07/16/08	JML	2320	
	Elrod-1	07/21/10	JML	1540	
	Elrod-2	07/17/08	JML	810	

Table 5-2 (continued)
Recent EC and TDS Results for Deep Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25ºC (µmhos/cm)	TDS (mg/L)
	Elrod-2	07/21/10	JML	670	
	Elrod-3	07/21/10	JML	470	
	Burkhart-Heirs	07/16/08	JML	810	
	Burkhart-Heirs	07/21/10	JML	660	
	Diepersloot-1	07/17/08	JML	2320	
	Diepersloot-1	07/21/10	JML	1710	
	Diepersloot-2	07/22/10	JML	2110	
	Davis-1	07/16/08	JML	1010	
	Davis-1	07/21/10	JML	900	
	Davis-2	07/16/08	JML	1120	
	Davis-2	07/21/10	JML	760	
	Garcia-1	07/16/08	JML	940	
	Garcia-1	07/22/10	JML	660	
	Garcia-2	07/16/08	JML	1130	
	Garcia-2	07/22/10	JML	890	
	Garcia-3	07/17/08	JML	920	
	Garcia-4	07/17/08	JML	1140	
	Garcia-4	07/22/10	JML	980	
	Garcia-5	07/17/08	JML	820	
	Garcia-5	07/22/10	JML	640	
	Snyder	07/16/08	JML	890	
	Snyder	07/21/10	JML	750	
	Hunger	07/22/10	JML	820	
	Lorenzetti	07/21/10	JML	720	
	Texiera	07/21/10	JML	750	
	Harrison-1	07/21/10	JML	950	
	Harrison-2	07/21/10	JML	590	
	Harrison-3	07/21/10	JML	1530	
	Harrison-4	07/21/10	JML	1790	
Paramount Farming Co.					
	3311-62 (W-8)	09/10/09	JML	710	
	3311-62 (W-8)	08/17/10	JML	760	
	3591-66 (W-11)	09/18/08	JML	770	
	3591-66 (W-11)	09/10/09	JML	760	
	3591-66 (W-11)	08/17/10	JML	790	
	3211-66 (W-15)	09/18/08	JML	750	
	3211-66 (W-15)	09/10/09	JML	730	
	3211-66 (W-15)	08/17/10	JML	720	
	3431-61 (W-32)	09/11/08	JML	1140	
	3431-61 (W-32)	09/10/09	JML	1170	
	3431-61 (W-32)	08/17/10	JML	1190	
	2480-66 (W-42)	09/11/08	JML	1180	
	2480-66 (W-42)	09/10/09	JML	1190	
	2480-66 (W-42)	08/17/10	JML	1240	
	3730-65 (W-53)	09/11/08	JML	410	
	3730-65 (W-53)	09/10/09	JML	430	
	3730-65 (W-53)	08/09/10	JML	410	
	3421-62 (W-74)	09/18/08	JML	940	

Table 5-2 (continued)
Recent EC and TDS Results for Deep Wells (2008-2010)

Well Owner	Well ID	Date	Laboratory [1]	EC at 25°C (µmhos/cm)	TDS (mg/L)
	3421-62 (W-74)	09/10/09	JML	1060	
	3421-62 (W-74)	08/17/10	JML	940	
	3211-69 (W-77)	09/10/09	JML	890	
	3211-69 (W-77)	08/17/10	JML	820	
	2630-61 (W-78)	09/11/08	JML	420	
	2630-61 (W-78)	09/10/09	JML	420	
	2630-61 (W-78)	08/09/10	JML	430	
	3311-61 (W-89)	09/18/08	JML	1160	
	3311-61 (W-89)	09/10/09	JML	1230	
	3311-61 (W-89)	08/17/10	JML	1310	
	3431-62 (W-91)	09/11/08	JML	1010	
	3431-62 (W-91)	09/10/09	JML	990	
	3431-62 (W-91)	08/17/10	JML	830	
	3730-62 (W-94)	09/10/09	JML	450	
	3730-62 (W-94)	08/09/10	JML	480	
	3730-61 (W-95)	09/11/08	JML	290	
	3730-61 (W-95)	09/10/09	JML	290	
	3730-61 (W-95)	08/09/10	JML	340	
	3730-69 (W-106)	09/10/09	JML	580	
	3730-69 (W-106)	08/17/10	JML	520	
	3730-72 (W-107)	09/10/09	JML	520	
	3730-72 (W-107)	08/09/10	JML	510	
	3730-70 (W-108)	09/10/09	JML	530	
	3730-70 (W-108)	08/09/10	JML	550	
	3211-68 (W-110)	09/10/09	JML	630	
	3211-68 (W-110)	08/09/10	JML	660	
	3730-64 (W-111)	09/10/09	JML	540	
	3730-64 (W-111)	08/09/10	JML	570	
	3730-63 (W-112)	09/10/09	JML	570	
	3730-63 (W-112)	08/09/10	JML	500	
	MW-1	09/11/08	JML	610	
	MW-1	08/19/10	JML	640	

1. BD - Betz Dearborn; BSK - BSK Analytical Laboratories, Fresno; FGL - Fruit Growers Laboratory, Santa Paula; JML - JM Lord Inc., Fresno; SSC - Spreckels Sugar Company; TL - The Twining Laboratories, Inc., NA - Not Available; UNK - Unknown

VI. Surface-Water Flow Direction and Quality

Prior to the completion of Friant Dam in 1942, the flow direction in the SJR branch of the Mendota Pool was to the west. Since the construction of Friant Dam, however, flow in the River between Gravelly Ford and the Pool during the irrigation season has been minimal during most years, and the flow direction in this branch of the Pool has generally been to the east from the DMC to the Columbia Canal intake. Westerly flow occurred in some years as a result of upstream flood releases from Friant Dam and is expected to occur in the future due to the SJRRP. In 2010, water was released from Friant Dam on February 1 for the SJRRP. The releases reached the Pool on February 28, 2010, and the flow continued for the rest of the year.

The Fresno Slough is a tributary of the SJR, and the natural direction of flow in the Slough was to the north. Since the construction of the DMC, the Mendota Pool has become a regulated water conveyance facility, and the flow direction during most of the year is to the south. The amount of flow depends primarily on the inflow from the DMC and diversions to the SJREC in the northern portion of the Pool and to James and Tranquillity Irrigation Districts, the MWA, and WWD in the southern portion of the Pool (**Figure 6-1**). Northerly flow still occurs in some years as a result of upstream flood releases to the Kings River. Northerly flow also occurs during late November or early December if the Pool is being drained in preparation for maintenance work on the Mendota Dam. The MPG does not pump for transfer during these periods. It is also possible for a northerly flow to occur as a result of MPG pumping if diversions in the southern portion of the Pool are insufficient to offset the inflow from the MPG wells along the Slough.

Water Budget Analysis

The calculation of a water budget is an accounting process which evaluates the inflows, outflows, and change in storage during a given time period. Data provided by the SLDMWA (including inflows, diversions, and stage height measurements) have been used by the MPG since 1999 to prepare a monthly water budget for the southern portion of the Fresno Slough Branch of the Pool, i.e., south of transect A-A', which is located between the southernmost SJREC canal intake (the Firebaugh Intake Canal) and the Fordel wells (now operated by the City of Mendota) (see **Figure 6-1**). The water budget also accounts for additional outflow components, such as the net evaporation and seepage losses.

The net evaporation is calculated as the difference between evaporation and precipitation as obtained from a CIMIS weather station in Firebaugh, applied to the surface area of the southern portion of the Pool. This area was estimated at 1,087 acres based on aerial photographs taken for the Army Corps of Engineers in August 1998. The seepage loss from the Mendota Pool was estimated based on the decline in stage measured at Mendota Dam over a 44-hour period from November 25 to 27, 1999 after DMC inflows were suspended in preparation for draining the Pool. The total seepage loss for the southern portion of the Pool during this period was estimated to be 40 cubic feet per second (cfs) (KDSA and LSCE, 2000a). The seepage rate is assumed to be constant throughout the year except when the Pool is drained.

The water budget is used to calculate the monthly amount of inflow from the DMC that reaches the southern portion of the Pool, i.e., south of transect A-A'. The basic equation for a water budget is as follows:

$$\text{Inflow} - \text{Outflow} = \text{Change in Storage } (\Delta S) \qquad (1)$$

To calculate the unknown inflow or outflow across the transect line, the equation is rewritten as

$$(\text{Inflow}_{meas} + \text{Inflow}_{calc}) - (\text{Outflow}_{meas} + \text{Outflow}_{calc}) = \Delta S \qquad (2)$$

Rearranging terms yields

$$\text{Inflow}_{meas} - \text{Outflow}_{meas} - \Delta S = \text{Outflow}_{calc} - \text{Inflow}_{calc} \qquad (3)$$

or

$$\text{Inflow}_{meas} - \text{Outflow}_{meas} - \Delta S = \text{Net Flow}_{calc} \qquad (4)$$

Rearranging terms to accommodate the conceptual design of the water budget for the southern area yields

$$\text{Outflow}_{meas} - \text{Inflow}_{meas} + \Delta S = -(\text{Net Flow}_{calc}) \qquad (5)$$

Finally, to be consistent with previous reports, the minus sign on the right side of the equation was dropped so that flow to the south would be indicated by positive values.

The Pool was not drained in 2010, and the results of the 2010 water budget indicate a southerly flow direction, on average, during each month of the year. The calculated DMC inflow across transect A-A' ranged from a low of 36 cfs in March to a high of 345 cfs in July (**Table 6-1**). The average flow to the south in 2010 was estimated to be 166 cfs.

Surface-Water Quality

The 1999-2010 analytical results from grab samples retrieved at twelve surface-water sampling locations along the Fresno Slough are compiled in their entirety in **Appendix F**. This includes samples collected by the MPG along with data obtained from the SJREC and USBR. Access to the Mowry Bridge sampling location is no longer available, and this site has been dropped from the monitoring program. As discussed in the next section, the Lateral 6 and 7 sampling location will also be dropped in 2011 because the flow in these laterals is too low to provide meaningful sample results during most of the year. **Appendix G** lists the daily average EC values for the DMC and the SJREC's canal intakes in 2010.

Salinity

The salinity of the water delivered to the Pool via the DMC is subject to large daily and seasonal fluctuations. Daily fluctuations are due to tidal effects in the Sacramento-San Joaquin Delta, and seasonal fluctuations are due to other factors such as discharge of drain water to the DMC in the spring. Historically, the highest EC values have occurred in the winter and spring, and the EC is generally lower during the summer months. These patterns were also observed in 2010 (**Figure 6-2**), with the highest ECs (a daily average of about 1,000 µmhos/cm) occurring in April and the lowest ECs (a daily average of about 260 µmhos/cm) occurring in July. The daily avaerage EC at the DMC terminus is compiled from hourly measurements, and the EC measured in grab samples collected in 2010 is generally between the daily maximum and minimum for most samples.

The daily average EC values at the SJREC's canal intakes in 2010 (compiled from measurements taken every two hours) was closely correlated with the DMC data during most of the year, but there were several exceptions. The EC at the Columbia Canal intake was lower than that of the DMC during most of the year due to inflow of low salinity water from the SJR. The EC at the CCID Outside Canal and the Firebaugh Intake Canal was elevated in March and April, as discussed below. The results of grab samples retrieved from the DMC and the SJREC canal intakes are shown on **Figures 6-3** and **6-4**.

As shown in **Table G-1** in **Appendix G**, the EC at the CCID Outside Canal and the Firebaugh Intake Canal exceeded the EC measured at the DMC by more than 90 µmhos/cm on a number of occasions in March and April 2010. There were five exceedances at the CCID Outside Canal and eight at the Firebaugh Intake Canal, each lasting from one to three days. Most of the exceedances are difficult to see on **Figure 6-3** because they are of relatively short duration and occurred during a period of high and variable EC in the DMC. The net flow to the south averaged 36 cfs in March and 50 cfs in April (**Table 6-1**). These are relatively low flow rates, which would make it possible for brief north flow events to occur. The City of Mendota Fordel wells and the Terra Linda wells were pumping during this period. Previous reports have noted that an eddy along the western bank of the Fresno Slough in this area could allow water from the Fordel and Terra Linda wells to north flow to the Firebaugh Intake Canal during periods of low flow (KDSA and LSCE, 2000).

One design constraint applicable to MPG pumping programs requires the temporary cessation of MPG transfer pumping if the EC at any SJREC canal intake exceeds that of the DMC by 90 µmhos/cm or more for at least three days. Since none of the exceedances lasted for more than three days, the SJREC did not notify the MPG or request that any wells be shut off during the March and April period.

The average EC measured at the MWA in the southern portion of the Pool was about 650 µmhos/cm in 2010, but there were gaps in the data due to problems with the EC recorder. As shown on **Figure 6-5**, the lowest EC values were recorded during June, July, and August (mostly below 600 µmhos/cm). The highest EC values were recorded in early May (about 1,300 µmhos/cm). During most of the year, the salinity at the MWA was significantly higher than at the DMC due primarily to inflows from MPG wells along the Fresno Slough (pumping for both transfer and adjacent use), pumping of the Fordel wells by the City of Mendota, and extraction from the Bank. The EC of grab samples retrieved at the MWA was generally consistently with the average daily EC compiled from hourly measurements at that location.

The average EC measured in grab samples collected south of the MWA was about 650 µmhos/cm at JID and about 720 µmhos/cm at Tranquillity ID, which is higher than at the MWA (about 560 µmhos/cm). The causes of increased concentrations of salts south of the MWA are unrelated to MPG pumping. These increases are due in part to pumping of well water to the Pool by Tranquillity ID, Fresno Slough WD, and Reclamation District 1606, which occurred in every month of the year in 2010. The salinity was even higher at Lateral 6 and 7, but several of the water quality samples from this location appear to be affected by stagnant water. The flow in these laterals has continued to decline over the last several years, and the Authority reported no flow in 2010 except for a three-month period (April-June). This sampling location will be removed from the surface-water monitoring program in 2011.

Trace Elements

The surface-water grab samples from the Mendota Pool were analyzed for eight trace elements as shown in **Table F-1** in **Appendix F**. The data for four key trace elements (arsenic, boron, molybdenum, and selenium) are summarized in **Table 6-2** and discussed below. Data from the Lateral 6 and 7 intake are not shown in **Table 6-2** due to the lack of flow discussed above. All grab sample results represent total (suspended and dissolved) rather than dissolved concentrations because the samples were unfiltered.

As in previous years, arsenic concentrations were low in 2010 with little variability throughout the Pool. The arsenic concentrations ranged from non-detect (<2 µg/L) to 3 µg/L. Median arsenic concentrations in the northern portion of the Pool were 2 µg/L at the DMC terminus (Check 21), the SJREC canal intakes, Mendota Dam, and the sampling point West of Fordel. Median arsenic concentrations were 2 to 3 µg/L at the MWA, the JID Booster Plant, and Tranquillity ID in the southern portion of the Pool.

Boron concentrations at the DMC terminus ranged from 0.09 to 0.43 mg/L with a median of 0.20 mg/L in 2010. The median boron concentration at most of the other sampling locations was also about 0.20 mg/L. The median concentration was lower at the Columbia Canal (0.09 mg/L) and higher at Tranquilliy ID (0.35 mg/L based on two samples).

Only one sample from each location (collected in September) was analyzed for molybdenum in 2011, and the results were non-detect (<1.4 µg/L) at the DMC terminus and most of the SJREC canal intakes. The only exception was the Columbia Canal where molybdenum was detected at a concentration of 3.1 µg/L. In the southern portion of the Pool, molybdenum concentrations were non-detect at the MWA, but molybdenum was detected at concentrations of 4.1 mg/L the JID Booster Plant and 2.9 mg/L at Tranquillity ID.

Selenium concentrations in grab samples retrieved from the DMC terminus in 2010 ranged from 0.45 to 1.7 µg/L. These analytical results are plotted on **Figure 6-6** along with the daily average based on automated samples. An automated sampler retrieves samples from the DMC on an hourly basis, and daily composites of these samples are analyzed for selenium at USBR's laboratory. A total of 296 daily samples were analyzed for selenium in 2010, and 79 of these were non-detect (<0.4 µg/L). Concentrations in the other daily composite samples ranged from 0.4 to 4.9 µg/L, with a median of about 1 µg/L. Selenium concentrations were the highest in early February due to drainwater pumped to the DMC upstream of the Pool. Selenium concentrations were also above 2 µg/L for brief periods in April and December. At the SJREC canal intakes, selenium concentrations ranged from non-detect (<0.4 to <1 µg/L) to 1.2 µg/L, and the median concentrations were all non-detect (<1 µg/L).

Selenium concentrations were also low in the southern portion of the Pool. A total of five samples were collected from three sampling locations, and four of these were non-detect (<0.4

μg/L). The single selenium detection was in a sample from JID at a concentration of 0.48 μg/L.

As discussed in Chapter V, arsenic and selenium concentrations in groundwater discharged to the Pool from MPG wells along the Fresno Slough have typically been below the reporting limits of 2 and 0.4 μg/L, respectively. Likewise, boron concentrations in these wells are low (typically below 0.5 mg/L). As discussed above, molybdenum concentrations in groundwater are more variable and tend to be higher in the southern portion of the MPG well field. Molybdenum concentrations at most MPG wells are higher than in DMC water, but the molybdenum concentration at the MWA was still non-detect in 2010.

Water quality objectives (WQOs) established by the CVRWQCB for inland surface waters are 10 μg/L for arsenic, 19 μg/L for molybdenum, 0.8 mg/L for boron, and 2 μg/L for selenium (**Table 6-3**). The WQOs were not exceeded in any of the surface-water samples in 2010.

CDFG has also developed specific target WQOs for the MWA. The WQO for selenium was unchanged at 2 μg/L, but the WQOs for the other constituents were lower than the CVRWQCB criteria: 5 μg/L for arsenic, 0.3 mg/L for boron, and 10 μg/L for molybdenum. These WQOs were also not exceeded in 2010.

Sediment Sampling Results

As described in Chapter II, a sediment-monitoring program in the Pool was initiated in 2001 at the request of CDFG. Most of the sediment sampling stations are co-located with surface-water sampling locations (**Figure 2-4**). These locations allow estimation of metal introduced by inflow from the SJR, the DMC, the James Bypass, and the MPG wells. Sediment sampling in 2010 was conducted during November 18-22. As in previous transfer-pumping years, samples were collected in triplicate from four general geographic area in the Mendota Pool (**Figure 2-5**):

1. San Joaquin River Branch – Columbia Canal intake
2. Northern Fresno Slough – Mendota Dam, DMC terminus, Firebaugh Intake Canal
3. Central Fresno Slough – Etchegoinberry introduction point
4. Southern Fresno Slough – MWA approximately one-quarter mile south of Whitesbridge Road, JID Booster Plant, and Lateral 6

The sediment samples were analyzed for total selenium, arsenic, boron, and molybdenum on a dry weight basis. Samples were also analyzed for EC, total organic carbon, pH, cation exchange capacity, moisture content, and grain size (percent sand, silt, and clay). Several of these parameters are included to allow evaluation of the ability of the sediment to bind metals. The results of the November 2009 sediment-sampling event are summarized in **Table 6-4**. Concentrations estimated above the sample-specific method detection limit (MDL) and below the method reporting limit (MRL) are flagged as "J" in this table. Non-quantifiable concentrations below the MDL are indicated with a "smaller than" symbol, e.g., <0.1.

The 2010 arsenic concentrations in the sediment samples were lowest at the JID Booster Plant (median of 1.8 mg/kg) and highest at the DMC terminus (median of 6.1 mg/kg). Median arsenic concentrations at the other sampling locations ranged from 2.8 to 5.8 mg/kg.
The 2010 boron concentrations were also lowest at the JID Booster Plant (median of 7.0 mg/kg) and highest at Lateral 6 (median of 27.8 mg/kg). In the northern portion of the Pool, boron concentrations were highest at the DMC terminus (median of 23.0 mg/kg).

As in previous years, molybdenum concentrations were relatively low in the 2010 sediment samples, and some of the results from all but one sampling location were J-flagged. The median concentrations were lowest at the JID Booster Plant (0.2 mg/kg, J-flagged) and highest at Lateral 6 (0.9 mg/kg).

The median selenium concentrations were low at all sediment sampling locations in 2010. In the northern portion of the Pool, the median selenium concentrations were 1.1 to 1.2 mg/kg. The highest selenium concentration was 2.4 mg/kg in one of the samples from the DMC terminus. In the southern portion of the Pool, the median selenium concentrations ranged from 0.2 to 0.7 mg/kg.

Unlike surface-water and groundwater quality sampling results, few guidelines are available for evaluation of sediment quality in general and the effects of MPG pumping in particular (USBR, 2005a). For the parameters of concern in this analysis, guidelines are only available for arsenic and selenium. The "effects range-low" value for arsenic identified by the U.S. Environmental Protection Agency is 12.1 mg/kg dry weight. None of the detected arsenic concentrations exceeded this screening value. Screening criteria have been developed by the U.S. Fish and Wildlife Service (USFWS) for the Grasslands Watershed (URS, 2001), which is located north of the Pool. The USFWS screening criteria for selenium include a target level of 2 mg/kg and a toxicity threshold of 4 mg/kg dry weight. The selenium concentration in only one sample (from the DMC) exceeded the screening level in 2010, and none exceeded the toxicity threshold.

Summary

The salinity at the SJREC canal intakes in the northern portion of the Pool tracked that of the DMC very well in 2010. There were several one to three-day periods in March and April when the EC at the canal intakes exceeded that of the DMC by 90 µmhos/cm or more. The salinity was higher in the southern portion of the Pool due primarily to pumping to the Fresno Slough by the MPG and others. This pumping had a greater effect on water quality in 2010 because flow to the south has decreased over the last several years due to reduced diversions from the southern portion of the Pool. The flow in Lateral 6 and 7 was too low to obtain meaningful sampling results in 2010, and this sample location will be dropped in 2011.

Surface-water grab samples from the Mendota Pool were analyzed for eight trace elements, and four key trace elements (arsenic, boron, molybdenum, and selenium) are summarized in the report. Almost all trace element concentrations were low in 2010. The only exceptions were elevated selenium concentrations (up to 4.9 µg/L) measured in daily composite samples from the DMC in February, April, and December.

Sediment sampling was conducted in 2010 at eight locations in the Pool. The samples were analyzed for a variety of constituents, including the same four trace elements discussed above for surface water. Concentrations of all four trace elements were low at all sampling locations. However, selenium concentrations in one sediment sample from the DMC was above a screening level of 2 mg/kg established by the USFWS.

Table 6-1
Monthly Summary of Water Budget for Fresno Slough Branch of Mendota Pool South of Transect A-A' (2010)

Month	Inflow[1]					Outflow								Change in Storage (cfs)	Net Flow[4] (cfs)
	MPG Wells Along Fresno Slough[2] (cfs)	Meyers Farm Water Bank (cfs)	James Bypass (cfs)	James ID (cfs)	Tranquillity ID, FCWD, RD 1606, & Fresno Slough WD (cfs)	James & Tranquillity ID (cfs)	Mendota Wildlife Area (cfs)	WWD Lateral 6 & 7 (cfs)	Meyers Farm Water Bank (cfs)	MPG Adjacent Use[3] (cfs)	Hughes, Wilson, Mid Valley, F. Slough, RD 1606 (cfs)	Net Evap. (cfs)	Est. Seepage (cfs)		
January	0	0	0	0	12	0	14	0	13	0	0	-1	40	148	**201**
February	10	0	0	0	13	55	31	0	24	20	1	0	40	5	**154**
March	30	0	0	0	34	26	8	0	14	10	1	4	40	-3	**36**
April	13	0	0	0	20	16	3	4	0	11	1	6	40	3	**50**
May	39	0	0	0	0	80	16	10	15	21	5	11	40	-4	**154**
June	26	0	0	0	15	201	39	17	22	28	10	12	40	-2	**326**
July	25	0	0	0	8	220	42	0	25	28	7	12	40	4	**345**
August	26	0	0	0	14	101	49	0	22	21	3	11	40	-2	**204**
September	12	0	0	0	18	65	72	0	23	11	1	8	40	0	**191**
October	13	0	0	0	16	25	116	0	21	7	0	5	40	-1	**184**
November	13	0	0	0	2	18	41	0	18	2	0	1	40	3	**109**
December	0	0	30	0	1	0	21	0	14	1	0	-2	40	-5	**38**
Mean (cfs)	**17**	**0**	**3**	**0**	**13**	**67**	**37**	**3**	**18**	**13**	**3**	**6**	**40**	**12**	**166**
Total[5] (af)	**12,600**	**13**	**1,800**	**0**	**9,200**	**48,600**	**27,100**	**1,800**	**12,800**	**9,600**	**1,900**	**4,100**	**28,500**	**8,800**	**119,600**

1. Inflow from the north (primarily from the DMC) is not shown. Inflow from the north is calculated in the last column.
2. Also Includes Fordel wells operated by the City of Mendota.
3. Includes Terra Linda, Coelho-Gardner-Hansen, and Meyers Farming.
4. Calculated as outflow minus inflow plus change in storage. Positive values indicate flow to south; negative values indicate flow to north. Positive values generally represent inflow from the DMC to the southern portion of the Pool.
5. Valuses greater than 100 af are rounded to the nearest 100 af.

Table 6-2
Summary of 2010 Surface-Water Grab Sample Results[1]

Location	EC (µmhos/cm) @ 25°C				Arsenic (µg/L)				Boron (mg/L)				Molybdenum (µg/L)				Selenium (µg/L)			
	Min	Max	Median	n[2]	Min	Max	Median	n[2]	Min	Max	Median	n[2]	Min	Max	Median	n[2]	Min	Max	Median	n[2]
Columbia Canal	44	614	238	8	2	2	2	2	<0.1	0.14	0.09	8	3.1	-	-	1	<0.4	0.47	<1	7
Mendota Dam	253	727	454	10	2	2	2	2	0.10	0.44	0.18	9	<1.4	-	-	1	<0.4	<0.4	<1	10
CCID Main Canal	246	651	414	10	2	2	2	2	0.10	0.35	0.20	10	<1.4	-	-	1	<0.4	1.1	<1	9
DMC Check 21	222	687	477	15	2	3	2	7	0.09	0.43	0.20	15	<1.4	-	-	1	0.45	1.7	<1	10
CCID Outside Canal	268	709	481	9	<2	2	-	2	0.11	0.44	0.19	9	<1.4	-	-	1	0.48	<1	<1	8
Firebaugh Intake Canal	301	760	496	9	2	2	2	2	0.12	0.46	0.19	9	<1.4	-	-	1	0.48	<1	<1	8
West of Fordel	381	508	445	2	2	2	2	2	0.2	0.2	0.2	2	<1.4	-	-	1	0.57	0.62	0.60	2
Etchegoinberry	581	-	-	1	<2	-	-	1	0.2	-	-	1	1.7	-	-	1	0.64	-	-	1
Mendota Wildlife Area	405	729	541	7	<2	2	2	7	0.2	0.3	0.2	7	<1.4	-	-	1	<0.4	-	-	1
James ID (Booster Plant)	410	960	641	7	<2	3	3	7	0.2	0.4	0.2	7	4.1	-	-	1	<0.4	0.48	-	2
Tranquillity ID	609	824	717	2	3	3	3	2	0.3	0.4	0.35	2	2.9	-	-	1	<0.4	-	-	2

1. Total concentrations.
2. n = number of samples

Table 6-3
Applicable Water Quality Criteria for Trace Elements in Mendota Pool

Constituent[2]	CAS #	Applicable Water Quality Criteria[1] (µg/L)			Criteria Type	Total or Dissolved Concentration
		USEPA: Freshwater Aquatic Life Protection Criteria (Hardness = 85 mg/L)[3]	CVRWQCB: Water Quality Objectives (WQO) for Inland Surface Waters	CDFG: Target WQO for Mendota Wildlife Area		
Antimony	7440-36-0					
Arsenic	7440-38-2		10	5	Maximum conc.	Dissolved
Barium	7440-39-3		100		Maximum conc.	Dissolved
Beryllium	7440-41-7					
Boron	7440-42-8		800[4]	300	Monthly mean (3/15-9/15)	Total
Cadmium	7440-43-9	0.22			4-day mean	Dissolved
Chromium (III)[5]	16065-83-1	65			4-day mean	Dissolved
Cobalt	7440-48-4					
Copper	7440-50-8	7.8			4-day mean	Dissolved
Iron	7439-89-6		300		Maximum conc.	Dissolved
Lead	7439-92-1	2.1			4-day mean	Dissolved
Manganese	7439-96-5		50		Maximum conc.	Dissolved
Mercury (total)	7439-97-6	0.77[6]			4-day mean	Dissolved
Molybdenum	7439-98-7		19	10	Monthly mean	Total
Nickel	7440-02-0	45			4-day mean	Dissolved
Selenium	7782-49-2		2[7]	2[7]	Monthly mean	Total
Silver	7440-22-4	2.4			1-hour mean	Dissolved
Thallium	7440-28-0					
Vanadium	7440-62-2					
Zinc	7440-66-6	100			4-day mean	Dissolved

[1] The most stringent criterion for each constituent is listed. CDFG's target WQOs are also listed where available. USEPA criteria are based on California Toxics Rule Criterion Continuous Concentration values. CVRWQCB criteria are based on Sacramento-San Joaquin Valley Basin Plan (CVRWQCB, 1998).
[2] California Title-22 metals (Curtis and Tompkins website, June 2003) plus iron and manganese.
[3] USEPA criteria vary with hardness (except for mercury). During 1999-2003, the total hardness at the DMC (as $CaCO_3$) during the months when the Bank would extract water (May through August) ranged from 64 to 120 mg/L, with a mean of 85 mg/L.
[4] CVRWQCB Boron criterion from 9/16 to 3/14 is monthly mean of 1,000 µg/L.
[5] Used as surrogate for total chromium.
[6] Mercury criterion does not vary with hardness.
[7] Based on USFWS criterion established for Grasslands watershed.

Table 6-4
Sediment Sampling Results

Sampling Station	Date	Replicate	Lab	EC[b] (umhos/cm)	Arsenic (mg/kg)[a]	Boron (mg/kg)[a]	Molybdenum (mg/kg)[a]	Selenium (mg/kg)[a]	TOC[a] (mg/kg)	TOC[a] (%)	pH[b]	CEC (meq/100g)	% Moisture	Sieve Analysis % Gravel	% Sand	% Silt	% Clay
San Joaquin River Branch																	
Columbia Canal	8/22/01	1	FGL	485	4	<12	<1.2	<1.2	3,123	0.3	6.6	7.1	58.7	0.0	58.0	34.0	8.0
	8/22/01	1	FGS	-	-	-	-	0.7	-	-	-	-	-	-	-	-	-
	8/22/01	2	FGL	534	7	<15	<1.5	<7.5	4,136	0.4	6.6	14.9	66.8	0.0	30.0	56.0	14.0
	8/22/01	3	FGL	565	6	<12	<1.2	<6.2	4,454	0.4	6.8	10.6	59.5	0.0	44.0	46.4	9.6
	10/30/01	1	CAS	201	3.5	5.1 (J)	<0.8	<1.1	-	0.7	8.2	27.7	34.9	0.0	64.0	26.8	9.2
	10/30/01	2	CAS	160	2.8	6.5 (J)	0.8 (J)	<0.9	-	0.8	8.1	25.9	40.7	0.0	54.7	34.6	10.7
	10/30/01	3	CAS	132	3.9	8.0 (J)	<0.7	<1.1	-	1.1	7.8	30.6	47.5	0.0	43.1	46.3	10.6
	10/15/02	1	CAS	44	3.3	6.4 (B)	<0.6	<1	-	1.4	7.6	33.7	51.8	0.0	27.4	58.3	15.1
	10/15/02	2	CAS	79	2.7	2.9 (B)	<0.6	<1	-	0.8	7.4	21.1	38.5	0.0	54.1	36.7	8.1
	10/15/02	3	CAS	63	1.9 (B)	<2.3	0.7 (B)	<1.1	-	0.5	7.3	14.0	30.7	0.0	67.4	23.5	6.2
	10/25/07	1	CAS	264	1.0 (B)	3.5 (B)	<0.6	<0.6	-	0.5	7.3	7.2	29.6	0.0	85.2	6.4	8.4
	10/25/07	2	CAS	242	1.6	5.1 (B)	<0.5	<0.5	-	0.9	7.2	13.0	40.8	0.0	87.3	5.5	7.2
	10/25/07	3	CAS	142	0.6 (B)	4.5 (B)	<0.5	<0.5	-	0.3	7.1	7.6	20.5	0.0	93.6	3.7	2.7
	11/13/09	1	CAS	179	4.6	5.4	0.3 (J)	2.0	-	2.2	7.8	41.0	39.7	0.0	36.8	0.0	63.2
	11/13/09	2	CAS	153	3.1	4.5	<0.1	1.7 (J)	-	1.0	7.8	23.0	51.6	0.0	46.2	1.6	52.2
	11/13/09	3	CAS	94	2.6	3.2	<0.1	0.3 (J)	-	0.7	7.6	18.0	58.7	0.0	65.6	0.0	34.4
	11/18/10	1	CAS	80	4.8	8.9	0.4 (J)	1.4	-	1.4	6.7	30.3	57.2	5.5	24.0	17.5	53.0
	11/18/10	2	CAS	88	4.9	8.4	0.4	1.2	-	1.4	6.8	28.4	54.4	0.0	32.8	15.3	51.9
	11/18/10	3	CAS	87	5.8	8.4	0.3 (J)	0.7 (J)	-	1.1	7.0	34.1	53.3	0.0	31.1	17.9	51.0
Northern Fresno Slough																	
Mendota Dam	8/22/01	1	FGL	1,140	10	20	<1.5	<7.4	4,024	0.4	7.0	20.5	66.2	0.0	10.0	72.4	17.6
	8/22/01	2	FGL	1,070	9	20	<1.2	<5.9	4,596	0.5	7.4	17.4	57.6	0.0	28.0	54.4	17.6
	8/22/01	2	FGS	-	-	-	-	0.7	-	-	-	-	-	-	-	-	-
	8/22/01	3	FGL	951	8	20	<1.2	<5.8	5,126	0.5	7.0	15.6	57.2	0.0	38.0	46.4	15.6
	10/30/01	1	CAS	236	6	18	1.0 (J)	<0.9	-	1.2	7.6	28.8	51.5	0.0	24.3	68.7	7.0
	10/30/01	2	CAS	211	6.1	15.2	1.0 (J)	<1.0	-	0.9	7.5	35.5	47.9	0.0	26.7	64.3	9.0
	10/30/01	3	CAS	246	5.6	12.1	<0.7	<1.0	-	0.9	7.5	37.6	47.7	0.0	24.3	66.2	9.5
	10/15/02	1	CAS	130	4.6	11.8	<0.6	<1.1	-	0.9	7.4	35.6	40.9	0.0	29.4	60.5	10.5
	10/15/02	2	CAS	156	4.6	11.2	0.8 (B)	<1.1	-	1.1	7.3	38.9	44.6	0.0	21.2	66.3	11.4
	10/15/02	3	CAS	106	4.1	9.2 (B)	0.6 (B)	<0.9	-	1.0	7.6	40.0	45.5	0.0	35.8	53.3	12.1
	10/25/07	1	CAS	210	9.1	60.4	<0.5	<0.5	-	0.8	7.7	36.0	41.7	0.0	11.2	38.2	50.6
	10/25/07	2	CAS	290	8.3	49.1	<0.6	<0.6	-	0.8	7.7	31.0	37.2	0.0	10.0	15.6	74.4
	10/25/07	3	CAS	433	7.4	48.7	<0.6	<0.6	-	0.9	7.5	18.0	38.9	0.0	11.2	18.0	70.8
	11/13/09	1	CAS	81	3.6	6.5	0.2 (J)	0.7 (J)	-	1.1	7.2	28.0	51.8	0.0	32.8	3.1	64.1
	11/13/09	2	CAS	97	5.2	8.6	0.2 (J)	0.9 (J)	-	1.4	7.2	52.0	43.0	0.0	13.9	8.9	77.2
	11/13/09	3	CAS	180	4.4	7.8	0.2 (J)	1.3 (J)	-	1.4	7.2	28.0	44.2	0.0	7.5	8.5	84.0
	11/18/10	1	CAS	240	4.7	13.8	0.4	1.5	-	1.9	6.8	40.2	61.3	0.0	6.5	24.7	68.8
	11/18/10	2	CAS	273	5.4	11.9	0.3 (J)	1.1	-	1.5	7.0	33.9	58.1	0.0	18.7	23.5	57.8
	11/18/10	3	CAS	209	3.6	10.8	0.3 (J)	1.1	-	1.8	6.9	24.1	57.8	0.0	25.3	12.8	61.9

Table 6-4 (continued)
Sediment Sampling Results

Sampling Station	Date	Replicate	Lab	EC[b] (umhos/cm)	Arsenic (mg/kg)[a]	Boron (mg/kg)[a]	Molybdenum (mg/kg)[a]	Selenium (mg/kg)[a]	TOC[a] (mg/kg)	TOC[a] (%)	pH[b]	CEC (meq/100g)	% Moisture	Sieve Analysis % Gravel	% Sand	% Silt	% Clay
Delta-Mendota Canal	8/22/01	1	FGL	1,280	13	70	2	<6.1	5,032	0.5	7.8	42.0	59.3	0.0	10.4	34.0	55.6
	8/22/01	1	FGS	-	-	-	-	2.9	-	-	-	-	-	-	-	-	-
	8/22/01	2	FGL	782	4.8	11	<0.86	<4.3	1,127	0.1	7.7	8.0	41.7	0.0	78.4	12.0	9.6
	8/22/01	3	FGL	506	4.8	11	<0.86	<0.86	810	0.1	7.8	7.6	41.6	0.0	78.0	14.0	8.0
	10/30/01	1	CAS	265	8.8	40.0	1.5 (J)	<1.1	-	1.1	7.7	27.5	48.8	0.0	16.2	49.9	33.9
	10/30/01	2	CAS	314	10.9	41.3	1.5 (J)	<1.0	-	0.7	7.7	20.3	55.4	0.0	7.5	44.0	48.5
	10/30/01	3	CAS	329	10.8	52.8	1.8 (J)	<1.0	-	0.9	8.0	21.5	53.0	0.0	9.8	41.0	49.1
	10/15/02	1	CAS	212	6.7	23.7	2.4	1.1 (B)	-	0.9	7.4	26.4	46.5	0.0	13.4	50.1	37.6
	10/15/02	2	CAS	178	7.1	35.2	1.8 (B)	<1	-	0.6	7.5	35.0	44.6	0.0	18.7	14.0	30.3
	10/15/02	3	CAS	223	6.8	35.5	1.7 (B)	1.1 (B)	-	0.8	7.5	24.6	51.0	0.0	10.3	35.0	42.0
	10/24/07	1	CAS	343	5.7	23.7	<0.5	0.5 (B)	-	1.5	7.5	74.0	57.4	0.0	6.5	63.3	30.2
	10/24/07	2	CAS	277	4.9	26.3	<0.5	<0.5	-	1.3	7.3	71.0	51.5	0.0	8.0	68.5	23.5
	10/24/07	3	CAS	371	5.0	23.6	<0.5	<0.5	-	1.4	7.2	64.0	56.1	0.0	9.0	64.0	27.0
	11/12/09	1	CAS	450	9.2	26.0	0.7	1.8 (J)	-	0.7	7.2	49.0	45.2	0.0	5.8	70.2	24.0
	11/12/09	2	CAS	250	8.1	13.6	0.4 (J)	0.9 (J)	-	0.4	7.8	32.0	63.7	0.0	53.0	24.7	22.3
	11/12/09	3	CAS	133	5.0	9.6	<0.1	0.6 (J)	-	0.4	7.7	19.0	68.2	0.0	66.8	13.5	19.7
	11/18/10	1	CAS	423	7.8	32.5	1.4	2.4	-	0.7	7.5	49.0	52.4	1.7	13.8	79.7	4.8
	11/18/10	2	CAS	274	6.1	23.0	0.7	1.1	-	0.6	7.6	38.8	45.1	0.0	54.0	21.6	24.4
	11/18/10	3	CAS	268	5.6	12.7	0.3 (J)	1.0	-	0.8	7.4	37.5	52.5	0.0	31.6	29.0	39.4
Firebaugh Intake Canal	8/22/01	1	FGL	701	10	20	<1.3	<6.4	4,410	0.4	7.2	18.8	60.7	0.0	20.4	40.0	39.6
	8/22/01	2	FGL	763	9	20	<1.2	<5.9	4,008	0.4	7.4	13.9	57.4	0.0	32.4	52.0	15.6
	8/22/01	3	FGL	688	10	20	1.0	<6.3	5,536	0.6	7.3	16.3	60.6	0.0	28.4	53.0	18.6
	8/22/01	3	FGS	-	-	-	-	0.86	-	-	-	-	-	0.0	-	-	-
	10/30/01	1	CAS	168	5.8	16.3	<0.7	<1.0	-	1.1	8.4	43.3	48.4	0.0	24.1	67.8	8.1
	10/30/01	2	CAS	197	5.1	17.2	<0.8	<1.1	-	1.0	7.4	17.6	49.0	0.0	28.6	64.4	7.0
	10/30/01	3	CAS	225	6.1	15.8	<0.7	<1.0	-	1.2	7.1	26.2	47.1	0.0	24.5	69.3	6.2
	10/15/02	1	CAS	66	4.5	12.3	0.6 (B)	<0.9	-	1.4	7.2	35.4	48.1	0.0	17.0	70.0	12.1
	10/15/02	2	CAS	57	4.7	12.2	0.9 (B)	<1	-	1.2	7.3	35.7	41.4	0.0	14.8	70.8	12.7
	10/15/02	3	CAS	89	4.4	8.8 (B)	1.2 (B)	<0.9	-	1.2	7.3	41.1	46.4	0.0	21.1	66.9	12.1
	10/24/07	1	CAS	362	0.4 (B)	5.3 (B)	<0.5	<0.5	-	0.4	7.2	7.6	33.0	0.0	92.1	3.4	4.5
	10/24/07	2	CAS	187	0.5 (B)	8.6 (B)	<0.5	<0.5	-	0.2	7.6	5.3	22.0	0.0	90.7	1.8	7.5
	10/24/07	3	CAS	182	<0.2	7.4 (B)	<0.5	<0.5	-	0.2	7.6	4.8	20.2	0.0	92.6	3.1	4.3
	11/12/09	1	CAS	166	5.0	8.0	0.2 (J)	0.7 (J)	-	1.2	7.2	33.0	49.2	0.0	22.1	13.2	64.7
	11/12/09	2	CAS	174	5.7	6.9	<0.1	0.8 (J)	-	1.0	7.2	28.0	54.2	0.0	25.8	8.7	65.5
	11/12/09	3	CAS	165	5.6	8.6	0.1 (J)	0.8 (J)	-	1.4	7.2	28.0	51.6	0.0	20.1	14.3	65.6
	11/18/10	1	CAS	245	4.4	14.2	0.4	1.1	-	1.3	7.2	38.6	52.3	0.2	16.0	25.1	58.7
	11/18/10	2	CAS	236	4.7	13.7	0.4	1.2	-	1.6	6.9	41.5	60.2	0.0	10.0	30.9	59.1
	11/18/10	3	CAS	222	3.9	12.2	0.3 (J)	1.2	-	1.1	7.1	28.4	49.3	0.0	26.5	14.1	59.4
Central Fresno Slough																	
Etchegoinberry	8/22/01	1	FGL	665	9	30	<2.1	<2.1	7,978	0.8	7.3	30.4	75.8	0.0	18.4	40.0	41.6
	8/22/01	1	FGS	-	-	-	-	1.6	-	-	-	-	-	-	-	-	-
	8/22/01	2	FGL	660	8	20	<1.8	<8.8	8,464	0.8	7.3	27.7	71.6	0.0	16.4	46.0	37.6
	8/22/01	3	FGL	641	7	<18	<1.8	<8.8	7,837	0.8	7.3	26.4	71.7	0.0	14.4	48.0	37.6

Table 6-4 (continued)
Sediment Sampling Results

Sampling Station	Date	Replicate	Lab	EC[b] (umhos/cm)	Arsenic (mg/kg)[a]	Boron (mg/kg)[a]	Molybdenum (mg/kg)[a]	Selenium (mg/kg)[a]	TOC[a] (mg/kg)	TOC[a] (%)	pH[b]	CEC (meq/100g)	% Moisture	Sieve Analysis % Gravel	% Sand	% Silt	% Clay
Etchegoinberry	10/30/01	1	CAS	144	6.9	27.4	<0.7	<1.0	-	1.8	7.7	35.9	73.6	0.0	0.5	58.2	41.3
	10/30/01	2	CAS	187	5.8	27.2	1.0 (J)	<1.0	-	1.7	7.4	45.0	70.6	0.0	0.7	55.0	44.4
	10/30/01	3	CAS	182	2.8	10.0 (J)	0.8 (J)	<1.0	-	0.7	7.8	19.2	36.0	0.0	66.8	27.1	6.1
	10/15/02	1	CAS	133	5.0	20.6	0.9 B	<1.1	-	1.7	7.4	52.5	67.2	0.0	0.9	51.0	49.1
	10/15/02	2	CAS	129	5.0	14.1	<0.6	<1.1	-	1.6	7.5	54.7	66.0	0.0	0.8	52.2	47.9
	10/15/02	3	CAS	112	4.8	16.8	1 (B)	<1.1	-	1.7	7.6	57.1	69.8	0.0	1.1	54.3	48.5
	10/24/07	1	CAS	242	4.6	34.5	<0.6	<0.6	-	1.1	7.9	34.0	40.4	0.0	28.5	15.4	56.1
	10/24/07	2	CAS	157	4.1	43.8	<0.6	<0.6	-	0.7	7.9	17.0	36.0	0.0	29.0	13.1	57.9
	10/24/07	3	CAS	100	3.6	42.9	<0.6	<0.6	-	0.8	8.3	28.0	37.6	0.0	13.2	14.2	72.6
	11/12/09	1	CAS	371	6.7	18.3	<0.1	0.9 (J)	-	1.9	7.4	51.0	23.0	0.0	0.4	77.7	21.9
	11/12/09	2	CAS	249	4.1	9.2	<0.1	2.7	-	1.3	7.6	58.0	44.7	0.0	11.7	23.4	64.9
	11/12/09	3	CAS	308	5.7	14.8	<0.1	2.7	-	1.6	7.5	63.0	28.1	0.0	1.5	60.2	38.3
	11/22/10	1	CAS	370	5.8	20.9	0.4 (J)	1.0 (J)	-	2.1	7.2	68.7	74.8	0.0	0.5	74.9	24.6
	11/22/10	2	CAS	404	5.8	17.2	0.4 (J)	0.8 (J)	-	2.1	7.4	38.8	75.1	0.0	0.9	79.8	19.3
	11/22/10	3	CAS	398	6.5	16.6	0.5 (J)	1.1 (J)	-	2.0	7.4	38.7	73.9	0.0	1.7	74.9	23.4
Southern Fresno Slough																	
Whitesbridge Road	8/22/01	1	FGL	909	5	<22	<2.2	<2.2	5,045	0.5	7.5	33.5	77.1	0.0	18.0	36.0	46.0
	8/22/01	2	FGL	951	4	<20	<2	<2	7,134	0.7	7.4	33.6	75.2	-	22.0	30.0	48.0
	8/22/01	3	FGL	443	2.5	<9.5	<0.95	<0.95	1,941	0.2	7.4	11.3	47.1	0.0	58.0	26.0	16.0
	8/22/01	3	FGS	-	-	-	-	0.3	-	-	-	-	-	0.0	-	-	-
	10/30/01	1	CAS	205	4.5	31	<0.7	<1.0	-	1.5	7.4	46.5	71.4	0.0	2.4	49.5	48.1
	10/30/01	2	CAS	168	4.5	29.7	1.3 (J)	<1.2	-	1.4	7.8	49.2	68.5	0.0	2.0	50.3	47.7
	10/30/01	3	CAS	190	5.1	30.8	<0.7	<1.0	-	1.4	7.7	33.8	70.7	0.0	1.5	55.2	43.3
	10/15/02	1	CAS	168	2.6 (B)	4.6 (B)	0.6 (B)	<1.1	-	0.2	7.6	13.4	25.7	0.0	74.6	19.1	3.8
	10/15/02	2	CAS	202	3.2	4.2 (B)	0.7 (B)	<1	-	0.2	8.2	9.3	25.7	0.0	85.6	12.5	2.3
	10/15/02	3	CAS	162	8.6	25.1	1.7 (B)	<1	-	0.3	8.3	34.8	38.0	0.0	53.7	24.3	16.2
	10/24/07	1	CAS	363	2.2	12.8	<0.6	<0.6	-	0.5	7.8	13.0	26.4	0.0	70.6	19.9	9.5
	10/24/07	2	CAS	349	0.6 (B)	5.6 (B)	<0.5	<0.5	-	0.3	7.4	7.2	32.5	0.0	77.2	17.9	4.9
	10/24/07	3	CAS	325	0.3 (B)	6.5 (B)	<0.6	<0.6	-	0.4	7.6	8.9	26.8	0.0	68.2	24.7	7.1
	11/12/09	1	CAS	222	4.7	14.6	<0.1	2.8	-	1.2	7.3	78.0	29.9	0.0	4.1	58.2	37.7
	11/12/09	2	CAS	336	4.9	18.0	0.1 (J)	0.5 (J)	-	1.4	7.5	79.0	28.0	0.0	1.4	82.9	15.7
	11/12/09	3	CAS	216	5.4	6.2	0.3 (J)	0.5 (J)	-	0.2	8.1	14.0	71.8	0.0	75.9	5.7	18.4
	11/22/10	1	CAS	405	4.3	18.4	0.4 (J)	1.2	-	1.5	7.6	53.0	70.6	0.0	1.9	65.3	32.8
	11/22/10	2	CAS	420	7.3	10.4	0.7	0.3 (J)	-	0.3	8.2	22.8	37.6	4.9	68.3	3.3	23.5
	11/22/10	3	CAS	384	4.1	16.2	0.3 (J)	0.5 (J)	-	1.5	7.6	46.8	68.4	0.0	2.7	68.7	28.6
James ID Booster Plant	8/22/01	1	FGL	570	1.8	<8.4	<0.84	<4.2	1,649	0.2	7.5	5.2	40.4	0.0	88.0	6.0	6.0
	8/22/01	2	FGL	526	2.2	<8.1	<0.81	<4.1	874	0.1	7.5	3.9	38.4	0.0	90.0	5.0	5.0
	8/22/01	3	FGL	664	1.7	<8.3	<0.83	<0.83	799	0.1	7.6	5.8	40.1	0.0	88.0	7.0	5.0
	8/22/01	3	FGS	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-
	10/30/01	1	CAS	255	2.7	10.2	<0.7	<1.0	-	0.8	7.8	39.7	47.3	0.0	30.1	58.7	11.2
	10/30/01	2	CAS	265	2.3	6.6 (J)	<0.7	<1.0	-	0.5	7.5	24.4	42.1	0.0	53.0	37.4	9.5
	10/30/01	3	CAS	298	2.9	9.7 (J)	<0.7	<1.0	-	1.0	7.6	16.9	47.9	0.0	35.1	53.6	11.3

Table 6-4 (continued)
Sediment Sampling Results

Sampling Station	Date	Replicate	Lab	EC[b] (umhos/cm)	Arsenic (mg/kg)[a]	Boron (mg/kg)[a]	Molybdenum (mg/kg)[a]	Selenium (mg/kg)[a]	TOC[a] (mg/kg)	TOC[a] (%)	pH[b]	CEC (meq/100g)	% Moisture	Sieve Analysis % Gravel	% Sand	% Silt	% Clay
James ID Booster Plant	10/15/02	1	CAS	112	2.5 (B)	6.3 (B)	<0.6	<1	-	0.7	7.8	22.2	40.9	0.0	37.6	58.4	9.7
	10/15/02	2	CAS	140	2.6	10.8	1.1 (B)	<0.9	-	0.9	7.5	27.8	45.0	0.0	23.1	61.4	13.4
	10/15/02	3	CAS	170	1.4 (B)	4.1 (B)	1.5 (B)	<1	-	0.4	8.1	11.9	28.8	0.0	73.3	20.0	6.1
	10/25/07	1	CAS	167	0.8 (B)	5.8 (B)	<0.5	<0.5	-	0.2	8.1	3.7	20.4	0.0	91.9	6.3	1.8
	10/25/07	2	CAS	226	0.9 (B)	4.6 (B)	<0.5	<0.5	-	0.1	7.9	2.9	21.8	0.0	93.6	4.3	2.1
	10/25/07	3	CAS	170	0.7 (B)	6.4 (B)	<0.6	<0.6	-	0.1	7.8	2.3	17.7	0.0	95.2	3.8	1.0
	11/12/09	------------ No Sample ----------															
	11/19/10	1	CAS	222	1.2	3.9	0.1 (J)	0.5 (J)	-	0.2	7.2	4.3	22.7	0.0	90.0	2.9	7.2
	11/19/10	2	CAS	284	1.8	7.0	0.2 (J)	0.2 (J)	-	0.5	7.3	17.6	43.2	0.0	47.9	13.9	38.2
	11/19/10	3	CAS	273	2.1	8.6	0.3 (J)	0.2 (J)	-	0.7	7.4	15.4	42.7	0.0	51.7	4.3	44.0
Lateral 6	8/22/01	1	FGL	1,280	10	60	<1	<10	3,402	0.3	8.0	43.8	51.1	0.0	14.4	34.0	51.6
	8/22/01	1	FGS	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-
	8/22/01	2	FGL	1,260	5	40	<1.1	<5.4	5,826	0.6	8.0	39.9	53.5	0.0	24.4	27.6	48.0
	8/22/01	3	FGL	1,160	5.4	37	<0.97	<4.8	6,158	0.6	8.0	39.4	48.3	0.0	26.0	28.0	46.0
	10/30/01	1	CAS	305	3.3	33	1.0 (J)	<1.1	-	1.0	8.1	19.6	59.2	0.0	2.4	74.5	23.1
	10/30/01	2	CAS	277	3.4	28.9	<0.8	<1.1	-	1.0	8.0	33.7	59.4	0.0	9.5	67.8	22.7
	10/30/01	3	CAS	247	3.7	28.0	<0.8	<1.1	-	1.0	8.1	25.0	58.1	0.0	11.6	64.8	23.6
	10/15/02	1	CAS	147	3.2	17.2	1 B	<1.1	-	0.9	8.0	35.1	44.0	0.0	25.5	55.7	16.2
	10/15/02	2	CAS	147	2.8	25.7	0.8 (B)	<1	-	1.0	8.2	42.6	49.7	0.0	18.3	61.9	21.1
	10/15/02	3	CAS	271	2.6 (B)	28.1	<0.6	<1	-	1.1	7.8	40.8	51.7	0.0	5.3	72.9	21.9
	10/25/07	1	CAS	282	4.1	27.7	<0.5	<0.5	-	1.2	8.2	49.0	55.9	0.0	20.4	40.7	38.9
	10/25/07	2	CAS	320	4.4	27.2	<0.5	<0.5	-	1.6	8.2	67.0	55.8	0.0	26.6	34.9	38.5
	10/25/07	3	CAS	451	3.9	19.6	<0.5	<0.5	-	1.2	8.2	36.0	47.4	0.0	37.7	31.2	31.1
	11/13/09	1	CAS	479	4.1	18.2	0.4	1.2 (J)	-	0.9	8.0	49.0	52.1	0.0	10.1	42.3	47.6
	11/13/09	2	CAS	356	4.8	16.0	0.3 (J)	0.7 (J)	-	0.6	8.0	36.0	59.0	0.0	30.0	28.5	41.5
	11/13/09	3	CAS	303	5.0	14.3	0.7	1.1 (J)	-	0.6	8.1	27.0	63.2	0.0	43.4	23.3	33.3
	11/19/10	1	CAS	386	2.7	27.8	0.5	<0.1	-	1.1	8.2	47.0	44.6	0.0	18.2	0.0	81.8
	11/19/10	2	CAS	448	3.7	36.3	1.2	0.7 (J)	-	1.0	8.3	70.9	60.8	0.0	1.1	75.6	23.3
	11/19/10	3	CAS	380	2.8	27.6	0.9	0.7 (J)	-	0.9	8.6	35.3	48.3	0.3	13.7	55.7	30.3

Constituent abbreviations: EC = electrical conductivity @ 25 degrees C; TOC = total organic carbon; CEC = cation exchange capacity

Laboratory abbreviations: FGL - Fruit Growers Laboratory, Santa Paula, California; FGS - Frontier Geosciences, Seattle, Washington; CAS - Columbia Analytical Services, Kelso, Washington

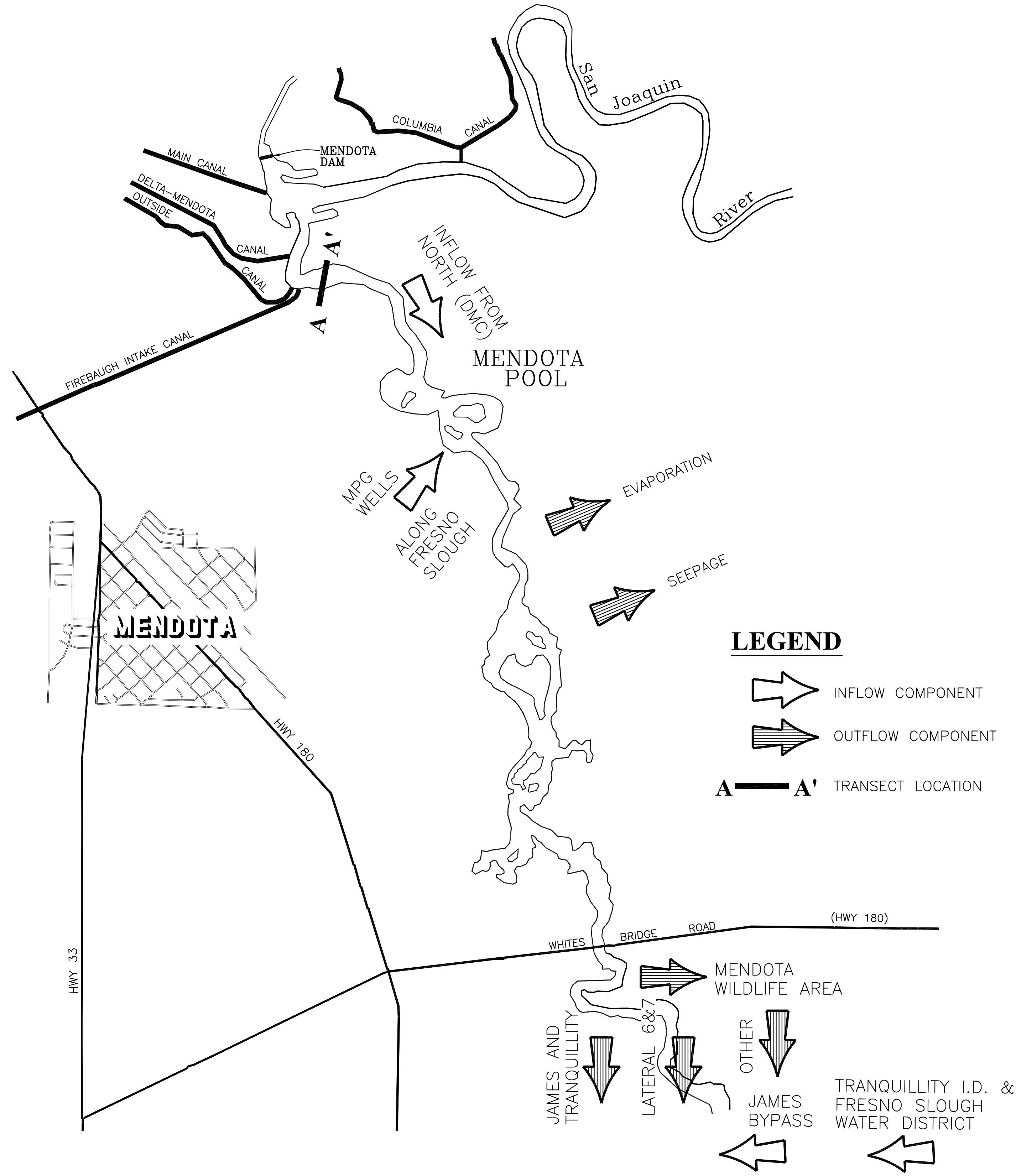
a. Data are expressed on a dry weight basis

b. Analysis performed on saturation extract

Data Qualifiers:

B - Analyte found in method blank at significant level relative to sample results

J - Result is an estimated concentration that is greater than the Method Detection Limit but less than the Method Reporting Limit.



CAD FILE: G:/Projects/Mendota Pool/04-1-013/Annual Report 2006/Figure 6-1.dwg CFG FILE: LSCE2500.PCP_MRG DATE: 02-21-07 11:24am

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Figure 6-1
Inflow and Outflow Componets for Southern Fresno Slough Water Budget

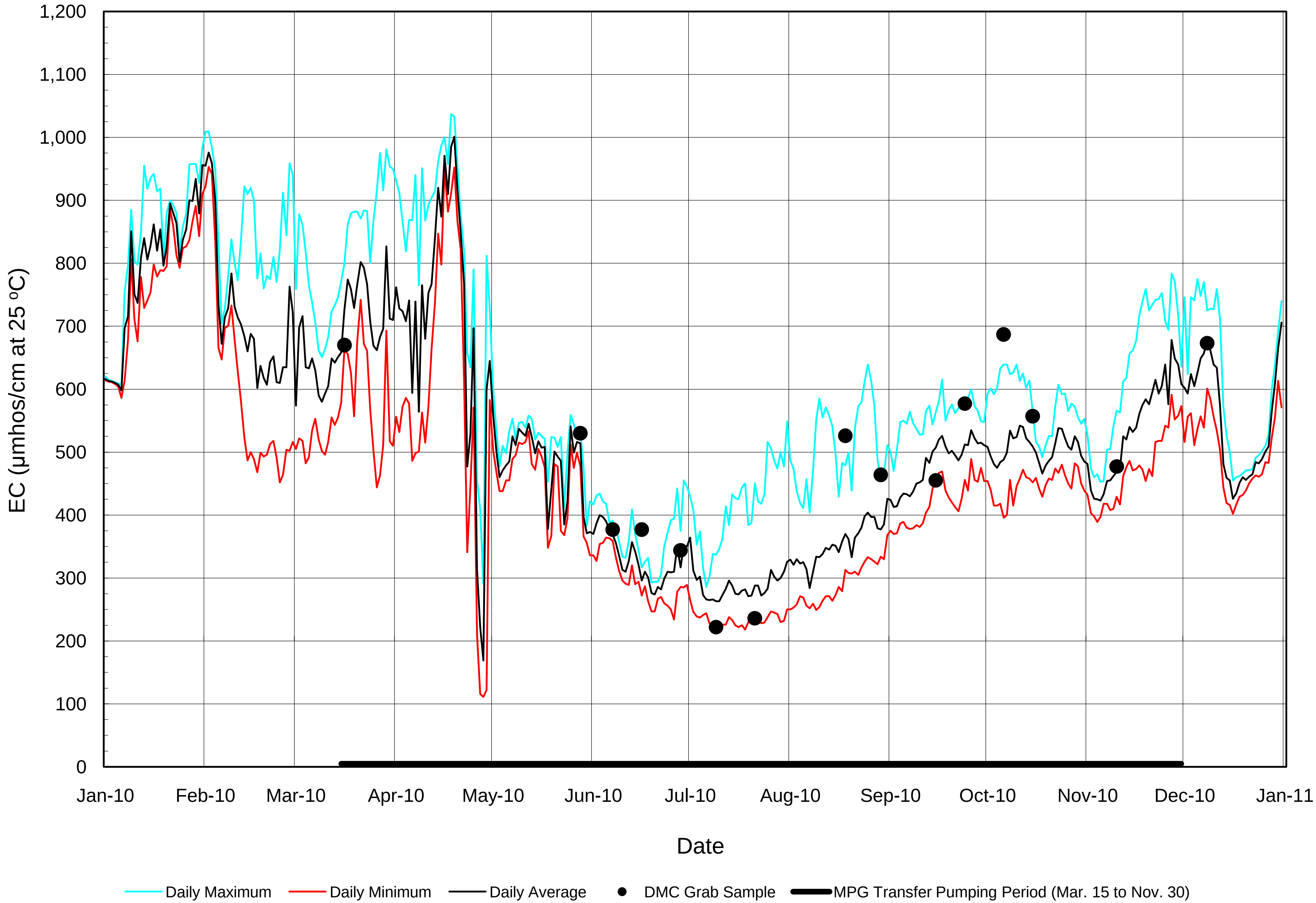

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Figure 6-2
Daily EC Fluctuations and Grab Sample Results at DMC Terminus

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Figure 6-3
Daily Average EC and Grab Sample Results at DMC, CCID Outside Canal, and Firebaugh Intake Canal

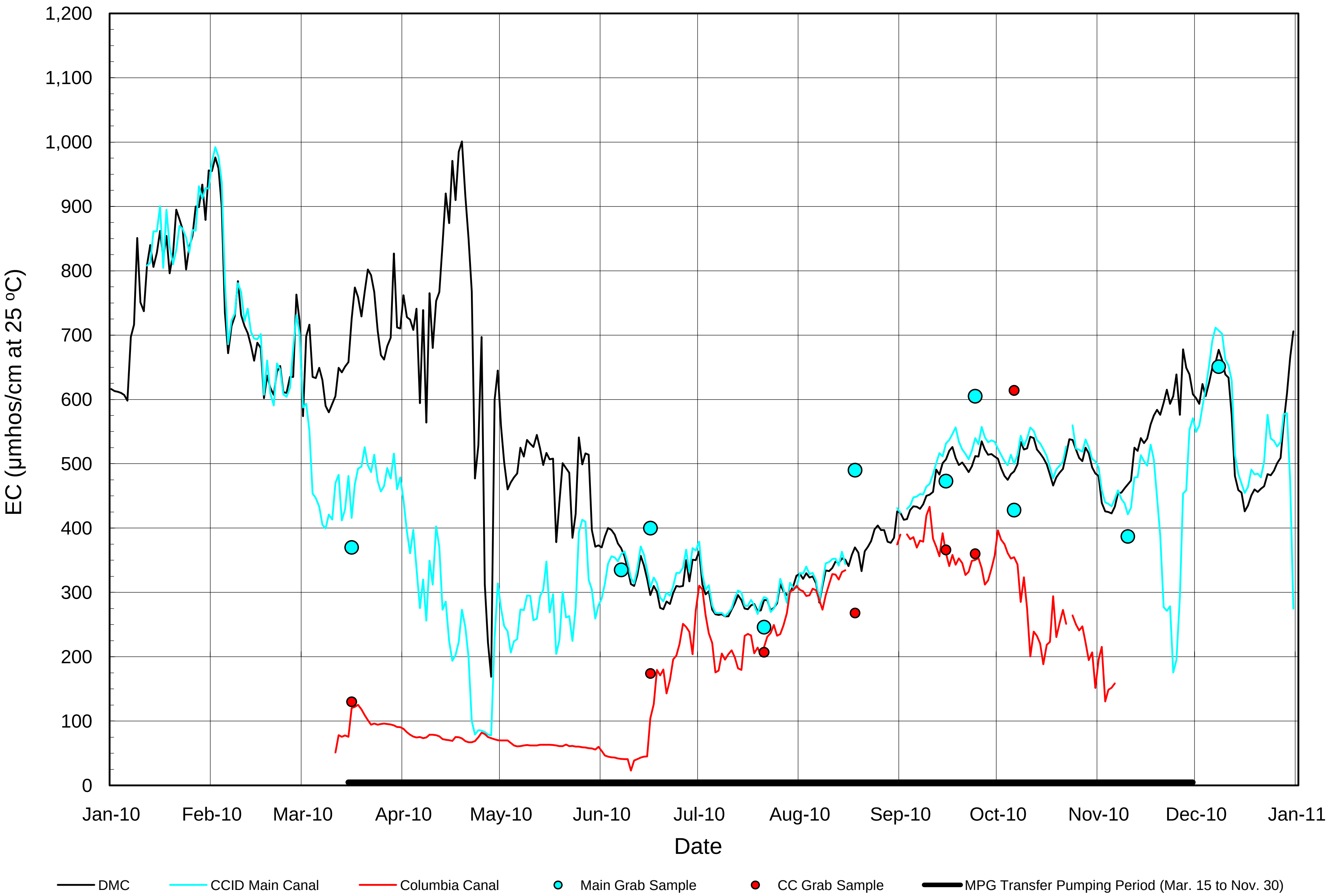

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Figure 6-4
Daily Average EC and Grab Sample Results at DMC, CCID Main Canal, and Columbia Canal

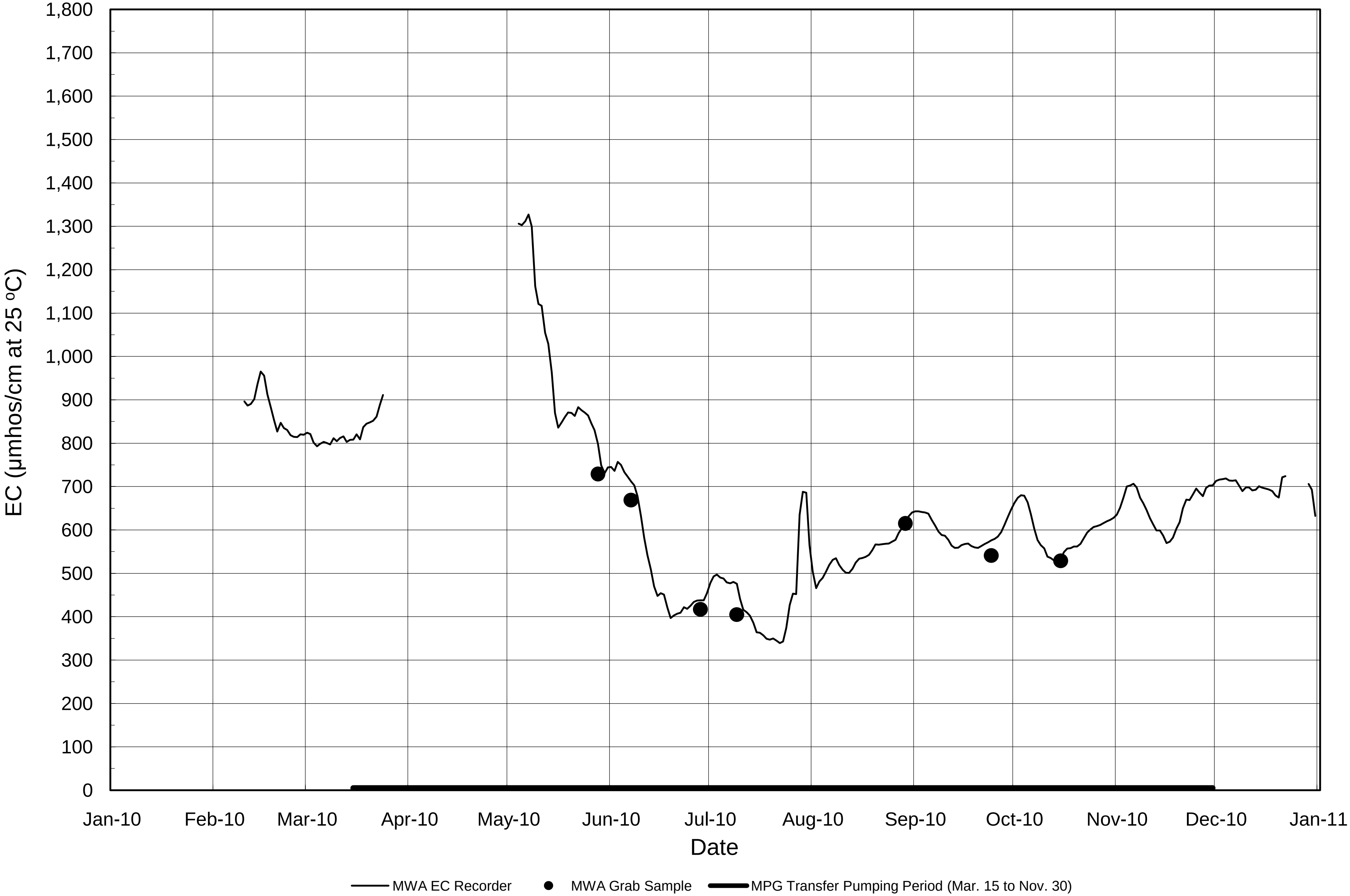

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Figure 6-5
Daily Average EC and Grab Sample Results at Mendota Wildlife Area

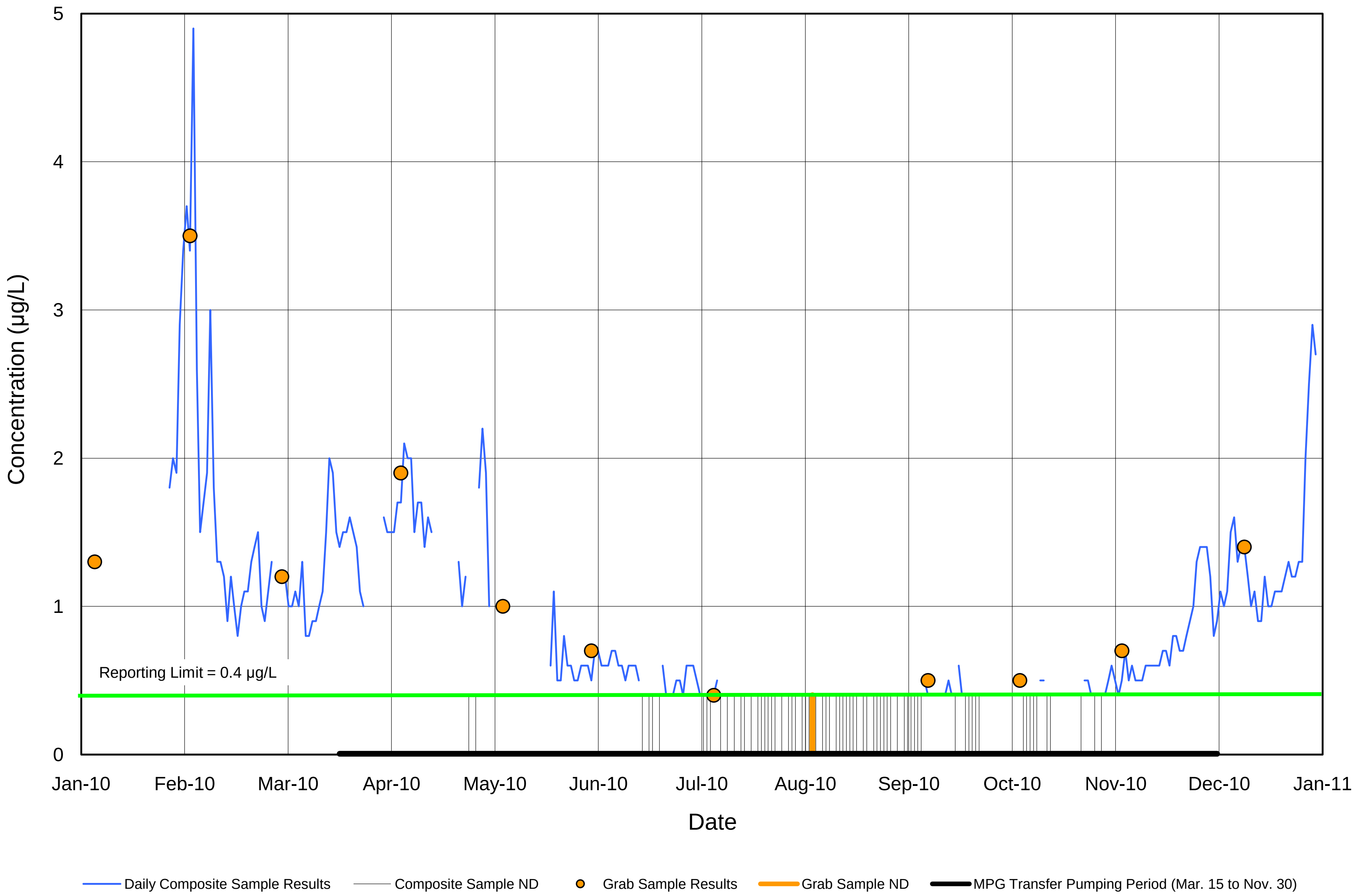

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Figure 6-6
Daily Average Total Selenium Concentration and Grab Sample Results at DMC Terminus

VII. Compaction and Land Subsidence

Compaction data are collected from two extensometers in the Mendota area to evaluate compliance with the subsidence criteria specified in the Settlement Agreement and the EIS. The Agreement states that MPG transfer pumping cannot cause more than an average of 0.005 foot of subsidence per year at the Yearout Ranch extensometer. The MPG EIS also applies this criterion to the Fordel extensometer.

The extensometer at Fordel, Inc. was installed by the MPG in 1999 at a site approximately one mile west of the Fresno Slough. This extensometer is located near the cluster of USGS and USBR monitoring wells west of the Mendota Airport. The Yearout Ranch extensometer, which was installed by DWR in 1965, is located about two miles east of the Fresno Slough, northeast of the Spreckels Sugar Co. Mendota factory. Historical compaction and water-level data were collected at this site from 1966 to 1982 by DWR. Data collection was reinitiated by CCID in 1999, and CCID has continued to monitor the extensometer since that time. The historical data record was analyzed to calculate the relationship between drawdown and inelastic compaction at the Yearout Ranch location (KDSA and LSCE, 2000b), and reexamined based on more recent data (LSCE and KDSA, 2003).

The two extensometers monitor the compaction of sediments between the ground surface and the top of the Corcoran Clay (the top of the Corcoran Clay was identified during construction of the extensometers at depths of 418 and 428 feet at the Fordel and Yearout Ranch sites, respectively). All measurements are reported in reference to an arbitrarily chosen reference datum. The reference datum was chosen to be the measurement of maximum recovery after the 1999 irrigation season, which occurred in March 2000. These measurements were assigned a zero value, and all subsequent measurements are reported in reference to this period.

For each year, the total compaction is calculated as the difference between the measurement of greatest compaction (this is typically a summer measurement coinciding with low groundwater levels) and the preceding measurement of least compaction (this is typically a winter or spring measurement coinciding with high groundwater levels). The total compaction is comprised of elastic and inelastic components. Elastic compaction occurs relatively instantaneously in response to water-level declines in the aquifer and is followed by expansion (i.e., elastic rebound) as water levels recover. If the compaction during the irrigation season is greater than the expansion during the subsequent winter/spring when water levels recover, this difference is considered to represent the inelastic compaction during that period. At the end of each year, the amount of land subsidence occurring at each site is indicated by the inelastic compaction.

Inelastic compaction can continue for years after water levels have recovered, and is generally considered permanent, i.e., non-reversible. However, as discussed below, data collected from the extensometers during years of rising groundwater levels shows that some or all of the compaction originally considered to be inelastic can be reversible. This means that inelastic compaction cannot be determined accurately on an annual basis.

Fordel Extensometer

Table 7-1 and **Figure 7-1** show compaction at the Fordel extensometer and water levels at nearby USGS monitoring well T13S/R15E-31J3 (31J3) for 1999-2010. Monitoring well 31J3 is perforated just above the Corcoran Clay from 400 to 410 feet in depth, and water levels are monitored daily by a pressure transducer installed in the well and checked with manual field measurements using an electric sounder about six times a year. The shallowest and deepest water levels in 2010 were recorded on February 3 (39.60 feet) and August 5 (74.71 feet), respectively, indicating a drawdown of 35.11 feet. The shallowest water level following the 2010 irrigation season was recorded on February 3, 2011 (35.12 feet), indicating 39.59 feet of recovery. This meant that the water level was about 4.5 feet higher than in February 2010. The February 2011 water level is similar to the highest water levels reported during 2001-2004.

Compaction at the Fordel extensometer is monitored hourly with electronic equipment and monthly with manual dial indicator readings. The total seasonal compaction in 2010 was 0.011 foot. As of January 26, 2011, the elastic rebound was 0.021 foot. This meant that there was no inelastic compaction in 2010, and the net expansion was 0.010 foot. The cumulative inelastic compaction at the Fordel site during the 11-year period beginning in March 2000 decreased to 0.024 foot. This amounts to an average inelastic compaction of about 0.0022 foot per year.

Yearout Ranch Extensometer

Table 7-1 and **Figure 7-2** show water levels and compaction measured at the Yearout Ranch extensometer, which is also completed as an observation well with a perforated interval of 373 to 433 feet in depth. Daily automated water-level measurements were made in this well until the transducer failed in 2004. Since that time, water-level measurements have been limited to manual measurements made every one to two months. Due to the much lower frequency of manual measurements, the actual seasonal water-level fluctuations have not been recorded in recent years. At the end of 2009, water-level measurements were not made between December 18 (depth to water = 59.25 feet) and March 5, 2010 (depth to water = 51.70 feet). Based on the available measurements, there was approximately 68.1 feet of drawdown and 70.5 feet of recovery between March 2010 and January 2011. As a result, water levels were 2.4 feet higher in 2011.

The compaction at this location was monitored with automated equipment on a daily basis until December 2007. There were no daily readings in 2008, but the automated readings resumed in January 2009 and continued until May 14, 2009. Only manual measurements are available since that time. In 2010, dial indicator readings were made every one to two months and a direct rod survey was conducted on March 9. Since the compaction measurements shown in **Table 7-1** and **Figure 7-2** are based on limited data, the elastic and inelastic compaction reported at this extensometer should be considered approximate.

As shown in **Table 7-1**, the total seasonal compaction measured in 2010 was 0.056 foot, and the elastic rebound was 0.065 foot as of January 10, 2011. As at the Fordel extensometer, there was no inelastic compaction in 2010, and the net expansion was 0.009 foot. As a result, the cumulative inelastic compaction at the Yearout Ranch site during the 11-year period beginning in March 2000 decreased from 0.113 to 0.104 foot. This amounts to an average inelastic compaction of about 0.01 foot per year.

As in previous years when the MPG pumped for transfer, drawdowns calculated with the groundwater flow model discussed in Chapter VIII were used to distinguish the inelastic compaction at Yearout Ranch caused by MPG transfer pumping from that caused by other pumping in the study area. As shown in **Table 7-2**, the 2010 groundwater model results indicated that 51 percent of the drawdown at the Yearout Ranch extensometer was caused by MPG transfer pumping and 49 percent was due to other pumping in the area. As in the past, these percentages were used in combination with measured water levels to estimate the actual amount of compaction attributable to MPG transfer pumping.

As shown in **Table 7-2**, the cumulative inelastic compaction caused by MPG transfer pumping since 2000 is estimated to be 0.031 foot, which corresponds to an average annual inelastic compaction of 0.0028 foot. This is less than the average annual compaction of 0.005 foot due to MPG transfer pumping specified in the Agreement.

Other Compaction Data

In addition to the two extensometers in the Mendota area, a number of GPS monitoring stations have been installed throughout the western United States in recent years by PBOwhich is a division of UNAVCO. One of these PBO stations (No. P304) is located on land owned by Meyers Farming southeast of Mendota and west of the Fresno Slough (see **Figure 1-2**). PBO's primary focus is monitoring plate tectonics, but data from the high-definition GPS monitoring stations are also useful to monitor subsidence. Extensometers such as the two discussed above monitor compaction within a specific depth interval (i.e. between the ground surface and the bottom of the extensometer). In contrast, GPS stations monitor the total displacement of the ground surface, which shows how much cumulative compaction is occurring in all depth zones, including the Corcoran Clay and the lower aquifer below the Corcoran Clay. Data from each of the GPS stations are uploaded daily to the UNAVCO website.

The Mendota PBO station began collecting data on April 28, 2004, and these data are plotted on **Figure 7-3** along with compaction data from the Fordel extensometer. Since the start of the monitoring period, there has been about 0.28 foot of total inelastic compaction at this site, which is ten times more than was measured at the Fordel extensometer over the same period. The additional inelastic compaction is apparently occurring in and below the Corcoran Clay. A hydrograph of water levels below the Corcoran Clay at USGS monitoring well T13S/R15E-31J6 is shown on the bottom of **Figure 7-3**. This well is located west of the Mendota Airport near the Fordel extensometer) and has a perforated interval of 480-490 feet.

There is little pumpage from the lower aquifer (below the Corcoran Clay) near the City of Mendota. There are four composite wells in FWD and at least 12 in PFC, but most of the perforated interval of these wells is above the Corcoran Clay. Inelastic compaction occurring in and below the Corcoran Clay in the Mendota area is caused primarily by pumping from the lower aquifer occurring west of Mendota in Westlands and Panoche Water Districts and north and east of the PFC service area in Madera County.

Table 7-1
Water Levels and Compaction at Fordel and Yearout Ranch Extensometers

	Measured Depth to Water[1]								Annual Compaction[2]			Cumulative Inelastic Compaction
	Minimum (Start)		Maximum		Minimum (End)		Drawdown	Recovery	Total	Elastic	Inelastic	
Year	(date)	(ft)	(date)	(ft)	(date)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Fordel, Inc.												
1999	01/08/99	27.70	09/06/99	88.91	03/22/00	30.81	61.21	58.10	NA[3]	0.035	NA[3]	NA
2000	03/22/00	30.81	08/17/00	99.96	02/25/01	33.90	69.15	66.06	0.043[4]	0.041[4]	0.002	0.002
2001	02/25/01	33.90	06/28/01	89.19	01/07/02	35.70	55.29	53.49	0.035	0.032[5]	0.003[5]	0.005
2002	01/07/02	35.70	07/01/02	70.50	01/25/03	35.21	34.80	35.29	NA	0.024	0.001[6]	0.006[6]
2003	01/25/03	35.21	08/02/03	67.40	01/06/04	34.65	32.19	32.75	0.020	0.019	0.000	0.006
2004	01/06/04	34.65	08/02/04	71.10	03/30/05	32.57	36.45	38.53	0.018	0.020	-0.002	0.005
2005	03/30/05	32.57	08/16/05	64.01	02/03/06	28.18	31.44	35.83	0.015	0.021	-0.007	-0.002
2006	02/03/06	28.18	07/20/06	51.08	01/17/07	24.41	22.90	26.67	0.009	0.017	-0.007	-0.010
2007	01/17/07	24.41	06/12/07	76.09	02/16/08	34.26	51.68	41.83	0.044	0.022	0.023	0.013
2008	02/16/08	34.26	08/19/08	79.32	12/25/08	37.03	45.06	42.29	0.030	0.022	0.008	0.021
2009	12/25/08	37.03	05/06/09	85.98	02/03/10	39.60	48.95	46.38	0.031	0.018	0.013	0.034
2010	02/03/10	39.60	08/05/10	74.71	02/03/11	35.12	35.11	39.59	0.011	0.021	-0.010	0.024
Yearout Ranch												
1999	NA	NA	NA	NA	NA	NA	NA	NA	NA[3]	0.098	NA[3]	NA
2000	03/06/00	36.66	08/18/00	121.43	03/12/01	37.84	84.77	83.59	0.112	0.097	0.015	0.015
2001	03/12/01	37.84	06/19/01	132.12	02/05/02	44.07	94.28	88.05	0.109	0.088	0.021	0.035
2002	02/05/02	44.07	07/30/02	114.02	01/22/03	46.27	69.95	67.75	0.095[7]	0.084[7]	0.011[7]	0.046[7]
2003	01/22/03	46.27	09/19/03	106.31	01/20/04	48.38	60.04	57.93	0.073[8]	0.058[8]	0.015[8]	0.061[8]
2004	01/20/04	48.38	08/19/04	110.67	03/08/05	49.57	62.29	61.10	0.075	0.074	0.001	0.062
2005	03/08/05	49.57	06/30/05	115.69	02/08/06	43.10	66.12	72.59	0.082	0.083	-0.001	0.061
2006	02/08/06	43.10	08/04/06	92.00	01/08/07	38.50	48.90	53.50	0.074	0.073	0.001	0.062
2007	01/08/07	38.50	NA[9]	NA[9]	02/08/08	44.75	NA[9]	NA[9]	0.106	0.088	0.018	0.081
2008	02/08/08	44.75	05/16/08	125.40	01/01/09	45.50	80.65	79.90	0.088	0.068	0.020	0.100
2009	01/01/09	45.50	05/27/09	130.00	03/05/10	51.70	84.50	78.30	0.098	0.085	0.013	0.113
2010	03/05/10	51.70	08/12/10	119.82	01/10/11	49.30	68.12	70.52	0.056	0.065	-0.009	0.104

NA = not available

1. Water levels at Fordel are measured at USGS well T13S/R15E-31J3 (located approximately 150 feet north of the extensometer).
2. Total compaction is calculated as the difference between the measurement of greatest compaction in a given year and the preceding measurement of least compaction. Elastic compaction is calculated as the difference between the measurement of greatest compaction in a given year and the subsequent measurement of least compaction. Inelastic compaction is calculated as the difference between total compaction and its elastic component. This is equal to the difference between the recovered compaction levels at the end of one compaction cycle and the preceding recovered compaction levels at the beginning of a compaction cycle. Measurements are rounded to one-thousandth of a foot.
3. Total and inelastic compaction could not be calculated in 1999 because data collection did not begin until July.
4. Values were increased by 0.003 foot, based on the difference in drawdown between July 11 and August 17, 2000, to correct for unmeasured periods.
5. Estimated value. See discussion in 2001 Annual Report regarding foundation washout.
6. Estimated value. See discussion in 2002 Annual Report regarding foundation washout and new reference datum.
7. Estimated value. See discussion in 2002 Annual Report regarding malfunction of logging equipment.
8. Estimated value. See discussion in 2003 Annual Report regarding malfunction of logging equipment.
9. No 2007 water level measurements after March 30.

Table 7-2
Distribution of Drawdown and Compaction at Yearout Ranch Extensometer (2000-2010)

Year	Simulation	Drawdown: Simulated Drawdown (ft)	Drawdown: Simulated Drawdown (%)	Measured Drawdown (ft)	Distribution of Measured Drawdown (ft)	Compaction: Measured Inelastic Compaction (ft)	Distribution of Measured Inelastic Compaction: Annual[1] (ft)	Distribution of Measured Inelastic Compaction: Cumulative (ft)
2000	Transfer Pumping	13.0	16		13.1		0.0023	**0.0023**
	Other Pumping	70.6	84		71.6		0.0122	0.0122
	All Pumping	83.6	100	84.77		0.0145		0.0145
2001	Transfer Pumping	35.7	39		36.9		0.0081	**0.0104**
	Other Pumping	55.5	61		57.4		0.0127	0.0249
	All Pumping	91.2	100	94.28		0.0208		0.0353
2002	Transfer Pumping	23.8	33		23.1		0.0036	**0.014**
	Other Pumping	48.3	67		46.9		0.0074	0.0323
	All Pumping	72.1	100	69.95		0.011[2]		0.046[2]
2003	Transfer Pumping	NA	NA		0.00		0.000	**0.014**
	Other Pumping	NA	NA		60.04		0.015	0.047
	All Pumping	NA	NA	60.04		0.015[3]		0.061[2]
2004	Transfer Pumping	NA	NA		0.00		0.000	**0.014**
	Other Pumping	NA	NA		62.29		0.001	0.048
	All Pumping	NA	NA	62.29		0.001		0.062
2005	Transfer Pumping	NA	NA		0.00		0.000	**0.014**
	Other Pumping	NA	NA		66.12		-0.001	0.048
	All Pumping	NA	NA	66.12		-0.001		0.061
2006	Transfer Pumping	NA	NA		0.00		0.000	**0.014**
	Other Pumping	NA	NA		48.90		0.001	0.048
	All Pumping	NA	NA	48.90		0.001		0.062
2007	Transfer Pumping	15.6	23		15.9		0.004	**0.018**
	Other Pumping	53.2	77		54.1		0.014	0.062
	All Pumping	68.8	100	NM[3]		0.018		0.081
2008	Transfer Pumping	32.4	49		39.5		0.010	**0.028**
	Other Pumping	33.8	51		41.2		0.010	0.072
	All Pumping	66.2	100	80.65		0.020		0.100
2009	Transfer Pumping	36.1	56		47.5		0.007	**0.035**
	Other Pumping	28.1	44		37.0		0.006	0.078
	All Pumping	64.2	100	84.50		0.013		0.113
2010	Transfer Pumping	29.6	51		34.4		-0.005	**0.031**
	Other Pumping	29.0	49		33.7		-0.004	0.074
	All Pumping	58.6	100	68.12		-0.009		0.104

NA = not applicable; NM = mot measured

1. Calculated as measured value multiplied by the percentage based on simulation.
2. Estimated values. See discussion in 2002 and 2003 annual reports regarding malfunction of logging equipment.
3. 2007 water level measurements not available after March 30.

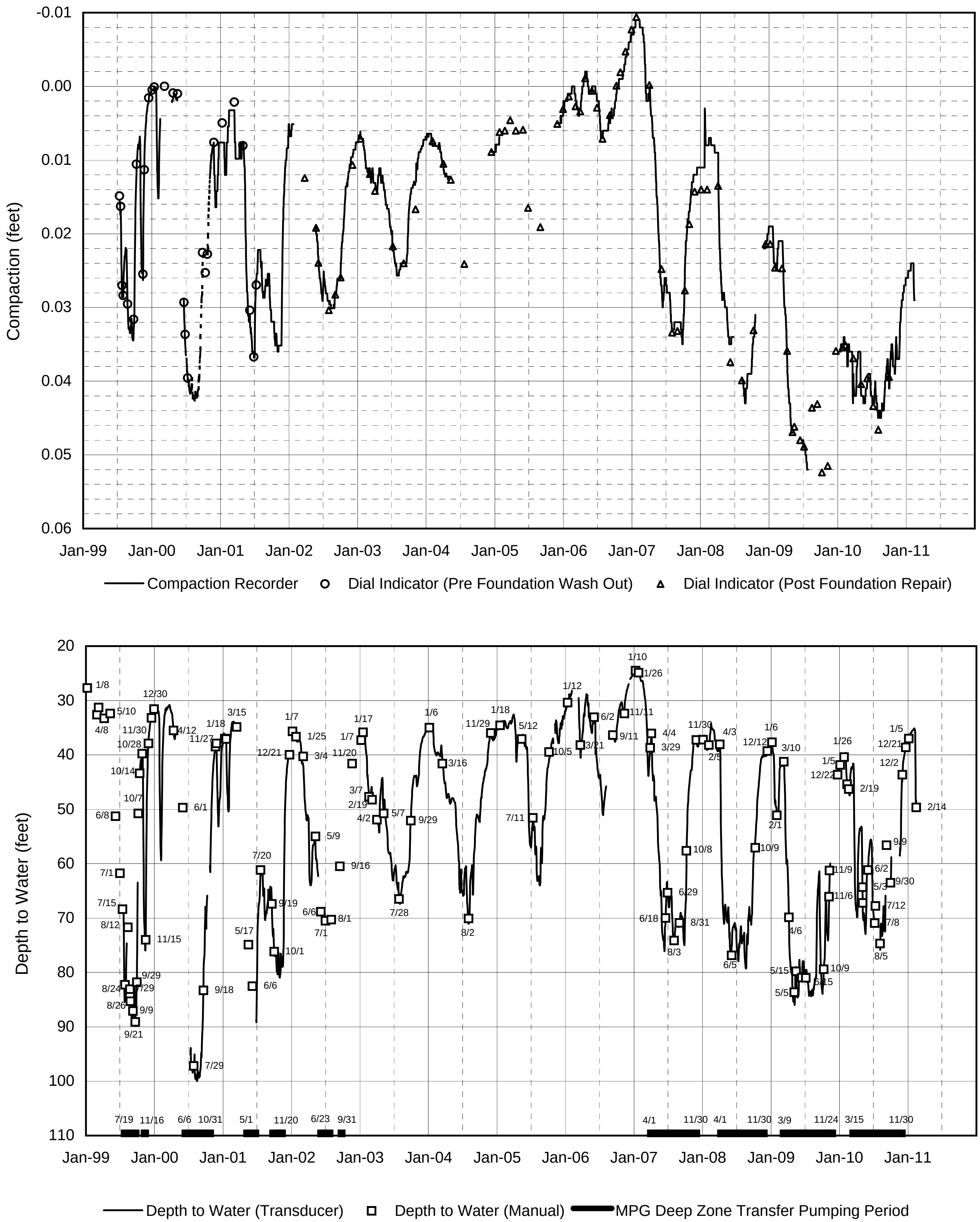

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Figure 7-1
Compaction at Fordel Extensometer and Depth to Water at USGS Monitoring Well T13S/R15E-31J3

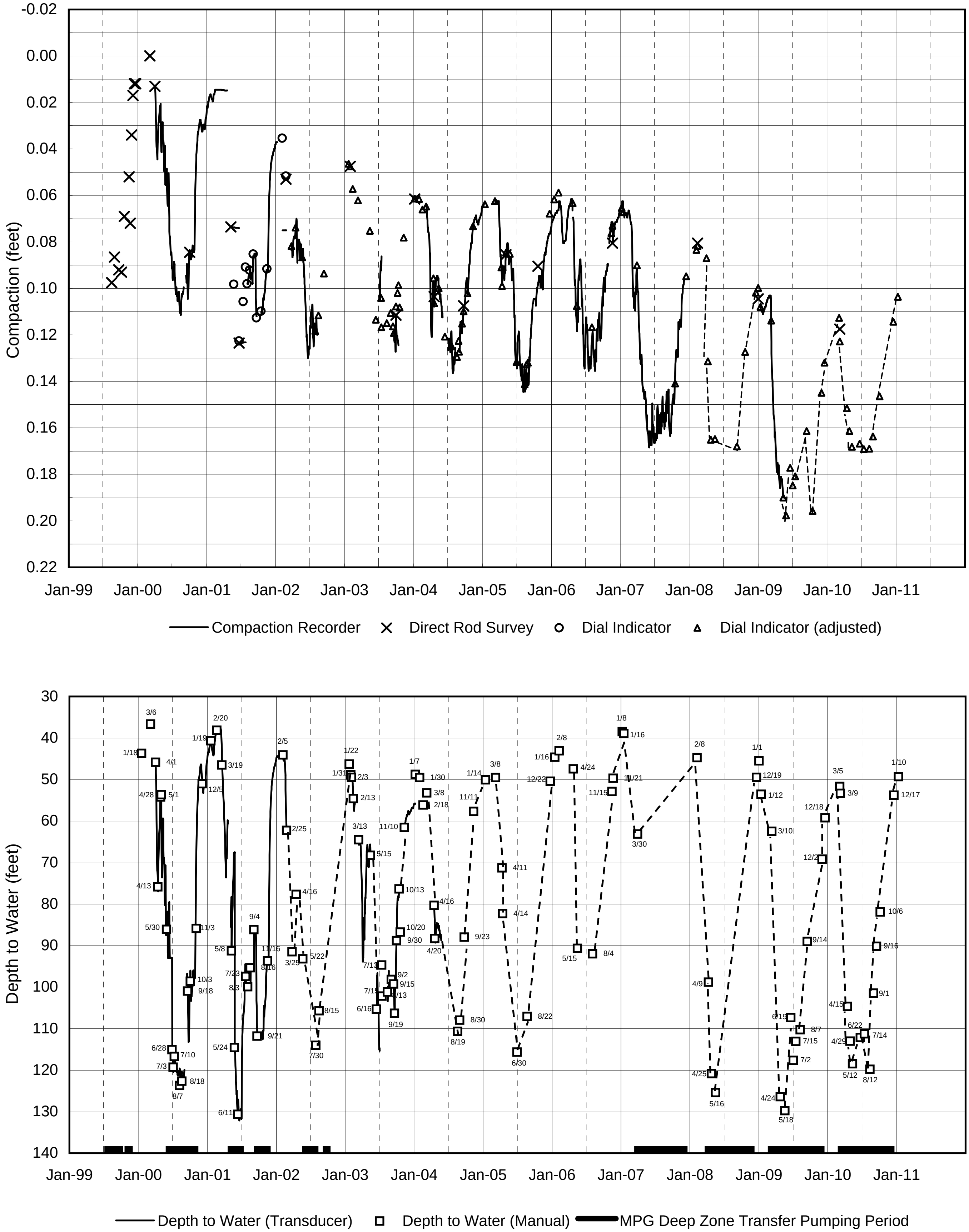

Figure 7-2
Compaction and Depth to Water at Yearout Ranch Extensometer

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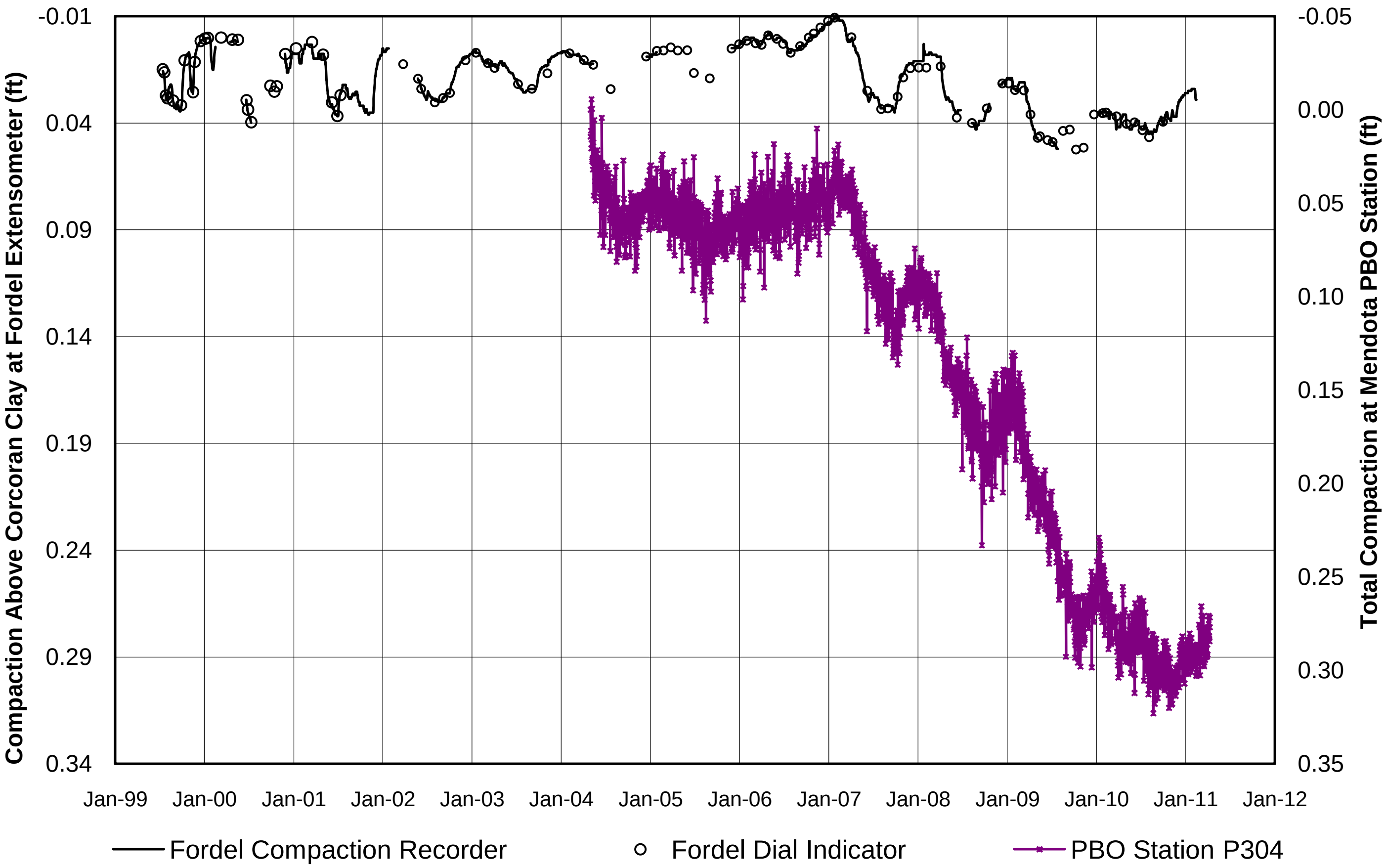

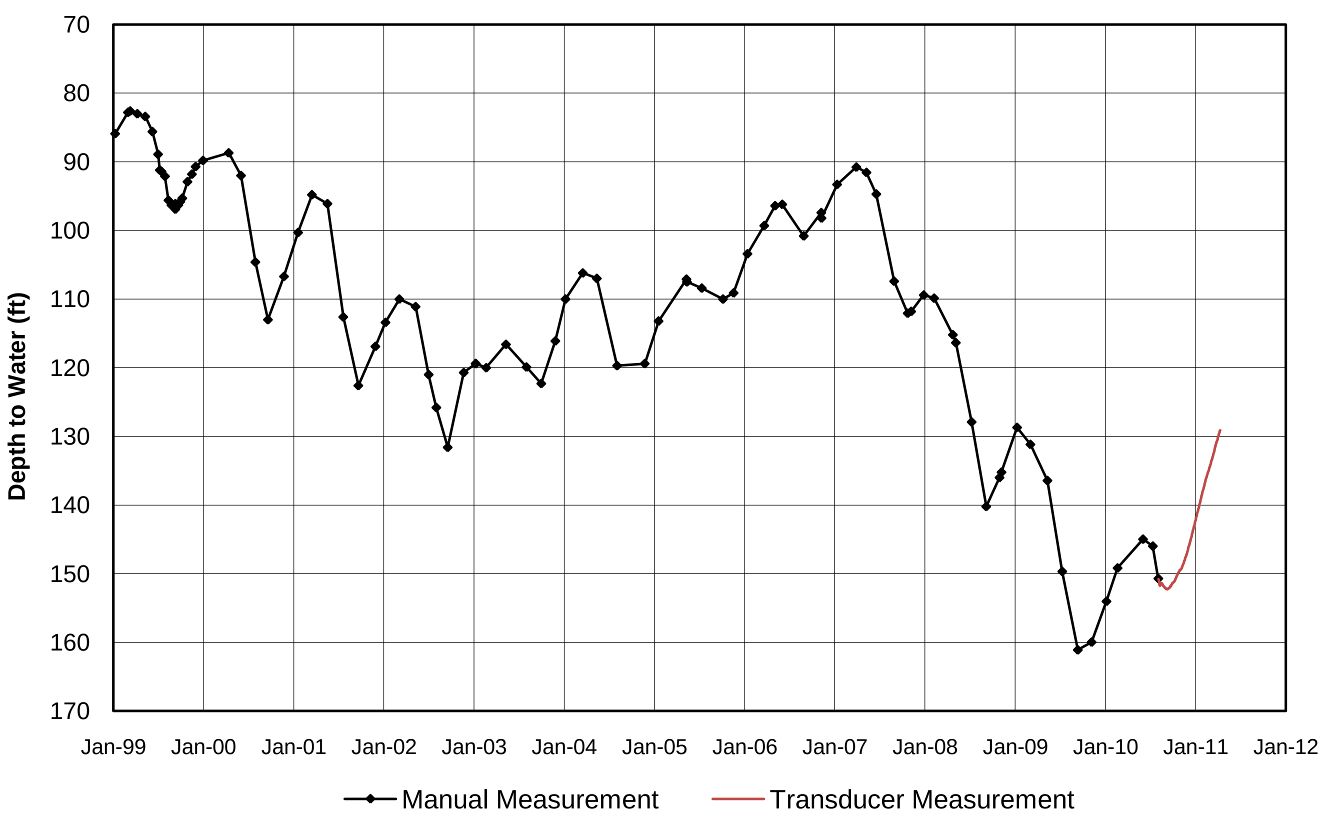

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Figure 7-3
Total Compaction West of Mendota Pool and Depth to Water Below Corcoran Clay

VIII. Pumping Cost Reimbursements

Analytical groundwater flow models have been used to predict drawdowns caused by MPG pumping in many previous reports. Beginning in 2000, an analytical model based on the Hantush-Jacob (1955) equation, which calculates the drawdown in a semi-confined (leaky) aquifer, was used for drawdown simulations. Detailed discussions of the Hantush-Jacob model are included in the 2000, 2001, and 2002 annual reports. The model was initially calibrated against 1999-2000 water-level data for wells in the original study area, and was recalibrated against 2000-2001 water-level data after the study area was expanded in 2001. The model calibration was checked by comparing 2007 measured and simulated water levels for deep-zone wells in different parts of the study area. The results showed that the simulated drawdown and recovery were sufficiently accurate for the reimbursement calculations (LSCE and KDSA, 2008). Additional calibration checks for wells in the CCID and PFC service areas were performed for this report using 2010 model results and water-level data.

The simulation period discussed in this report is the 2010 calendar year. The model results were used to estimate the percentage of total drawdown at non-MPG wells caused by MPG transfer pumping. The drawdown percentage was used to calculate the amount of inelastic compaction at the Yearout Ranch extensometer caused by MPG transfer pumping and the reimbursement to be paid by the MPG to other well owners for increased pumping costs.

Pumping Cost Reimbursement Calculations

Under the terms of the Settlement Agreement, the MPG is required to reimburse well owners in the SJREC and PFC service areas for increased pumping costs due to drawdowns estimated to be caused by MPG transfer pumping. The reimbursement calculation requires the use of the groundwater model to estimate the monthly percentage of the total drawdown at each well caused by MPG transfer pumping. In addition to these estimated percentages, the reimbursement calculation requires the following inputs:

1) estimated monthly drawdown at each well,
2) monthly pumpage (discussed in Chapter III)
3) average annual power cost, and
4) pump efficiency determined from pump tests.

The pumping cost reimbursement calculation is explained below using one of the southern PFC wells (No. 3211-61 [W-73]) as an example.

Example Calculation

Table 8-1 shows an example pumping cost reimbursement calculation for PFC well No. 3211-61 (W-73). Note that this and other tables at the end of this chapter only show the March to November period, which includes the months when deep-zone transfer pumpage and associated drawdowns occurred in 2010. The rows in **Table 8-1** are numbered and the calculation for each row is described below:

1) Well No. W-73 was not included in the MPG water-level monitoring program; therefore, the monthly drawdown in this well due to all pumping was estimated

based on drawdown contour maps. These were prepared by first extrapolating between the bimonthly measured values to estimate the monthly drawdown for each well in the monitoring program. A separate contour map was prepared for each month using these estimated drawdowns.

2) The percentage of the total drawdown caused by MPG transfer pumping was estimated using the Hantush-Jacob groundwater model discussed above. To estimate the percentage, the model was used to simulate drawdown due to all deep-zone pumping in the study area (A), followed by a separate simulation of drawdown due only to MPG deep-zone transfer pumping (B). Dividing B by A yields the proportion of the total drawdown estimated to be caused by MPG transfer pumping. For well No. W-73, this proportion ranged from zero in July and August to a high of about 68 percent in April.
3) Multiplying the estimated monthly drawdown by these percentages yielded the drawdown in well No. W-73 assumed to be caused by MPG transfer pumping. These drawdowns ranged from zero in July and August to 23 feet in April.
4) The 2010 monthly pumpage for most PFC production wells, including well No. W-73, is based on flow meter readings.
5) The average power cost for all PFC production wells was calculated by dividing PFC's total PG&E charges for groundwater pumping by the total kilowatt-hours (kwh). For 2010, the average power cost was $0.1543 per kwh. These power costs include PG&E's fixed charges known as standby or demand charges.
6) The pump efficiency for well No. W-73 (63 percent) was based on a pump test conducted by Mid Valley Pump Testing on July 5, 2010.
7) The effective pumping cost ($/af/foot of drawdown) was calculated as the power cost ($/kwh) divided by the pump efficiency times a conversion factor for kilowatt-hours and acre-feet (1.0237 kwh/af/ft). For well No. W-73, the effective pumping cost was calculated to be $0.2507/af/foot of drawdown.
8) The estimated monthly pumping cost attributed to MPG transfer pumping was calculated as the drawdown due to transfer pumping times the monthly pumpage times the effective pumping cost. The calculated pumping cost reimbursement for each month is shown on the last row of **Table 8-1**. The pumping cost reimbursement for well W-73 ranged from zero in July and August to $309 in May. The 2010 total was $368.

Calculations for All Wells

The reimbursement calculations for all wells in the compensation program are shown in **Tables 8-2** through **8-4**. **Table 8-2** shows the simulated monthly drawdowns due to: 1) all pumping in the area and 2) MPG transfer pumping only. The percentage of the total drawdown estimated to be caused by MPG transfer pumping was derived from these results. Note that this table shows all deep production wells simulated with the model. The average percentage of drawdown due to MPG transfer pumping during March-November shown on **Table 8-2** ranged from zero at the CCID wells to about 22 percent at PFC well No. 3730-62 (W-94).

The total estimated drawdown for each well is shown in **Table 8-3**. For wells included in the MPG water-level monitoring program, the monthly drawdown was calculated using measured values as available. For wells or months without water-level data, the monthly drawdown (shown in italics) was estimated based on drawdown contour maps described above. The estimated drawdowns were multiplied by the MPG percentages from **Table 8-2** to calculate the monthly drawdown attributed to MPG transfer pumping, and the results are shown on **Table 8-3**.

Reimbursement for SJREC and Paramount Farming Co.

Table 8-4 shows the calculated reimbursement for most of the wells included in the Settlement Agreement. The power cost used for all wells in 2010 ($0.1543 per kwh) was based on the power cost reported by PFC, which is the principal recipient of pumping cost reimbursements from the MPG. This table also shows the pump efficiency based on recent pump test results. PFC supplied 2010 pump tests for 73 of its wells, and the pump efficiencies ranged from 39 to 75 percent. The average pump efficiency for all PFC wells with 2010 pump test data was 63 percent. Pump tests conducted in 2001 were used for the CCID and some CCC wells. A pump efficiency of 60 percent was assumed for wells for which no pump test data were available. **Table 8-4** shows the calculated reimbursement for each well on a monthly basis. The total reimbursement for all wells in 2010 was $6,642. All of the reimbursement is for wells in the PFC service area, especially wells in the southern portion of PFC. Most of the 2010 reimbursement is due to pumpage occurring in May, which was the only month with significant pumping in both MPG and PFC wells.

Summary

Analytical models based on the Hantush-Jacob equation, which incorporates vertical leakage, have been used for simulations of drawdown due to MPG transfer pumping and total pumping beginning with the 2000 Annual Report. The current version of the model includes pumpage for over 200 irrigation and other large-capacity wells in the expanded study area. The primary use of the model is to determine the percentage of total drawdown caused by MPG transfer pumping. This percentage is one of the components needed to calculate the pumping cost reimbursement to be paid by the MPG to other major pumpers in the area. Use of the model to estimate the percentage of total drawdown is more accurate than using simulated drawdowns in the calculation, because the model error at each well is generally equivalent regardless of whether the drawdown is caused by MPG or non-MPG pumping. The calculated reimbursements are still considered approximations in that they are based on a combination of estimated drawdowns and groundwater model results.

Table 8-1
2010 Example Reimbursement Calculation for PFC Well 3211-61 (W-73)

	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Total
1. Calculated drawdown (ft)	16	34	44	42	40	36	32	24	15	
2. MPG percentage (calculated using model)	21.9	68.2	28.2	0.2	0.0	0.0	1.4	1.6	6.0	
3. Drawdown due to MPG pumping (ft)[1]	3.6	23.0	12.3	0.1	0.0	0.0	0.4	0.4	0.9	
4. 3211-65 (W-62) pumpage (af)	15	4	100	103	98	96	76	51	39	582
5. 2010 power cost ($/kwh)	0.1543	0.1543	0.1543	0.1543	0.1543	0.1543	0.1543	0.1543	0.1543	
6. Pump efficiency (e_o) from PG&E test (%)	63	63	63	63	63	63	63	63	63	
7. Effective pumping cost ($/af/ft of drawdown)[2]	0.251	0.251	0.251	0.251	0.251	0.251	0.251	0.251	0.251	
8. Increased pumping cost due to MPG drawdown[3]	$14	$22	$309	$2	$0	$0	$8	$5	$9	$368

1. Row 1 **x** (Row 2/100)
2. Effective pumping cost = 1.0237 **x** ($/kwh)/$e_o$ = 1.0237 **x** Row 5/(Row 6/100)
3. Row 3 **x** Row 4 **x** Row 7

Table 8-2
Simulated Deep-Zone Drawdown at Non-MPG Production Wells Due to MPG Transfer Pumping in 2010

Well Owner/ Service Area	Well Name	March			April			May			June			July			August			September			October			November			Mean (Mar-Nov)		
		Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD		
		All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %
Western Area																															
Central California ID	5A	12.2	0.0	0.0	9.1	0.0	0.0	3.9	0.0	0.0	0.9	0.0	0.0	10.2	0.0	0.0	11.8	0.0	0.0	5.1	0.0	0.0	12.7	0.0	0.0	3.3	0.0	0.0	7.7	0.0	0.0
	12C	0.2	0.0	0.0	10.7	0.0	0.0	4.0	0.0	0.0	0.6	0.0	0.0	7.8	0.0	0.0	12.5	0.0	0.0	13.9	0.0	0.0	9.0	0.0	0.0	2.5	0.0	0.0	6.8	0.0	0.0
	15B	9.3	0.0	0.0	6.4	0.0	0.0	2.6	0.0	0.0	0.4	0.0	0.0	5.7	0.0	0.0	8.1	0.0	0.0	3.5	0.0	0.0	8.0	0.0	0.0	2.1	0.0	0.0	5.1	0.0	0.0
	16B	12.4	0.0	0.0	11.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	7.3	0.0	0.0	11.1	0.0	0.0	5.4	0.0	0.0	11.5	0.0	0.0	3.2	0.0	0.0	6.9	0.0	0.0
	23B	13.1	0.0	0.0	9.9	0.0	0.0	3.8	0.0	0.0	0.5	0.0	0.0	7.0	0.0	0.0	11.5	0.0	0.0	12.8	0.0	0.0	8.1	0.0	0.0	2.2	0.0	0.0	7.7	0.0	0.0
	28B	12.3	0.0	0.0	8.9	0.0	0.0	4.7	0.0	0.0	0.8	0.0	0.0	6.4	0.0	0.0	9.6	0.0	0.0	5.2	0.0	0.0	10.4	0.0	0.0	3.1	0.0	0.0	6.8	0.0	0.0
	32B	13.2	0.0	0.0	9.3	0.0	0.0	4.5	0.0	0.0	3.2	0.0	0.0	10.4	0.0	0.0	13.4	0.0	0.0	13.8	0.0	0.0	10.1	0.0	0.0	2.6	0.0	0.0	8.9	0.0	0.0
	35A	17.3	0.0	0.0	12.1	0.0	0.0	4.8	0.0	0.0	0.7	0.0	0.0	12.0	0.0	0.0	12.4	0.0	0.0	6.4	0.0	0.0	14.0	0.0	0.0	3.4	0.0	0.0	9.2	0.0	0.0
	38A	1.7	0.0	0.0	0.0	0.0	0.0	4.7	0.0	0.0	1.9	0.0	0.0	1.8	0.0	0.0	0.9	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
Eastern Area																															
Columbia Canal Company	CCC-1	15.1	7.5	49.7	26.7	13.2	49.4	37.9	8.0	21.1	42.6	0.1	0.2	47.4	0.0	0.0	38.1	0.0	0.0	24.8	0.3	1.2	11.3	0.2	1.8	3.2	0.3	9.4	27.5	3.3	12.0
	CCC-2	18.4	9.2	50.0	30.5	18.0	59.0	50.2	14.0	27.9	47.1	0.0	0.0	52.2	0.0	0.0	44.3	0.0	0.0	32.0	0.4	1.3	14.6	0.2	1.4	6.4	0.4	6.3	32.9	4.7	14.3
	Snyder	8.0	1.1	13.8	7.1	2.1	29.6	10.4	1.7	16.3	12.2	0.0	0.0	20.1	0.0	0.0	15.2	0.0	0.0	8.3	0.6	7.2	6.3	0.2	3.2	2.6	0.4	15.4	10.0	0.7	6.8
	B-Heirs	0.9	0.0	0.0	0.9	0.0	0.0	1.0	0.1	10.0	7.2	0.0	0.0	8.7	0.0	0.0	6.6	0.0	0.0	1.5	0.0	0.0	0.9	0.0	0.0	0.3	0.0	0.0	3.1	0.0	0.4
	Cardella-2	9.4	2.8	29.8	10.3	5.4	52.4	19.3	4.2	21.8	19.6	0.0	0.0	24.0	0.0	0.0	19.2	0.0	0.0	12.2	0.7	5.7	7.1	0.3	4.2	3.9	0.6	15.4	13.9	1.6	11.2
	D.M.A.	1.4	0.0	0.0	1.4	0.1	7.1	2.3	0.1	4.3	16.2	0.0	0.0	17.5	0.0	0.0	16.5	0.0	0.0	2.6	0.0	0.0	1.3	0.0	0.0	0.4	0.0	0.0	6.6	0.0	0.3
	Elrod-1	2.4	0.1	4.2	2.4	0.3	12.5	4.5	0.2	4.4	7.1	0.0	0.0	9.9	0.0	0.0	8.0	0.0	0.0	4.5	0.0	0.0	2.2	0.1	4.5	0.7	0.0	0.0	4.6	0.1	1.7
	Elrod-2	1.0	0.1	10.0	1.0	0.1	10.0	1.1	0.0	0.0	8.4	0.0	0.0	9.5	0.0	0.0	8.5	0.0	0.0	1.6	0.0	0.0	0.9	0.0	0.0	0.3	0.0	0.0	3.6	0.0	0.6
	N.F. Davis	2.4	0.1	4.2	2.3	0.1	4.3	2.6	0.1	3.8	12.2	0.0	0.0	15.2	0.0	0.0	7.8	0.0	0.0	3.8	0.0	0.0	2.2	0.0	0.0	0.7	0.1	14.3	5.5	0.0	0.8
	G-2 Farms 1	7.1	0.6	8.5	6.0	1.0	16.7	9.5	0.8	8.4	10.8	0.1	0.9	18.4	0.0	0.0	14.1	0.0	0.0	8.8	0.3	3.4	5.8	0.1	1.7	2.1	0.3	14.3	9.2	0.4	3.9
	G-2 Farms 2	7.3	0.3	4.1	6.8	0.5	7.4	45.9	0.4	0.9	48.9	0.0	0.0	54.0	0.0	0.0	52.4	0.0	0.0	48.9	0.1	0.2	6.9	0.0	0.0	2.1	0.2	9.5	30.4	0.2	0.5
Paramount Farming Company	2480-61 (W-43)	6.1	1.6	26.2	8.0	3.1	38.8	16.9	2.4	14.2	18.9	0.1	0.5	25.2	0.0	0.0	15.8	0.0	0.0	9.2	0.2	2.2	4.4	0.1	2.3	2.3	0.2	8.7	11.9	0.9	7.2
	2480-62 (W-97)	6.3	1.7	27.0	8.5	3.1	36.5	18.3	2.4	13.1	20.4	0.0	0.0	38.3	0.0	0.0	16.9	0.0	0.0	9.8	0.3	3.1	4.6	0.1	2.2	2.3	0.2	8.7	13.9	0.9	6.2
	2480-63 (W-100)	6.6	1.7	25.8	9.3	3.2	34.4	20.0	2.5	12.5	22.5	0.0	0.0	29.3	0.0	0.0	18.1	0.0	0.0	10.4	0.2	1.9	4.8	0.1	2.1	2.3	0.2	8.7	13.7	0.9	6.4
	2480-64 (W-88)	7.0	1.7	24.3	10.2	3.2	31.4	21.9	2.4	11.0	24.6	0.0	0.0	30.0	0.0	0.0	19.6	0.0	0.0	11.1	0.2	1.8	5.1	0.1	2.0	2.4	0.2	8.3	14.7	0.9	5.9
	2480-65 (W-33)	4.6	1.0	21.7	5.7	2.0	35.1	12.4	1.5	12.1	14.6	0.0	0.0	18.8	0.0	0.0	12.3	0.0	0.0	6.8	0.2	2.9	3.4	0.1	2.9	1.6	0.1	6.3	8.9	0.5	6.1
	2480-66 (W-42)	1.4	0.2	14.3	1.7	0.5	29.4	4.9	0.3	6.1	6.1	0.0	0.0	9.4	0.0	0.0	5.5	0.0	0.0	2.4	0.0	0.0	1.1	0.1	9.1	0.6	0.1	16.7	3.7	0.1	3.6
	2480-67 (W-84)	5.1	1.1	21.6	6.9	2.1	30.4	15.6	1.6	10.3	18.3	0.0	0.0	23.2	0.0	0.0	14.8	0.0	0.0	8.0	0.2	2.5	3.7	0.0	0.0	1.7	0.1	5.9	10.8	0.6	5.2
	2480-69 (W-30)	2.7	0.3	11.1	2.7	0.6	22.2	5.4	0.5	9.3	7.2	0.0	0.0	9.9	0.0	0.0	7.1	0.0	0.0	4.1	0.1	2.4	2.2	0.1	4.5	0.8	0.0	0.0	4.7	0.2	3.8
	2480-70 (W-81)	2.7	0.3	11.1	2.8	0.7	25.0	6.0	0.6	10.0	8.1	0.0	0.0	11.5	0.0	0.0	7.2	0.0	0.0	4.0	0.1	2.5	2.1	0.0	0.0	0.9	0.1	11.1	5.0	0.2	4.0
	2480-71 (W-5)	2.3	0.3	13.0	2.3	0.5	21.7	5.2	0.4	7.7	7.0	0.0	0.0	9.9	0.0	0.0	6.2	0.0	0.0	3.4	0.1	2.9	1.7	0.0	0.0	0.7	0.1	14.3	4.3	0.2	3.6
	2480-72 (W-35)	2.4	0.3	12.5	2.6	0.6	23.1	6.4	0.5	7.8	8.8	0.0	0.0	11.3	0.0	0.0	6.8	0.0	0.0	3.6	0.1	2.8	1.8	0.0	0.0	0.7	0.1	14.3	4.9	0.2	3.6
	2480-73 (W-56)	1.5	0.2	13.3	1.5	0.2	13.3	3.4	0.3	8.8	5.1	0.0	0.0	7.1	0.0	0.0	4.7	0.0	0.0	2.3	0.0	0.0	1.2	0.0	0.0	0.4	0.0	0.0	3.0	0.1	2.6
	2480-74 (W-55)	1.6	0.2	12.5	1.7	0.4	23.5	3.9	0.3	7.7	5.5	0.0	0.0	7.2	0.0	0.0	4.8	0.0	0.0	2.4	0.0	0.0	1.2	0.0	0.0	0.4	0.0	0.0	3.2	0.1	3.1
	2480-75 (W-50)	1.6	0.2	12.5	1.8	0.4	22.2	4.3	0.3	7.0	5.8	0.0	0.0	7.5	0.0	0.0	4.9	0.0	0.0	2.5	0.1	4.0	1.2	0.0	0.0	0.4	0.0	0.0	3.3	0.1	3.3
	2560-61 (W-82)	5.5	0.4	7.3	4.8	0.7	14.6	8.8	0.7	8.0	10.2	0.0	0.0	15.9	0.0	0.0	12.5	0.0	0.0	8.3	0.2	2.4	4.6	0.1	2.2	1.7	0.1	5.9	8.0	0.2	3.0

Table 8-2 (continued)
Simulated Deep-Zone Drawdown at Non-MPG Production Wells Due to MPG Transfer Pumping in 2010

Well Owner/ Service Area	Well Name	March			April			May			June			July			August			September			October			November			Mean (Mar-Nov)		
		Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD			Simulated DD		
		All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %	All Pumping (ft)	MPG Transfer Pumping (ft)	MPG Transfer Pumping %
Paramount	2560-62 (W-25)	4.3	0.4	9.3	3.9	0.6	15.4	7.5	0.6	8.0	9.1	0.0	0.0	13.1	0.0	0.0	10.7	0.0	0.0	7.0	0.2	2.9	3.6	0.1	2.8	1.3	0.1	7.7	6.7	0.2	3.3
Farming	2570-61 (W-51)	1.9	0.2	10.5	1.9	0.3	15.8	3.7	0.3	8.1	6.5	0.0	0.0	8.8	0.0	0.0	6.1	0.0	0.0	3.1	0.0	0.0	1.6	0.0	0.0	0.6	0.1	16.7	3.8	0.1	2.6
Company	2570-62 (W-68)	1.7	0.1	5.9	1.7	0.2	11.8	3.3	0.2	6.1	5.9	0.0	0.0	7.8	0.0	0.0	6.1	0.0	0.0	3.0	0.0	0.0	1.5	0.0	0.0	0.5	0.0	0.0	3.5	0.1	1.6
	3191-61 (W-85)	11.3	4.2	37.2	14.3	8.0	55.9	29.0	6.1	21.0	28.9	0.0	0.0	32.4	0.0	0.0	25.6	0.0	0.0	17.1	0.6	3.5	8.2	0.3	3.7	5.1	0.6	11.8	19.1	2.2	11.5
	3191-62 (W-86)	10.6	3.9	36.8	14.0	7.4	52.9	28.7	5.7	19.9	29.3	0.1	0.3	32.8	0.0	0.0	25.1	0.0	0.0	16.8	0.4	2.4	7.7	0.2	2.6	5.2	0.5	9.6	18.9	2.0	10.7
	3191-63 (W-44)	8.3	2.3	27.7	8.8	4.3	48.9	16.9	3.4	20.1	18.0	0.0	0.0	22.2	0.0	0.0	16.7	0.0	0.0	10.5	0.6	5.7	5.9	0.3	5.1	3.5	0.4	11.4	12.3	1.3	10.2
	3191-64 (W-57)	8.6	2.8	32.6	10.2	5.2	51.0	20.3	4.0	19.7	21.5	0.0	0.0	26.0	0.0	0.0	18.8	0.0	0.0	13.0	0.5	3.8	6.3	0.3	4.8	3.6	0.4	11.1	14.3	1.5	10.3
	3191-65 (W-87)	8.8	2.8	31.8	12.4	5.4	43.5	26.3	4.2	16.0	28.2	0.0	0.0	31.9	0.0	0.0	23.3	0.0	0.0	14.3	0.3	2.1	6.5	0.2	3.1	3.4	0.3	8.8	17.2	1.5	8.5
	3191-67 (W-17)	7.1	1.7	23.9	7.4	3.3	44.6	14.5	2.6	17.9	15.9	0.0	0.0	20.2	0.0	0.0	14.5	0.0	0.0	8.9	0.4	4.5	4.9	0.2	4.1	3.1	0.4	12.9	10.7	1.0	8.9
	3191-68 (W-76)	4.7	1.0	21.3	5.6	2.1	37.5	11.7	1.6	13.7	13.7	0.1	0.7	17.6	0.0	0.0	11.8	0.0	0.0	6.7	0.2	3.0	3.4	0.1	2.9	1.7	0.2	11.8	8.5	0.6	6.9
	3191-69 (W-52)	3.5	0.6	17.1	3.8	1.2	31.6	8.1	0.9	11.1	11.6	0.0	0.0	14.0	0.0	0.0	8.8	0.0	0.0	4.9	0.1	2.0	2.6	0.0	0.0	1.2	0.1	8.3	6.5	0.3	5.0
	3211-61 (W-73)	21.7	11.2	51.6	32.1	21.9	68.2	60.2	17.0	28.2	53.0	0.1	0.2	56.3	0.0	0.0	49.6	0.0	0.0	36.1	0.5	1.4	18.4	0.3	1.6	10.0	0.6	6.0	37.5	5.7	15.3
	3211-62 (W-69)	22.0	11.1	50.5	30.6	21.3	69.6	59.3	16.3	27.5	52.8	0.1	0.2	55.1	0.0	0.0	48.3	0.0	0.0	34.5	0.7	2.0	16.8	0.4	2.4	8.9	0.6	6.7	36.5	5.6	15.4
	3211-63 (W-2)	16.5	7.6	46.1	25.8	14.7	57.0	44.6	11.4	25.6	42.6	0.1	0.2	47.9	0.0	0.0	40.3	0.0	0.0	27.5	0.4	1.5	13.1	0.2	1.5	6.2	0.4	6.5	29.4	3.9	13.2
	3211-65 (W-62)	14.7	6.4	43.5	21.9	12.4	56.6	41.4	9.5	22.9	41.0	0.1	0.2	44.0	0.0	0.0	36.4	0.0	0.0	24.3	0.5	2.1	11.6	0.2	1.7	5.8	0.4	6.9	26.8	3.3	12.2
	3211-66 (W-15)	14.5	5.9	40.7	22.6	11.6	51.3	40.6	9.0	22.2	40.5	0.0	0.0	45.8	0.0	0.0	37.9	0.0	0.0	24.6	0.4	1.6	11.3	0.2	1.8	5.6	0.4	7.1	27.0	3.1	11.3
	3211-67 (W-3)	14.4	6.2	43.1	20.7	12.0	58.0	40.7	9.3	22.9	39.2	0.0	0.0	41.5	0.0	0.0	34.4	0.0	0.0	23.0	0.6	2.6	10.9	0.3	2.8	5.6	0.5	8.9	25.6	3.2	12.5
	3211-68 (W-110)	16.2	5.8	35.8	18.8	10.9	58.0	44.4	8.4	18.9	45.2	0.0	0.0	46.8	0.0	0.0	40.9	0.0	0.0	26.7	0.7	2.6	11.8	0.3	2.5	10.1	0.7	6.9	29.0	3.0	10.3
	3211-69 (W-77)	12.5	5.0	40.0	18.5	9.6	51.9	39.0	7.4	19.0	38.0	0.0	0.0	38.5	0.0	0.0	31.6	0.0	0.0	19.9	0.4	2.0	9.2	0.2	2.2	4.9	0.4	8.2	23.6	2.6	10.8
	3211-70 (W-98)	12.4	4.3	34.7	19.6	8.4	42.9	39.2	6.5	16.6	45.9	0.1	0.2	50.3	0.0	0.0	37.0	0.0	0.0	22.6	0.3	1.3	10.5	0.2	1.9	5.5	0.3	5.5	27.0	2.2	8.3
	3211-71 (W-46)	10.1	3.4	33.7	15.0	6.4	42.7	35.2	5.0	14.2	39.9	0.0	0.0	41.6	0.0	0.0	31.8	0.0	0.0	19.5	0.3	1.5	7.9	0.2	2.5	4.1	0.3	7.3	22.8	1.7	7.6
	3211-72 (W-101)	10.4	3.3	31.7	16.2	6.3	38.9	39.3	4.8	12.2	48.5	0.1	0.2	48.4	0.0	0.0	37.2	0.0	0.0	22.6	0.3	1.3	8.6	0.2	2.3	4.0	0.3	7.5	26.1	1.7	6.5
	3211-73 (W-14)	11.0	3.1	28.2	17.5	6.0	34.3	36.8	4.6	12.5	42.8	0.0	0.0	44.2	0.0	0.0	33.4	0.0	0.0	19.8	0.3	1.5	8.2	0.1	1.2	3.7	0.3	8.1	24.2	1.6	6.6
	3211-74 (W-31)	9.2	2.5	27.2	14.0	4.8	34.3	30.4	3.7	12.2	33.1	0.1	0.3	36.5	0.0	0.0	26.2	0.0	0.0	15.4	0.3	1.9	6.7	0.1	1.5	3.1	0.2	6.5	19.4	1.3	6.7
	3211-75 (W-63)	8.9	2.7	30.3	13.1	5.1	38.9	30.3	4.0	13.2	31.9	0.0	0.0	35.5	0.0	0.0	25.2	0.0	0.0	15.2	0.3	2.0	6.6	0.1	1.5	3.3	0.3	9.1	18.9	1.4	7.4
	3211-76 (W-13)	10.1	2.1	20.8	16.3	4.1	25.2	32.7	3.1	9.5	38.9	0.0	0.0	40.9	0.0	0.0	29.2	0.0	0.0	16.3	0.2	1.2	7.6	0.1	1.3	3.2	0.2	6.3	21.7	1.1	5.0
	3311-61 (W-89)	3.2	0.5	15.6	4.8	0.8	16.7	11.9	0.7	5.9	13.5	0.0	0.0	15.4	0.0	0.0	10.3	0.0	0.0	5.1	0.0	0.0	2.4	0.0	0.0	1.1	0.1	9.1	7.5	0.2	3.1
	3311-62 (W-8)	9.0	1.5	16.7	14.4	2.7	18.8	34.3	2.1	6.1	37.5	0.1	0.3	40.8	0.0	0.0	28.6	0.0	0.0	13.5	0.1	0.7	7.4	0.0	0.0	2.3	0.1	4.3	20.9	0.7	3.5
	3311-63 (W-12)	8.4	1.0	11.9	12.3	1.9	15.4	29.5	1.6	5.4	34.1	0.0	0.0	36.5	0.0	0.0	25.2	0.0	0.0	13.6	0.1	0.7	6.9	0.1	1.4	3.5	0.0	0.0	18.9	0.5	2.8
	3311-64 (W-90)	8.5	0.9	10.6	11.2	1.7	15.2	31.7	1.3	4.1	36.3	0.0	0.0	38.4	0.0	0.0	26.5	0.0	0.0	16.9	0.0	0.0	8.3	0.1	1.2	4.8	0.1	2.1	20.3	0.5	2.2
	3421-61 (Cardella-1)	13.9	2.7	19.4	11.9	5.2	43.7	17.8	4.1	23.0	19.4	0.0	0.0	28.6	0.0	0.0	23.3	0.0	0.0	12.4	2.1	16.9	9.9	0.8	8.1	4.9	1.5	30.6	15.8	1.8	11.5
	3421-62 (W-74)	7.7	1.2	15.6	7.0	2.3	32.9	10.7	1.8	16.8	12.5	0.1	0.8	19.8	0.0	0.0	15.5	0.0	0.0	8.2	0.5	6.1	6.0	0.2	3.3	2.6	0.4	15.4	10.0	0.7	7.2
	3421-64 (W-18)	6.2	1.3	21.0	6.0	2.4	40.0	11.5	1.9	16.5	13.3	0.1	0.8	17.3	0.0	0.0	12.2	0.0	0.0	7.2	0.3	4.2	4.2	0.1	2.4	2.5	0.3	12.0	8.9	0.7	8.0
	3421-66 (W-19)	5.2	0.9	17.3	4.9	1.7	34.7	9.4	1.3	13.8	11.7	0.0	0.0	15.3	0.0	0.0	10.6	0.0	0.0	6.2	0.2	3.2	3.6	0.1	2.8	1.7	0.2	11.8	7.6	0.5	6.4
	3421-68 (W-24)	3.7	0.5	13.5	3.7	1.1	29.7	7.2	0.8	11.1	9.0	0.0	0.0	12.2	0.0	0.0	8.7	0.0	0.0	5.1	0.2	3.9	2.9	0.1	3.4	1.2	0.1	8.3	6.0	0.3	5.2
	3431-61 (W-32)	1.1	0.2	18.2	1.0	0.2	20.0	3.6	0.2	5.6	4.9	0.0	0.0	7.2	0.0	0.0	4.0	0.0	0.0	1.6	0.0	0.0	0.7	0.0	0.0	0.3	0.0	0.0	2.7	0.1	2.5
	3431-62 (W-91)	0.9	0.1	11.1	0.8	0.2	25.0	3.2	0.1	3.1	4.2	0.0	0.0	6.2	0.0	0.0	3.3	0.0	0.0	1.2	0.0	0.0	0.6	0.0	0.0	0.2	0.0	0.0	2.3	0.0	1.9

Table 8-2 (continued)
Simulated Deep-Zone Drawdown at Non-MPG Production Wells Due to MPG Transfer Pumping in 2010

Well Owner/ Service Area	Well Name	March			April			May			June			July			August			September			October			November			Mean (Mar-Nov)		
		Simulated DD All Pumping (ft)	Simulated DD MPG Transfer Pumping (ft)	MPG Transfer Pumping %	Simulated DD All Pumping (ft)	Simulated DD MPG Transfer Pumping (ft)	MPG Transfer Pumping %	Simulated DD All Pumping (ft)	Simulated DD MPG Transfer Pumping (ft)	MPG Transfer Pumping %	Simulated DD All Pumping (ft)	Simulated DD MPG Transfer Pumping (ft)	MPG Transfer Pumping %	Simulated DD All Pumping (ft)	Simulated DD MPG Transfer Pumping (ft)	MPG Transfer Pumping %	Simulated DD All Pumping (ft)	Simulated DD MPG Transfer Pumping (ft)	MPG Transfer Pumping %	Simulated DD All Pumping (ft)	Simulated DD MPG Transfer Pumping (ft)	MPG Transfer Pumping %	Simulated DD All Pumping (ft)	Simulated DD MPG Transfer Pumping (ft)	MPG Transfer Pumping %	Simulated DD All Pumping (ft)	Simulated DD MPG Transfer Pumping (ft)	MPG Transfer Pumping %	Simulated DD All Pumping (ft)	Simulated DD MPG Transfer Pumping (ft)	MPG Transfer Pumping %
Paramount	3431-63 (W-36)	2.8	0.4	14.3	3.0	0.6	20.0	8.9	0.5	5.6	10.5	0.0	0.0	13.5	0.0	0.0	8.2	0.0	0.0	4.0	0.1	2.5	1.9	0.0	0.0	0.7	0.0	0.0	5.9	0.2	3.0
Farming	3561-61 (W-27)	3.3	0.4	12.1	3.3	0.9	27.3	6.4	0.6	9.4	8.2	0.0	0.0	11.3	0.0	0.0	8.1	0.0	0.0	4.8	0.2	4.2	2.6	0.1	3.8	1.1	0.1	9.1	5.5	0.3	4.7
Company	3561-62 (W-28)	3.1	0.4	12.9	3.0	0.7	23.3	6.0	0.5	8.3	7.8	0.0	0.0	10.7	0.0	0.0	7.8	0.0	0.0	4.6	0.1	2.2	2.5	0.1	4.0	1.0	0.1	10.0	5.2	0.2	4.1
	3561-63 (W-83)	2.4	0.2	8.3	2.4	0.5	20.8	4.7	0.3	6.4	6.7	0.0	0.0	9.1	0.0	0.0	6.8	0.0	0.0	3.9	0.1	2.6	2.0	0.0	0.0	0.7	0.0	0.0	4.3	0.1	2.8
	3561-64 (W-80)	1.5	0.1	6.7	1.5	0.2	13.3	2.8	0.1	3.6	5.9	0.0	0.0	7.5	0.0	0.0	6.2	0.0	0.0	2.7	0.1	3.7	1.3	0.0	0.0	0.5	0.1	20.0	3.3	0.1	2.0
	3591-61 (W-34)	4.2	0.7	16.7	5.4	1.4	25.9	13.3	1.1	8.3	16.6	0.0	0.0	21.3	0.0	0.0	13.0	0.0	0.0	6.6	0.2	3.0	3.0	0.0	0.0	1.3	0.1	7.7	9.4	0.4	4.1
	3591-63 (W-7)	6.1	0.7	11.5	8.6	1.4	16.3	22.9	1.1	4.8	29.5	0.0	0.0	32.7	0.0	0.0	22.5	0.0	0.0	10.1	0.1	1.0	4.5	0.0	0.0	1.7	0.0	0.0	15.4	0.4	2.4
	3591-64 (W-92)	3.8	0.5	13.2	4.2	1.0	23.8	12.6	0.7	5.6	18.8	0.0	0.0	21.3	0.0	0.0	12.2	0.0	0.0	5.5	0.1	1.8	2.5	0.1	4.0	0.9	0.0	0.0	9.1	0.3	2.9
	3591-65 (W-75)	4.9	0.5	10.2	5.4	0.9	16.7	19.4	0.8	4.1	26.6	0.0	0.0	31.6	0.0	0.0	21.2	0.0	0.0	8.5	0.0	0.0	3.0	0.0	0.0	1.1	0.1	9.1	13.5	0.3	1.9
	3591-66 (W-11)	5.1	0.6	11.8	6.4	1.0	15.6	20.1	0.8	4.0	27.5	0.0	0.0	31.0	0.0	0.0	20.8	0.0	0.0	8.5	0.1	1.2	3.4	0.0	0.0	1.2	0.1	8.3	13.8	0.3	2.1
	3591-67 (W-10)	3.1	0.4	12.9	3.5	0.8	22.9	10.0	0.6	6.0	12.9	0.0	0.0	16.7	0.0	0.0	9.5	0.0	0.0	4.5	0.1	2.2	2.2	0.1	4.5	0.8	0.1	12.5	7.0	0.2	3.3
	3591-68 (W-93)	5.0	0.3	6.0	5.9	0.8	13.6	19.6	0.6	3.1	28.0	0.0	0.0	28.6	0.0	0.0	18.2	0.0	0.0	8.7	0.1	1.1	4.1	0.0	0.0	1.1	0.0	0.0	13.2	0.2	1.5
	3591-69 (W-39)	2.7	0.3	11.1	2.5	0.6	24.0	7.5	0.4	5.3	9.0	0.1	1.1	11.5	0.0	0.0	6.5	0.0	0.0	3.3	0.0	0.0	1.6	0.0	0.0	0.6	0.1	16.7	5.0	0.2	3.3
	3591-70 (W-72)	3.7	0.3	8.1	3.1	0.5	16.1	9.7	0.5	5.2	11.6	0.0	0.0	16.2	0.0	0.0	8.8	0.0	0.0	4.4	0.1	2.3	2.4	0.0	0.0	0.7	0.1	14.3	6.7	0.2	2.5
	3591-71 (W-71)	3.8	0.3	7.9	3.6	0.6	16.7	10.7	0.5	4.7	13.3	0.0	0.0	16.3	0.0	0.0	9.6	0.0	0.0	4.6	0.1	2.2	2.3	0.1	4.3	0.7	0.0	0.0	7.2	0.2	2.5
	3591-72 (W-60)	4.3	0.3	7.0	5.5	0.7	12.7	16.5	0.5	3.0	22.8	0.0	0.0	24.0	0.0	0.0	15.4	0.0	0.0	7.4	0.0	0.0	3.5	0.0	0.0	0.9	0.0	0.0	11.1	0.2	1.5
	3730-61 (W-95)	16.9	7.5	44.4	28.0	13.7	48.9	45.3	9.0	19.9	52.2	0.0	0.0	59.8	0.0	0.0	51.3	0.0	0.0	38.5	0.3	0.8	16.4	0.1	0.6	4.7	0.3	6.4	34.8	3.4	9.9
	3730-62 (W-94)	39.0	23.0	59.0	62.9	45.6	72.5	91.5	38.1	41.6	71.3	0.6	0.8	84.4	0.2	0.2	72.9	0.0	0.0	53.3	1.4	2.6	25.8	0.8	3.1	10.0	1.6	16.0	56.8	12.4	21.8
	3730-63 (W-112)	22.5	11.1	49.3	35.2	22.0	62.5	69.5	17.5	25.2	66.2	0.0	0.0	73.3	0.0	0.0	64.3	0.0	0.0	54.1	0.4	0.7	23.2	0.3	1.3	13.2	0.5	3.8	46.8	5.8	12.3
	3730-64 (W-111)	28.1	16.4	58.4	42.7	31.9	74.7	73.6	25.3	34.4	61.7	0.1	0.2	67.1	0.0	0.0	60.0	0.0	0.0	47.5	0.8	1.7	19.6	0.4	2.0	6.4	0.8	12.5	45.2	8.4	18.6
	3730-65 (W-53)	25.6	13.1	51.2	33.9	24.9	73.5	55.6	19.3	34.7	44.9	0.1	0.2	48.6	0.0	0.0	43.4	0.0	0.0	29.7	1.3	4.4	15.3	0.6	3.9	8.2	1.4	17.1	33.9	6.7	19.9
	3730-66 (W-59)	19.8	9.1	46.0	30.9	17.9	57.9	57.9	14.1	24.4	55.8	0.1	0.2	60.9	0.0	0.0	52.3	0.0	0.0	37.6	0.4	1.1	18.4	0.2	1.1	9.1	0.5	5.5	38.1	4.7	12.3
	3730-67 (W-96)	26.0	14.5	55.8	37.0	27.6	74.6	61.4	20.9	34.0	51.0	0.1	0.2	55.0	0.0	0.0	48.1	0.0	0.0	35.1	0.9	2.6	17.1	0.4	2.3	7.9	0.8	10.1	37.6	7.2	19.3
	3730-68 (W-48)	23.7	11.5	48.5	30.7	21.9	71.3	55.8	16.8	30.1	47.8	0.0	0.0	44.2	0.0	0.0	39.0	0.0	0.0	26.3	0.9	3.4	13.7	0.5	3.6	7.8	1.0	12.8	32.1	5.8	18.2
	3730-70 (W-108)	27.2	9.8	36.0	29.3	18.7	63.8	64.1	14.4	22.5	57.3	0.1	0.2	60.9	0.0	0.0	55.4	0.0	0.0	34.8	1.1	3.2	19.1	0.5	2.6	13.3	1.0	7.5	40.2	5.1	12.6
	3730-72 (W-107)	12.1	3.9	32.2	13.2	7.4	56.1	28.1	5.7	20.3	29.6	0.1	0.3	33.6	0.0	0.0	28.7	0.0	0.0	20.6	1.1	5.3	11.7	0.4	3.4	5.8	0.9	15.5	20.4	2.2	10.6
	3921-62 (W-78)	23.0	8.8	38.3	25.2	16.6	65.9	51.9	12.9	24.9	43.2	0.0	0.0	50.3	0.0	0.0	44.1	0.0	0.0	28.7	1.2	4.2	16.1	0.5	3.1	10.4	1.2	11.5	32.5	4.6	14.1
	7101-61 (W-61)	2.0	0.2	10.0	2.0	0.4	20.0	4.2	0.3	7.1	6.1	0.0	0.0	8.3	0.0	0.0	6.0	0.0	0.0	3.2	0.0	0.0	1.7	0.1	5.9	0.6	0.0	0.0	3.8	0.1	2.9
	7102-61 (W-99)	7.2	1.4	19.4	10.9	2.9	26.6	23.4	2.3	9.8	26.4	0.0	0.0	31.2	0.0	0.0	20.7	0.0	0.0	11.5	0.2	1.7	5.2	0.0	0.0	2.3	0.1	4.3	15.4	0.8	5.0
	7102-62 (W-66)	5.9	1.1	18.6	8.5	2.1	24.7	19.2	1.6	8.3	22.5	0.0	0.0	26.6	0.0	0.0	18.1	0.0	0.0	9.4	0.1	1.1	4.3	0.0	0.0	1.9	0.1	5.3	12.9	0.6	4.3
	7102-63 (W-65)	5.5	1.1	20.0	7.7	2.1	27.3	17.4	1.6	9.2	20.4	0.0	0.0	24.9	0.0	0.0	16.2	0.0	0.0	8.7	0.2	2.3	4.0	0.1	2.5	1.8	0.1	5.6	11.8	0.6	4.9
	7102-64 (W-64)	6.3	1.1	17.5	9.3	2.1	22.6	21.0	1.6	7.6	24.5	0.0	0.0	28.5	0.0	0.0	19.0	0.0	0.0	10.2	0.1	1.0	4.7	0.1	2.1	2.0	0.1	5.0	13.9	0.6	4.1
	7102-65 (W-70)	5.3	0.9	17.0	7.4	1.8	24.3	17.4	1.4	8.0	20.9	0.1	0.5	24.8	0.0	0.0	16.3	0.0	0.0	8.4	0.1	1.2	3.9	0.1	2.6	1.7	0.1	5.9	11.8	0.5	4.2
	7102-66 (W-67)	5.9	0.9	15.3	8.6	1.7	19.8	20.1	1.3	6.5	24.0	0.0	0.0	27.9	0.0	0.0	18.5	0.0	0.0	9.6	0.1	1.0	4.4	0.0	0.0	1.9	0.1	5.3	13.4	0.5	3.4

Table 8-3
Estimated Drawdowns for 2010 Pumping Cost Reimbursements

Well Owner /		Drawdown Due to All Pumping (ft)[1]									Drawdown Due to MPG Transfer Pumping (ft)[2]								
Service Area	Well Name	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Central	5A	5.4	6.5	6.3	8.3	6.7	8.7	7.1	5.8	2.0	0	0	0	0	0	0	0	0	0
California ID	12C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0
	15B	0.3	0.5	0.7	0.4	0.1	0.3	0.7	0.3	0.0	0	0	0	0	0	0	0	0	0
	16B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0
	23B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0
	28B	1.1	2.2	2.1	2.7	3.3	3.6	3.6	2.8	1.2	0	0	0	0	0	0	0	0	0
	32B	1.7	2.1	2.4	1.6	0.6	2.1	3.2	2.4	1.2	0	0	0	0	0	0	0	0	0
	35A	0.4	0.6	0.7	0.8	0.8	0.8	0.7	0.1	0.0	0	0	0	0	0	0	0	0	0
	38A	1.2	1.0	0.0	2.1	3.6	0.6	0.0	-2.5	0.0	0	0	0	0	0	0	0	0	0
Columbia	CC-1	11.2	21.0	33.0	38.1	43.2	38.0	36.8	24.0	13.8	1	10	7	0	0	0	0	0	1
Canal	CC-2	14.6	31.9	45.0	47.2	49.0	46.9	45.2	31.3	19.1	3	19	13	0	0	0	1	0	1
Company	Snyder	13.2	24.1	22.9	27.5	32.6	32.0	27.7	25.6	23.3	0	7	4	0	0	0	2	1	4
	B-Heirs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0
	Cardella-2	10.2	11.1	15.8	0.0	25.4	23.9	22.4	16.4	10.4	1	6	3	0	0	0	1	1	2
	Diepersloot #1	0.0	0.0	0.0	0.0	2.8	3.0	0.1	0.1	0.8	0	0	0	0	0	0	0	0	0
	Elrod-1	0.1	0.0	0.0	3.3	7.4	6.7	3.3	3.6	3.8	0	0	0	0	0	0	0	0	0
	Elrod-2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0
	N.F. Davis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0
	G-2 Farms 1	5.7	9.4	8.5	11.7	15.0	12.8	9.2	9.3	9.0	0	2	1	0	0	0	0	0	1
	G-2 Farms 2	0.2	0.0	0.0	0.7	2.1	0.4	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0
Paramount	2480-61 (W-43)	5.5	7.2	10.5	16.6	22.9	20.8	18.1	14.8	10.4	0	3	1	0	0	0	0	0	1
Farming Co.	2480-62 (W-97)	6.1	7.8	11.4	17.6	23.9	22.5	19.3	15.6	11.2	0	3	1	0	0	0	1	0	1
	2480-63 (W-100)	7.8	9.6	13.3	19.8	26.0	25.4	21.9	17.7	13.6	0	3	2	0	0	0	0	0	1
	2480-64 (W-88)	10.2	12.2	16.0	22.9	29.0	29.2	25.3	20.8	16.6	0	4	2	0	0	0	0	0	1
	2480-65 (W-33)	7.8	9.1	10.2	14.5	20.3	18.3	17.2	15.9	13.7	0	3	1	0	0	0	1	0	1
	2480-66 (W-42)	2.5	3.1	4.3	8.3	12.0	12.6	9.4	9.6	6.5	0	1	0	0	0	0	0	1	1
	2480-67 (W-84)	3.8	4.4	6.2	9.9	15.0	15.7	13.6	10.8	9.8	0	1	1	0	0	0	0	0	1
	2480-69 (W-30)	3.1	4.3	3.8	9.9	15.6	14.8	11.1	10.8	9.9	0	1	0	0	0	0	0	0	0
	2480-70 (W-81)	3.7	4.9	4.7	11.5	17.9	17.1	13.5	12.9	11.6	0	1	0	0	0	0	0	0	1
	2480-71 (W-5)	1.4	1.8	1.6	8.6	15.1	15.2	11.1	10.2	9.3	0	0	0	0	0	0	0	0	1
	2480-72 (W-35)	0.5	0.5	0.8	8.7	15.9	16.6	12.2	10.7	9.6	0	0	0	0	0	0	0	0	1
	2480-73 (W-56)	0.0	0.0	0.0	4.3	10.4	11.3	6.9	5.6	5.8	0	0	0	0	0	0	0	0	0
	2480-74 (W-55)	0.0	0.0	0.0	4.8	11.2	12.6	7.9	6.2	6.3	0	0	0	0	0	0	0	0	0
	2480-75 (W-50)	0.0	0.0	0.0	4.8	11.4	13.3	8.4	6.2	6.4	0	0	0	0	0	0	0	0	0
	2560-61 (W-82)	4.4	6.9	6.0	9.6	13.2	11.1	7.5	7.9	7.7	0	1	0	0	0	0	0	0	0
	2560-62 (W-25)	3.7	5.6	4.8	8.9	12.9	11.1	7.6	8.0	7.7	0	1	0	0	0	0	0	0	1
	2570-61 (W-51)	0.0	0.0	0.0	4.7	9.9	9.9	6.0	5.6	5.6	0	0	0	0	0	0	0	0	1
	2570-62 (W-68)	0.0	0.0	0.0	3.4	8.3	8.3	4.5	4.2	4.4	0	0	0	0	0	0	0	0	0
	3191-61 (W-85)	8.1	11.4	21.2	29.4	36.3	31.0	24.0	15.6	5.4	1	6	4	0	0	0	1	1	1
	3191-62 (W-86)	8.5	12.6	22.4	31.7	39.6	34.7	27.3	18.5	8.2	1	7	4	0	0	0	1	0	1
	3191-63 (W-44)	7.8	12.6	16.5	22.1	27.7	25.8	23.6	18.7	12.8	0	6	3	0	0	0	1	1	1
	3191-64 (W-57)	7.1	10.2	16.2	22.9	29.1	25.9	22.3	16.4	8.9	0	5	3	0	0	0	1	1	1
	3191-65 (W-87)	8.6	12.8	20.4	29.7	37.5	34.3	28.1	20.7	12.3	0	6	3	0	0	0	1	1	1
	3191-67 (W-17)	8.6	13.2	16.0	21.9	27.8	25.8	23.5	19.8	14.6	0	6	3	0	0	0	1	1	2
	3191-68 (W-76)	8.8	11.0	12.2	17.2	23.3	21.0	19.5	18.1	15.1	0	4	2	0	0	0	1	1	2
	3191-69 (W-52)	8.0	10.1	10.2	16.5	23.0	21.5	18.8	18.2	16.0	0	3	1	0	0	0	0	0	1
	3211-61 (W-73)	16.4	33.8	43.6	42.4	40.5	36.2	31.9	23.6	14.8	4	23	12	0	0	0	0	0	1
	3211-62 (W-69)	16.1	30.2	40.3	41.5	41.3	35.5	29.1	21.0	11.6	3	21	11	0	0	0	1	1	1
	3211-63 (W-2)	7.0	25.0	31.9	30.2	28.2	24.8	21.5	15.1	9.2	1	14	8	0	0	0	0	0	1
	3211-65 (W-62)	6.3	20.6	29.0	32.0	34.0	29.4	22.9	15.5	7.6	1	12	7	0	0	0	0	0	1
	3211-66 (W-15)	1.4	18.8	22.8	19.6	16.4	13.2	10.1	6.9	3.7	0	10	5	0	0	0	0	0	0
	3211-67 (W-3)	9.6	20.0	31.4	38.9	44.8	39.1	30.2	20.0	9.0	1	12	7	0	0	0	1	1	1
	3211-68 (W-110)	9.5	14.2	25.3	32.5	38.1	31.5	23.3	14.3	3.5	1	8	5	0	0	0	1	0	0
	3211-69 (W-77)	8.8	17.4	30.6	40.7	52.6	44.6	36.8	22.9	11.3	1	9	6	0	0	0	1	0	1

Table 8-3 (continued)
Estimated Drawdowns for 2010 Pumping Cost Reimbursements

Well Owner / Service Area	Well Name	Drawdown Due to All Pumping (ft)[1] Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Drawdown Due to MPG Transfer Pumping (ft)[2] Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Paramount Farming Co.	3211-70 (W-98)	3.5	16.3	22.9	26.9	29.7	26.7	21.2	14.5	8.4	0	7	4	0	0	0	0	0	0
	3211-71 (W-46)	8.3	14.7	23.4	33.1	41.0	37.6	30.3	21.7	12.5	1	6	3	0	0	0	0	1	1
	3211-72 (W-101)	7.2	14.8	22.3	30.7	37.3	34.6	28.1	20.5	12.6	0	6	3	0	0	0	0	0	1
	3211-73 (W-14)	5.5	14.1	20.2	27.0	32.0	30.3	24.8	18.1	11.9	0	5	3	0	0	0	0	0	1
	3211-74 (W-31)	9.2	14.3	20.3	28.9	35.5	34.0	28.5	22.2	15.5	0	5	2	0	0	0	1	0	1
	3211-75 (W-63)	9.1	13.9	20.8	29.8	37.1	34.8	28.8	21.9	14.2	0	5	3	0	0	0	1	0	1
	3211-76 (W-13)	6.8	11.5	16.2	24.4	30.2	30.4	25.5	20.1	15.1	0	3	2	0	0	0	0	0	1
	3311-61 (W-89)	13.8	15.7	20.7	27.0	34.9	34.3	32.4	26.3	24.3	0	3	1	0	0	0	0	0	2
	3311-62 (W-8)	2.2	1.7	5.8	15.0	21.6	25.0	19.3	15.8	12.3	0	0	0	0	0	0	0	0	1
	3311-63 (W-12)	3.6	4.0	7.4	14.4	20.6	25.3	19.9	13.9	13.0	0	1	0	0	0	0	0	0	0
	3311-64 (W-90)	3.8	4.2	7.4	12.8	18.6	24.4	18.9	12.1	12.5	0	1	0	0	0	0	0	0	0
	3421-61 (Cardella-1)	10.2	13.5	18.4	22.4	26.2	21.1	16.1	10.2	11.3	1	6	4	0	0	0	3	1	3
	3421-62 (W-74)	14.6	26.8	25.6	30.6	37.6	35.6	32.7	28.7	26.1	0	9	4	0	0	0	2	1	4
	3421-64 (W-18)	10.0	15.6	16.6	22.2	28.1	26.4	23.9	21.6	17.8	0	6	3	0	0	0	1	1	2
	3421-66 (W-19)	9.7	14.6	14.8	20.4	26.4	24.7	22.0	20.7	17.8	0	5	2	0	0	0	1	1	2
	3421-68 (W-24)	7.1	10.3	9.9	15.8	21.7	20.1	16.9	16.5	14.7	0	3	1	0	0	0	1	1	1
	3431-61 (W-32)	15.9	16.6	17.5	20.9	26.6	25.7	26.2	23.5	24.3	0	3	1	0	0	0	0	0	0
	3431-62 (W-91)	0.8	0.5	0.1	9.8	17.2	18.5	13.5	12.3	10.0	0	0	0	0	0	0	0	0	0
	3431-63 (W-36)	0.0	0.0	0.0	7.2	14.5	16.9	12.0	9.3	8.8	0	0	0	0	0	0	0	0	0
	3561-61 (W-27)	5.5	7.8	7.4	13.3	19.1	17.8	14.3	14.1	12.7	0	2	1	0	0	0	1	1	1
	3561-62 (W-28)	4.4	6.4	5.8	11.6	17.2	16.0	12.5	12.3	11.2	0	1	0	0	0	0	0	0	1
	3561-63 (W-83)	1.7	2.3	1.8	7.4	12.7	12.1	8.3	8.1	7.7	0	0	0	0	0	0	0	0	0
	3561-64 (W-80)	0.0	0.0	0.0	2.0	6.6	6.8	3.1	2.8	3.3	0	0	0	0	0	0	0	0	1
	3591-61 (W-34)	7.6	8.0	9.7	11.6	16.2	19.4	16.8	13.5	14.4	0	2	1	0	0	0	1	0	1
	3591-63 (W-7)	3.2	3.7	7.1	8.9	13.2	21.8	16.2	8.4	11.2	0	1	0	0	0	0	0	0	0
	3591-64 (W-92)	4.2	4.1	5.8	9.5	15.2	19.5	15.4	11.6	12.7	0	1	0	0	0	0	0	0	0
	3591-65 (W-75)	2.3	2.7	5.9	4.7	8.0	18.3	13.0	5.6	10.1	0	0	0	0	0	0	0	0	1
	3591-66 (W-11)	1.0	1.6	5.7	1.9	3.8	18.0	11.7	1.9	8.5	0	0	0	0	0	0	0	0	1
	3591-67 (W-10)	0.7	0.3	1.6	7.9	14.6	18.0	13.2	10.0	10.1	0	0	0	0	0	0	0	0	1
	3591-68 (W-93)	0.0	0.4	3.8	2.7	6.2	17.9	11.5	2.2	7.8	0	0	0	0	0	0	0	0	0
	3591-69 (W-39)	0.0	0.0	0.0	6.1	13.2	15.6	10.6	7.9	7.8	0	0	0	0	0	0	0	0	1
	3591-70 (W-72)	0.0	0.0	0.0	5.7	12.2	16.7	11.4	7.3	8.3	0	0	0	0	0	0	0	0	1
	3591-71 (W-71)	0.0	0.0	1.2	4.9	10.5	17.0	11.5	5.9	8.4	0	0	0	0	0	0	0	0	0
	3591-72 (W-60)	0.0	0.0	2.6	2.9	7.2	17.6	11.2	2.2	7.2	0	0	0	0	0	0	0	0	0
	3730-61 (W-95)	16.5	33.0	49.1	55.5	69.2	54.6	47.1	33.9	25.0	2	16	10	0	0	0	0	0	2
	3730-62 (W-94)	37.7	63.8	93.6	75.7	70.8	61.8	56.9	41.7	34.2	17	46	39	1	0	0	1	1	5
	3730-63 (W-112)	14.4	30.0	42.9	45.0	46.8	46.4	46.4	32.1	18.6	3	19	11	0	0	0	0	0	1
	3730-64 (W-111)	28.6	49.3	62.5	59.4	55.8	49.6	43.6	33.8	23.5	9	37	21	0	0	0	1	1	3
	3730-65 (W-53)	23.5	46.5	57.6	55.4	57.3	46.9	39.7	30.4	21.8	6	34	20	0	0	0	2	1	4
	3730-66 (W-59)	13.1	30.1	40.9	41.9	42.4	40.3	38.6	26.9	16.7	2	17	10	0	0	0	0	0	1
	3730-67 (W-96)	19.3	33.0	43.1	43.9	43.2	37.4	31.3	23.1	13.5	5	25	15	0	0	0	1	1	1
	3730-68 (W-48)	19.1	31.9	42.6	44.3	44.6	37.0	29.1	20.7	10.9	4	23	13	0	0	0	1	1	1
	3730-70 (W-108)	16.7	29.9	40.9	42.2	43.0	34.9	26.5	17.6	8.6	3	19	9	0	0	0	1	0	1
	3730-72 (W-107)	3.8	7.1	14.2	18.4	22.4	17.7	12.7	5.6	1.3	0	4	3	0	0	0	1	0	0
	3921-62 (W-78)	11.6	26.7	10.5	37.5	17.0	31.6	1.4	13.9	0.0	2	18	3	0	0	0	0	0	0
	7101-61 (W-61)	0.7	0.8	0.3	6.3	12.0	11.9	7.9	7.4	7.1	0	0	0	0	0	0	0	0	0
	7102-61 (W-99)	12.5	14.2	17.4	24.6	30.4	31.8	27.9	23.5	20.0	0	4	2	0	0	0	0	0	1
	7102-62 (W-66)	7.1	7.9	10.7	14.7	19.6	23.5	19.7	14.9	14.4	0	2	1	0	0	0	0	0	1
	7102-63 (W-65)	5.7	6.5	9.0	12.6	17.6	20.2	17.1	13.1	12.4	0	2	1	0	0	0	0	0	1
	7102-64 (W-64)	7.8	8.5	11.5	16.1	21.1	25.7	21.4	16.2	15.7	0	2	1	0	0	0	0	0	1
	7102-65 (W-70)	5.3	5.9	8.6	10.8	15.0	20.3	16.6	11.5	12.5	0	1	1	0	0	0	0	0	1
	7102-66 (W-67)	5.9	6.5	9.5	12.6	17.2	23.4	18.8	12.9	13.7	0	1	1	0	0	0	0	0	1

1. Drawdowns were estimated based on measured water levels shown on hydrographs where available. Contour maps were used to estimate drawdowns in wells lacking water level data (italicized values).
2. Values obtained by multiplying the estimated drawdowns by the monthly MPG percentages (see Table 8-2).

Table 8-4
2010 Pumping Cost Reimbursement for Well Owners Included in Settlement Agreement

Well Owner / Service Area	Well ID	Power Cost ($/kwh)	Pump* Efficiency	Pumpage (af)									Reimbursement ($)									
				Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Central	5A	0.1543	*0.49*	148	107	47	6	115	139	59	154	38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
California ID	12C	0.1543	*0.45*	0	124	48	6	94	151	163	109	29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	15B	0.1543	*0.51*	105	68	30	4	64	91	38	90	22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	16B	0.1543	*0.77*	146	125	2	0	85	129	60	135	37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	23B	0.1543	*0.55*	161	117	46	6	85	139	151	99	26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	28B	0.1543	*0.55*	149	105	57	6	71	114	60	126	37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	32B	0.1543	*0.55*	160	109	55	6	62	130	163	123	31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	35A	0.1543	*0.57*	210	142	58	8	145	150	75	169	40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	38A	0.1543	*0.69*	20	0	56	21	20	9	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	Total			**1,099**	**897**	**399**	**62**	**741**	**1,052**	**769**	**1,004**	**260**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Columbia	CC-1	0.1543	*0.64*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
Canal	CC-2	0.1543	*0.69*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
Company	***Total***			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
CCC	Snyder	0.1543	*0.60*	0	0	0	24	30	15	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
Service Area	Cardella-2	0.1543	*0.68*	0	0	0	96	96	96	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	Diepersloot #1	0.1543	*0.60*	0	0	0	127	127	127	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	Elrod-1	0.1543	*0.60*	0	0	0	0	3	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	Elrod-2	0.1543	*0.60*	0	0	0	0	1	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	N.F. Davis	0.1543	*0.60*	0	0	0	141	141	141	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	G-2 Farms 1	0.1543	*0.60*	0	0	0	0	16	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	G-2 Farms 2	0.1543	*0.60*	0	0	378	378	378	378	378	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	Total			**0**	**0**	**378**	**767**	**793**	**758**	**378**	**0**	**0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Paramount	2480-61 (W-43)	0.1543	*0.56*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
Farming Co.	2480-62 (W-97)	0.1543	0.74	0	0	0	0	142	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2480-63 (W-100)	0.1543	0.69	0	0	0	2	10	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2480-64 (W-88)	0.1543	0.64	0	0	0	0	8	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2480-65 (W-33)	0.1543	*0.48*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2480-66 (W-42)	0.1543	0.61	0	0	0	0	8	8	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2480-67 (W-84)	0.1543	*0.35*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2480-69 (W-30)	0.1543	*0.56*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2480-70 (W-81)	0.1543	0.63	0	0	0	3	10	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0

Table 8-4 (continued)
2010 Pumping Cost Reimbursement for Well Owners
Included in Settlement Agreement

Well Owner / Service Area	Well ID	Power Cost ($/kwh)	Pump* Efficiency	Pumpage (af) Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Reimbursement ($) Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Paramount Farming Co.	2480-71 (W-5)	0.1543	0.62	0	0	0	0	7	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2480-72 (W-35)	0.1543	0.71	0	0	0	6	6	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2480-73 (W-56)	0.1543	0.51	0	0	0	0	4	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2480-74 (W-55)	0.1543	*0.60*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2480-75 (W-50)	0.1543	*0.61*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2560-61 (W-82)	0.1543	0.70	0	0	0	0	9	0	0	0	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	$0
	2560-62 (W-25)	0.1543	*0.72*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2570-61 (W-51)	0.1543	*0.73*	0	0	0	7	11	1	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	2570-62 (W-68)	0.1543	*0.80*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3191-61 (W-85)	0.1543	0.67	0	0	2	2	5	0	4	0	0	0.00	0.00	1.89	0.00	0.00	0.00	0.82	0.00	0.00	$3
	3191-62 (W-86)	0.1543	0.73	0	0	2	5	9	0	7	0	7	0.00	0.00	2.34	0.11	0.00	0.00	1.03	0.00	1.19	$5
	3191-63 (W-44)	0.1543	0.49	4	0	2	5	5	0	0	0	3	0.40	0.00	1.94	0.00	0.00	0.00	0.00	0.00	1.41	$3
	3191-64 (W-57)	0.1543	0.67	0	0	3	9	15	0	11	0	0	0.00	0.00	2.34	0.00	0.00	0.00	2.32	0.00	0.00	$5
	3191-65 (W-87)	0.1543	*0.60*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3191-67 (W-17)	0.1543	0.70	4	0	2	4	6	0	0	0	4	0.28	0.12	1.39	0.00	0.00	0.00	0.00	0.00	1.70	$3
	3191-68 (W-76)	0.1543	*0.53*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3191-69 (W-52)	0.1543	0.73	0	0	0	17	9	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3211-61 (W-73)	0.1543	0.63	15	4	100	103	98	96	76	51	39	13.60	21.69	308.79	2.07	0.00	0.00	8.38	4.92	8.69	$355
	3211-62 (W-69)	0.1543	0.60	16	4	108	118	113	106	80	39	24	14.62	22.41	314.15	2.45	0.00	0.00	12.44	5.14	4.95	$362
	3211-63 (W-2)	0.1543	0.61	0	0	0	4	22	21	14	9	5	0.00	0.00	0.00	0.08	0.00	0.00	1.17	0.54	0.77	$3
	3211-65 (W-62)	0.1543	0.41	0	0	12	20	21	20	15	9	4	0.00	0.00	31.04	0.62	0.00	0.00	2.64	0.93	0.81	$36
	3211-66 (W-15)	0.1543	0.59	0	0	1	2	23	27	12	5	6	0.00	0.00	1.77	0.00	0.00	0.00	0.55	0.16	0.43	$3
	3211-67 (W-3)	0.1543	0.55	0	1	17	19	17	15	12	5	0	0.00	3.57	36.01	0.00	0.00	0.00	2.69	0.82	0.00	$43
	3211-68 (W-110)	0.1543	0.66	25	9	112	138	127	127	78	23	46	6.18	18.39	127.93	0.00	0.00	0.00	11.40	2.01	2.67	$162
	3211-69 (W-77)	0.1543	0.52	0	6	39	23	0	9	0	0	0	0.00	15.15	68.65	0.00	0.00	0.00	0.00	0.00	0.00	$84
	3211-70 (W-98)	0.1543	0.72	0	4	31	81	104	53	24	15	13	0.00	5.47	25.49	1.04	0.00	0.00	1.49	0.91	1.30	$36
	3211-71 (W-46)	0.1543	0.60	0	2	44	66	57	48	27	4	3	0.00	3.38	38.74	0.00	0.00	0.00	3.35	0.58	0.72	$47
	3211-72 (W-101)	0.1543	0.65	0	4	77	141	116	96	55	10	3	0.00	5.61	50.71	2.17	0.00	0.00	4.99	1.16	0.69	$65
	3211-73 (W-14)	0.1543	0.61	0	2	33	60	50	39	19	4	2	0.00	2.43	21.75	0.00	0.00	0.00	1.82	0.23	0.50	$27
	3211-74 (W-31)	0.1543	0.55	0	0	11	3	10	2	0	0	0	0.00	0.00	7.78	0.08	0.00	0.00	0.00	0.00	0.00	$8
	3211-75 (W-63)	0.1543	0.70	0	0	25	12	16	3	2	0	0	0.00	0.00	15.45	0.00	0.00	0.00	0.26	0.00	0.00	$16

Table 8-4 (continued)
2010 Pumping Cost Reimbursement for Well Owners
Included in Settlement Agreement

Well Owner / Service Area	Well ID	Power Cost ($/kwh)	Pump* Efficiency	Pumpage (af)									Reimbursement ($)									
				Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Paramount Farming Co.	3211-76 (W-13)	0.1543	0.55	0	2	20	55	50	30	12	11	5	0.00	1.87	8.88	0.00	0.00	0.00	1.09	0.84	1.35	$14
	3311-61 (W-89)	0.1543	0.68	0	0	0	0	5	5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3311-62 (W-8)	0.1543	0.72	0	1	70	67	77	51	4	18	0	0.00	0.08	5.40	0.59	0.00	0.00	0.14	0.00	0.00	$6
	3311-63 (W-12)	0.1543	0.58	8	3	42	49	49	33	16	15	13	0.15	0.47	4.52	0.00	0.00	0.00	0.64	0.82	0.00	$6
	3311-64 (W-90)	0.1543	0.70	18	6	93	96	91	65	65	36	29	0.26	0.86	6.43	0.00	0.00	0.00	0.00	1.19	1.71	$10
	3421-61 (Cardella-1)	0.1543	0.39	3	0	1	2	9	0	0	0	0	0.74	0.00	1.63	0.00	0.00	0.00	0.00	0.00	0.00	$2
	3421-62 (W-74)	0.1543	0.69	0	0	0	0	9	7	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3421-64 (W-18)	0.1543	0.68	5	0	2	6	7	0	0	0	4	0.25	0.00	1.44	0.23	0.00	0.00	0.00	0.00	1.99	$4
	3421-66 (W-19)	0.1543	0.68	4	0	1	7	7	0	0	0	0	0.16	0.00	0.48	0.00	0.00	0.00	0.00	0.01	0.00	$0
	3421-68 (W-24)	0.1543	*0.67*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3431-61 (W-32)	0.1543	0.67	0	0	0	0	7	5	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3431-62 (W-91)	0.1543	0.63	0	0	1	0	7	5	0	0	0	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3431-63 (W-36)	0.1543	0.64	0	0	9	1	3	2	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3561-61 (W-27)	0.1543	*0.43*	0	0	0	0	0	0	0	0	0	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3561-62 (W-28)	0.1543	*0.58*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3561-63 (W-83)	0.1543	*0.44*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3561-64 (W-80)	0.1543	*0.66*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3591-61 (W-34)	0.1543	0.68	0	0	0	0	10	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3591-63 (W-7)	0.1543	0.65	5	1	32	57	62	46	7	3	0	0.05	0.12	2.69	0.00	0.00	0.00	0.28	0.00	0.00	$3
	3591-64 (W-92)	0.1543	0.67	3	0	16	48	41	13	2	0	0	0.03	0.00	1.22	0.00	0.00	0.00	0.15	0.00	0.00	$1
	3591-65 (W-75)	0.1543	0.66	8	0	52	79	105	75	19	0	0	0.04	0.00	3.02	0.00	0.00	0.00	0.00	0.00	0.00	$3
	3591-66 (W-11)	0.1543	0.59	6	1	39	64	74	52	9	0	0	0.02	0.06	2.35	0.00	0.00	0.00	0.32	0.00	0.00	$3
	3591-67 (W-10)	0.1543	0.50	0	0	5	7	16	2	0	0	0	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	$0
	3591-68 (W-93)	0.1543	0.66	11	1	49	86	69	39	19	11	2	0.00	0.01	1.34	0.00	0.00	0.00	0.60	0.00	0.00	$2
	3591-69 (W-39)	0.1543	0.71	4	0	12	7	10	0	1	0	0	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	$0
	3591-70 (W-72)	0.1543	0.60	10	0	11	5	28	5	4	5	0	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	$0
	3591-71 (W-71)	0.1543	0.50	8	0	8	4	8	0	0	1	0	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.09	0.00	$0
	3591-72 (W-60)	0.1543	0.61	6	1	27	45	37	21	11	6	1	0.00	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00	$1
	3730-61 (W-95)	0.1543	0.74	17	10	64	104	140	146	147	56	13	8.33	32.75	134.27	0.00	0.00	0.00	11.47	2.47	4.42	$185
	3730-62 (W-94)	0.1543	0.47	14	5	48	75	116	90	89	35	0	80.33	82.62	630.45	15.99	6.57	0.00	44.52	15.25	0.00	$795
	3730-63 (W-112)	0.1543	0.64	32	21	213	247	275	250	264	104	80	25.15	98.51	566.90	0.00	0.00	0.00	22.32	10.66	13.90	$712

Table 8-4 (continued)
2010 Pumping Cost Reimbursement for Well Owners
Included in Settlement Agreement

Well Owner / Service Area	Well ID	Power Cost ($/kwh)	Pump* Efficiency	Pumpage (af) Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Reimbursement ($) Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Paramount Farming Co.	3730-64 (W-111)	0.1543	0.63	30	19	179	220	232	215	195	61	0	69.83	172.00	965.33	5.32	0.00	0.00	35.94	10.47	0.00	$1,189
	3730-65 (W-53)	0.1543	0.54	11	6	65	81	87	74	54	16	4	18.73	61.02	377.38	2.91	0.00	0.00	27.29	5.58	4.35	$479
	3730-66 (W-59)	0.1543	0.72	17	10	97	114	122	111	80	51	32	8.82	38.47	212.74	1.88	0.00	0.00	7.18	3.27	6.45	$270
	3730-67 (W-96)	0.1543	0.64	17	9	77	100	116	99	84	38	9	22.39	52.63	278.83	2.13	0.00	0.00	16.61	5.08	3.04	$358
	3730-68 (W-48)	0.1543	0.60	14	4	61	74	0	1	0	0	0	15.03	26.61	207.32	0.00	0.00	0.00	0.00	0.00	0.00	$234
	3730-70 (W-108)	0.1543	0.67	72	28	206	209	223	215	114	67	63	53.13	124.85	446.83	3.63	0.00	0.00	22.47	7.27	9.60	$615
	3730-72 (W-107)	0.1543	0.75	0	0	50	73	70	62	63	31	10	0.02	0.00	30.35	0.95	0.00	0.00	8.94	1.25	0.42	$42
	3921-62 (W-78)	0.1543	0.67	31	6	100	72	116	94	56	32	28	14.09	22.89	61.33	0.00	0.00	0.00	0.78	3.26	0.00	$88
	7101-61 (W-61)	0.1543	*0.70*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	7102-61 (W-99)	0.1543	0.66	0	0	0	0	11	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	7102-62 (W-66)	0.1543	0.58	0	0	0	0	0	6	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	7102-63 (W-65)	0.1543	0.70	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	7102-64 (W-64)	0.1543	0.63	0	0	0	0	4	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	7102-65 (W-70)	0.1543	*0.38*	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$0
	7102-66 (W-67)	0.1543	0.57	0	4	3	5	3	2	2	2	0	0.00	1.26	0.51	0.00	0.00	0.00	0.11	0.00	0.00	$2
	Total			**420**	**172**	**2,276**	**2,910**	**3,333**	**2,494**	**1,752**	**773**	**453**	**$353**	**$815**	**$5,011**	**$42**	**$7**	**$0**	**$256**	**$85**	**$73**	**$6,642**
Total (All Wells)				**1,519**	**1,069**	**3,052**	**3,739**	**4,867**	**4,304**	**2,899**	**1,777**	**713**	**$353**	**$815**	**$5,011**	**$42**	**$7**	**$0**	**$256**	**$85**	**$73**	**$6,642**

* Italicized values indicate estimates or values from 2002, 2007, 2008, or 2009

IX. Summary

Data collected in accordance with the 2010 MPG monitoring program are summarized in this annual report. The MPG classified 2010 as a normal year and engaged in transfer pumping for the sixth time since the Agreement went into effect in 2001.

Pumpage

MPG transfer pumping (and non-MPG transfer pumping by Don Peracchi) occurred between March 15 and November 30 and totaled 11,865 af, which is 15,025 af less than the planned pumpage. MPG pumping for irrigation of overlying and adjacent lands occurred from February through December and totaled 8,071 af (2,060 af less than planned). The sum of MPG transfer and adjacent pumping in 2010 was 19,936 af. The total MPG and Peracchi pumping in FWD was 7,849 af, which is 6,294 af less than the approved pumping program.

Non-MPG pumpage west of the Chowchilla Bypass was estimated to be about 32,000 af in 2010. This included about 14,900 af pumped in the PFC service area, 6,700 af pumped in CCID, and 3,500 af pumped in the CCC service area. Pumpage data are not available for wells east of the Chowchilla Bypass, and the estimates originally made for the 2001 Annual Report (LSCE and KDSA, 2002) were also used for 2010. The total pumpage above the Corcoran Clay east of the Bypass was estimated to be 68,600 af within the study area, which includes about 36,600 af in Aliso Water District and undistricted portions of Madera County and 32,000 af in the undistricted portion of Fresno County east of FWD and Spreckels Sugar Co.

A number of wells in FWD and PFC have been identified as composite wells, but the percentage of the total pumpage occurring below the Corcoran Clay has not been estimated. An estimate of pumpage from the lower aquifer in these composite wells will be made for the next annual report.

Groundwater Levels

Water levels in most wells west of the Chowchilla Bypass have generally been stable over the period of record, but there are notable short-term fluctuations. Water levels rose significantly in almost all shallow and deep wells in 2005 and 2006, due to recharge from flood releases to the SJR and the Bypass and reduced pumping by the MPG and other entities in the study area. After two years of rising water levels, most wells showed residual drawdowns at the end of each year during the 2007-2009 period. In 2010, seasonal drawdowns were similar to previous years, but there was full recovery in early 2011 in almost all wells.

East of the Fresno Slough, water levels in Spreckels Sugar Co. monitoring wells rose during 2003-2006 due to reduced MPG pumping west of the Fresno Slough and recharge from the Bank. In the shallow zone, there were larger drawdowns during 2007-2009 due to extraction from the Bank and MPG pumping. Water levels in shallow wells in the western portion of

Spreckels Sugar Co. showed little recovery at the end of 2008 and 2009, but there was full recovery at the end of 2010.

In the deep zone, water levels in the FWD wells rose during 2005-2006, declined during 2007-2009, and rose in 2010. Water levels in January 2011 were similar to 2004. North of the SJR, hydrographs of deep PFC and CCC wells showed water-level declines from the late 1990s through 2004, followed by rising water levels during 2005-2006 and water-level declines during 2007-2009. Drawdowns in these wells averaged about 31 feet in 2010, and most PFC and CCC wells showed full recovery by early 2011.

Groundwater Quality

TDS concentrations in shallow and deep wells in the Mendota area vary widely, from less than 300 mg/L near the SJR east of the Pool to over 3,000 mg/L west of the Fresno Slough. The CCID wells have the longest period of record showing water quality changes in the Mendota area, with salinity data (measured as EC) going back to the 1960s at several wells. Degradation was observed at several CCID wells, especially in the 1960s and 1970s, due to easterly movement of the saline front. In recent years, degradation has continued at several wells in the CCID area, but most wells showed improved water quality in 2010.

MPG shallow and deep wells west of the Fresno Slough continue to experience degradation due to easterly movement of the saline front, which has increased due to MPG transfer pumping. This is especially true for the CGH wells in the central portion of the well field west of the Slough. Groundwater quality appears to be stable or improving at many wells in the northern and southern portions of the MPG well field along the Fresno Slough. For the southern wells, this is attributed in part to the Bank, which pumps relatively low salinity surface water from the Pool into its recharge ponds.

The operation of the Bank has resulted in substantial water quality improvements in the western portion of the Spreckels Sugar Co. property. In the central portion of the Spreckels' property, however, shallow groundwater remains degraded due to historical wastewater disposal practices. This degraded groundwater has moved downward to the deep zone and is moving north toward the southernmost FWD wells. FWD wells R-3 and R-11 have shown salinity increases as a result, but most other FWD wells exhibit low salinity and stable groundwater quality due to recharge from the SJR and the Mendota Pool.

North of the SJR, the water quality at most wells in the PFC and CCC service areas has generally been stable and acceptable for irrigation. Although many of the PFC and CCC wells have experienced year-to-year salinity fluctuations, the salinity of samples collected in 2010 was similar to that of the mid-1990s.

Surface-Water Flow and Quality

The Pool was not drained in 2010, and the results of the 2010 water budget indicate a southerly flow direction throughout the year. The average monthly DMC inflow across transect A-A' ranged from a high of 345 cfs in June to a low of 36 cfs in March. The average flow to the south was about 166 cfs in 2010.

The salinity of the water delivered to the Pool via the DMC has been subject to large daily and seasonal fluctuations. Daily fluctuations are due to tidal effects in the Delta, and seasonal fluctuations are due to factors such as discharge of drain water to the DMC in the spring. Historically, the highest salinities and greatest daily salinity fluctuations have been measured in the winter and spring, and lower salinity generally occurs during the summer months. These patterns were also observed in 2010, with the highest ECs (a daily average of about 1,000 µmhos/cm) occurring in April and the lowest ECs (a daily average of about 260 µmhos/cm) occurring in July.

The daily average EC values at the SJREC's canal intakes correlated closely with the DMC data in 2010. However, there were several one to three-day periods in March and April when the EC at one or more of the SJREC canal intakes exceeded the EC measured at the DMC by more than the limit specified in the Agreement (90 µmhos/cm). None of these exceedances lasted for more than three days. Since the flow direction in the Fresno Slough is primarily to the south, MPG transfer pumping has the most effect on water quality in the southern portion of the Pool. Sample results document higher salinities at the MWA and other sampling locations in the southern portion of the Pool compared to the SJREC canal intakes.

Surface-water quality data for four key trace elements (arsenic, molybdenum, boron, and selenium) are summarized in the report. Concentrations of trace elements were low in both the northern and southern portion of the Pool, except for elevated selenium concentrations in daily composite samples from the DMC during portions of February, April, and December.

Sediment sampling was conducted in 2010 at eight locations in the Pool. Concentrations of arsenic, boron, molybdenum, and selenium were relatively low at all sampling locations. The selenium concentration in one sample (from the DMC) was above the screening level of 2 mg/kg established by the USFWS.

Compaction

There was no inelastic compaction above the Corcoran Clay at the Fordel or Yearout Ranch extensometers in 2010. At the Fordel extensometer, there was a net expansion of 0.010 foot in 2010, and the cumulative inelastic compaction during the 11-year period beginning in March 2000 decreased to 0.024 foot. This amounts to an average inelastic compaction of about 0.002 foot per year.

At the Yearout Ranch extensometer, the net expansion was 0.009 foot in 2010, and the cumulative inelastic compaction since March 2000 decreased to 0.104 foot. This amounts to an average inelastic compaction of about 0.01 foot per year. The cumulative inelastic compaction caused by MPG transfer pumping since 2000 is estimated to be 0.031 foot, which corresponds to an average annual inelastic compaction of 0.0028 foot. This is less than the limit on average annual compaction of 0.005 foot due to MPG transfer pumping specified in the Agreement.

Total compaction in the area is monitored using high-definition GPS equipment on the Meyers Farm property south of the City of Mendota. Since data collection began in April 2004, there has been about 0.28 foot of total inelastic compaction at this site, which is ten times more than was measured at the Fordel extensometer during the same period. The additional inelastic compaction is apparently occurring in and below the Corcoran Clay.

Pumping Cost Reimbursements

A groundwater flow model was used to estimate the percentage of total drawdown at non-MPG wells caused by MPG transfer pumping. The drawdown percentage was used to calculate the amount of inelastic compaction at the Yearout Ranch extensometer caused by MPG transfer pumping and the reimbursement to be paid by the MPG to other well owners for increased pumping costs. The total reimbursement for all wells was $6,642 in 2010. All of the reimbursement is for pumpage occurring in the PFC service area, and most is for wells in the southern portion of the New Columbia Ranch.

X. References

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FINAL ENVIRONMENTAL ASSESSMENT (12-023)

ANNUAL EXCHANGE AT THE MENDOTA POOL BETWEEN THE BUREAU OF RECLAMATION AND DONALD J. PERACCHI AND AFFILIATES FOR UP TO 3,600 ACRE-FEET OF FARMERS WATER DISTRICT'S GROUNDWATER FOR CENTRAL VALLEY PROJECT WATER THROUGH FEBRUARY 2015

Appendix E
Comment Letters and Reclamation's Response to Comments

June 2012

June 14, 2012

VIA ELECTRONIC MAIL

Ms. Rain Healer
Bureau of Reclamation
1243 N Street
Fresno, CA 93721
rhealer@usbr.gov

Re: Comments on Draft Environmental Documents for Donald J. Peracchi and Affiliates Annual Water Exchanges at Mendota Pool

Dear Ms. Healer,

Thank you for the opportunity to comment on the draft Environmental Assessment and Finding of No Significant Impact (EA/FONSI) regarding water exchanges at the Mendota Pool for Mr. Donald J. Peracchi and Affiliates. We understand that the proposed project will result in an increase of up to 3,600 AF per in the amount of water that is exchanged from the Mendota Pool to the San Luis Canal (or San Luis Reservoir). FWA-1

We note that the only reference to evaluation of potential impacts of the proposed action relative to implementation of the San Joaquin River Restoration Program (SJRRP) is part of the analysis of cumulative impacts. In that regard, the description of the SJRRP includes reference to plans developed by Reclamation for recirculation, recapture, reuse, and exchange or transfer of interim flows, including an EA that analyzed the impacts of recirculation of interim flows entitled Recirculation of Recaptured Water Year 2012 San Joaquin River Restoration Program Interim Flows that resulted in a FONSI that was completed on April 3, 2012.

The 2012 recapture and recirculation of Interim Flows includes water that is exchanged from the Mendota Pool to the San Luis Canal (SLC) or San Luis Reservoir (SLR) in the same manner as the proposed project and we anticipate that will continue to be the case as long as there are limitations on the amounts of Interim or Restoration Flows that can be released past Sack Dam, which could include the period covered by this environmental documentation.

We are pleased to see that the conclusion relative to cumulative impacts is that the proposed action will not interfere with the SJRRP. While we have no fundamental objection to the project, the description of the SJRRP only includes reference to the 2012 recapture and recirculation actions and there is no description of the analysis that supports that conclusion. The EA does not contain any analysis or data to support its conclusion that the proposed action will not adversely affect the volume or timing of Interim or Restoration Flows that can be recaptured at the Mendota Pool and exchanged to the SLC or SLR for the duration of the proposed action. Likewise, the EA does not contain analysis or data to support its conclusion that the proposed action will not have a significant effect, cumulative or otherwise, on the SJRRP. While the data and analysis may support this conclusion, the failure to include this information in the EA renders the EA and the proposed FONSI fatally defective. We trust USBR will correct this deficiency, obtain any necessary data and perform all required analyses, and reissue the EA and proposed FONSI before undertaking the proposed action. FWA-1 cont.

If you have any questions regarding these comments, please to not hesitate to contact Steve Ottemoeller at 559-562-6930 or sottemoeller@friantwater.org.

Sincerely,

Ronald D. Jacobsma
General Manager

Response to Comments from the Friant Water Authority

FWA-1 The Mendota Pool is impounded by Mendota Dam, which is owned and operated by Central California Irrigation District (CCID). The Pool is supplied with surface water from the Delta-Mendota Canal (its' primary source), the San Joaquin River (during restoration and flood releases from Friant Dam), and the Kings River via Fresno Slough (during flood releases from Pine Flat Dam). In addition, local wells owned by the Mendota Pool Group (MPG), Tranquillity Irrigation District, and Fresno Slough Water District also pump groundwater into the Pool, and the Mendota Wildlife Area drains its waterfowl ponds into the Pool during the spring. Water is diverted from the Pool for agricultural and wildlife uses. Most of this water is used by the members of the San Joaquin River Exchange Contractors Water Authority (Exchange Contractors) to irrigate lands within their service areas, but there are other Central Valley Project (CVP) contractors that divert water from the Pool for irrigation.

CCID operates and maintains Mendota Dam under a very narrow operating range, and provides no operational storage for water supply operations (Resources Management Coalition 2003). The San Luis & Delta-Mendota Water Authority (SLDMWA) operates and maintains the Mendota Pool on behalf of Reclamation. The Mendota Pool is held at a fairly constant elevation, between 14.2 feet above mean sea level (msl) and 14.5 msl, to maintain water deliveries to water users in the upper end of the Mendota Pool/Fresno Slough areas (Resources Management Coalition 2003). To maintain this constant elevation, releases from Mendota Dam need to be made via the gates and with boards at the dam in place. The gates have a release capacity of approximately 1,500 cubic feet per second. As described in the Final Environmental Assessment/Initial Study (EA/IS) prepared for the 2010 Interim Flow Releases and incorporated in the Supplemental Environmental EAs prepared for the continuation of releases in 2011 and 2012,operations at the Mendota Pool would not change from existing operations during Interim Flow releases due to CCID's operating requirements.

The Final EA/IS and Supplemental EAs prepared for the 2010 through 2012 Interim Flow Releases analyzed the recapturing of Interim Flows at several diversion locations, including existing facilities in the Delta, the Mendota Pool, the Lone Tree Unit of the Merced National Wildlife Refuge (NWR), and the East Bear Creek Unit of the San Luis NWR. Recaptured water available for transfer to Friant Division long-term contractors would range from zero to the full quantity released and would vary based upon the year type and subject to available capacity within CVP/State Water Project storage and conveyance. Recaptured Interim Flows diverted by CVP contractors at the Mendota Pool would be in lieu of supplies typically delivered via the Delta-Mendota Canal. CVP water supplies that would have been delivered via the Delta-Mendota Canal would then be made available for delivery to the Friant Division, subject to existing contractual obligations and existing and any future agreements. Reclamation would assist

Friant Division long-term contractors in arranging agreements for the transfer or exchange of flows recaptured at these locations.

As described in Section 1.3 and Section 2 of EA-12-023, the extraction of groundwater by Farmers Water District (FWD) wells and subsequent exchange with Reclamation at the Mendota Pool was included in the affected environment analyzed in the MPG Environmental Impact Statement (EIS)-01-81 *Mendota Pool 10 Year Exchange Agreements*. The only difference between the Proposed Action analyzed in this EA and the action analyzed in EIS-01-81 is the delivery of CVP water to Donald J. Peracchi and affiliates lands in Westlands Water District (WWD) rather than MPG lands in WWD and San Luis Water District. As the groundwater pumped under the Proposed Action is the same amount of water previously included under the MPG exchange program, there would be no additional groundwater pumped for introduction into the Mendota Pool under the Proposed Action beyond what is already occurring. This would not change CCID's operations of Mendota Pool nor would it impact the release or potential recapturing of Interim or Restoration Flows at Mendota Pool as operation of the Mendota Pool would not change.

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