MADERA IRRIGATION DISTRICT WATER SUPPLY ENHANCEMENT PROJECT

FINAL ENVIRONMENTAL IMPACT STATEMENT

Appendix D: Monitoring and Operational Constraint Plan

June 2011

Monitoring and Operational Constraint Plan

Madera Irrigation District
Water Supply Enhancement Project

(FINAL)

October 8, 2010

Madera Ranch Oversight Committee Resolution

WHEREAS, the Madera Irrigation District (MID) is implementing the Madera Irrigation District Water Supply Enhancement Project (the Project).

WHEREAS, the Madera Ranch Oversight Committee (the Committee) is responsible for approval and oversight of MID implementation of a Project Monitoring and Operational Constraint Plan (MOCP).

NOW THEREFORE, BE IT RESOLVED that the Committee agrees and authorizes that the Committee has reviewed and approves the MOCP dated 10·08·10.

DATED: 10·08·10

ATTEST:

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List of Acronyms

APN: Assessor Parcel Number
CI MIS: California Irrigation Management Information System
CORS: Continuously Operated Reference Station
DWR: California Department of Water Resources
EC: electrical conductivity
EIR: Environmental Impact Report
ET: evapotranspiration
ETAW: evapotranspiration of applied water
GFWD: Gravelly Ford Water District
MID: Madera Irrigation District
MOCP: Monitoring and Operational Constraint Plan
MROC: Madera Ranch Oversight Committee
NOAA: National Oceanic and Atmospheric Administration
QAQC: Quality Assurance/Quality Control
Reclamation: Bureau of Reclamation
TDS: Total dissolved solids
USGS: United States Geological Survey

1 Introduction

This document is the Monitoring and Operational Constraint Plan (MOCP) for the Madera Irrigation District Water Supply Enhancement Project (the Project) as defined in the Final Environmental Impact Report (EIR, September 2005) and associated Mitigation Monitoring and Reporting Plan.

As detailed in the EIR, the Project will recharge up to 55,000 acre-feet per year of water through swales, ponds and agricultural land for storage in the currently dewatered portion of the upper aquifer. No "in-lieu recharge" will be allowed. Up to 55,000 acre-feet per year will be recovered with wells when needed. Ten percent of all recharged water will be left behind. The Project will entail construction and operation of various recharge facilities and recovery wells on a property known as Madera Ranch, a property owned by MID.

As detailed in the EIR, MID will monitor groundwater levels and quality to evaluate Project impacts and guide operational adjustments to prevent unacceptable impacts. This monitoring will be performed in coordination with the Madera Ranch Oversight Committee (MROC) as detailed below.

1.1 Project and Oversight Committee Background

On February 15, 2005, the MID Board approved formation of a nine-member MROC and on April 17, 2006 the MROC was expanded to 10 members with the following representation:

- the five MID board members;
- one elected board member from the Gravelly Ford Water District (GFWD);
- two independent members representing the interests of surrounding landowners and one at large member; and
- one elected Madera County Supervisor.

The EIR specified that the MROC would develop this MOCP to protect adjacent landowners from unacceptable impacts.

1.2 MOCP Objectives, Elements and Intended Use

It is appropriate and desirable to prevent, mitigate or eliminate short-term and long-term unacceptable Project impacts to adjacent lands and to provide a meaningful and appropriate compensation mechanism to ensure that unacceptable impacts that occur, despite efforts to prevent them, are compensated in a timely manner. MID and the MROC desire that the design, operation and monitoring of the Project be conducted and coordinated in a manner to ensure that the beneficial effects of the Project are maximized but that the Project does not result in unacceptable impacts to water levels, water quality or elevation of adjacent lands relative to conditions that would have occurred absent the Project. Therefore, Project operations will be subject to the so-called "Golden Rule" of water banking projects, meaning that, unless acceptable mitigation is provided, MID may not operate the Project so as to create conditions that are worse than would have prevailed absent the Project.

This MOCP sets forth the minimum monitoring and operational constraint requirements which the MROC has specified and which MID has agreed to. MID at their own discretion can choose to perform additional monitoring and operational constraint as the District deems appropriate.

1.2.1 MOCP Requirements and Objectives

Table 1 presents the Key Project Principles approved by the MROC (April 17, 2006). In addition, through the Final EIR (September 2005) and various MROC votes, MID has committed to various additional monitoring obligations and constraints. Table 2 summarizes these requirements and objectives.

This MOCP covers monitoring and operational constraints associated with water resources that might be impacted by the Project. Monitoring of aesthetic, air, biological and cultural resources are covered by the separate Project Mitigation Monitoring and Reporting Plan issued with the Final EIR (September 2005).

Table 1: MROC Approved Key Project Principles

The Madera Ranch Oversight Committee reaffirms its prior agreement to the first three principles set forth below, which it adopted on April 11, 2005. These three principles, as well as Principle No. 4 set forth below, shall be included in the memorandum of understanding for the Committee and treated as key principles for the Madera Irrigation District (MID) Water Supply Enhancement Project to move forward.

Committee decisions and rulings will be made through a simple majority vote except for the following:

1. Approval to connect the groundwater supply from the MID Water Supply Enhancement Project at Madera Ranch to or from the Mendota Pool shall require a 9-0 vote.

2. Approval to extract groundwater at Madera Ranch for the purpose of delivery outside of Madera County as part of the MID Water Supply Enhancement Project shall require a 10-0 vote.

3. Approval to expand the MID Water Supply Enhancement Project shall require a minimum of 8 positive votes of Committee members in agreement of the expansion.

4. Approval to develop project land that has never been farmed shall require a minimum of 6 positive votes of Committee members in agreement. "Develop" is defined as follows: MID changing the characteristics of those portions of the project land that have never been farmed to agricultural or other use besides cattle grazing. "Other use" does not include MID using such land for any purpose associated with its Water Supply enhancement Project, such as construction of canals, installation of pipelines or wells, or use for spreading or percolation basins. Further, "other use" does not include restricting the land for conservation purposes.

Dated: April 17, 2006

Table 2: Summary of MOCP Requirements

Item	Committee Specification
Groundwater level measurement frequency	Weekly to monthly *(Items 1.C.1.a and 1.C.1.b of Draft Operational Guidelines and (Item 2.C of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, approved by MROC on 8/22/05)*
Groundwater level measurement locations	Ranch plus 2 mile radius *(Items 1.C.2.a of Draft Operational Guidelines and (Item 2.C of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, approved by MROC on 8/22/05)*
Groundwater sampling parameters and locations	Sample and analyze extracted water and groundwater flowing away from Ranch for total dissolved solids (TDS), levels to be set by committee *(Item 1.D. 1 of Draft Operational Guidelines, edited and approved by MROC on 8/22/05)* Sample and analyze drinking wells within 1-mile radius for fecal coliform, TDS and select components of TDS as Committee specifies *(Item 1.D.2 of Draft Operational Guidelines approved by MROC on 8/22/05 and Draft EIR pp. 2-24)*
Surface water sampling frequency	A minimum of twice a year or more if the water supply changes from Sierra Watershed source *(approved by MROC on 8/22/05)*
Surface water sampling parameters	Total dissolved solids *(approved by MROC on 8/22/05)* Perform ongoing surveillance of MID conveyances to ensure that, if accidental spills of hazardous materials occur, these spills do not enter the recharge facilities *(Draft EIR pp. 3.12-16)*
Surface water sampling locations	Incoming water to the ranch *(approved by MROC on 8/22/05)*
Subsidence monitoring	MID envisions that Project operations would include high accuracy Global Positioning System (GPS) monitoring of multiple locations on Madera Ranch before and during Project operation. The elevations of on-site markers would be measured on an annual basis and compared to distant USGS benchmarks to allow detection of any change in ground elevations. *(Draft EIR pp. 2-25)*
Water balance	Gross/Net inflow/outflow to Project *(Item 1.B of Draft Operational Guidelines, and Item 2.B of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, approved by MROC on 8/22/05)* Ten percent leave behind of recharged water to prevent "over recovery" *(Item 1.E. 2 of Draft Operational Guidelines approved by MROC on 8/22/05 and Draft EIR pp.2-25)*
Operational constraints and adjustments	Prevent water levels at the property boundary from rising above 30 feet below ground surface *(August 2005 MID Response to Gravelly Ford Water District July 29, 2005 comment 11 on the Draft EIR, approved by MROC on 8/22/05)* Committee to make recommendations for adjustment to operations if data suggest unacceptable impacts *(Item 2.C.2 of Draft Operational Guidelines, approved by MROC on 8/22/05)*
Reporting	Triennial Monitoring Report providing executive summary of ranch status *(Item 2.H of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, edited and approved by MROC on 8/22/05)* Report all groundwater levels a minimum of 4 times per year or as the Committee Chair requests *(Item 1.A of Draft Operational Guidelines, approved by MROC on 8/22/05)* Water quality report 2 times per year *(Item 1.D.3 of Draft Operational Guidelines, approved by MROC on 8/22/05)*

Item	Committee Specification
	Report amount stored annually or as Committee requests, but no more than 3 times per year *(Item 1.E.1 of Draft Operational Guidelines, approved by MROC on 8/22/05)*
Monitoring and reporting costs	Monitoring costs will be carried by proponent *(Item 1.F of Draft Operational Guidelines and Item 2.F of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, approved by MROC on 8/22/05)*
Project operations	MID responsible for Project operations and/or maintenance pertaining to purchases, sales or storage of water *(Item 2.D of Draft Operational Guidelines and Item 3.D of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, approved by MROC on 8/22/05)*
MOCP changes	Changes to MOCP will require an affirmative vote of at least 8 members *(Item 2.B of Draft Operational Guidelines and Item 3.B of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, approved by MROC on 8/22/05)*
Conflict of interest	A Committee member shall not participate or vote on any matter before the committee in which that member has a direct or indirect financial interest *(Item 2.E of Draft Operational Guidelines, approved by MROC on 8/22/05)*
Damages	A determination of liability or of remedy will require an affirmative vote of at least 6 members *(Item 2.F of Draft Operational Guidelines and Item 3.F of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, approved by MROC on 8/22/05)*
Connection of Project to Mendota Pool	Approval to connect the groundwater supply to or from the MID Water Supply Enhancement Project at Madera Ranch to the Mendota Pool shall require a 9-0 vote *(Item 1.A of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, edited and passed by MROC on 8/22/05)*
Delivery of groundwater outside of Madera County	Approval to extract groundwater stored at Madera Ranch for the purpose of delivery outside of Madera County as part of the MID Water Supply Enhancement Project shall require a 10-0 vote *(Item 1.B of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, edited and passed by MROC on 8/22/05 and amended by MROC on 4/17/06)*
Project expansion	Approval to expand the MID Water Supply Enhancement Project shall require a minimum of 8 affirmative votes of Committee members in agreement of the expansion *(Item 1.C of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, approved by MROC on 8/22/05)*
Development of land that has never been farmed	Approval to develop Project land that has never been farmed shall require a minimum of 6 positive votes of Committee members in agreement. "Develop" is defined as follows: MID changing the characteristics of those portions of the Project land that have never been farmed to agricultural or other use besides cattle grazing. "Other use" does not include MID using such land for any purpose associated with its Water Supply Enhancement Project, such as construction of canals, installation of pipelines or wells, or use for spreading or percolation basins. Further, "other use" does not include restricting the land for conservation purposes." *(approved by MROC on 10/24/05)* Map of "never farmed lands" to be included in the MOU *(Item 2.G of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, approved by MROC on 8/22/05)* The baseline must be established at the current (2005) acres of irrigated farm ground before any unfarmed ground may be converted to other uses *(approved by MROC on 8/22/05)*
Dispute resolution	As per Semitropic MOU D#8 *(Item 3. G of June-July-August 2005 Principles, Monitoring, Reporting, Responsibilities, approved by MROC on 7/11/05)*

1.2.2 MOCP Elements

Taking into account the requirements listed in Table 2, this MOCP has been organized to include the following elements

- Groundwater level monitoring;
- Groundwater and Surface Water Quality Monitoring;
- Flow Rate Monitoring and Water Accounting;
- Surrounding Land Use and Well Status Monitoring;
- Meteorological Monitoring;
- Subsidence Monitoring;
- Reporting;
- Data Evaluation, Operational Constraints and Mitigation; and
- Funding of Activities and Mitigation shall be by MID.

This MOCP specifies overall program requirements, but wherever possible, refers to agency approved standard operating procedures for the details of how data are to be collected and verified.

1.3 MOCP Implementation Roles and Responsibilities

Roles and responsibilities for implementation of the MOCP are summarized in the following table. For the purposes of this MOCP, a 3rd party is defined as any entity other than MID or the MROC. MID obligations may be performed by the District or representatives hired by the district at the discretion of MID.

Table 3: MOCP Implementation Roles and Responsibilities

Item	Responsible Party
Project owner and operator	MID
Implementation of the MCOP	MID
Fund Project operations, MOCP implementation and MROC activities	MID
Data management, reporting and response to 3rd party information requests	MID
Obtain executed 3rd party access agreements for monitoring locations that are on land not controlled by MID	MID
Maintain and implement MROC approved changes to the MOCP	MID
Install access ports, valves, taps and other devices on wells as required to enable water level measurements and sampling	MID
First response to complaints	MID
Dispute resolution and potential imposition of remedies on MID if mutually acceptable terms for resolution of a complaint have not been reached within 60 days of MID first receiving the complaint	MROC
Review of MOCP reports and data with recommendations to MID as desired	MROC

1.4 Summary of MROC Voting Requirements

The following table summarizes the MROC voting requirements relating to various Project and MROC activities.

Table 4: MROC Voting Requirements

Action	Voting Requirements
Connection of the Project to Mendota Pool	9 votes in favor
Extraction of groundwater at Madera Ranch for delivery outside of Madera County as part of the Project	10 votes in favor
Expansion of the project	8 votes in favor
Development of Project land that has never been farmed	6 votes in favor
Changes to MOCP	8 votes in favor
Determination that a complaint is not warranted and should be dismissed	6 votes in favor
The MROC may impose an operational constraint or mitigation measure on MID if: • MID and a 3rd party cannot reach mutually acceptable resolution within 60 days of a complaint or MID finding of unacceptable impact; • MID finding that Project operations may be causing subsidence.	6 votes in favor

1.5 Access and Confidentiality of Information Collected from 3rd Party Properties

Implementation of this MOCP will require monitoring of 3rd party wells by MID. Prior to entering a 3rd party property, MID will obtain written permission from the 3rd party to perform the required monitoring. If a 3rd party does not provide permission for MID to perform the monitoring specified in this MOCP, MID will notify the MROC and the District will be relieved from further responsibilities to perform the specified monitoring on that 3rd party property and the MOCP will be revised accordingly.

MID will use information collected from 3rd party wells to prepare MOCP reports, which will be available for public review. Prior to use of these data in MOCP reports, MID will obtain written permission from the 3rd party to present this information in MOCP reports. If a 3rd party does not provide permission for MID to present collected data in MOCP reports, MID will notify the MROC and the District will be relieved from further responsibilities to perform the specified monitoring on that 3rd party property and the MOCP will be revised accordingly. An exception will be driller logs. All driller logs for 3rd party wells will remain confidential and will not be made available for public review without written permission from the 3rd party.

MID will allow 3rd parties to review and copy information collected from their wells.

As requested, MID will provide MROC representatives with access to Project facilities to perform inspections to the degree that inspections do not impede Project operations, result in damage to Project facilities or cause unsafe conditions.

1.6 Well Naming Conventions

Wells will be identified on forms and in the Project database using the California Department of Water Resources (DWR) State Well Numbering System as detailed below.

The numbering system is based on the public land grid, and includes the township, range, and section in which the well is located. Each section is further subdivided into sixteen 40-acre tracts, which are assigned a letter designation as shown in the figure below. Within each 40-acre tract, wells are numbered sequentially. The final letter of the State Well Number refers to the base line and meridian of the public land grid in which the well lies. "M" refers to the Mount Diablo base line and meridian; "S" refers to the San Benardino base line and meridian; "H" refers to the Humboldt base line and meridian.

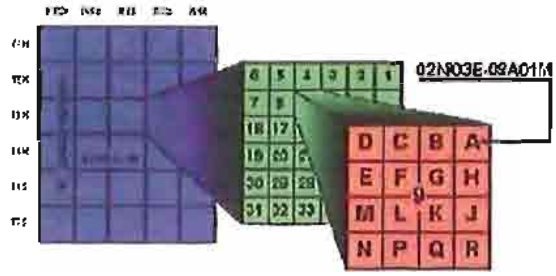

Figure 1: Well Naming Convention Example

In addition, many wells have an "alias" name assigned by the owner or district. Where applicable, these aliases will also be recorded.

1.7 MOCP Revision Procedures

From time to time MID or the MROC may determine that revisions to the MOCP are required. When requested, a Draft Modified MOCP, Draft Errata to the MOCP, or Draft Inserts to the MOCP will be prepared by MID and presented to the MROC according to a timeline agreed to by both parties. The proposed changes can be approved by an affirmative vote of at least 8 members of the MROC.

MID will be responsible for maintaining and revising the master copy of the approved MOCP. MID will provide one copy of the MOCP, errata or inserts to each MROC member each time an approved revision is incorporated.

1.8 MOCP Revision Log

This section is reserved for a list of potential future revisions to the MOCP.

2 MOCP Implementation Schedule

The following table is a compilation of the various monitoring schedule requirements specified in following sections.

Table 5: MOCP Implementation Schedule

Item	When Activity Will Start	Frequency
Water level measurements	Within 90 days of MOCP approval	Weekly to semi-annually
Groundwater quality sampling	First Fall following MOCP approval	Annually in the Fall
Surface (recharge) water quality sampling	First recharge season following MOCP approval	Semi-Annually during recharge years (early and late season)
Recovered surface water quality sampling	First recovery season following MOCP approval	Semi-Annually during recovery years (early and late season)
Flow measurements	First recharge season following MOCP approval	Continuous, daily and weekly
Meteorological measurements	First recharge season following MOCP approval	Hourly to daily
Water accounting calculations	Within 30 days of MOCP approval	Monthly
Subsidence measurements	Prior to first recovery season	Annually
Land use and well status surveys	Within 12 months of MOCP approval	Annually
Water Level Reports	Within 90 days of MOCP approval	Quarterly
Water Quality Reports	First recharge season following MOCP approval	Semi-Annually
Water Accounting Reports	Within 12 months of MOCP approval	Annually
Project Status Reports	Within 12 months of MOCP approval	Triennially (every 3 years)
MID evaluates complaint and presents findings to MROC	Within 14 days of complaint	Within 14 days of complaint
MID responds to complaint and if appropriate, proposes mitigation to complainant	Within 30 days of complaint	Within 30 days of complaint
If complainant and MID are unable to reach acceptable mitigation terms, MROC will arbitrate mitigation and may impose measures on MID	Within 60 days of complaint (requires 6 positive MROC votes)	Within 60 days of complaint (requires 6 positive MROC votes)

3 Water Level Monitoring

As summarized in the Final EIR (September 2005), MID will monitor water levels in wells and will adjust recharge operations to prevent groundwater levels from rising to within 30 feet of the ground surface at the property boundary of the ranch as a consequence of Project operations. During recovery operations, MID will monitor water levels in wells and will adjust operations to prevent unacceptable water level declines in 3rd party wells as a consequence of Project operations relative to conditions that would have occurred absent the Project. This section specifies the frequencies, locations and procedures at which water levels will be measured.

3.1 Objectives

The objectives of water level monitoring program are as follows:

- Provide information regarding background groundwater level variations that are occurring independent of Project operations;
- Provide information regarding groundwater level variations that are occurring because of Project operations; and
- Document the locations and stages of surface water at Madera Ranch.

3.2 Responsibilities

MID is responsible for implementation of the groundwater level monitoring program with the following specific responsibilities:

- Obtaining 3rd party permission to access their wells and report data;
- Installing and maintaining wells on Madera Ranch;
- Procuring and maintaining water level measurement devices;
- Measurement of groundwater levels;
- Compilation of groundwater levels measured by the Bureau of Reclamation (Reclamation) within the area of the MOCP monitoring program;
- Quality assurance/quality control (QAQC) of water level measurements; and
- Entry of water level measurements into an electronic database.

3.3 Monitoring Locations and Frequencies

Water levels will be measured on a weekly, monthly and semi-annual basis as detailed on Table 6 and Depicted on Figure 2.

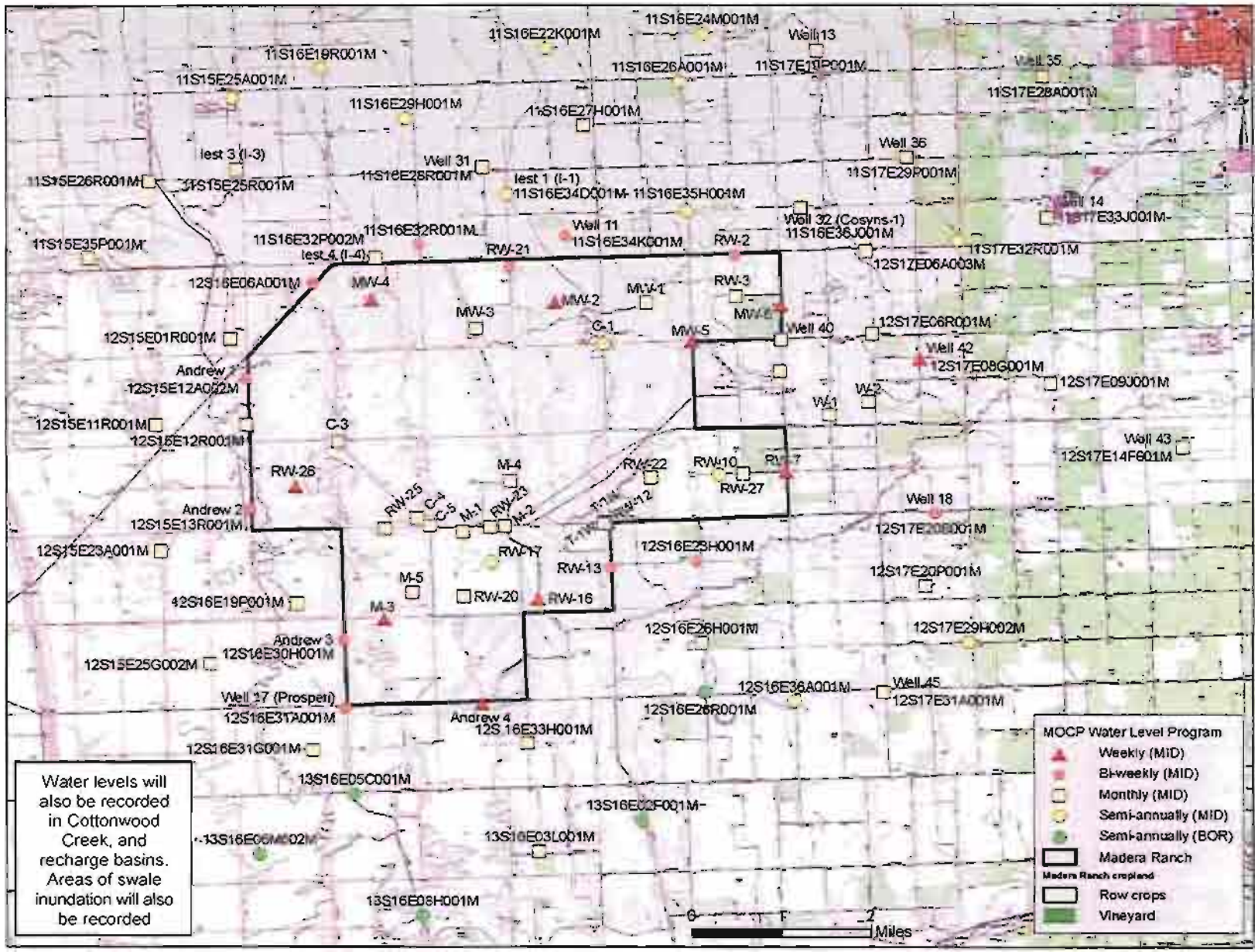

Figure 2: Water Level Monitoring Network

Table 6: Water Level Monitoring Program

Well Number	Well Alias	Frequency and Agency
12S16E01J002M	MW-6	52MID
12S16E02R001M	MW-5	52MID
12S16E03F001M	MW-2	52MID
12S16E05F001M	MW-4	52MID
12S16E13H001M	RW-7	52MID
12S16E18G001M	RW-26	52MID
12S16E22A001M	RW-12	52MID
12S16E22N001M	RW-16	52MID
12S16E28Q001M	Andrew 4	52MID
12S16E29C001M	M-3	52MID
12S17E08G002M	Well 42	52MID
11S16E32R001M		26MID
11S16E34K001M	Well 11	26MID
12S15E12A002M	Andrew 1	26MID
12S15E13R001M	Andrew 2	26MID
12S16E01B001M	RW-2	26MID
12S16E04A002M	RW-21	26MID
12S16E06A001M		26MID
12S16E22J001M	RW-13	26MID
12S16E23H001M		26MID
12S16E30H001M	Andrew 3	26MID
12S16E31A001M	Well 17 (Prosperi)	26MID
12S17E20B001M	Well 18	26MID
11S15E25R001M	lest 3 (I-3)	12MID
11S15E26R001M		12MID
11S15E35P001M		12MID
11S16E27H001M		12MID
11S16E28R001M	Well 31	12MID
11S16E32P002M	lest 4 (I-4)	12MID
11S16E36J001M	Well 32 (Cosyns 1)	12MID
11S17E19P001M	Well 13	12MID
11S17E28A001M	Well 35	12MID
11S17E29P001M	Well 36	12MID
11S17E33J001M	Well 14	12MID
12S15E01R001M		12MID
12S15E11R001M		12MID
12S15E12R001M		12MID
12S15E23A001M		12MID
12S15E25G002M		12MID
12S16E01G001M	RW-3	12MID
12S16E02L001M	MW-1	12MID
12S16E04K001M	MW-3	12MID
12S16E07R001M	C-3	12MID
12S16E12A001M	Well 40	12MID
12S16E12H001M		12MID
12S16E13G002M	RW-27	12MID
12S16E14F001M	RW-22	12MID
12S16E16J001M	M-4	12MID
12S16E17P001M	RW-25	12MID
12S16E17R001M	RW-24	12MID

Well Number	Well Alias	Frequency and Agency
12S16E17R002M	C-4	12MID
12S16E19P001M		12MID
12S16E20K001M	M-5	12MID
12S16E21A001M	M-2	12MID
12S16E21B001M	RW-23	12MID
12S16E21C002M	M-1 (87')	12MID
12S16E21C003M	M-1 (131')	12MID
12S16E21C004M	M-1 (189')	12MID
12S16E21N001M	RW-20	12MID
12S16E22B001M	T-1N	12MID
12S16E22B002M	T-1W	12MID
12S16E26H001M		12MID
12S16E31G001M		12MID
12S16E33H001M	DeSilva 1	12MID
12S17E06A003M		12MID
12S17E06R001M		12MID
12S17E07P001M	W-1	12MID
12S17E07R001M	W-2	12MID
12S17E09J001M		12MID
12S17E14F001M	Well 43	12MID
12S17E20P001M		12MID
12S17E31A001M	Well 45	12MID
13S16E03L001M		12MID
11S15E25A001M		2MID
11S16E19R001M		2MID
11S16E22K001M		2MID
11S16E24M001M		2MID
11S16E26A001M		2MID
11S16E29H001M		2MID
11S16E34D001M		2MID
11S16E35H001M		2MID
11S17E32R001M		2MID
12S16E02N001M	C-1	2MID
12S16E13E001M	RW-10	2MID
12S16E21K001M	RW-17	2MID
12S16E36A001M		2MID
12S17E29H002M		2MID
12S16E26R001M		2BOR
13S16E02F001M		2BOR
13S16E05C001M		2BOR
13S16E06M002M		2BOR
13S16E08H001M		2BOR
Surface Water Locations		
Cottonwood Creek where it leaves Madera Ranch		Continuous, MID
Recharge basins		52, MID
Mapping of the wetted extent of recharge swales		12, MID

Continuous, MID: continuous recorder operated by MID
52MID: weekly by MID
26MID: bi-weekly by MID
12MID: monthly by MID
2MID: semi-annual by MID
2BOR: semi-annual by Bureau of Reclamation

3.4 Baseline Well Documentation and Inspection

As part of the previously described access agreement process with each well owner, MID will request permission to obtain copies of driller logs, pump tests and any other construction and operational information that might be available for each well. MID will perform a baseline inspection of each well within 6 months of access approval, recording the following information:

- Date and time;
- Inspection technician;
- Well owner;
- State Well Number and alias if applicable;
- Digital photograph of well and water level measurement point;
- Assessor parcel number (APN) for the parcel on which the well is located;
- Operating status (operable, inoperable, abandoned etc.);
- Well use (irrigation, domestic, combined);
- Pump type (vertical turbine, jet pump, submersible etc.), make and horsepower (if applicable);
- Motor type (diesel, electric) and horsepower;
- Power meter number (if any);
- Discharge pipe type and diameter;
- Oil feed (Y/N);
- Fertilizer feed (Y/N);
- Tank (Y/N) and estimated capacity;
- Tap or other access for sampling (Y/N) and description;
- Description of the water level measurement point;
- The distance from the water level measurement point to the ground surface;
- Description of surrounding land uses;
- Well pad dimensions, material and condition;
- Descriptions of any potential indications of potential sources of contamination (soil staining, fuel or oil leaks, trash piles etc.); and
- Attempt total depth measurement of the well, to the degree it can be attempted without risking a hang-up of the measuring tape on the pump string.

In some instances the existing well header will not include a port for water level measurement. In these instances, MID will have an access port installed in a manner which is acceptable to the owner within 6 months of access approval. Also within 6 months of access approval, MID will survey the location and elevation of the water level measurement point on each well. Elevation and location measurements will be made under the supervision of a professional engineer or land surveyor licensed to practice in California.

Potential changes to well production capacity as a consequence of Project operations is a specific concern for adjacent landowners. Therefore, well performance will be documented as follows:

1. If the well owner provides the results of pump tests that were performed on a well in its current configuration within the last 5 years; and those tests included measurement of both

flow rate and changes in water level (drawdown) during pumpage, these results will be considered adequate documentation of baseline well performance; and

2. If adequate existing pump test data are not available for a well; within 1 year of access approval, MID will have the flow rate and drawdown measured during normal operational pumpage.

3.5 Monitoring Procedures

Water levels will be measured in accordance with applicable procedures specified in the following guidance document:

Nye County Nevada, Nuclear Waste Repository Project Office Technical Procedure TP-9.9, "Measurement of Groundwater Levels Using Electric Well Sounders," (most recent revision. This technical procedure may be electronically downloaded from the following Internet site:
http://www.nyecounty.com/plansprocedures.htm

Water levels may be measured manually or automatically using data loggers and can be recorded on forms (in pen) or in log books (in pen), but in all cases, the following information will be recorded:

- Location (State Well Number and alias if applicable);
- Date and time (military);
- General description of weather;
- Depth to water (in feet, precise to at least 0.1 feet);
- Measuring device used (with an identification number);
- Technician name;
- ON/OFF condition of the well (if applicable);
- Electric meter or engine hour reading on the well motor (if applicable); and
- Note any significant changes to well condition since last measurement.

In instances where an automatic data logger is used, confirmatory manual measurements (and associated backup information listed above) will be collected at 10% of the manual measurement frequency specified in Table 2. The technicians should record any circumstances which may cause water level measurements to be questionable or could cause water levels to deviate significantly from those previously measured at a location. Some examples of these circumstances include the following:

- Change in the elevation of the point from which the water level is measured;
- Well is on or off or other nearby wells are on or off;
- A new well has been installed nearby;
- Nearby irrigation has started or stopped;
- Nearby irrigation practices or crop types have changed;
- The ground surface around the well indicates subsidence and/or the well pad shows evidence of damage or sinking;
- Water can be heard cascading down the well;
- The well has been re-worked, a new pump installed or the existing pump removed;
- The method of measuring water levels has changed or the specific water level meter used has changed; and
- There is evidence of oil in the well.

The technicians should record any circumstances which prevent them from measuring water level measurements in a well. Some examples of these circumstances include the following:

- The well or access to the well is locked;
- The owner prevents access;
- There is blockage in the well or the tape is hung-up in the well;
- The well is being worked on by others;
- Malfunction of the water level measurement device;
- The well cannot not be found or has been destroyed; and
- The well is dry.

If it becomes apparent that circumstances will permanently prevent measurement of valid water levels in a well, MID will notify the MROC and the District will be relieved from further responsibilities to perform water level measurements in that well and the MOCP will be revised accordingly.

Surface water level measurement locations will be equipped with a staff gage that meets the accuracy and precision requirements specified below.

The wetted extents of recharge swales will be mapped using the coordinate systems specified above and to the accuracies specified below. These accuracies can be accomplished through GPS mapping, by georeferenced aerial photography or by satellite imagery.

3.6 Data Management

MID will develop a standard water level measurement form or log book format which meets the information requirements specified in the previous section. The District will maintain a file where these forms and log books are stored when not in use. If data loggers are used, information will be downloaded at least once a month.

MID will create a separate file for each well in which the baseline well inspection information, pump tests, logs and photographs specified above will be stored for easy reference by MID, the owner and the MROC.

MID will enter water level measurements into an electronic database within 1 month of measurement collection.

3.7 Required Accuracy, Quality Control and Quality Assurance

Water level measurements, elevation measurements and location measurements will meet the following accuracy requirements:

Water level measurement accuracy: at least 0.1 foot, precise to at least 0.05 foot;
Elevation measurement accuracy: at least 3.28 feet (1.0 meter); and
Location measurement accuracy: at least 1.64 feet (0.5 meter).

QA/QC measures will be as follows:

- Field measures: When measuring water levels, technicians will briefly review previous measurements to determine if the recorded water level is reasonably within the previously measured range. If the newest measurement is not reasonably within the previously measured range, the water level will be re-measured. If this deviation from previous measurements is confirmed, this will be noted by the technician on the field form or log book;
- GIS measures: Within 1 month of surveys to measure the elevations and locations of wells, MID will import these data into the Project geographic information system and overlay the measurements on aerial photographs and/or USGS topographic maps to confirm that the measurements plot in the expected locations. If a well does not plot at the expected location and/or within the expected elevation range indicated on the USGS topographic map, MID will re-survey the well location and/or elevation;
- Database measures: Upon entry of a water level into the Project database, MID will review previous measurements to determine if the newly water levels are reasonably within the previously measured range. If a newest measurement is not reasonably within the previously measured range, MID will review measurement technician notes and interview the technician to confirm that the anomalous measurement was made and recorded correctly. If the measurement cannot be confirmed to be correct, the level will be re-measured within 30 days, or during the next water level measurement cycle, whichever is sooner;
- Manual equipment measures: Semi-annually, MID will use a tape measure (accurate to at least 0.01 ft) to confirm that each manual water level meter accurately (+0.05 ft) measures the distance from water to a measuring point at least 5 feet above the water;
- Automatic data logger measures: MID will make confirmatory manual water measurements at 10% of the manual frequency specified in Table 2.

4 Groundwater and Surface Water Quality Monitoring

As summarized in the Final EIR (September 2005), MID will monitor the quality of water entering the ranch for recharge, the quality of water in wells and the quality of recovered water leaving the ranch. This section specifies the frequencies, locations and procedures by which water quality will be measured.

4.1 Objectives

The objectives of the water quality monitoring program are as follows:

- Provide information regarding background groundwater quality variations that are occurring independent of Project operations; and
- Provide information regarding groundwater quality variations that are occurring because of Project operations.

4.2 Responsibilities

MID is responsible for implementation of the water quality monitoring program with the following specific responsibilities:

- Obtaining 3rd party permission to access wells and report data;
- Installing and maintaining wells on Madera Ranch;
- Procuring and maintaining water sampling devices (or retaining sampling contractors);
- Contracting with laboratories that are certified to perform the specified analyses in California; and
- Entry of water quality measurements into an electronic database.

MID's daily, ongoing operations currently include surveillance of conveyance facilities to ensure that accidental spills of hazardous materials that may occur near its facilities are discovered and addressed to prevent contamination of MID's water. This surveillance will continue and extend to the facilities constructed as part of the Project.

4.3 Monitoring Locations, Frequencies and Analytical Suites

Figure 8 and Table 7 present required water quality monitoring locations and frequencies. Table 8 presents required analytical suites. The EIR requires that all active domestic wells within a 1 mile radius of the ranch be included in the MOCP water quality monitoring program. Figure 3 depicts estimated locations of domestic wells within 1 mile of the ranch. The estimated locations were inferred by the presence of a residence (there is no municipal water supply system in this part of Madera County) and State Well Numbers have not yet been assigned to these wells. If during the previously described access agreement process it becomes apparent that some of the estimated domestic wells are not active, do not exist or are at different locations than indicated on Figure 8, MID will notify the MROC and the District will submit a corrected Figure 8 and Table 7.

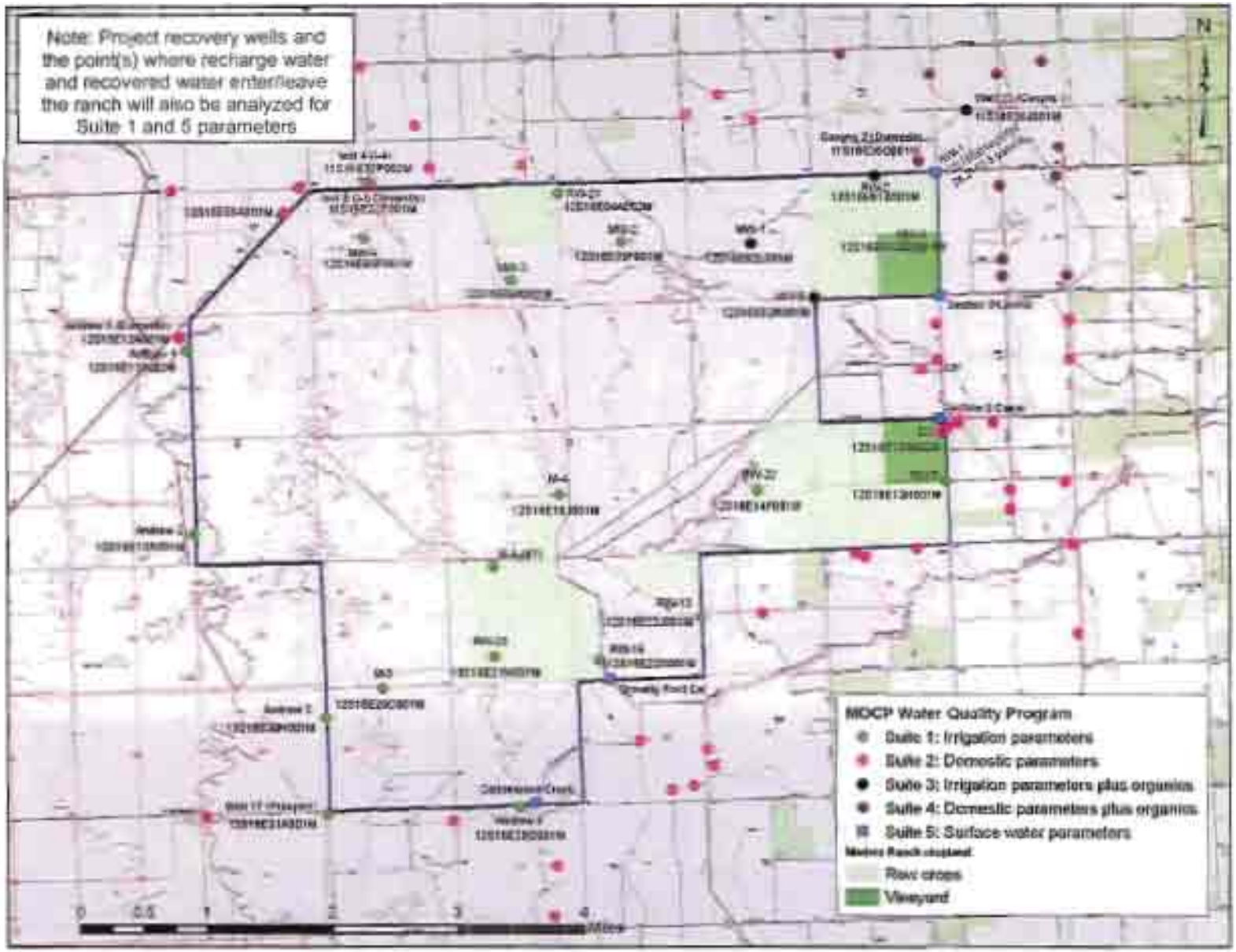

Figure 3: Water Quality Monitoring Network

Table 7: Water Quality Monitoring Program

Well Number	Alias	Well Type	Analytical Suite
Annual Schedule			
11S16E32P002M	Iest 4 (I-4)	Irrigation	1
12S15E12A002M	Andrew 1	Irrigation	1
12S15E13R001M	Andrew 2	Irrigation	1
12S16E04A002M	RW-21	Irrigation	1
12S16E06A001 M		Irrigation	1
12S16E13H001M	RW-7	Irrigation	1
12S16E14F001 M	RW-22	Irrigation	1
12S16E21N001M	RW-20	Irrigation	1
12S16E22J001M	RW-13	Irrigation	1
12S16E22N001M	RW-16	Irrigation	1
12S16E28Q001 M	Andrew 4	Irrigation	1
12S16E30H001M	Andrew 3	Irrigation	1
12S16E31A001M	Well 17 (Prosperi)	Irrigation	1
12S16E03F001M	MW-2	Monitoring	1
12S16E04K001M	MW-3	Monitoring	1
12S16E05F001M	MW-4	Monitoring	1
12S16E16J001M	M-4	Monitoring	1
12S16E21C002M	M-1 (87')	Monitoring	1
12S16E29C001M	M-3	Monitoring	1
Recovery wells (not yet installed)	Not yet specified	Recovery	1
Various	Various	Estimated 36 domestic wells within 1 mile of ranch	2
11S16E32P001M	Iest 5 (I-5 Domestic)	Domestic	2
12S15E12A001 M	Andrew 5 (Domestic)	Domestic	2
12S16E13A002M	D-1	Domestic	2
11 S1 6E36J001 M	Well 32 (Cosyns 1)	Irrigation	3
12S16E01A001M	RW-1	Irrigation	3
12S16E01B001M	RW-2	Irrigation	3
12S16E01J002M	MW-6	Monitoring	3
12S16E02L001M	MW-1	Monitoring	3
12S16E02R001M	MW-5	Monitoring	3
Various	Various	Estimated 10 domestic wells within 1 mile of ranch	4
11S1 6E36Q001 M	Cosyns 2 (Domestic)	Domestic	4
	24.2-19.5 Lateral	Surface water	5
	Section 8 Canal	Surface water	5
	Section 8 Lateral	Surface water	5
	Cottonwood Creek	Surface water	5
	Gravelly Ford Canal	Surface water	5
Semi-Annual Schedule During Project Operations Only			
Recharge water entering ranch	Not yet specified	Surface water	5
Recovered water leaving ranch	Not yet specified	Surface water	5

Table 8: Water Quality Analytical Suites

Suite	Parameter	Analytical Method
1 Irrigation Parameters	Total dissolved solids (TDS)	
	pH (Field)	
	Specific conductance (Field)	
	Turbidity (Field)	
	Temperature (Field)	
2 Domestic Parameters	Fecal coliform	
	Total dissolved solids (TDS)	
	Chloride	
	Nitrate	
	Sulfate	
	pH (Field)	
	Specific conductance (Field)	
	Turbidity (Field)	
	Temperature (Field)	
3 Irrigation Parameters plus Organics	Total dissolved solids (TDS)	
	1 ,2,3-Trichloropropane	
	pH (Field)	
	Specific conductance (Field)	
	Turbidity (Field)	
	Temperature (Field)	
4 Domestic Parameters plus Organics	Fecal coliform	
	Total dissolved solids (TDS)	
	Chloride	
	Nitrate	
	Sulfate	
	1 ,2,3-Trichloropropane	
	pH (Field)	
	Specific conductance (Field)	
	Turbidity (Field)	
	Temperature (Field)	
5 Surface Water Parameters	Total dissolved solids (TDS)	
	pH (Field)	
	Specific conductance (Field)	
	Turbidity (Field)	
	Temperature (Field)	

4.4 Sampling and Analytical Procedures

Water sampling will be performed, field measurements collected and laboratory analyses performed in compliance with applicable procedures specified in the documents:

"National Field Manual for the Collection of Water-Quality Data," Techniques of Water-Resources Investigations Book 9, Handbooks for Water-Resources Investigations, US Geological Survey, available on the Internet at: http://water.usgs.gov/owq/FieldManual/

Laboratory analyses will be made in compliance with applicable procedures listed in Table 8.

4.5 Data Management

MID will create a separate file for each monitoring location in which sampling records and analytical data will be stored for easy reference by MID, the owner and the MROC. In addition, MID will maintain a separate file of the original sampling and analytical reports as received from contractors and laboratories.

MID will enter water quality data into an electronic database within 1 month of receipt of validated analytical data from the laboratories.

4.6 Quality Control and Quality Assurance

Laboratory QA/QC will be performed in compliance with the procedures specified in the documented cited above.

Sampling events will include the following QA/QC samples:

- 1 duplicate sample will be collected for every 10 samples of a particular analytical suite; and
- 1 trip blank will be analyzed for each day of sampling for Analytical Suite 3 or 4. These trip blanks will be analyzed for 1 ,2,3-trichloropropane.

If data are entered into the electronic database manually, MID will perform a visual check of at least 10% of all manually entered data. If a data entry data is found, 100% of the data manually entered on that day will be checked against the original laboratory and sampling reports.