Groundwater Quality Management Plan Amendment

East San Joaquin Water Quality Coalition

Central Valley Regional Water Quality Control Board

Resubmittal
December 2, 2019

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LIST OF ACRONYMS

AMR	Annual Monitoring Report
A	Applied
CY	Crop Year
ESJWQC	East San Joaquin Water Quality Coalition
FE	Farm Evaluation
FREP	Fertilizer Research and Education Program
GAR	Groundwater Assessment Report
GQMP	Groundwater Quality Management Plan
HVA	High Vulnerability Area
INMP	Irrigation and Nitrogen Management Plan
MPEP GCC	Management Practice Evaluation Program Group Coordinating Committee
MPIR	Management Practice Implementation Report
MUN	Municipal Supply Beneficial Use
PM	Performance Measure
R	Removed

OVERVIEW

The East San Joaquin Water Quality Coalition (ESJWQC) is submitting an amendment to its Groundwater Quality Management Plan (GQMP), which was approved by the Central Valley Regional Water Quality Control Board (Regional Board) on July 31, 2017. This amendment incorporates new requirements within the revised Waste Discharge Requirements General Order (Order, R5-2012-0116-R8) and updates references to existing requirements that have changed. The ESJWQC is submitting a revised Performance Goals and Measures table to address new elements of the Order and reporting timelines. In addition, this amendment provides clarification on how the Groundwater Management Practice Implementation Report (GW MPIR) is incorporated into the existing Management Plan Process. A GW MPIR survey template is included in Appendix I (tree/vine crops) and Appendix II (row crops) for approval.

PERFORMANCE GOALS AND MEASURES REVISIONS

The ESJWQC's GQMP specifies the approach to reducing and/or eliminating impairment of the municipal supply (MUN) beneficial use of groundwater. The approved GQMP listed four main processes which the Coalition is updating to include five processes:

1. Identifying potential sources of discharges that impair beneficial uses,
2. Providing education to growers on management practices to minimize discharge,
3. Encouraging growers to adopt practices to reduce nitrate leaching to groundwater,
4. Evaluating monitoring results and providing feedback to the Regional Board on the GQMP progress, and
5. Providing feedback to members on the progress toward meeting receiving water limitations.

The ESJWQC's Performance Goals listed in Table 10 of the GQMP, are built on actions needed for successful completion of the GQMP strategy. Revisions to the Performance Goals, Performance Measures, and Outputs included in this amendment are due to changes in reporting frequencies and reporting requirements as described within the most recent revision to the Order (Table 1). However, the overall management plan strategy is the same. Brief summaries of the changes for each Performance Goal, Measure, and Output are provided below.

Performance Goal 1:

The Performance Measure reporting frequency was revised from 'annually' to a timeline based on when Farm Evaluations (FEs) are received (current requirement is every five years starting with the 2020 crop year). Performance Measure 1.1 and 1.3 were revised to include reporting frequencies for wellhead protection practices. Information on the reporting of wellhead protection practices was consolidated in Performance Measure 1.1 and removed from Performance Measure 1.3.

Performance Goal 2:

No revisions were made to Performance Goal 2 or its Measures.

Performance Goal 3:

Performance Measures 3.1, 3.5, and 3.6 referenced alfalfa as one of the top six crops grown in the ESJWQC region. The list was updated to replace the reference to alfalfa with corn to match the crop prioritization list provided by the Management Practice Evaluation Program Group Coordinating Committee (MPEP GCC).

Performance Goal 4:

References to Applied and Yield (A and Y) A/Y in Performance Measures and Outputs of 4.1, 4.3, and 4.4, were replaced with Applied and Removed (A and R) A/R and/or A-R. The previous Order required that the determination of outliers be done using a box and whisker analysis by crop and township.

As required by the current Order, the ESJWQC provided a strategy for determining outliers which was approved by the Executive Officer on July 3, 2019. The updated outlier strategy uses a three-year running total based on A/R. The reference to the use of box and whisker plots in Performance Measure 4.1 was removed. Performance measure 4.2 was added to address the identification of outliers through an Executive Officer-approved method.

ESJWQC members are now required to submit an Irrigation and Nitrogen Management Plan (INMP) Summary Report which replaces the previous NMP Summary Report. Therefore, the reference to High Vulnerability Areas (HVA) was removed in Performance Measure 4.2, as all members identified with outlier management units are required to complete additional surveys, attend meetings, and trainings. Performance Measure 4.4 was updated to exclude the metric of evaluation as it is currently undetermined and could change over time. The deadline in Performance Measure 4.6 was updated to coincide with the 2019 crop year (CY) when the INMP worksheet is required to be completed and kept on farm. Additionally, the language in Performance Measure 4.6 was updated to be consistent with State Board revisions to the ESJWQC Order regarding irrigation water nitrate testing.

References to summaries provided in the Annual Monitoring Report (Performance Measures 4.1 and 4.2) were updated to the Annual Management Practice Implementation and Nitrogen Application Report. Lastly, the language in Performance Measure 4.7 was updated to replace "verified" with "determined to be."

Performance Goal 5:

The reference to A/Y in Performance Measure and Output of 5.1 was removed since 99% of crop nitrogen removed coefficients must be determined by March 1, 2023.

Table 1. Revised Performance Goals and Performance Measures for the ESJWQC GQMP.

Performance Goal/Performance Measure	Outputs	Who
Performance Goal 1: Review each member's Farm Evaluation (FE) to determine number/type of management practices in place		
Performance Measure 1.1 - *Analyze 100% of FEs to track implementation of wellhead protection practices on member irrigation supply wells*	In 2018, report the irrigation supply wellhead protection practices, the number of members who may need additional practices, and an evaluation of changes over time. Evaluate again in 2021 and every five years thereafter.	ESJWQC
Performance Measure 1.2 - *Analyze 100% of FEs to track destruction of abandoned wells on member management units.*	In 2018, report the number of abandoned wells that are destroyed, the number of members associated with wells that have an unknown method of abandonment, and an evaluation of changes over time. Evaluate again in 2021 and every five years thereafter.	ESJWQC
Performance Measure 1.3 - *Analyze 100% of INMPs and FEs to track changes in irrigation, pesticide, and nitrogen fertilizer management practices.*	Report annually the changes in member practices for irrigation and nitrogen management that are more protective of groundwater quality. In 2018, report the changes in practices for pesticide management; evaluate again in 2021 and every five years thereafter.	ESJWQC
Performance Goal 2: Ensure all members have properly abandoned wells and adequate wellhead protection measures		
Performance Measure 2.1 – *Within two years of the approved GQMP, the ESJWQC will educate all members regarding the need to have adequate wellhead protection measures.*	Report annually the updated abandonment information.	ESJWQC
Performance Measure 2.2 – *All members will have adequate wellhead protection measures in place within 24 months.*	Report annually in the AMR, the percent of wells with adequate wellhead protection.	ESJWQC Members
Performance Measure 2.3 – *All members will properly destroy abandoned wells on their property within 24 months of either identifying the abandoned well, or after having abandoned the well.*	Report annually in the AMR, the number and percent of abandoned wells known to members that are properly destroyed.	ESJWQC Members
Performance Goal 3: Develop a list of management practices associated with the 4Rs and distribute the information to members		
Performance Measure 3.1 – *Within six months of GQMP approval, develop a list of practices associated with the 4 R's that can be distributed to members growing almonds, walnuts, pistachios, tomatoes, corn, and grapes.*	A completed information packet ready for member distribution.	ESJWQC
Performance Measure 3.2 – *Within six months from completion of PM 3.1, provide to ESJWQC members representing at least 50% of the HVA acreage the product output from PM 3.1 (information on practices that are considered to be protective of groundwater).*	Report in the AMR a count of members by crop who have received the information packet from PM 3.1.	ESJWQC
Performance Measure 3.3 - *Within 24 months from GQMP approval, provide to 100% of ESJWQC members within the HVA area that grow those crops, the product output from PM 3.1.*	Report in the AMR a count of members by crop who have received the information packet from PM 3.1.	ESJWQC
Performance Measure 3.4 – *Within one year of GQMP approval, develop a summary of information for growers regarding the use of nitrogen. The summary shall include information regarding how growers should determine appropriate nitrogen application rates for their crops based on available information from CDFA, UCCE and others, determine the right timing for application, and determine the right placement for the crops identified in 3.1, which collectively cover approximately 80% of the acreage in the HVAs.*	A matrix of crop-specific nitrogen application rates, timing, and placement based on guidelines developed by CDFA, UCCE, and commodity groups.	ESJWQC

Performance Goal/Performance Measure	Outputs	Who
Performance Measure 3.5 – *Within six months of completion of PM 3.4, distribute the product output from PM 3.4 to 50% of members growing almonds, walnuts, pistachios, tomatoes, corn, and grapes that collectively cover approximately 80% of the HVA acreage.*	Report in the AMR a count of members by crop who received the product output of PM 3.4.	ESJWQC
Performance Measure 3.6 – *Within one year of completion of PM 3.4, distribute the product output from PM 3.4 to 100% of members growing almonds, walnuts, pistachios, tomatoes, corn, and grapes that collectively cover approximately 80% of the HVA acreage.*	Report in the AMR a count of members by crop who received the product output of PM 3.4.	ESJWQC
Performance Goal 4: Members adopt additional management practices when appropriate to reduce potential leaching of nitrate to groundwater		
Performance Measure 4.1 – Annually analyze distribution of crop-specific A/R and A-R values to evaluate nitrogen management performance of growers for all crops. If crop- specific removal coefficients are not available, A/Y will be plotted.	Annual Management Practice Implementation and Nitrogen Application Report	ESJWQC
Performance Measure 4.2 – *Identify individual fields that are outliers in the crop-specific distribution of A/R values.*	Annual Management Practice Implementation and Nitrogen Application Report	ESJWQC
Performance Measure 4.3 – Within 12 months of completing PM 4.2, conduct crop-specific meetings with 100% of members with outlier management units and obtain additional information on management practices (See Figure 1 for outreach prioritization schedule).	Member surveys and additional information about nitrogen application.	ESJWQC Members
Performance Measure 4.4 – *Within five years of a member attending the ESJWQC meeting as described in PM 4.3, the ESJWQC will re-evaluate outlier member information.*	Summary of changes in A-R and A/R values for growers with management units identified as verified outliers.	ESJWQC
Performance Measure 4.5 – *Within five years of a member attending the ESJWQC meeting as described in PM 4.3, outlier members will improve their running 3-year average A/R, A-R or other appropriate approved metric.*	Summary of changes in A-R and A/R values for growers with management units identified as verified outliers.	ESJWQC
Performance Measure 4.6 –*Starting with the 2019 crop year, members will utilize N concentration data applicable to the parcel for use in planning nitrogen applications.*	Reporting of the amount of nitrogen applied in irrigation water based on submitted Irrigation and Nitrogen Management Plan Summary Reports.	ESJWQC Members
Performance Measure 4.7 – *As management practices are determined to be protective through the Management Practices Evaluation Program (MPEP), members will implement these practices as appropriate. Within five years of receiving outreach materials (schedule provided in MPEP Phase III Work Plan), 100% of growers will implement practices on parcels as needed.*	Summary of nitrogen and irrigation management practices will be reported annually and compared to MPEP verified practices.	ESJWQC Members
Performance Goal 5: Evaluate the effectiveness of new management practices		
Performance Measure 5.1 – *Within five years from the time a management unit is identified as a verified outlier, evaluate if verified outlier management units are reducing their 3-year running average A/R.*	Documented reduction in crop-specific A/R statistics.	ESJWQC
Performance Measure 5.2 – *Evaluate groundwater quality in wells monitored during the Groundwater Trend Monitoring Program.*	Groundwater quality monitoring results in the Groundwater Trend Monitoring Update Report.	ESJWQC
Performance Measure 5.3 – *Evaluate trends in groundwater quality every five years in the GAR Update.*	Trend in groundwater quality in ESJWQC HVAs analyzed in the GAR Update.	ESJWQC

OUTREACH PROCESS AND INCORPORATION OF MPIR

The Focused Outreach process for nitrate described in the GQMP consists of identifying management units with high A/R ratios, conducting outreach and education, and tracking management practice implementation.

The Coalition will prioritize members for Focused Outreach by first addressing the highest acreage crops grown in the Coalition area, eventually addressing all crops with outlier management units (Figure 1). Focused Outreach for groundwater will be conducted with members who have parcels identified as outliers using the updated outlier strategy. These growers will be required to attend crop-specific meetings to discuss nitrogen application recommendations from the Fertilizer Research and Education Program (FREP) including "the 4 Rs" (Right time, Right place, Right rate and Right form).

All members participating in Focused Outreach will complete a GW MPIR (either the Tree/Vine or the Row Crop version) by indicating which practices they are currently implementing and which practices they plan to implement in the upcoming year based on information received in the meetings (Appendix I and Appendix II). The year following the initial meeting, the ESJWQC will follow-up with growers who indicated that they planned to implement additional management practices to determine if they were implemented. Members will be contacted if practices were not implemented and asked what the reason is for the delay.

The Coalition will re-evaluate the member's A/R 3-year ratio in the fifth year of the Focused Outreach cycle (Figure 1). The Coalition needs three years of A/R data from when members began implementing new practices in order to determine if the member's A/R ratio is changing to a value that will move the member's field out of outlier status.

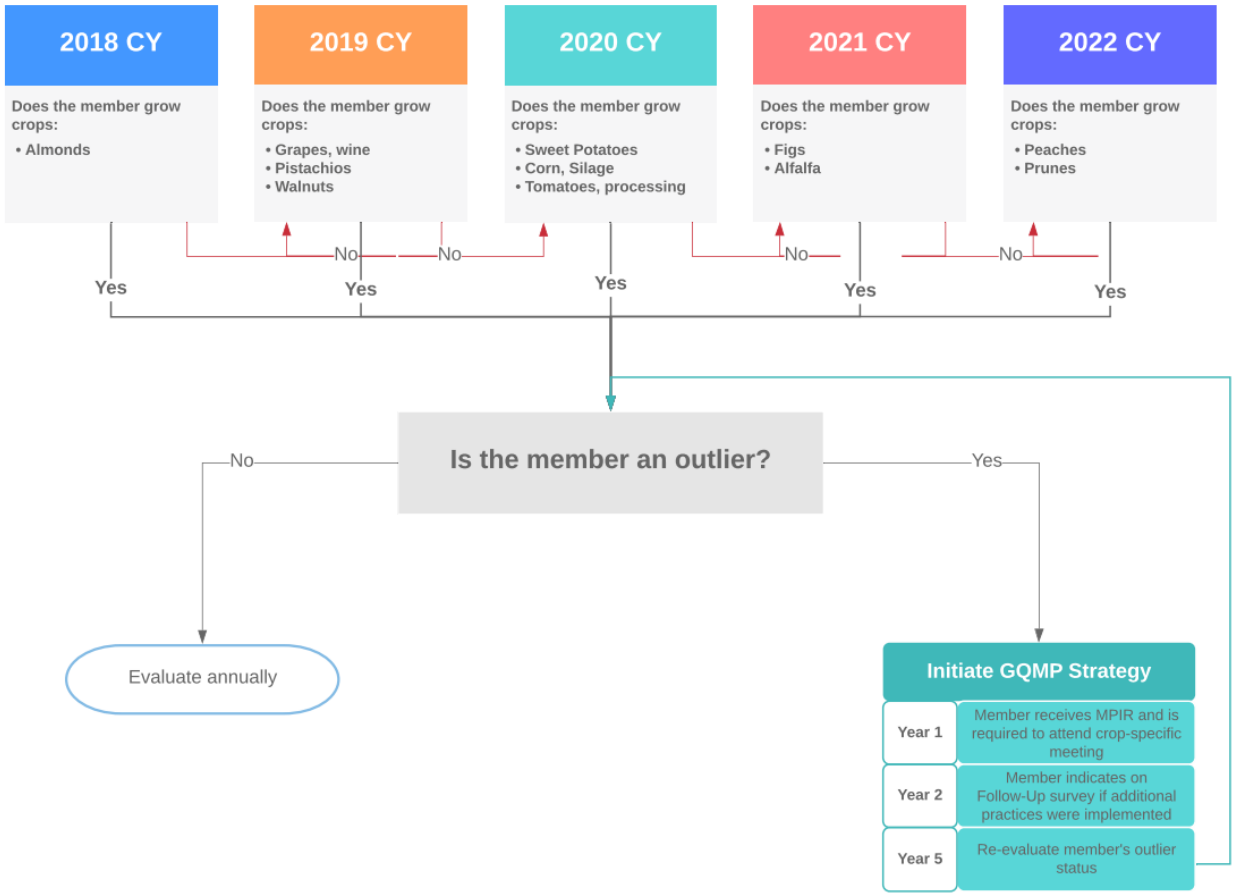
Annually, the Coalition will calculate A/R 3-year ratios and determine which parcels are outliers. If newly identified outlier parcels are managed by members that have not participated in Focused Outreach for a previously prioritized crop, the member will be contacted to participate in Focused Outreach. Members will be asked to view a recording of the crop-specific meeting for their crop and complete the MPIR survey. Coalition staff will host viewings of the crop-specific meetings and be available to answer questions at participating Farm Bureau offices. The Coalition will encourage members to physically come into the Farm Bureau office but will allow members to watch the videos online if they are unable to attend in person.

As new members are required to participate in Focused Outreach, they will be mailed a GW MPIR packet that includes either the Vine/Tree and/or Row Crop GW MPIR survey. The packets will provide all the necessary information to inform members of their nitrogen applied and removed values compared to other members in the ESJWQC growing the same crop. The packet will also include when crop specific meetings will be held for them to attend.

The GW MPIR packet contains (Appendix I & II):

1. Groundwater Management Practice Implementation Report - 2019
2. Follow-Up Groundwater MPIR (*sent to member one year after initial survey is received*).

Figure 1. GQMP Focused Outreach flow chart and crop prioritization schedule.



GROUNDWATER MPIR REPORTING

For the 2019 GW MPIRs and Focused Outreach, the ESJWQC will prioritize members growing almonds with A/R 3-year ratios that are considered outliers based on the medcouple interquartile outlier method approved by the Executive Office on July 3, 2019. The data used to determine outliers for the 2019 GW MPIR and Focused Outreach is reflective of the nitrogen applied and reported yields from the 2016, 2017, and 2018 CYs.

These members have likely already been notified that they were outliers based on the box and whisker outlier approach previously utilized. These members were required to attend crop-specific meetings conducted by the ESJWQC in 2017 and 2018 where FREP outreach and education materials regarding nitrogen and irrigation management practices were made available.

The GW MPIR included in Appendix I (Tree/Vines) and Appendix II (Row Crops) will be utilized to document current irrigation and nitrogen management practices and record any practices that will be implemented in the growing season of 2020. A follow-up survey will be sent by March 2021 to determine which practices were implemented in 2020. The ESJWQC will use the initial and follow-up GW MPIRs to track newly implemented practices.

Groundwater MPIR data will be summarized in the May 1 Annual Report and data will be submitted to the Regional Board annually on July 1 with the Annual Management Practice Implementation and Nitrogen Application Report.

FUTURE GQMP AMENDMENTS

Six months from the Executive Officer's approval of the Groundwater Protection Formula, the Coalition will amend the GQMP to incorporate the use of Groundwater Protection Values. At that time, the Coalition will re-evaluate the GQMP strategy including who is required to participate in Focused Outreach and complete a GW MPIR.

It is anticipated that the GQMP will be amended to incorporate Groundwater Protection Values in 2021 and the flowchart in Figure 1 will be revised at that time.

Appendix I

Groundwater Management Practice Implementation Report – Template for Trees & Vines

Appendix II

Groundwater Management Practice Implementation Report – Template for Row Crops

PLEASE RETURN TO COALITION

[Trees & Vines]
[Crop Years Evaluated]
Management Practice Implementation Report

ESJWQC Member ID# [Prepopulated]

Date: _____

Attendees: _____

Packet Contents

To Be Determined

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Management Practice Implementation Report

Irrigation Management

I-1. What is the source of your irrigation water?

- ☐ Surface water (including irrigation district deliveries)
- ☐ Groundwater
- ☐ Riparian water rights/pumping

I-2. What information is used to schedule irrigations:

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Crop condition
☐	☐	☐	Soil type
☐	☐	☐	Weather
☐	☐	☐	Use a predetermined frequency (example: Every 15 days based on surface water deliveries)
☐	☐	☐	Evaluate plant water status either visually or using a pressure chamber
☐	☐	☐	Estimate crop water requirements using regional evapotranspiration (ET) data
☐	☐	☐	Regularly evaluate soil moisture using tensiometers, electrical resistance blocks, manual soil probe, neutron probe, etc.
☐	☐	☐	Calculate water applied each irrigation

I-3. Which of the following irrigation management practices do you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Measure irrigation system performance and efficiency using flow meters and/or measuring pressure at key points in irrigation system
☐	☐	☐	Measure water flow using water meters or time of operation combined with pump test data
☐	☐	☐	Use deficit irrigation to reduce water use and potential leaching of nitrate

Questions I-4 through I-7 are irrigation practice specific. Please answer the questions that apply to your field or management unit. Check N/A if you do not use that irrigation practice.

I-4. Which of the following flood/furrow irrigation efficiency practices do you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐			N/A – Do not flood or furrow irrigate
☐	☐	☐	Grade for constant slope or taper slope for bottom 1/3rd of field
☐	☐	☐	Short furrow length (under half a mile)
☐	☐	☐	Increase flow rate as high as possible without erosion
☐	☐	☐	Decrease duration of irrigation set to reduce deep percolation
☐	☐	☐	Alternate furrow irrigation
☐	☐	☐	“Surge” irrigation

I-5. Which of the following solid set sprinkler irrigation efficiency practices do you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐			N/A – Do not use solid set sprinkler irrigation
☐	☐	☐	Measure system average application rate
☐	☐	☐	Irrigate at low wind speed to minimize interference
☐	☐	☐	Manage or monitor depth of wetting for each irrigation event
☐	☐	☐	Address factors of poor distribution uniformity

I-6. Which of the following micro-sprinkler irrigation efficiency practices do you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐			N/A – Do not irrigate with micro-sprinklers
☐	☐	☐	Design and maintain micro system for pressure and distribution uniformity
☐	☐	☐	Manage or monitor depth of wetting for each irrigation event
☐	☐	☐	Irrigate when wind is least expected to cause interference

I-7. Which of the following drip irrigation efficiency practices do you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐			N/A – Do not drip irrigate
☐	☐	☐	Design and maintain drip system for pressure and distribution uniformity
☐	☐	☐	Manage or monitor depth of wetting for each irrigation event

I-8. If using flood or furrow irrigation, do you plan to convert to drip or micro-sprinkler irrigation in future?

- ☐ Yes (in less than one year)
- ☐ Yes (in one to two years)
- ☐ Yes (in more than two years)
- ☐ No
- ☐ I do not flood or furrow irrigate

Notes:

Nitrogen Management

N-1. Do you test your irrigation water for nitrate?

- ☐ Yes
- ☐ No

N-2. Do you test your soil for residual nitrogen?

- ☐ Yes
- ☐ No

N-3. Do you test the nitrogen content of plant tissue?

- ☐ Yes
- ☐ No

N-4. Check all nitrogen (N) management practices that you use or plan to use:

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Inject nitrogen fertilizer toward the end of an irrigation event
☐	☐	☐	Multiple N applications to match crop uptake
☐	☐	☐	Adjust N applications based on visual plant health/condition
☐	☐	☐	Adjust N applications based on amount of nitrate in irrigation water
☐	☐	☐	Adjust N applications based on amount of residual nitrogen in soil
☐	☐	☐	Adjust N applications based on use of organic amendments (manure, compost)
☐	☐	☐	Adjust N applications based on plant tissue testing results

N-5. What form of nitrogen fertilizer do you use, if any?

- ☐ Nitrate
- ☐ Ammonium
- ☐ Anhydrous ammonia (gas)
- ☐ Urea
- ☐ Slow release nitrogen
- ☐ Nitrogen derived from organic residues including; compost, manure, greenwaste, or similar
- ☐ I don't use nitrogen fertilizer

N-6. When injecting nitrogen fertilizer into a pressurized irrigation system, which of the following practices do you use?

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Check valve/backflow prevention device
☐	☐	☐	Precision injection metering device
☐	☐	☐	Inject nitrogen fertilizer over a long enough period to ensure adequate uniformity across the treated field
☐	☐	☐	Inject nitrogen fertilizer in last half/quarter of irrigation set
☐	☐	☐	Manage or monitor the concentration (ppm) of nitrogen dissolved in water after injection

N-7. For fields irrigated by flood/furrow, how do you apply nitrogen?

N/A	Already Implemented	Plan to Implement	
☐			N/A - I do not flood or furrow irrigate
☐	☐	☐	Preplant broadcast
☐	☐	☐	Preplant banding
☐	☐	☐	In-season sidedress banding

Notes:

Soil Management and Cover Crops

S-1. What soil improvement practices do you use?

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Planted or native cover crops
☐	☐	☐	Gypsum or lime
☐	☐	☐	Compost
☐	☐	☐	Deep ripping
☐	☐	☐	Plant legumes (alfalfa, beans, and clover) to fix nitrogen in soil

S-2. If your soil is poorly drained or salt-affected, what are the management practices you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Planted or native cover crops
☐	☐	☐	Subsurface drains
☐	☐	☐	Soil amendments
☐	☐	☐	Apply water in excess of crop needs to leach salts
☐	☐	☐	Deep ripping

Notes:

Yield Impacted by Uncontrollable Conditions

Y-1. An outlier designation for a field or management unit can result from uncontrollable factors that caused reduction in yields for one or more years. Check all circumstances below that apply.

- ☐ Not applicable
- ☐ Pest outbreak
- ☐ Poor crop set
- ☐ Weather stress (frost, hail, heat, drought, rain at harvest, etc.)
- ☐ Salt stress
- ☐ Alternate bearing years (“off”)
- ☐ Old trees or vines (production declining)
- ☐ Not full production plants (trees or vines)

X-4. Where do you get your nitrogen management information? Please check all that apply.

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Certified Crop Advisor (CCA)
☐	☐	☐	University farm advisor
☐	☐	☐	East San Joaquin Water Quality Coalition
☐	☐	☐	Agronomist
☐	☐	☐	Farm input supplier
☐	☐	☐	Soil analytical laboratory
☐	☐	☐	Online resources

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REQUIRED

Follow-Up Survey to Crop-Specific Meeting

This survey is in follow-up to the meeting on [Date] for [Crop Type]. Based on the information received during your meeting, the Coalition would like to know if you implemented additional management practices to improve your A/R efficiency value.

Survey responses for which you selected "Plan to Implement" on the initial Groundwater Management Practice Implementation Report are shown below by category. Check the box for all new practices you implemented. Fill out the bottom of the page if you were unable to implement new practices.

Attendee(s):
[Member/Member Representative Name]

Parcel Number	Acreage	Crop Type	A/R 3-Year Outlier Ratio
[XXX-XX-XXX]	[XX]	[XX]	[XX]

Section I: Irrigation Management

Information used to schedule irrigations:	Planned to Implement	Implemented
Weather	✓	☐
Use a predetermined frequency (example: Every 15 days based on surface water deliveries)	✓	☐
Evaluate plant water status either visually or using a pressure chamber	✓	☐
Estimate crop water requirements using regional evapotranspiration (ET) data	✓	☐

Irrigation management practices:	Planned to Implement	Implemented
Measure irrigation system performance and efficiency using flow meters and/or measuring pressure at key points in irrigation system	✓	☐
Measure water flow using water meters or time of operation combined with pump test data	✓	☐
Account for rooting depth of crop to minimize the movement of water past the root zone (row crop specific)	✓	☐
Estimate crop water requirements using regional evapotranspiration (ET) data	✓	☐

Drip irrigation efficiency practices:	Planned to Implement	Implemented
Design and maintain drip system for pressure and distribution uniformity	✓	☐
Know the wetted area and choose application amounts and frequencies that keep water in the root zone (row crop only)	✓	☐

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Section N: Nitrogen Management

Nitrogen (N) management practices:	Planned to Implement	Implemented
Multiple N applications to match crop uptake	✓	☐
Adjust N applications based on visual plant health/condition	✓	☐
Adjust N applications based on amount of nitrate in irrigation water	✓	☐
Adjust N applications based on amount of residual nitrogen in soil	✓	☐

Injecting nitrogen into a pressurized system management practices:	Planned to Implement	Implemented
Precision injection metering device	✓	☐
Inject nitrogen fertilizer over a long enough period to ensure adequate uniformity across the treated field	✓	☐
Inject nitrogen fertilizer in last half/quarter of irrigation set	✓	☐

Section S: Soil Management and Cover Crops

Soil improvement practices:	Planned to Implement	Implemented
Compost	✓	☐
Deep ripping	✓	☐

Section 4: Crop Information Resources

Nitrogen management information:	Planned to Implement	Implemented
Certified Crop Advisor (CCA)	✓	☐
University farm advisor	✓	☐

If you were unable to implement a planned practice, please include a brief explanation as to why:

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[Row Crop]
[Crop Years Evaluated]
Management Practice Implementation Report

ESJWQC Member ID# [Prepopulated]

Date: _____

Attendees: _____

Packet Contents

To Be Determined

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Management Practice Implementation Report

Irrigation Management

I-1. What is the source of your irrigation water?

- ☐ Surface water (including irrigation district deliveries)
- ☐ Groundwater
- ☐ Riparian water rights/pumping

I-2. What information is used to schedule irrigations:

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Crop condition
☐	☐	☐	Soil type
☐	☐	☐	Weather
☐	☐	☐	Use a predetermined frequency (example: Every 15 days based on surface water deliveries)
☐	☐	☐	Evaluate plant water status either visually or using a pressure chamber
☐	☐	☐	Estimate crop water requirements using regional evapotranspiration (ET) data
☐	☐	☐	Regularly evaluate soil moisture using tensiometers, electrical resistance blocks, manual soil probe, neutron probe, etc.
☐	☐	☐	Calculate water applied each irrigation

I-3. Which of the following irrigation management practices do you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Measure irrigation system performance and efficiency using flow meters and/or measuring pressure at key points in irrigation system
☐	☐	☐	Measure water flow using water meters or time of operation combined with pump test data
☐	☐	☐	Account for rooting depth of crop to minimize the movement of water past the root zone
☐	☐	☐	Use deficit irrigation to reduce water use and potential leaching of nitrate

Questions I-4 through I-7 are irrigation practice specific. Please answer the questions that apply to your field or management unit. Check N/A if you do not use that irrigation practice.

I-4. Which of the following flood/furrow irrigation efficiency practices do you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐			N/A – Do not flood or furrow irrigate
☐	☐	☐	Grade for constant slope or taper slope for bottom 1/3rd of field
☐	☐	☐	Short furrow length (under half a mile)
☐	☐	☐	Increase flow rate as high as possible without erosion
☐	☐	☐	Decrease duration of irrigation set to reduce deep percolation
☐	☐	☐	Compact furrows after cultivation
☐	☐	☐	Alternate furrow irrigation

☐	☐	☐	"Surge" irrigation
☐	☐	☐	Cutback flow in border-check irrigation when water reaches end

I-5. Which of the following solid set sprinkler irrigation efficiency practices do you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐			N/A – Do not use solid set sprinkler irrigation
☐	☐	☐	Measure system average application rate
☐	☐	☐	Irrigate at low wind speed to minimize interference
☐	☐	☐	Manage or monitor depth of wetting for each irrigation event
☐	☐	☐	Address factors of poor distribution uniformity

I-6. Which of the following micro-sprinkler irrigation efficiency practices do you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐			N/A – Do not irrigate with micro-sprinklers
☐	☐	☐	Design and maintain micro system for pressure and distribution uniformity
☐	☐	☐	Know the wetted area and choose application amounts and frequencies that keep water in the root zone
☐	☐	☐	Manage or monitor depth of wetting for each irrigation event
☐	☐	☐	Irrigate when wind is least expected to cause interference

I-7. Which of the following drip irrigation efficiency practices do you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐			N/A – Do not drip irrigate
☐	☐	☐	Design and maintain drip system for pressure and distribution uniformity
☐	☐	☐	Know the wetted area and choose application amounts and frequencies that keep water in the root zone
☐	☐	☐	Manage or monitor depth of wetting for each irrigation event

I-8. If using flood or furrow irrigation, do you plan to convert to drip or micro-sprinkler irrigation in future?

- ☐ Yes (in less than one year)
- ☐ Yes (in one to two years)
- ☐ Yes (in more than two years)
- ☐ No
- ☐ I do not flood or furrow irrigate

Notes:

Nitrogen Management

N-1. Do you test your irrigation water for nitrate?

- ☐ Yes
- ☐ No

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N-2. Do you test your soil for residual nitrogen?

- ☐ Yes
- ☐ No

N-3. Do you test the nitrogen content of plant tissue?

- ☐ Yes
- ☐ No

N-4. Check all nitrogen (N) management practices that you use or plan to use:

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Inject nitrogen fertilizer toward the end of an irrigation event
☐	☐	☐	Multiple N applications to match crop uptake
☐	☐	☐	Adjust N applications based on visual plant health/condition
☐	☐	☐	Adjust N applications based on amount of nitrate in irrigation water
☐	☐	☐	Adjust N applications based on amount of residual nitrogen in soil
☐	☐	☐	Adjust N applications based on use of organic amendments (manure, compost)
☐	☐	☐	Adjust N applications based on plant tissue testing results

N-5. What form of nitrogen fertilizer do you use, if any?

- ☐ Nitrate
- ☐ Ammonium
- ☐ Anhydrous ammonia (gas)
- ☐ Urea
- ☐ Slow release nitrogen
- ☐ Nitrogen derived from organic residues including; compost, manure, greenwaste, or similar
- ☐ I don't use nitrogen fertilizer

N-6. When injecting nitrogen fertilizer into a pressurized irrigation system, which of the following practices do you use?

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Check valve/backflow prevention device
☐	☐	☐	Precision injection metering device
☐	☐	☐	Inject nitrogen fertilizer over a long enough period to ensure adequate uniformity across the treated field
☐	☐	☐	Inject nitrogen fertilizer in last half/quarter of irrigation set
☐	☐	☐	Manage or monitor the concentration (ppm) of nitrogen dissolved in water after injection

N-7. For fields irrigated by flood/furrow, how do you apply nitrogen?

N/A	Already Implemented	Plan to Implement	
☐			N/A - I do not flood or furrow irrigate
☐	☐	☐	Preplant broadcast
☐	☐	☐	Preplant banding
☐	☐	☐	In-season side dress banding

Notes:

Soil Management and Cover Crops

S-1. What soil improvement practices do you use?

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Planted or native cover crops
☐	☐	☐	Gypsum or lime
☐	☐	☐	Compost
☐	☐	☐	Deep ripping
☐	☐	☐	Plant legumes (alfalfa, beans, and clover) to fix nitrogen in soil

S-2. If your soil is poorly drained or salt-affected, what are the management practices you use or plan to use?

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Planted or native cover crops
☐	☐	☐	Subsurface drains
☐	☐	☐	Soil amendments
☐	☐	☐	Apply water in excess of crop needs to leach salts
☐	☐	☐	Deep ripping

Notes:

Yield Impacted by Uncontrollable Conditions

Y-1. An outlier designation for a field or management unit can result from uncontrollable factors that caused reduction in yields for one or more years. Check all circumstances below that apply.

- ☐ Not applicable
- ☐ Pest outbreak
- ☐ Poor crop set
- ☐ Weather stress (frost, hail, heat, drought, rain at harvest, etc.)
- ☐ Salt stress
- ☐ Alternate bearing years (“off”)
- ☐ Old trees or vines (production declining)
- ☐ Not full production plants (trees or vines)

X-4. Where do you get your nitrogen management information? Please check all that apply.

N/A	Already Implemented	Plan to Implement	
☐	☐	☐	Certified Crop Advisor (CCA)
☐	☐	☐	University farm advisor
☐	☐	☐	East San Joaquin Water Quality Coalition
☐	☐	☐	Agronomist
☐	☐	☐	Farm input supplier
☐	☐	☐	Soil analytical laboratory
☐	☐	☐	Online resources

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REQUIRED

Follow-Up Survey to Crop-Specific Meeting

This survey is in follow-up to the meeting on [Date] for [Crop Type]. Based on the information received during your meeting, the Coalition would like to know if you implemented additional management practices to improve your A/R efficiency value.

Survey responses for which you selected "Plan to Implement" on the initial Groundwater Management Practice Implementation Report are shown below by category. Check the box for all new practices you implemented. Fill out the bottom of the page if you were unable to implement new practices.

Attendee(s):
[Member/Member Representative Name]

Parcel Number	Acreage	Crop Type	A/R 3-Year Outlier Ratio
[XXX-XX-XXX]	[XX]	[XX]	[XX]

Section I: Irrigation Management

Information used to schedule irrigations:	Planned to Implement	Implemented
Weather	✓	☐
Use a predetermined frequency (example: Every 15 days based on surface water deliveries)	✓	☐
Evaluate plant water status either visually or using a pressure chamber	✓	☐
Estimate crop water requirements using regional evapotranspiration (ET) data	✓	☐

Irrigation management practices:	Planned to Implement	Implemented
Measure irrigation system performance and efficiency using flow meters and/or measuring pressure at key points in irrigation system	✓	☐
Measure water flow using water meters or time of operation combined with pump test data	✓	☐
Account for rooting depth of crop to minimize the movement of water past the root zone (row crop specific)	✓	☐
Estimate crop water requirements using regional evapotranspiration (ET) data	✓	☐

Drip irrigation efficiency practices:	Planned to Implement	Implemented
Design and maintain drip system for pressure and distribution uniformity	✓	☐
Know the wetted area and choose application amounts and frequencies that keep water in the root zone (row crop only)	✓	☐

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Section N: Nitrogen Management

Nitrogen (N) management practices:	Planned to Implement	Implemented
Multiple N applications to match crop uptake	✓	☐
Adjust N applications based on visual plant health/condition	✓	☐
Adjust N applications based on amount of nitrate in irrigation water	✓	☐
Adjust N applications based on amount of residual nitrogen in soil	✓	☐

Injecting nitrogen into a pressurized system management practices:	Planned to Implement	Implemented
Precision injection metering device	✓	☐
Inject nitrogen fertilizer over a long enough period to ensure adequate uniformity across the treated field	✓	☐
Inject nitrogen fertilizer in last half/quarter of irrigation set	✓	☐

Section S: Soil Management and Cover Crops

Soil improvement practices:	Planned to Implement	Implemented
Compost	✓	☐
Deep ripping	✓	☐

Section 4: Crop Information Resources

Nitrogen management information:	Planned to Implement	Implemented
Certified Crop Advisor (CCA)	✓	☐
University farm advisor	✓	☐

If you were unable to implement a planned practice, please include a brief explanation as to why: