

JAMES IRRIGATION DISTRICT
CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

APPENDIX A
PUBLIC PARTICIPATION

WEST SIDE ADVANCE

14693 W. Whitesbridge Ave.
P.O. Box 336
Kerman, CA 93630
Telephone: 559-846-6689

This space is for the County Clerk's Filing Stamp

PROOF OF PUBLICATION
(2015.5 C.C.P.)

STATE OF CALIFORNIA
County of Fresno,

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the **West Side Advance**, a newspaper of general circulation, printed and published weekly in the City of Kerman, County of Fresno, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Fresno, State of California, under the date of February 9, 1956, Case Number 45745; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following date, to-wit:

Dec. 31, Jan 7

all in the year 20 09. I Certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Kerman, California this 7th

day of January, 20 09

Kathy A. Matthe

Signature

Proof of Publication

Notice of Hearing on Intention
To Update Groundwater

NOTICE OF HEARING ON INTENTION TO UPDATE GROUNDWATER MANAGEMENT PLAN FOR JAMES IRRIGATION DISTRICT NOTICE IS HEREBY GIVEN that at 10:00 a.m. on January 13, 2009, at 8749 9th Street, San Joaquin, CA, a public hearing will be held to discuss whether or not the James Irrigation District should update their Groundwater Management Plan to be in compliance with California

Senate Bill No. 1838

Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their service areas.

Landowners within the agency boundaries and other interested parties are invited to attend the hearing. Opportunity for public questions and input will be provided at the hearing. In compliance with Water Code § 10753.4 (b), landowners and other interested parties who wish to participate in preparing the Groundwater Management Plan may do so by attending the hearing and indicating their interest or by submitting a written letter to John Mallyon, General Manager, James Irrigation District, 8749 9th Street, San Joaquin, CA 93860.

John Mallyon
District Manager

Dated December 22, 2008

RESOLUTION 2009-01

RESOLUTION
OF THE
BOARD OF DIRECTORS
JAMES IRRIGATION DISTRICT

INTENTION TO UPDATE
GROUNDWATER MANAGEMENT PLAN

At a meeting of the Board of Directors of the JAMES IRRIGATION DISTRICT, a public Irrigation District organized and existing under the Irrigation District Law (California Water Code, Division 11, Section 20,500 *et seq.*) of the State of California, held on the 13th day of January, 2009, the following resolution was adopted:

WHEREAS, the JAMES IRRIGATION DISTRICT adopted a Groundwater Management Plan in 2001 that is in accordance with Assembly Bill 3030; and

WHEREAS, the California Water Code permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, updating the District's Groundwater Management Plan is in furtherance of and consistent with the District's goals and objectives and will be in the best interests of the District's landowners and water users; and

WHEREAS, a public hearing was held on January 13, 2009, to discuss updating the Groundwater Management Plan;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the JAMES IRRIGATION DISTRICT that it is the intention of the District to update their Groundwater Management Plan in accordance with Senate Bill No. 1938, that this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2 and that the Board hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

The foregoing Resolution was introduced and adopted at a Regular Meeting of the Board of Directors of the JAMES IRRIGATION DISTRICT conducted January 13th, 2009, on motion of Director Robert Motte, and seconded by Director Thomas Chaney, was hereby authorized by the following vote:

AYES: 5 (Motte, Chaney, Ayerza, Carvalho, Hale)
NOES: 0
ABSTAIN: 0
EXCUSED: 0
ABSENT: 0



Kenneth R. Hale, President
BOARD OF DIRECTORS
JAMES IRRIGATION DISTRICT

ATTEST:



Donna Y. Hanneman, Secretary
BOARD OF DIRECTORS
JAMES IRRIGATION DISTRICT

CERTIFICATION OF SECRETARY

The undersigned certifies that she is the Secretary of JAMES IRRIGATION DISTRICT and that the foregoing Resolution was adopted by the Board of Directors of said District at a meeting thereof, duly and regularly held on January 13th, 2009, at which meeting a quorum of the Board of Directors was at all times present and acting.

IN WITNESS WHEREOF, I have set my hand and seal of the Board of Directors this 13th day of January, 2009.

{ SEAL }



Donna Y. Hanneman, Secretary
BOARD OF DIRECTORS
JAMES IRRIGATION DISTRICT

WEST SIDE ADVANCE

14693 W. Whitesbridge Ave.
P.O. Box 336
Kerman, CA 93630
Telephone: 559-846-6689

This space is for the County Clerk's Filing Stamp

PROOF OF PUBLICATION
(CIVIL CODE)

STATE OF CALIFORNIA
County of Fresno,

I am a citizen of the United States and a resident of the County aforesaid, I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the **West Side Advance**, a newspaper of general circulation, printed and published weekly in the City of Kerman, County of Fresno, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Fresno, State of California, under the date of February 9, 1956, Case Number 45745; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following date, to-wit:

April 8, 15

all in the year 20 09 I Certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Kerman, California this 15th

day of April, 20 09
Kathy A. Mallick
Signature

Proof of Publication
Resolution 2009-01
Resolution of James Irrigation District

RESOLUTION 2009-01
RESOLUTION OF THE BOARD OF DIRECTORS JAMES IRRIGATION DISTRICT
INTENTION TO UPDATE GROUNDWATER MANAGEMENT PLAN
At a meeting of the Board of Directors of the JAMES IRRIGATION DISTRICT, a public Irrigation District organized and existing under the Irrigation District Law (California Water Code, Division 11, Section 20,600 et seq.) of the State of California, held on the 13th day of January, 2009, the following resolution was adopted:
WHEREAS, the JAMES IRRIGATION DISTRICT adopted a Groundwater Management Plan in 2001 that is in accordance with Assembly Bill 3030 and
WHEREAS, the Cal-

Section 10755.1 and that the Board hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.
The foregoing Resolution was introduced and adopted at a Regular Meeting of the Board of Directors of the JAMES IRRIGATION DISTRICT (conducted January 13th, 2009, in motion of Director Robert Meiss, and seconded by Director Thomas Chaney, was hereby authorized by the following vote:
AYES: 6 (Molitor, Chaney, Ayers, Carver, Hale)
NOES: 0
ABSENT: 0
EXCUSED: 0
ABSENT: 0
Kenneth R. Hale, President
BOARD OF DIRECTORS JAMES IRRIGATION DISTRICT
ATTEST

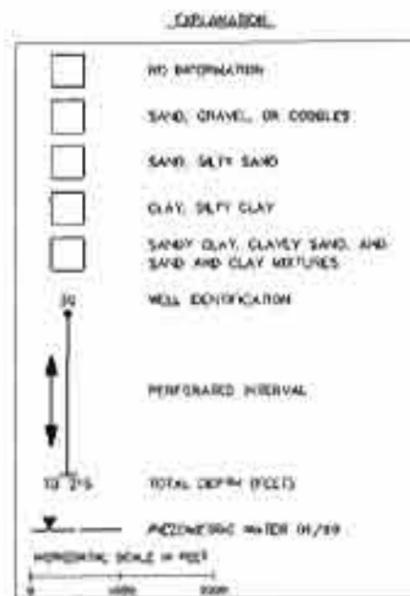
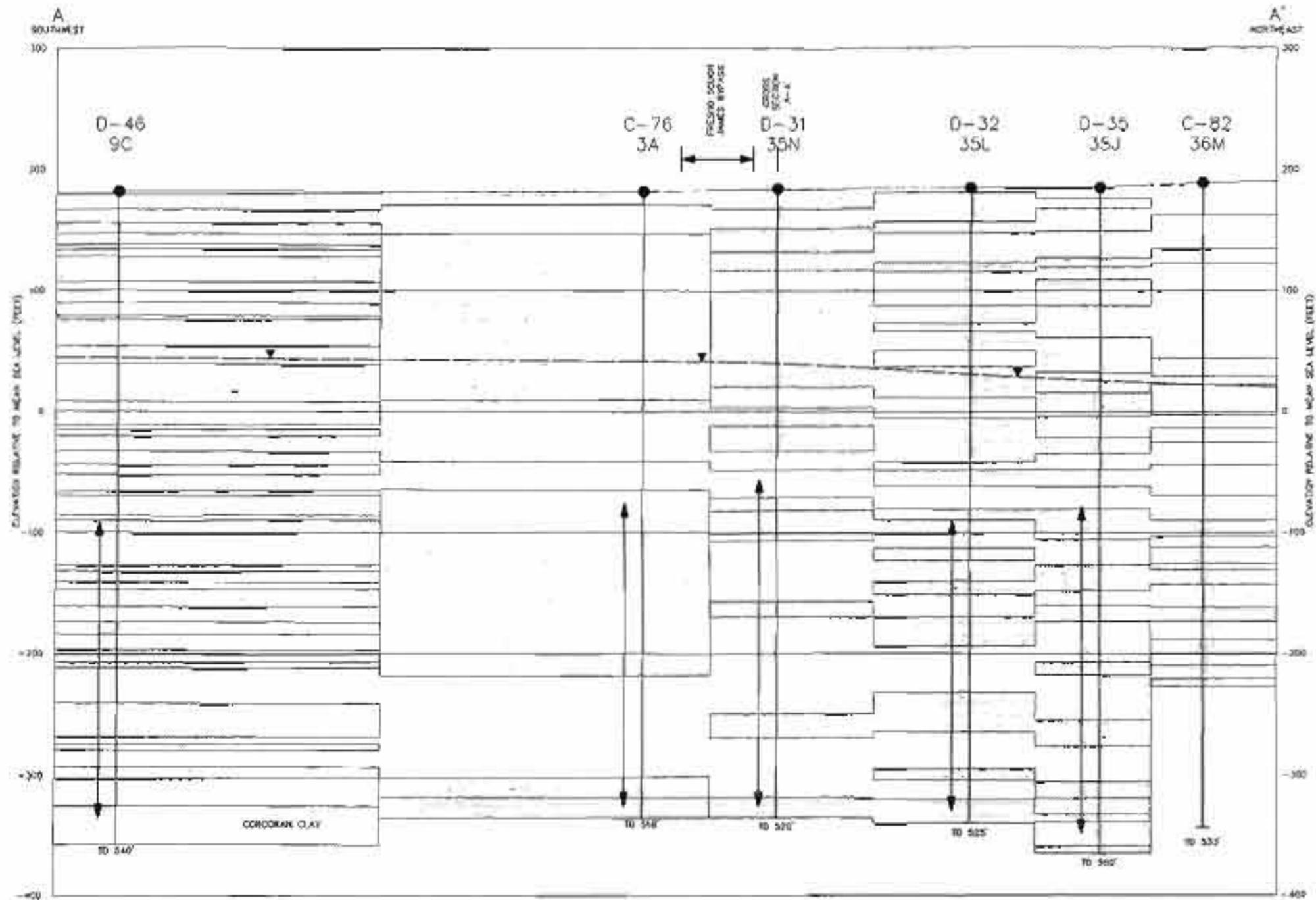
ifornia Water Code permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their service areas; and
WHEREAS, updating the District's Groundwater Management Plan is in furtherance of, and consistent with the District's goals and objectives and will be in the best interests of the District's landowners and water users; and
WHEREAS, a public hearing was held on January 13, 2009, to discuss updating the Groundwater Management Plan
NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the JAMES IRRIGATION DISTRICT that it is the intention of the District to update their Groundwater Management Plan in accordance with Senate Bill No. 1938, that this resolution shall be deemed a resolution of intention in accordance with California Water Code

Doree Y. Hartman,
Secretary
BOARD OF DIRECTORS JAMES IRRIGATION DISTRICT
CERTIFICATION OF SECRETARY
The undersigned certifies that she is the Secretary of JAMES IRRIGATION DISTRICT and that the foregoing Resolution was adopted by the Board of Directors of said District at a meeting thereof, duly and regularly held on January 13th, 2009, at which meeting a quorum of the Board of Directors was at all times present and action
IN WITNESS WHEREOF, I have set my hand and seal of the Board of Directors this 13th day of January, 2009.
Doree Y. Hartman,
Secretary
BOARD OF DIRECTORS JAMES IRRIGATION DISTRICT
1405-W14-13C

JAMES IRRIGATION DISTRICT
CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

APPENDIX B
GEOLOGIC CROSS SECTIONS



Approved by the Board of Association

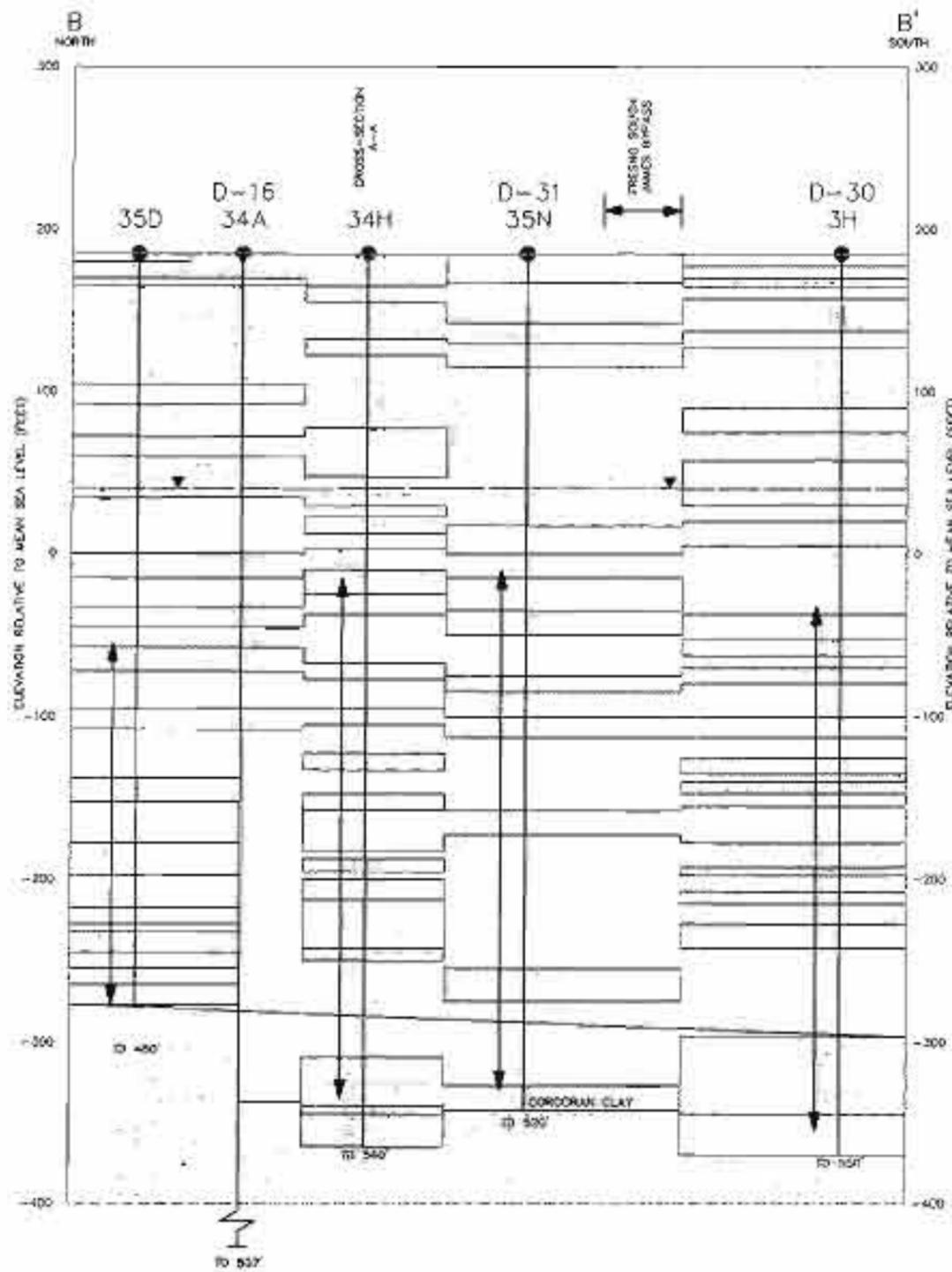
James Irrigation District
Fresno County, CA

Subsurface Geologic
Cross Section A-A'

PROVOST & RICHARD
CIVIL ENGINEERS
1000 N. MARKET ST., SUITE 200
FRESNO, CALIF. 93701
TEL. 438-1111
FAX 438-1112

DATE DRAWN	DATE PLOTTED	SCALE	SHEET
3-15-81	4-1-81	1" = 100'	1 OF 1
DATE CHECKED	DATE APPROVED		

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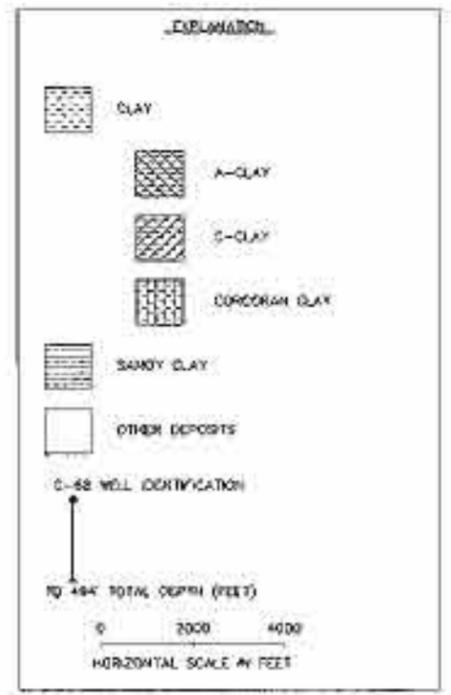
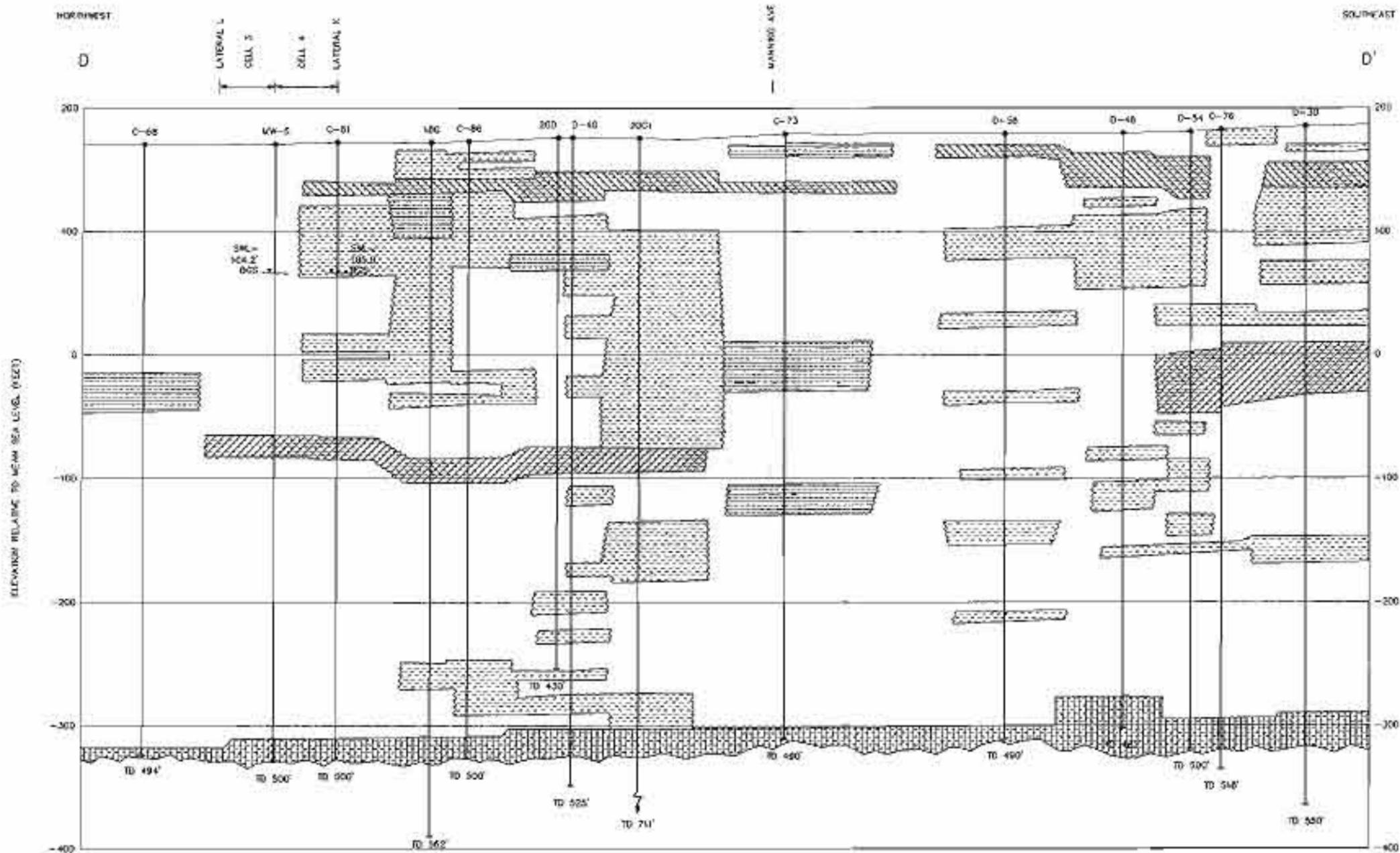


Project (3) Approved
02/20/2007

FROMST & PRITCHARD
ENGINEERS
1000 S. GARDNER ST., SUITE 100
FRESNO, CALIF. 93702
Tel: 559/232-1100
Fax: 559/232-1101

James Irrigation District Fresno County, CA		SCALE AS SHOWN
Subsurface Geologic Cross Section B-B'		DRAWN BY AWC
DESIGN OWNED	DATE 2-13-07	SHEET 1 OF 1
DATE 2-13-07	BY J. L. JONES, P.E.	DATE 2-13-07
APPROVED		

D:\Users\james@fpm.com\My Documents\Projects\2007\2007-02-13\2007-02-13.dwg



Archibald A. Alford
 of
PROVOST & PRITCHARD
 CIVIL ENGINEERS
 1001 N. STREET
 FRESNO, CALIF. 93703
 (559) 433-1111
 www.provostpritchard.com

James Irrigation District Fresno County, CA		SCALE AS SHOWN
Subsurface Geologic Cross Section D-D'		DRAWN BY CVA
DATE 2/2/2005		PROJECT NO. 20500
DATE REVISION		SHEET 1 OF 1
APPROVAL		DATE 2/2/2005

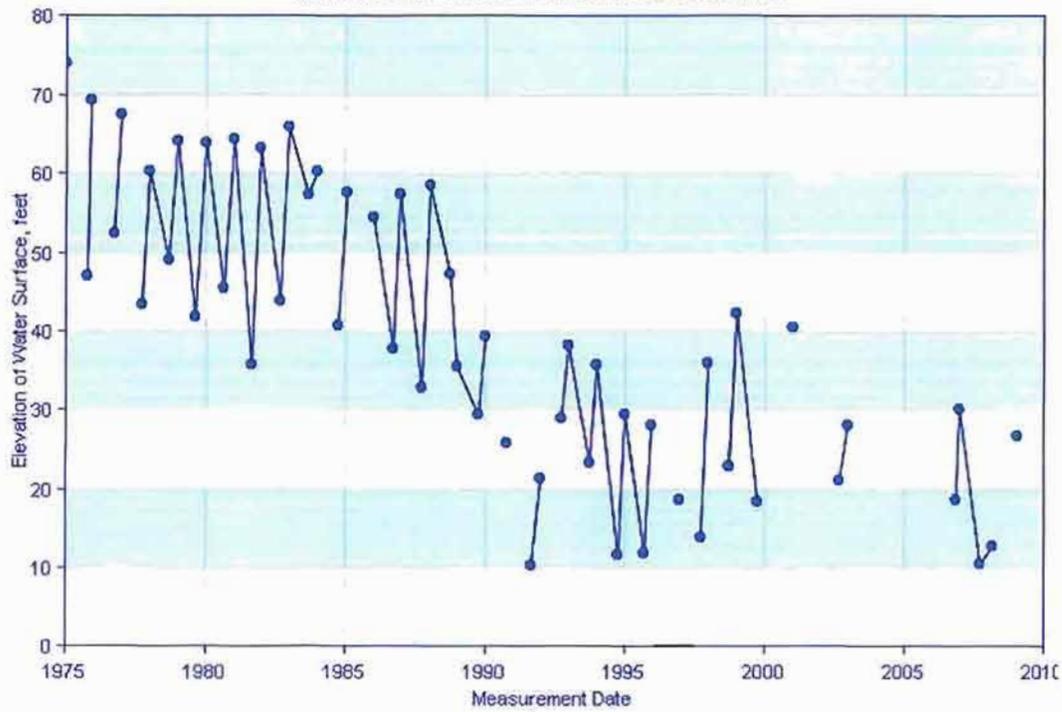
JAMES IRRIGATION DISTRICT
CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

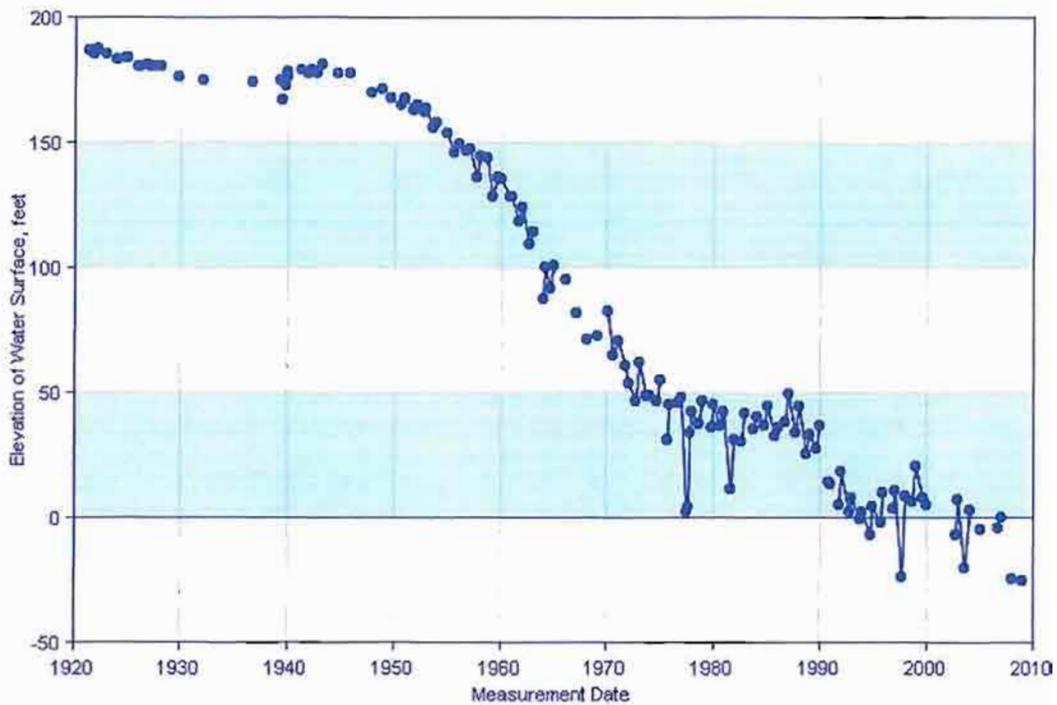
APPENDIX C
WELL HYDROGRAPHS

**JAMES IRRIGATION DISTRICT
APPENDIX C - INDICATOR WELL HYDROGRAPHS**

**Kerman Line of Eastside Wellfield
Groundwater Levels in Well 15S17E15J003M**



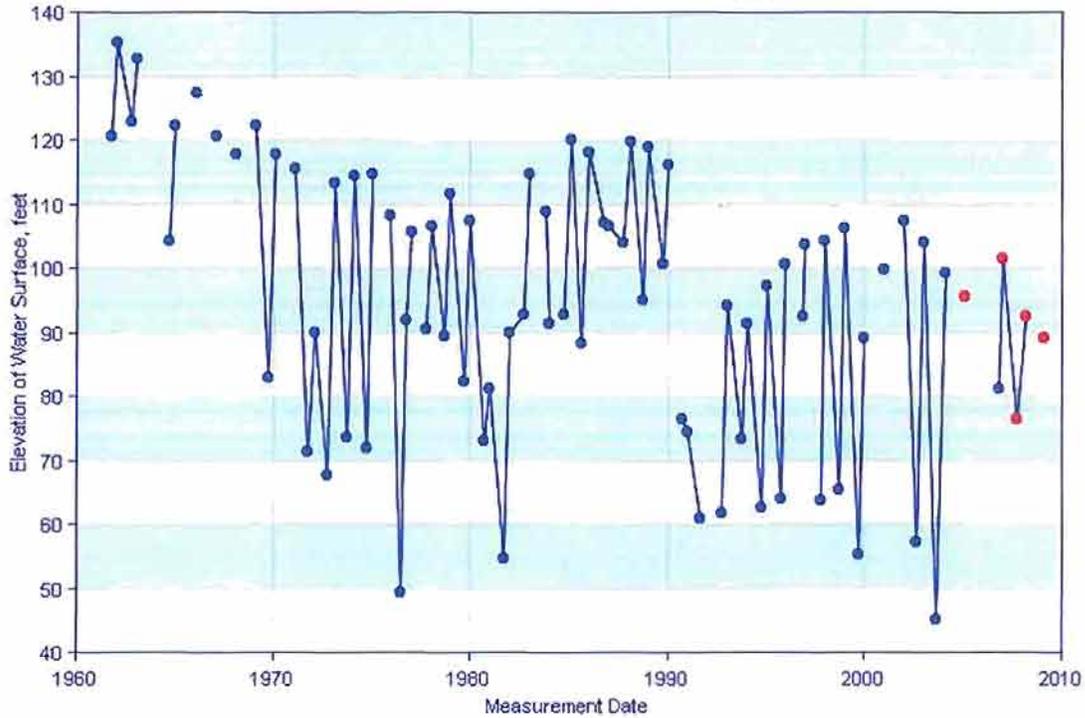
**Along McMullin Grade in Eastside Wellfield
Groundwater Levels in Well 15S18E30L001M**



JAMES IRRIGATION DISTRICT APPENDIX C - INDICATOR WELL HYDROGRAPHS

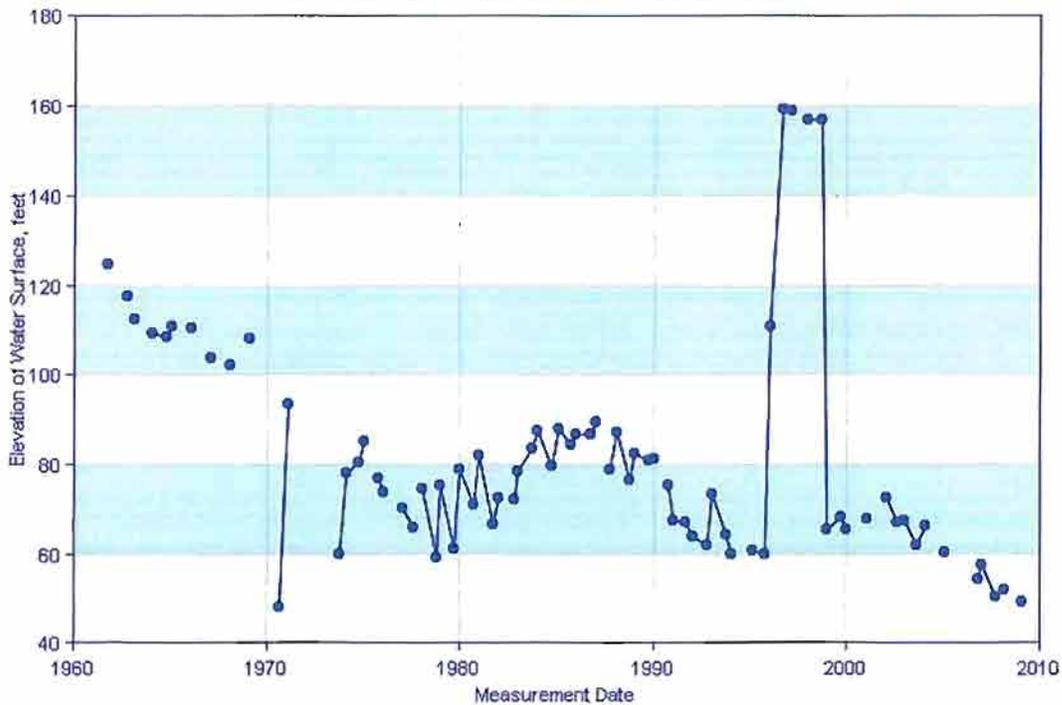
Northern Part of James Irrigation District

Groundwater Levels in Well 14S16E35M001M



Southeast of the City of San Joaquin

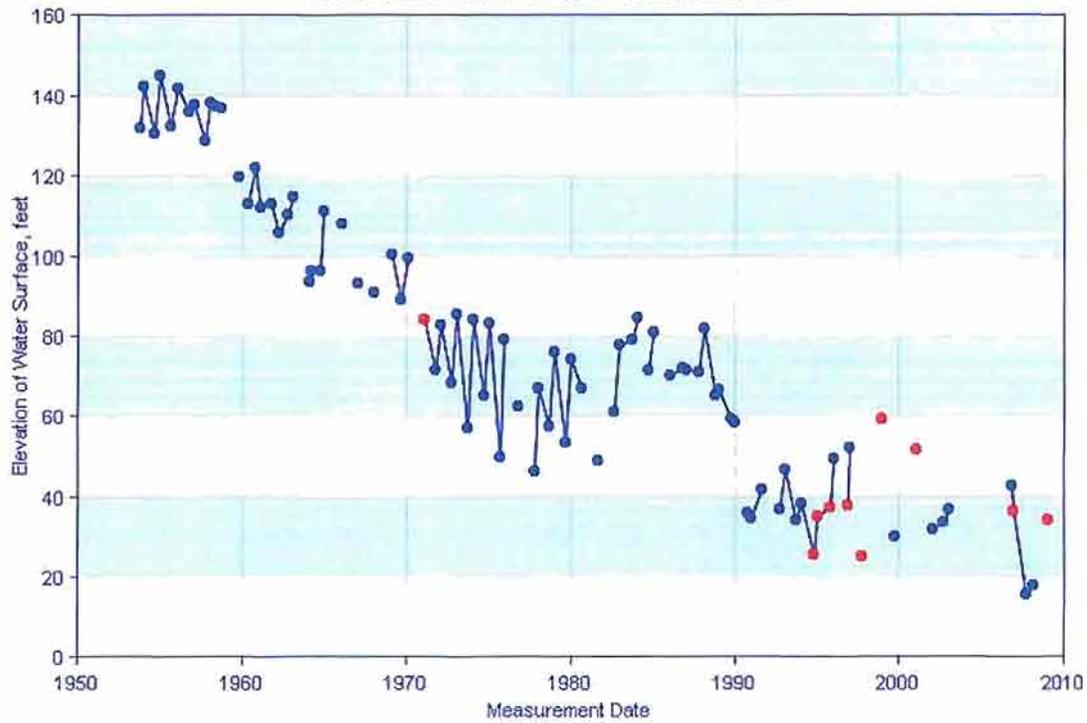
Groundwater Levels in Well 15S17E32L003M



JAMES IRRIGATION DISTRICT APPENDIX C - INDICATOR WELL HYDROGRAPHS

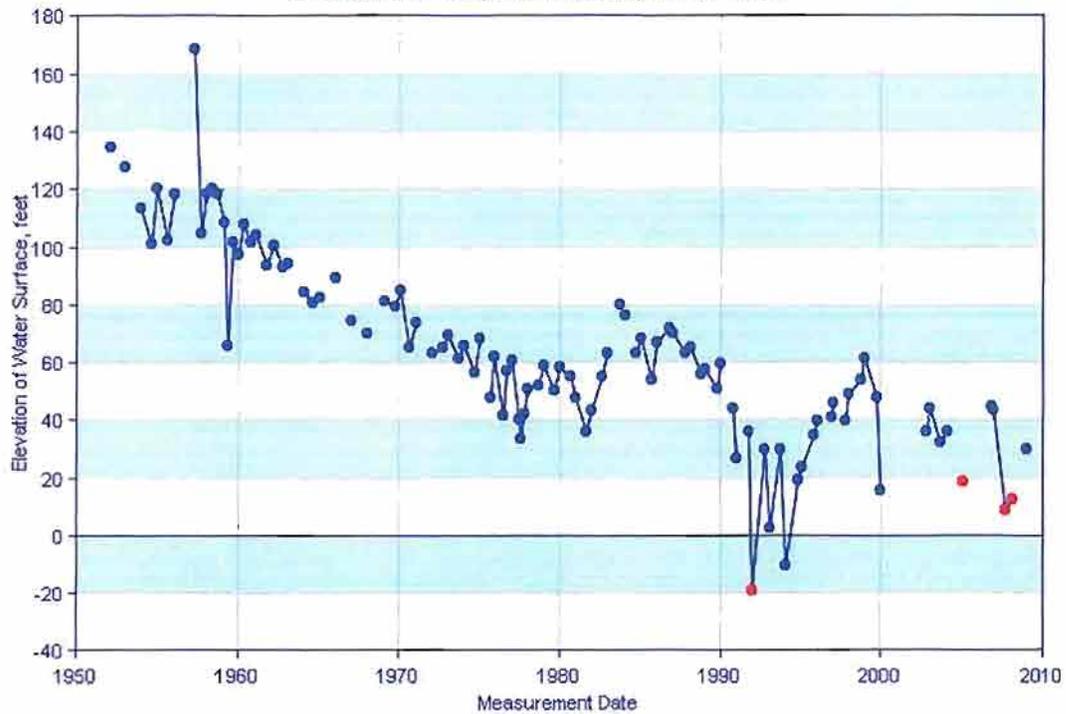
Along James Irrigation District Main Canal

Groundwater Levels in Well 15S17E28K001M



Southern Boundary of James Irrigation District

Groundwater Levels in Well 16S17E04P001M



WELL WATER QUALITY TESTS

TOTAL DISSOLVED SOLIDS / PARTS PER MILLION

LOCATION	STATUS	YEAR <-> WELL #	1999 PPM	2000 PPM	2001 PPM	2002 PPM	2003 PPM	2004 PPM	2005 PPM	2006 PPM	2007 PPM	2008 PPM	2009 PPM	2010 PPM	2011 PPM	2012 PPM	2013 PPM	2014 PPM	2015 PPM	2016 PPM	2017 PPM	2018 PPM	2019 PPM	2020 PPM	2021 PPM	2022 PPM	2023 PPM	2024 PPM	2025 PPM	2026 PPM	2027 PPM	2028 PPM	2029 PPM	2030 PPM	AVG		
MAIN CANAL		D-54 D-54		375	350	375	325	475	500	300	325	325	335	350		400																			340		
MAIN CANAL		D-55 D-55		400	400	275	325	375	300	300	580	300	300	375		400																			354		
INDIGO		D-56 D-56		125	800	675	725	950	700	400	700	650																							740		
INDIGO		D-57 D-57	177	325	375	450	500	800																										540			
MAIN CANAL		D-58 D-58		375	400	300	350	375																										300			
KBBW RECOVERY		D-59		350																														350			
KBBW RECOVERY		D-60		800	800																													800			
COALINGA		D-61	300	375																														337			
COALINGA		D-62		525																														525			
		15-18-3E1	1,400																															1,400			
AVERAGE:				729.407	697.498	731.456	650.478	633.26	728.779	681.384	770.688	772.8	754.1	783.8		817.2	826.4			710.8	713	1214	888.8	697.3	702.3	519.4	267.8	641.1	889.8		800.8	685.7	585.8		728.8		
TOTAL WELLS TESTED				59	57	88	42	81	88	88	56	88	88	60	0	98	58	0	0	33	84	7	63	44	51	36	8	60	88	0	81	60	40	6	19		
LEGEND:																																					

JAMES IRRIGATION DISTRICT
CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

APPENDIX E

*MOU BETWEEN JAMES IRRIGATION DISTRICT AND
CITY OF SAN JOAQUIN*

constitute a joint powers agreement.

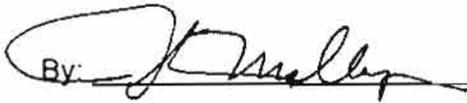
TERM

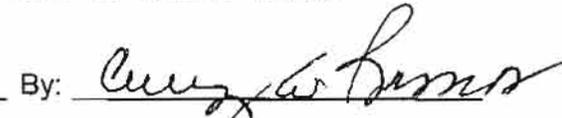
The initial term of the MOU shall commence on the date signed by both agencies, and continue for five (5) years, and shall continue year to year thereafter. This MOU can be terminated by either agency at any time including the initial term for any reason with 30 days written notice to the other party.

The City and District hereby acknowledge the potential benefits of pursuing the aforementioned water management actions and agree to work together to implement such actions. In WITNESS WHEREOF, the parties have executed this MOU as of the effective date.

JAMES IRRIGATION DISTRICT

CITY OF SAN JOAQUIN

By: 

By: 

Title: GENERAL MANAGER

Title: City manager

Date: APRIL 13, 2010

Date: 4-21-2010

By: _____

By: _____

Title: _____

Title: _____

Date: _____

Date: _____

JAMES IRRIGATION DISTRICT



GROUNDWATER QUALITY MONITORING AND MITIGATION PLAN

JULY 2010

PREPARED BY:





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Attachment 1 – Groundwater Quality Map

Attachment 2 – Groundwater Quality Graphs by Region



List of Abbreviations

AF	Acre-feet
DWR	Department of Water Resources
gpm	gallons per minute
JID	James Irrigation District
MP	Monitoring Plan
PVC	Poly-vinyl chloride
TDS	total dissolved solids



1 - INTRODUCTION

1.1 - Overview

This monitoring plan (MP) provides guidelines for monitoring the groundwater supply in the James Irrigation District.

This monitoring plan addresses the following topics:

- Monitoring well network
- Groundwater levels
- Groundwater quality
- Mitigation recommendations
- Annual monitoring reports

The following sections provide details of the monitoring plan including monitoring locations, monitoring frequency, water quality constituents, etc.

1.2 - Purpose of Monitoring Plan

The objectives of the monitoring plan are to provide the District with documented information to accomplish the following:

1. Evaluate short-term and long-term changes in groundwater levels to determine the extent of groundwater overdraft, or impact from groundwater recharge facilities.
2. Monitor western JID for shallow groundwater and characteristics typical of drainage impacted lands.
3. Evaluate groundwater quality in western JID for encroachment of poor water quality waters from the west.
4. Evaluate groundwater quality in the Eastside Wellfield for encroachment of saline waters from the Raisin City Oilfield.
5. Identify and monitor measures to mitigate the groundwater quality.

1.3 - Existing Groundwater Quality

The groundwater quality in JID was evaluated through an analysis of long-term trends and spatial characteristics in total dissolved solids. Total dissolved solids (TDS) is often used as a general indicator of groundwater quality, and it is the only parameter that was consistently monitored in JID for the past 30 years. The analysis did not include a statistical evaluation because most wells lack a sufficient number of data points for a meaningful analysis. Rather, the evaluation is based on visual examination of TDS graphs. The TDS data and graphs used in the analysis can be found in **Appendix A**. The District was separated into six different areas based on 'Area B', thought to be impacted by the Raisin City Oilfield, and 'Area A', an area with little groundwater quality data that is experiencing growth in irrigation well development. These areas are shown

James Irrigation District
Groundwater Quality Monitoring and Mitigation Plan



on the attached Groundwater Quality Map (**Attachment 1**). There is insufficient long-term data in Area C to form any conclusions. Note that not all District wells were used in the analysis, but instead representative wells with long-term data in each area were used. The results are summarized in **Table 1** below.

Table 1 – Groundwater Quality Evaluation for James Irrigation District (TDS)

Area	Average*	Range*	Long-Term trend		GW Quality vs. Perforated Interval
			ppm/year*	Remarks	
A	700	300-1,000	+10	Mixed	All perforations similar (~260 to 500 feet)
Vicinity of Area A	375	325-500	Stable	Stable except for slight increase in last 2 years	All perforations similar (~250 to 500 feet)
Area B	1,200	500-2,500	+30	Wells used to have similar water quality but now there is a wide range. All wells increasing in TDS. Well C-70 went up 2,000 ppm in 17 years.	Improves with depth. Wells perforated from 360 to 780 feet have best water quality.
North of Area B	1,100	500-1,750	+2	Mixed but overall slight increase.	Most wells perforated in the same interval but there appears to be a slight improvement with depth
West of Area B	650	375-1250	+10	Most wells increasing each year	Wells perforated in approximately the same depths
East of Area B	400	200-750	+ 7	Wells used to have similar water quality but now there is a wide range. Big jump in 2007 to 2008. Worst near Well C-62 with water quality improving north and south.	No pattern of water quality with depth.

James Irrigation District Groundwater Quality Monitoring and Mitigation Plan



* The average, range and long term trend (ppm/year) were based on a visual examination of graphs and are considered approximate.



2 - MONITORING WELL NETWORK

The monitoring network will include a combination of JID recovery wells (operational and abandoned), JID monitoring wells, and some private wells (operational and abandoned).

Due to a constantly evolving well network a thorough well canvass is recommended to inventory all existing wells. A well canvass would provide helpful information for planning new well sites and evaluating impacts to wells from existing and new JID wells. The well canvass would document the following information for each well:

- Well location (address and section, township and range)
- Well ID number
- Well owner
- Type of well
- Well status (active, abandoned, etc.)
- Well casing diameter
- Well depth
- Perforated interval
- Foundation
- Power supply
- Horsepower
- Discharge pipe diameter
- Discharge direction
- PG&E Tag No.
- Ground surface elevation
- Reference point elevation
- Digital image of well site



3 - GROUNDWATER LEVEL MONITORING

Existing Groundwater Level Monitoring

Groundwater level monitoring in JID includes the following:

Bi-annual Monitoring. PG&E pump tests are performed at each production well every other year, and water levels are measured as part of the tests.

Semi-annual Monitoring. Seventeen production and monitoring wells scattered throughout the District are monitored semi-annually (January and October) and the data is reported to DWR.

Monthly Monitoring. Five monitoring wells scattered throughout the District are monitored monthly.

Weekly Monitoring. Several monitoring and recovery wells at the Lateral K Recharge Basin are monitored weekly. In addition, several wells have data loggers for collecting continuous data.

A thorough well canvass (see Section 2) is recommended to list and inventory all the wells that are monitored.

Monitoring Recommendations for New Wells

The following recommendations are provided for monitoring new wells:

New production wells. Any new production well should be monitored semiannually.

New shallow monitoring wells in Westside of JID. New shallow wells on the Westside of JID should be monitored monthly.

New deep monitoring wells in Central Portion of JID. New deep monitoring wells should be monitored at least semiannually.



4 - GROUNDWATER QUALITY MONITORING

The purpose of groundwater quality monitoring is to identify impacts to the local groundwater supply, and characterize the quality of the water that is pumped and delivered to local growers.

The following recommendations are provided for monitoring groundwater quality in JID

1. Continue to test each new well for an Agricultural Suitability Analysis.
2. Perform Agricultural Suitability Analysis every 5 years (2015, 2020, 2025, etc.) in selected wells in areas of concern. This will be timed with the submission of 5-Year Water Management Plans to the USBR.
3. Test for Additional Constituents in Wells near the City of San Joaquin. If funding from the City of San Joaquin is available, perform more detailed water quality sampling in JID wells near the City of San Joaquin. This information could be useful in determining the quality of groundwater that may be migrating toward the City. Constituents that could be tested include arsenic, gross alpha, Total Organic Carbon, and other constituents important to drinking water quality.
4. Continue to measure Total Dissolved Solids in each well annually. Perform the testing during the same month each year, and document the month in the summary spreadsheet.
5. Regularly calibrate the hand-held TDS meter used to test wells each year, to help ensure that measurements are accurate and trends are properly identified.

Testing Laboratory

Water quality testing should preferably be performed by the same laboratory each sampling period for consistency. Samples will be collected by JID staff or their engineering consultant. In the past, JID has typically used Fruit Grower's Laboratory of Visalia, California.

Modifications to Water Quality Monitoring

Overtime, there may be a need to add or remove sampling sites and to adjust the timing of the sampling events. This monitoring plan will be updated with changes to the locations and schedule as needed. If more sampling sites are needed then monitoring wells can be purged and samples collected, or the District could seek permission to collect water quality samples from private agricultural or domestic wells in the area.



5 - MITIGATION RECOMMENDATIONS

The following measures are recommended to mitigate groundwater quality problems in the James Irrigation District.

WELL DRILLING

Continue Drilling Test Holes. Currently, before production wells are drilled, a test hole is installed to determine the lithology and perform an E-log. The E-log is used as a relative measure of groundwater salinity. These test holes have shown that groundwater quality is usually, but not always, better beneath the Corcoran Clay. Continued use of test holes will help to identify the best depth for groundwater quality in new JID wells.

Drill New Wells in Areas with Low TDS. New wells can be drilled in areas that have historically had low TDS values and/or are not showing a temporal increase in TDS. *Currently, the best location for groundwater quality is the northeast portion of the JID wellfield easement.*

Install Wells in Undeveloped Portion of JID Wellfield. A portion of the JID eastside wellfield remains undeveloped with no canals or wells, in particular the area east of Dickenson Avenue on alignments along Bishop Avenue and Adams Avenue. No information is readily available on the groundwater quality in this area, but just to the west the wells produce the best groundwater quality of any JID wells.

Install New Wells in Groundwater Recharge Areas. New production wells can be installed in or near groundwater recharge areas so they can extract some of the lower TDS surface water that was recharged.

GROUNDWATER RECHARGE

Increase Groundwater Recharge. An increase in groundwater recharge, either through construction of new facilities or diversion of more surface water, will help to improve the groundwater quality by diluting the lower TDS surface water with the higher TDS groundwater. Hence, groundwater recharge can be an effective form of salt management.

Install Injection Wells for Groundwater Recharge. Install injection wells (also known as aquifer-storage-recovery wells) in areas that do not have suitable soils for surface infiltration. This will also help to improve groundwater quality.

Groundwater Recharge along McMullin Grade. JID has numerous wells along McMullin Grade, but no dedicated recharge basins are operated in the area. JID's



groundwater recharge facilities are all located along the Fresno Slough Bypass. The McMullin Recharge Group has investigated potential recharge sites in the area, but no good sites were identified. Due to the potential benefits to the groundwater quality, JID should continue to investigate potential recharge sites along McMullin Grade.

WATER MANAGEMENT AND USAGE

Blend Water Supplies to Improve Water Quality. Blend surface water and groundwater supplies so the water delivered to farms is not too high in salts or other constituents. This could be maximized by extending surface water deliveries as long as possible during the irrigation season (i.e. avoid groundwater only periods). This goal can be met with development of additional surface and subsurface storage, and delaying use of surface water when practical.

Pump Lower TDS Wells when Feasible. When feasible, particularly when only some of the District wells are being used, pump water from wells with the best water quality.

Purchase Surface Water Supplies. JID can purchase surplus or unused water supplies from other water agencies, such as the Fresno Irrigation District, and use the water in-lieu of groundwater pumping. The surface water would have better water quality than the groundwater, and any water that percolates will help to improve the groundwater quality.

OTHER

Reduce Seepage in Westside of District. Minimize seepage from conveyance facilities to prevent buildup of shallow groundwater on the Westside of the District. This can be accomplished by compacting canal banks, lining canals, or pipelining canals. The amount of seepage on the District's west side is not accurately known. Therefore, a study and field tests may be needed to evaluate the merits and economics of any seepage control measures. Shallow monitoring wells constructed in 2010 showed groundwater levels were about 80 feet below ground surface, indicating there were no drainage problems. These wells should continue to be monitored.

Prepare a Salt Management Plan. Salt levels in JID area steadily rising, as evidenced from 30 years of continuous groundwater quality data. Under current practices, salts will continue to accumulate in the groundwater and soil, and reduce the beneficial use of the groundwater for crop irrigation. JID should prepare a Salt Management Plan as the initial step in identifying the salt loading sources as well as remedial and preventative measures. The State Water Resources Control Board is encouraging every region in California to develop salt/nutrient management plans by 2014, and it is possible that Salt Management Plans or salt monitoring will be required in the future.

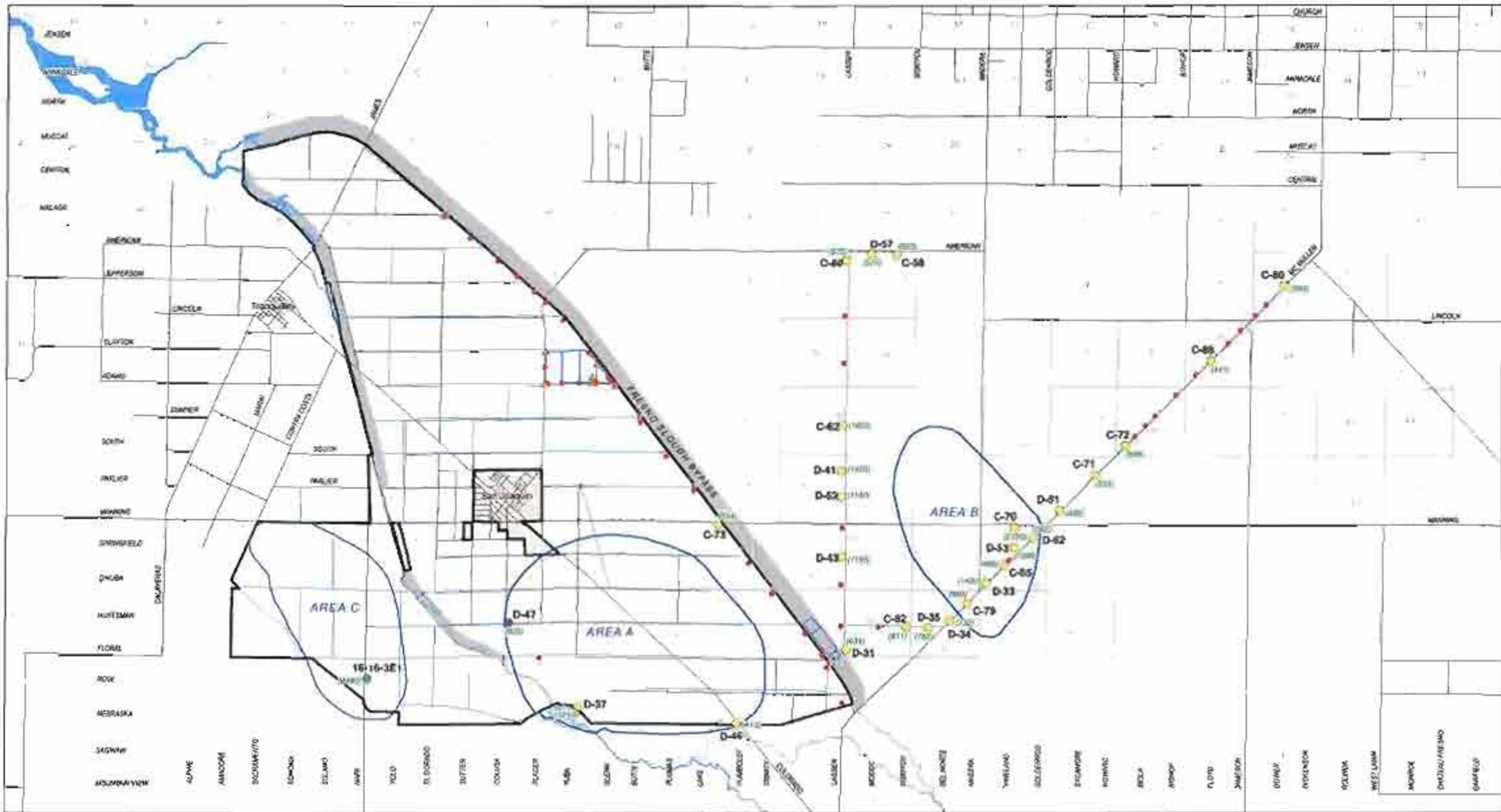


Reformed Land Practices. Groundwater quality generally declines with an increase in pumping. Therefore, water conservation efforts can help to preserve the groundwater quality. Water usage can be reduced by shifting to less thirsty crops, and improving irrigation efficiencies with the installation of drip and micro-irrigation systems. JID will encourage growers to take these steps and will facilitate efforts to secure grants and low interest loans on behalf of the growers.



6 - REFERENCES

1. California Department of Water Resources, *San Joaquin Valley Drainage Monitoring Program 2000, District Report*, September 2003.
2. Division of Water Resources, *Oil Field Waste Water Disposal, Raisin City Oil Field, Fresno County*, March 1955.
3. Provost and Pritchard Engineering Group, Inc., *James Irrigation District 5-Year Water Conservation Plan, 1993-2004*, December 2005.
4. Provost and Pritchard Engineering Group, Inc., *Groundwater Management Program -Technical Report for Local Groundwater Assistance Grant*, December 2007.



0 1 2 Miles

PROVOST & PRITCHARD
 CONSULTING ENGINEERS
 286 W. Cromwell Ave.
 Fresno, CA 93711-6162
 (555) 449-2700

Legend

- James ID
- Redemption District 1606
- James ID Well Field
- Section

Boosters, Lifts, and Wells

- BOOSTER
- MONITOR WELL
- PRODUCTION WELL

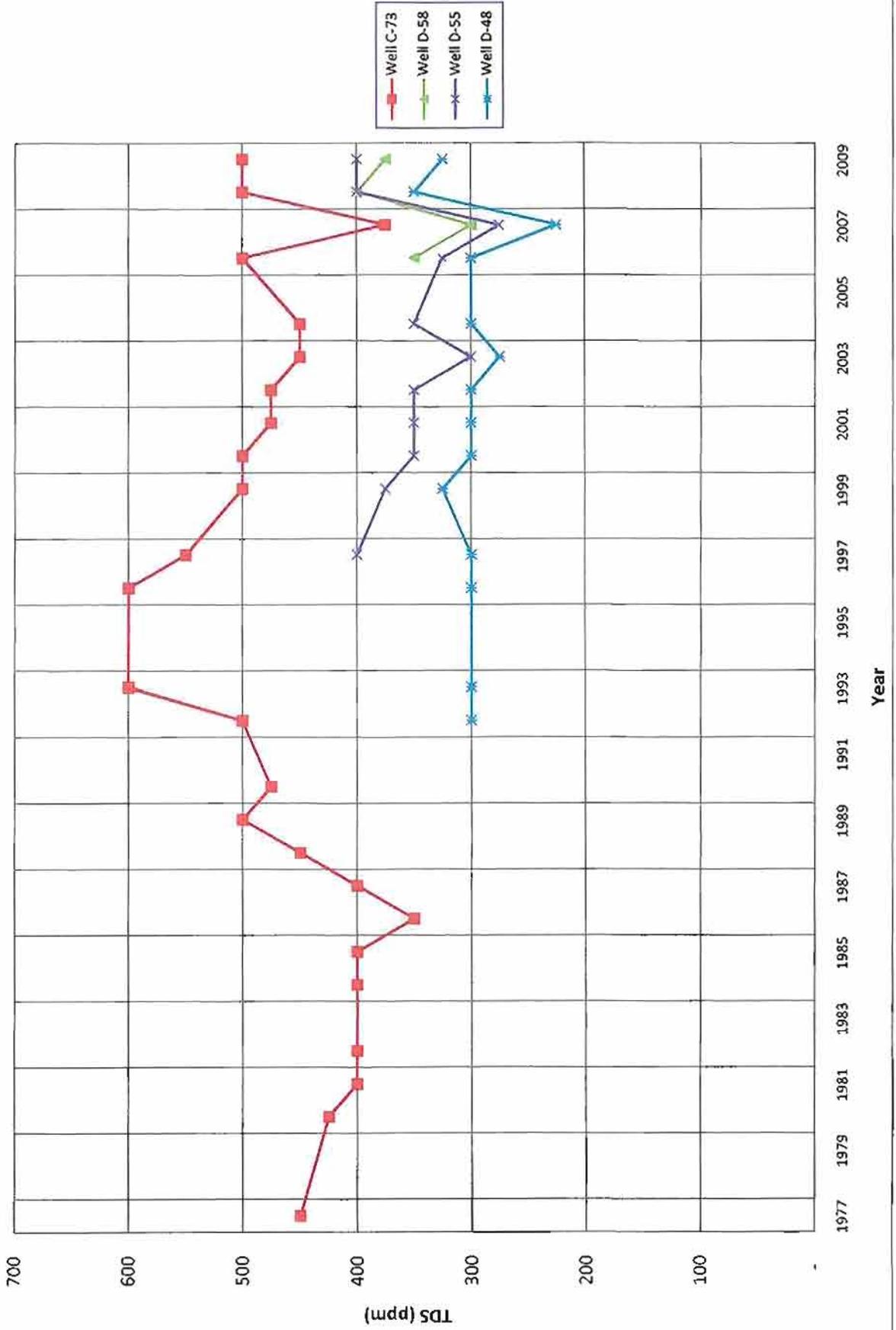
Wells Samples in August 2009
 Labeled With Total Dissolved Solids (ppm)

- Injection Suitability Analysis
- Selenium and Irrigation Suitability Analysis
- Selenium, Arsenic, TOC, Gross Alpha and Irrigation Suitability Analysis

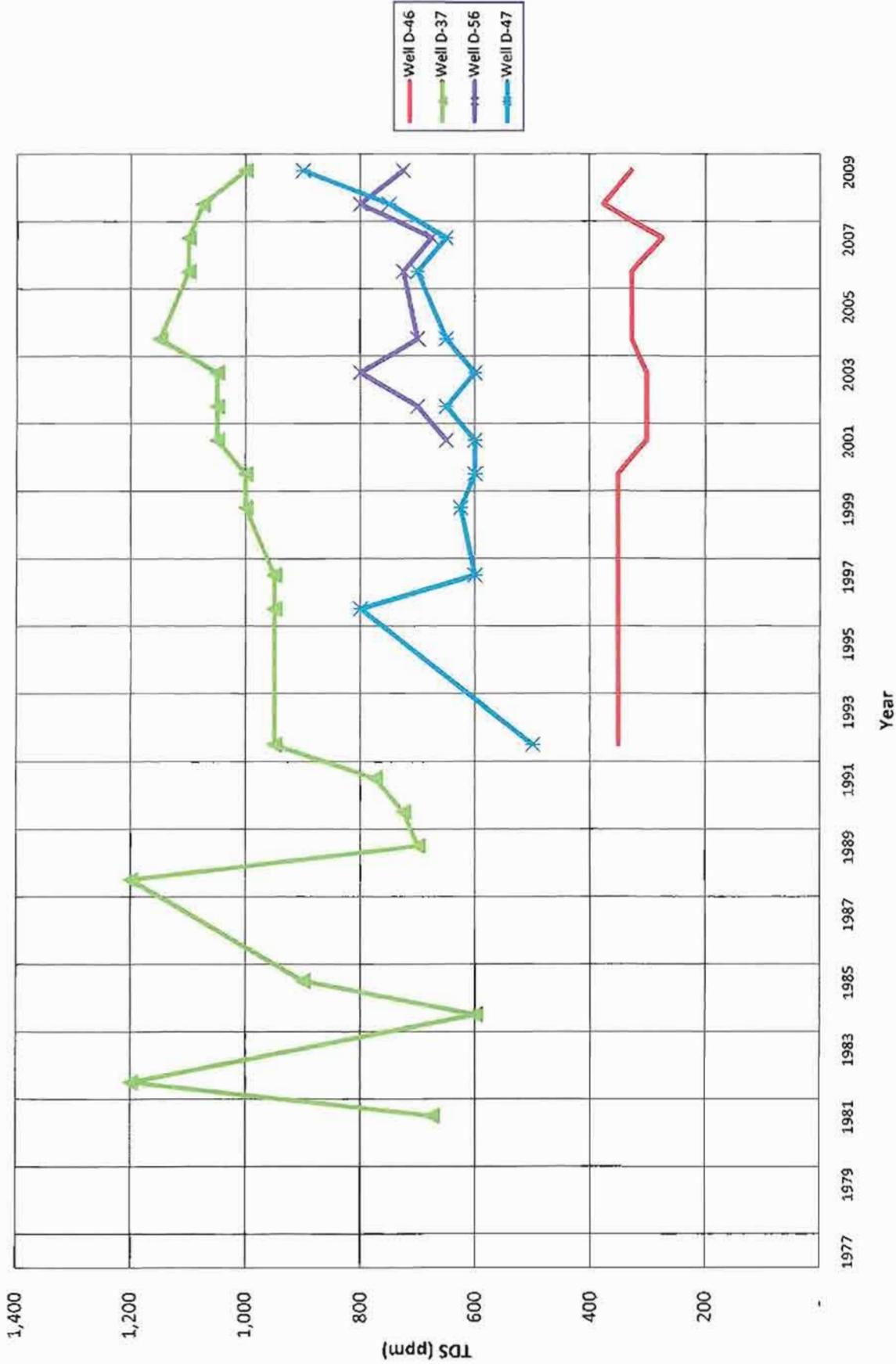
JAMES IRRIGATION DISTRICT

Local Groundwater Assistance Fund Grant
 Groundwater Quality Testing

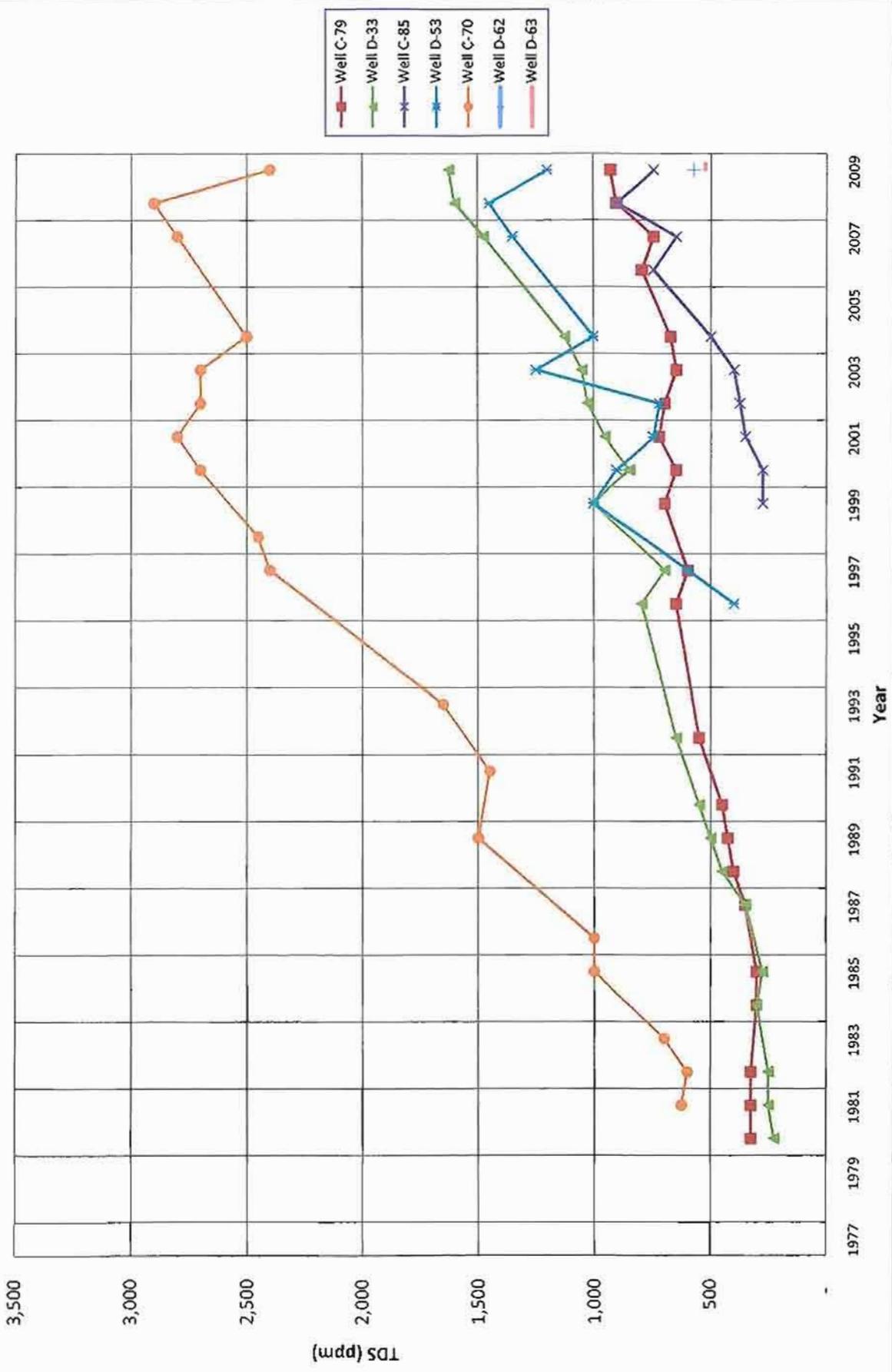
James Irrigation District Groundwater Quality - Vicinity of Area A



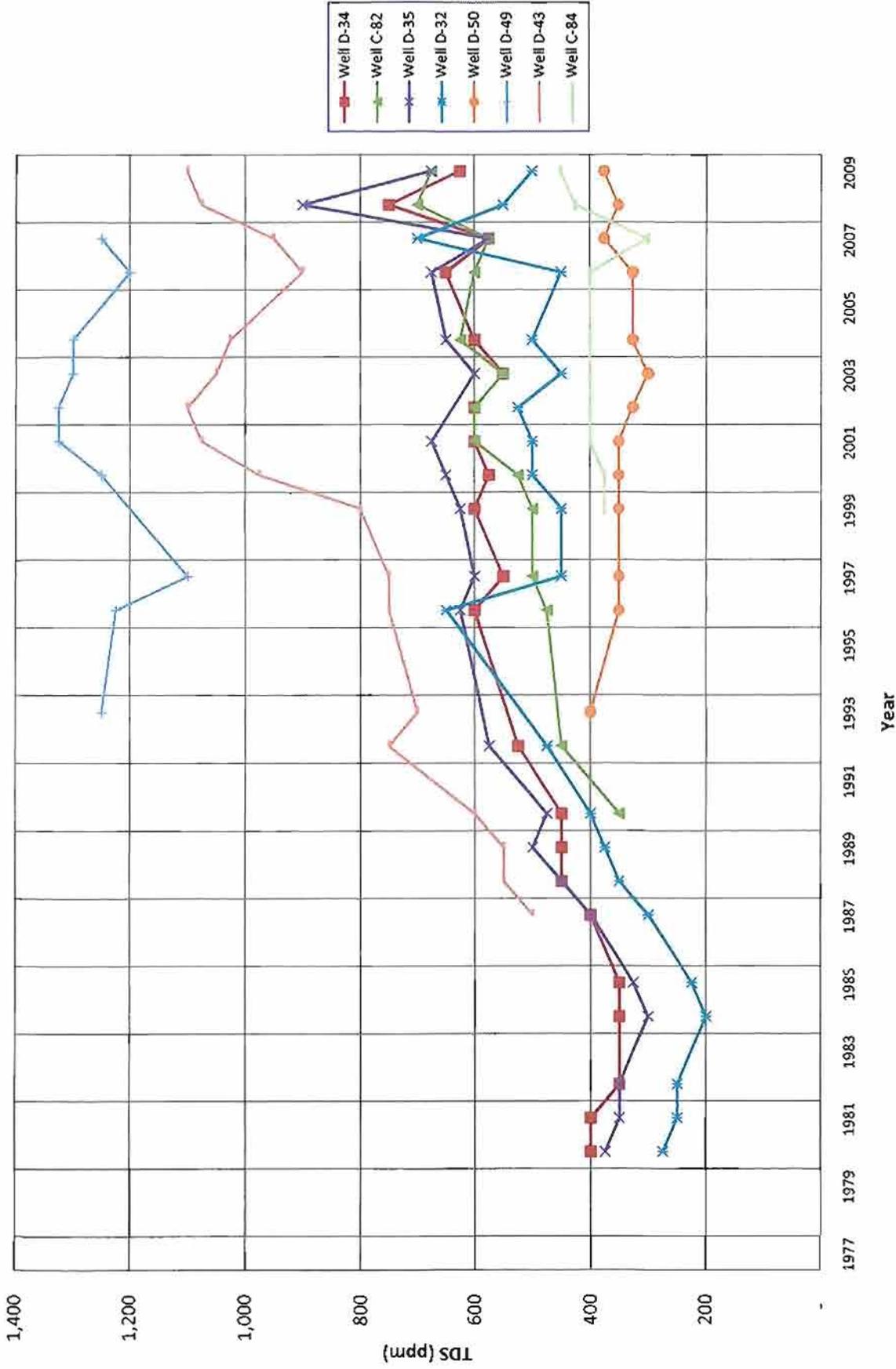
James Irrigation District Groundwater Quality - Area A



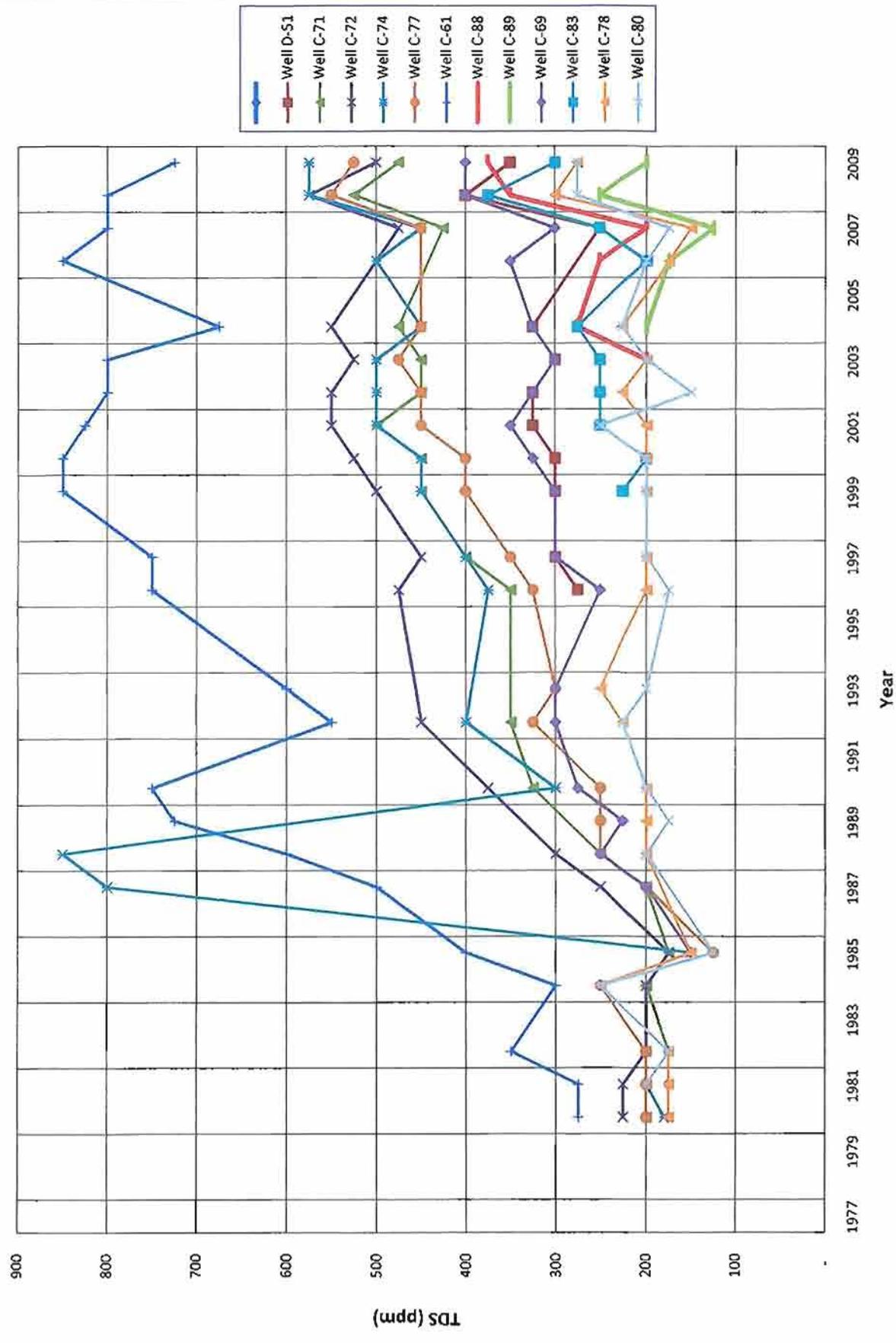
James Irrigation District Groundwater Quality - Area B



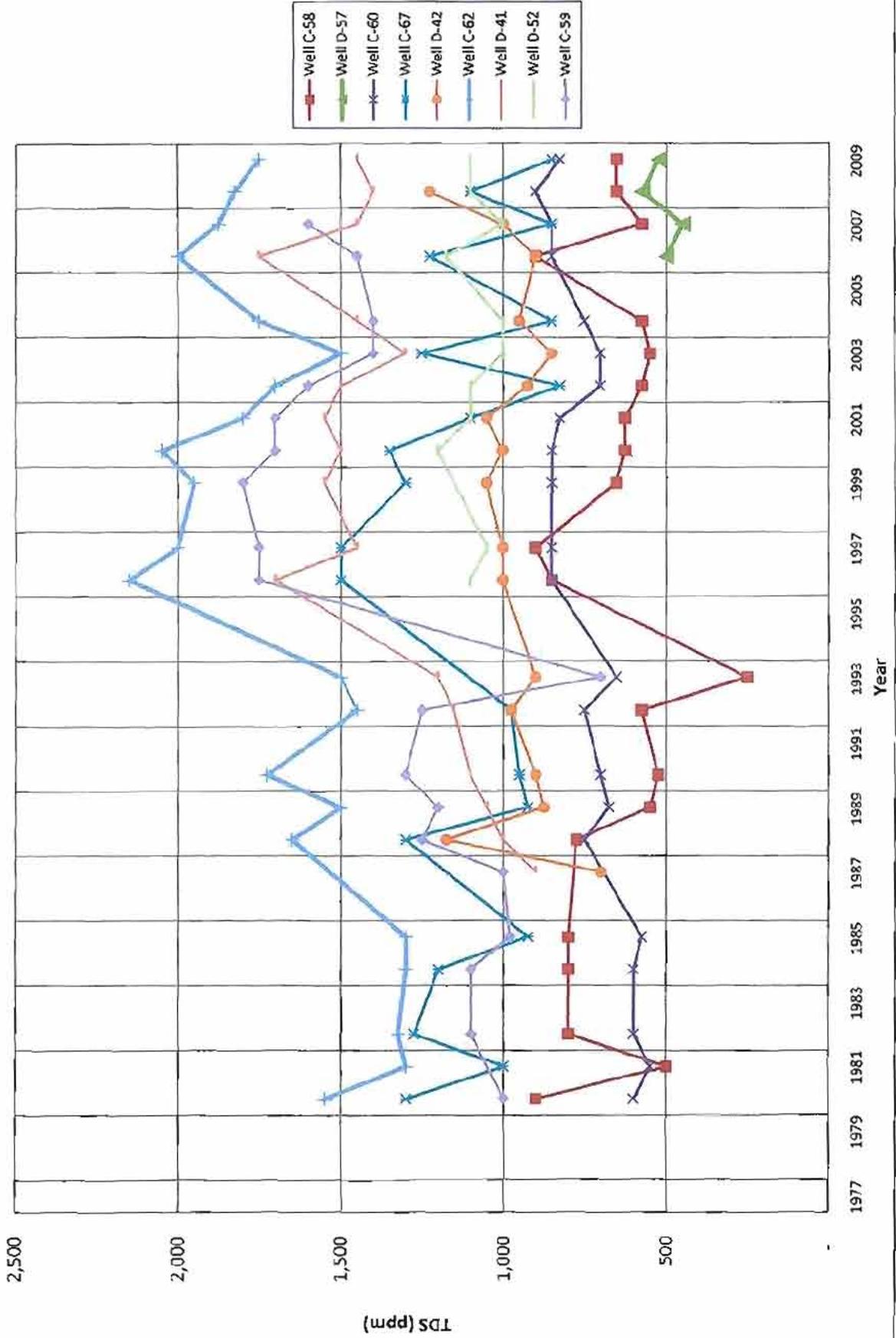
James Irrigation District Groundwater Quality - West of Area B



James Irrigation District Groundwater Quality - East of Area B



James Irrigation District Groundwater Quality - North of Area B



JAMES IRRIGATION DISTRICT
CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

APPENDIX G
GROUNDWATER MONITORING PROTOCOLS

GROUNDWATER MONITORING PROTOCOLS

GENERAL SCOPE

The purpose of this document is to insure that the sampling and analytical methods are adequately documented and appropriate for the project scope and purpose by individuals responsible for implementing the monitoring program. Examples of all required forms are presented at the end of this section.

In general, measurements of the static water level will be taken from the top of each casing, and then the monitoring wells will be purged and sampled. A detailed description of these procedures follows.

EQUIPMENT USED DURING SAMPLING

Water level sounding equipment and field meter probes (pH, dissolved oxygen, conductivity, temperature, and turbidity) will be thoroughly rinsed with deionized/distilled water before and after each reading. All field meters will be calibrated according to manufacturer's guidelines and specifications before and after every day of field use.

The monitoring wells will be equipped with a dedicated sampling well pump or sampling activities will utilize disposable bailing equipment. All non-dedicated sampling equipment (in contact with sample) shall be thoroughly cleaned prior to each sampling event to prevent cross-contamination between samples and to ensure accurate representation of analytes of interest in each sample. All sample containers and sampling equipment shall be sterilized and transported to the field under conditions to preserve its sterility. Personnel performing decontamination shall wear gloves, eye-protection, and such other safety equipment as needed. The analytical laboratory as part of their agreement shall provide all sample containers, container preparation services, preservatives, and field blanks.

EQUIPMENT DECONTAMINATION PROCEDURES

All equipment that comes into contact with potentially contaminated water will be decontaminated. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal. Decontamination will occur prior to and after each use of a piece of equipment. The following, to be carried out in sequence, is the recommended procedure.

- Non-phosphate detergent and tap water wash, using a brush if necessary;
- Tap water rinse; and
- Deionized/distilled water rinse.

WATER LEVEL MEASUREMENT PROCEDURES

Water levels will be measured in wells that have the least amount of known contamination first. Wells with known or suspected contamination will be measured last.

If wellheads are accessible, all wells will be sounded for depth to water from top of casing and total well depth prior to purging. An electronic sounder, accurate to the nearest +/- 0.01-ft, will be used to measure depth to water in each well. When using an electronic sounder, the probe is lowered down the casing to the top of the water column, the graduated markings on the probe wire or tape are used to measure the depth to water from the surveyed point on the rim of the well casing. Total well depth will be sounded from the surveyed top of casing by lowering the weighted probe to the bottom of the well. The weighted probe will sink into silt, if present, at the bottom of the well screen. Total well depths will be measured by lowering the weighted probe to the bottom of the well and recording the depth to the nearest 0.1-ft. Depth to water and total well depth will be recorded on a Monitoring Well Purging and Sampling Record as presented at the end of this section.

WELL PURGING

The wells will be sampled no sooner than 48 hours after well development. All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using the dedicated well pump, if present, or a bailer, hand pump, or submersible pump depending on the diameter and configuration of the well. When a submersible pump is used for purging, clean flexible Teflon tubes will be used for groundwater extraction. Pumps will be placed 2 to 3 ft from the bottom of the well to permit reasonable draw down while preventing cascading conditions.

Water will be collected into a measured bucket to record the purge volume. Casing volumes will be calculated based on total well depth, standing water level, and casing diameter. One casing volume will be calculated as $V = \pi r^2 h 7.48$ where V is the volume of one well casing of water in gallons (1ft³ = 7.48 gallons); $\pi = 3.14$; r is the radius of the inner well casing (in ft); and h is the total height of the water column in the well (in ft).

It is most important to obtain a representative sample from the well. Stable water quality parameter field measurements (temperature, pH, and specific conductivity [EC]) indicate representative sampling is obtainable. Water quality is considered stable if for three consecutive readings:

- Temperature range is no more than +1/C;
- pH varies by no more than 0.2 pH units; and
- EC readings are within 10% of the average.

If the well casing volume is known, measurements will be taken before the start of purging, in the middle of purging, and at the end of purging each casing volume. If the well casing volume is NOT known, measurements will be taken every 2.5 minutes after flow starts. If water quality parameters are not stable after 5 casing volumes or 30 minutes, purging will cease, which will be noted in the field notes, and ground water samples will be taken. The depth to water, water quality field measurements, and purge volumes will be recorded on a Monitoring Well Purging and Sampling Record as presented at the end of this section.

If a well dewateres during purging and three casing volumes are not purged, that well will be allowed to recharge up to 80% of the static water column and dewatered once more. After water levels have recharged to 80% of the static water column, groundwater samples will be collected.

WATER LEVEL MEASUREMENT AND WELL PURGING RECORDS

During the collection of each sample, the following information will be recorded on a Monitoring Well Purging and Sampling Record as presented at the end of this section:

- Well identification;
- Sampler's name(s);
- Date and time of sample collection;
- Designation of sample as composite or grab, if applicable;
- Type of sampling equipment used;
- Field instrument readings and calibration;
- Field observations and details related to analysis or integrity of samples (e.g., conditions in nearby waterways, weather conditions, noticeable odors, colors, etc.);
- Preliminary sample descriptions (e.g., clear with strong ammonia-like odor);
- Time of arrival/entry on site and time of site departure; and
- Deviations from sampling plans.

PURGED WATER DISPOSAL

Purged and excess groundwater collected for sample container filling may be disposed on site or in the sampling area by dispersing onto the ground, or at the owner's direction.

ANALYTICAL METHODS AND REPORTING LIMITS

Requested analytes are provided in the following table. Reporting limits are laboratory specific based on the type of equipment each laboratory uses. Analytical methods and holding times are listed by analyte below.

Analyte	Standard Method	EPA Method	Holding Time
PH	4500H-B	150.1	24 hours
EC	2510B	120.1	28 days
Alkalinity	2320B	310.1	14 days
Ammonium	4500NH4	350.1	28 days
Bicarbonate	2320B	310.1	14 days
Carbonate	2320B	310.1	14 days
Chloride	4500Cl	300.0	28 days
Iron	3120B	200.7	6 months
Magnesium	3120B	200.7	6 months
Manganese	3120B	200.7	6 months
Nitrate as N	4500NO3	353.2; 300.0	48 hours
Nitrite as N	4500NO2	353.2; 300.0	48 hours
Phosphorus	4500P	365	28 days
Potassium	3120B	200.7	6 months
Sodium	3120B	200.7	6 months
Sulfate	4500SO4	300.0	28 days
TDS	2540C	160.1	7 days
TKN	4500-NH3	351	28 days

SAMPLE CONTAINERS AND PRESERVATIVES

Sample containers are generally available directly from the laboratory. All containers will be one-liter polyethylene, precleaned, and analyte specific. Groundwater samples for TKN and ammonia will be collected in containers containing H₂SO₄ as a preservative. The remaining samples need not be preserved. If a preservative is present, the bottle will be capped and lightly shaken to mix in the preservative. Samples from each location that require the same preservative may be placed in the same bottle if being analyzed by the same laboratory. Samples to be analyzed for dissolved metals must be filtered prior to preservation and analysis.

SAMPLING PROCEDURES

Water samples will be collected from each well and placed into laboratory prepared containers, sealed with tight fitting caps, labeled, and stored in a cool ice chest. Water

used for field measurements of temperature, pH, and EC shall not be used as sample water. The following are the recommended sample collection procedures:

- Rinse the tubing with one liter of sample prior to sample collection;
- If no preservative is present, rinse sample bottles three times with a small amount of sample;
- Collect sample directly into the sample bottle;
- Allow sample containers to be open for the shortest time possible to prevent contamination;
- Do not touch the inside of bottles, lids, or tubes. Hold the bottle lid with the inside facing down to prevent contaminating the inside of the lid;
- Allow the sample water to flow into the bottle from above;
- Close bottle tightly,
- Samples will be chilled to 4 C° immediately upon collection; and
- Transport samples to the lab as soon as possible.

At each sampling location, all bottles designated for a particular analysis will be filled sequentially before bottles designated for the next analysis are filled. If a duplicate sample is to be collected at this location, all bottles designated for a particular analysis will be filled sequentially before bottles for another analysis are filled.

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. Every sample, including samples collected from a single location but going to separate laboratories, will be pre-assigned an identifiable, unique sample number. The following is an example sample label:

Sample #:	Well ID:
Analytes:	Date:
Collected by:	Time:

It will be possible to identify each unique sample by recording the following information on the Monitoring Well Purging and Sampling Record:

- Sample identification numbers and any explanatory codes;
- Sample date and time;
- Lot numbers of the sample containers;
- Chain-of-custody form numbers;
- Shipping arrangements (overnight air bill number); and
- Name(s) of recipient laboratory (ies).

CHAIN-OF-CUSTODY

A chain-of-custody (COC) record will be completed and accompany all sample shipments for each laboratory and each shipment. If multiple coolers are sent to a

single laboratory on a single day, COCs will be completed and sent with the samples for each cooler. Generally, the laboratory will supply blank COCs. An example COC is included at the end of this section.

The COC will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. The sampling team leader or designee will sign the COC in the "relinquished by" box and note date, time, and air bill number.

SAMPLE HANDLING AND TRANSPORT

The following outlines the packaging procedures for sample delivery to a California Certified Environmental Laboratory Accreditation Program (ELAP) laboratory:

- Pack ice in zip-locked, double plastic bags. Seal the drain plug of the cooler with tape to prevent melting ice from leaking out;
- Line the bottom of the cooler with bubble wrap to prevent breakage during shipment;
- Check screw caps for tightness;
- Seal all container tops with tape;
- Secure sample labels onto the containers with clear tape;
- Wrap all glass sample containers in bubble wrap to prevent breakage;
- Seal all sample containers in heavy-duty plastic zip-lock bags with the sample numbers written on the outside of the bags with indelible ink;
- Place samples in a sturdy cooler(s) lined with a large plastic trash bag. Enclose the appropriate COC(s) in a zip-lock plastic bag affixed to the underside of the cooler lid;
- Fill empty space in the cooler with bubble wrap or Styrofoam peanuts to prevent movement and breakage during shipment;
- Double seal ice in two ziplock plastic bags and place on top and around the samples;
- Secure each ice chest with strapping tape; and
- Secure address and shipping labels to cooler.

Monitoring Well Purging and Sampling Record

Client:	_____	Date:	_____
Project Name:	_____	County:	_____
Project Address:	_____		
Project Manager:	_____	Job No:	_____
Regulatory Contact:	_____	Phase(s):	_____
Sample Containers:	_____	Telephone:	_____
Preservatives:	_____	Air Temp (F):	_____
Instrumentation:	_____	Precipitation:	_____
Date Last Calibrated/By:	_____	Wind (dir/speed):	_____
		Sampler Signature:	_____

Well Number						
Well Elevation (ft)						
Well Diameter (in)						
Slotted Interval (ft)						
DTW (ft)						
GW Elevation (ft)						
Sounding Depth (ft)						
Well Volumes (gal)						
Notes:						
Well Volume Purged (1st)						
Time						
Temp (C°)						
pH						
EC						
Volume Removed (gal)						
Well Volume Purged (2nd)						
Time						
Temp (C°)						
pH						
EC						
Volume Removed (gal)						
Well Volume Purged (3rd)						
Time						
Temp (C°)						
pH						
EC						
Volume Removed (gal)						
Sample Depth (ft)						
Sample Time						

Equipment used:

Remarks: